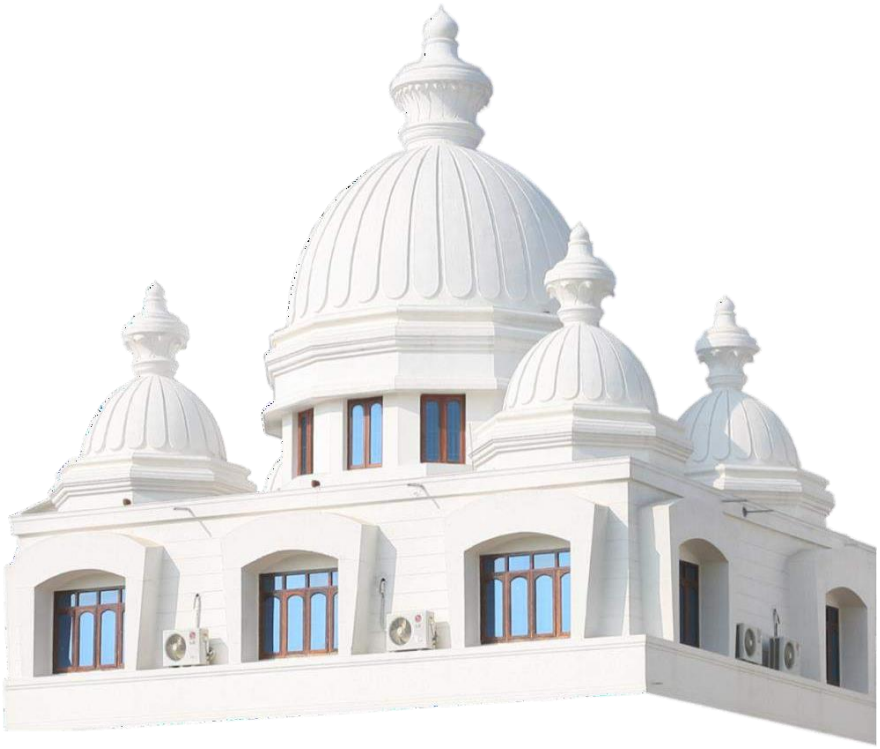
B.E. Civil Engineering

CURRICULUM AND SYLLABI

I to VIII Semesters

Regulation – 2023 / V2



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

www.excelinstitutions.com

EXCEL ENGINEERING COLLEGE

KOMARAPALAYAM

DEPARTMENT OF CIVIL ENGINEERING

VISION

- To impart quality engineering education to the Civil Engineering students for meeting the challenges of competent industrial scenario**.**

MISSION

- To provide a strong base for acquiring sound knowledge and to motivate creativity among the students.
- To inspire the students to get adopted for the environmental changes and to retain sustainability.
- To develop the students as technocrats for ever growing global demands.
- To mould the students for playing a vital role in the prosperity of human civilization with ethics, culture, human values and leadership.

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

I. To enhance the knowledge and skills of students in emerging trends of Science, Engineering and Technology.

II. To prepare the students to meet the industrial needs by adopting the latest technologies.

III. To encourage the students for continuous learning and creating opportunities through course work, seminar, workshop, symposium and conference.

IV. To motivate the students to become members in professional societies and update their knowledge for meeting the global challenges.

EXCEL ENGINEERING COLLEGE
KOMARAPALAYAM

DEPARTMENT OF CIVIL ENGINEERING

PROGRAMME OUTCOMES [PO's]

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science, and engineering science.

3. **Design/ development of solution:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigation of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective

presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES [PSO's]

DEVELOPING THE CIVIL ENGINEERING SOFTWARE SKILLS

- To develop the skills in Civil Engineering field to become well-versed in Modern Surveying, Structural Analysis, Structural Design and Quantity Surveying using the latest softwares.

DEVELOPING HUMAN SKILLS

- To imbibe the skills on supervising, co-ordinating guiding leading and decision making in the minds of Civil Engineering students for completing infrastructure projects in time.

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KOMARAPALAYAM - 637303

B E CIVIL ENGINEERING
REGULATION 2023
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTER CURRICULUM AND SYLLABI

I SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23CE101	Engineering Geology	ES	3	0	0	3	40	60	100
23MA102	Matrices and Calculus	BS	3	2	0	4	40	60	100
23LET07	Heritage of Tamils (தமிழர் மரபு)	HSS	1	0	0	1	100	0	100
Theory with Practical Course (s)									
23LEE01	Communicative English	HSS	2	0	2	3	50	50	100
23CH102	Chemistry for Material Sciences (Common to Aero, Agri, Civil, FT, Mech, PCT & SF)	BS	3	0	2	4	50	50	100
23ME101	Engineering Graphics	ES	1	0	4	3	50	50	100
Practical Course (s)									
23CE102	Civil Engineering Practices Laboratory	ES	0	0	2	1	60	40	100
Mandatory Course - I									
23MC101	Induction Programme	MC	2 Weeks			0	100	0	100
Total			**13**	**2**	**10**	**19**	**490**	**310**	**800**

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II SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23MA202	Mathematical Foundations for Engineering (Common to All Programmes)	BS	3	2	0	4	40	60	100
23ME201	Engineering Mechanics	ES	3	2	0	4	40	60	100
23LET08	Tamils and Technology (தமிழரும் தததொழில்நுட்பமும்)	HSS	1	0	0	1	100	0	100
Theory with Practical Course (s)									
23LEE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100
23LEJ06	Japanese	HSS	2	0	2	3	50	50	100
23PH202	Materials Physics	BS	3	0	2	4	50	50	100
23CS203	Problem Solving using Python Programming	ES	3	0	2	4	50	50	100
Practical Course (s)									
23CE201	Computer Aided Building Drawing Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MC202	Environmental Sciences	MC	2	0	0	0	100	0	100
Total			**17**	**4**	**8**	**21**	**540**	**360**	**900**

III SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									

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23MA301	Transforms and Boundary Value Problems	BS	3	2	0	4	40	60	100
23UH001	Universal Human Values	HSS	3	0	0	3	40	60	100
23CE301	Mechanics of Solids - I	ES	3	0	0	3	40	60	100
23CE302	Fluid Mechanics	ES	3	0	0	3	40	60	100
Theory with Practical Course									
23CE303	Surveying - I	PC	3	0	2	4	50	50	100
23CE304	Construction Materials and Technology	PC	3	0	2	4	50	50	100
Mandatory Course									
23MC003	Interpersonal Skills	MC	0	0	2	0	100	0	100
Total			**18**	**2**	**6**	**21**	**360**	**340**	**700**

IV SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course (s)									
23MA402	Statistical and Numerical Methods	BS	3	2	0	4	40	60	100
23CE401	Concrete Technology	PC	3	0	0	3	40	60	100
23CE402	Geotechnical Engineering - I	PC	3	0	0	3	40	60	100
23CE403	Mechanics of Solids - II	PC	3	2	0	4	40	60	100
Theory with Practical Course									
23CE404	Surveying - II	PC	3	0	2	4	50	50	100

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23CE405	Applied Hydraulics Engineering	ES	3	0	2	4	50	50	100
Practical Course (s)									
23CE406	Strength of Materials Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MC005	Yoga and Values for Holistic Development	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**	**ESE**	**Total**
Theory Course(s)									
23CE501	Design of Reinforced Cement Concrete Elements	PC	3	2	0	4	40	60	100
23CE502	Structural Analysis I	PC	3	0	0	3	40	60	100
23CEEXX	Professional Elective - I	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective - I	OE	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23CE503	Environmental Engineering I	PC	3	0	2	4	50	50	100
23CE504	Geotechnical Engineering II	PC	3	0	2	4	50	50	100
Practical Course(s)									
23CE505	Survey Camp	PC	1 Week			1	100	0	100
Mandatory Course (s)									
23MCXXX	Mandatory Course – IV	MC	2	0	0	0	100	0	100
	Knowledge Demonstration – III	KD	0	0	2	0	10%Total Sem Marks		
		Total	**20**	**2**	**6**	**22**	**460**	**340**	**800**

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VI SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23CE601	Design of Steel Structural Elements	PC	3	2	0	4	40	60	100
23CE602	Structural Analysis - II	PC	3	0	0	3	40	60	100
23CE603	Environmental Engineering - II	PC	3	0	0	3	40	60	100
23CE604	Highway Engineering	PC	3	0	0	3	40	60	100
23CEEXX	Professional Elective - II	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective - II	OE	3	0	0	3	40	60	100
Practical Course (s)									
23CE605	Highway Engineering Laboratory	PC	0	0	2	1	60	40	100
Employability Enhancement Course - EEC									
23EEC601	Design Thinking and Mini Project	EEC	0	0	4	2	60	40	100
23EEC602	Internship	EEC	2 Weeks			1	100	0	100
Total			**19**	**2**	**6**	**23**	**460**	**440**	**900**

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VII SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23CE701	Structural Dynamics and Earthquake Engineering	PC	3	0	0	3	40	60	100
23CE702	Estimation Costing and Valuation Engineering	PC	3	1	0	4	40	60	100
23CE703	Water Resource and Irrigation Engineering	PC	3	0	0	3	40	60	100
23CEEXX	Professional Elective - III	PE	3	0	0	3	40	60	100
23CEEXX	Professional Elective - IV	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective - III	OE	3	0	0	3	40	60	100
Practical Course (s)									
23CE704	Computer Aided Design and Drawing Laboratory (Concrete and Steel)	PC	0	0	2	1	60	40	100
Employability Enhancement Course (s)									
23CE705	Design Project	EEC	0	0	4	2	40	60	100
Total			**18**	**1**	**6**	**22**	**340**	**460**	**800**

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VIII SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23CEEXX	Professional Elective - V	PE	3	0	0	3	40	60	100
23CEEXX	Professional Elective - VI	PE	3	0	0	3	40	60	100
Employability Enhancement Course (s)									
23CE801	Major Project	EEC	0	0	16	08	60	40	100
Total			**6**	**0**	**16**	**14**	**140**	**160**	**300**

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PROFESSIONAL ELECTIVES (PE)									
STREAM-I : ENVIRONMENTAL AND WATER RESOURCE ENGINEERING									
Sub Code	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**ESE**	**Total**
23CEE01	Hydrology	PE	3	0	0	3	40	60	100
23CEE02	Ground Water Engineering	PE	3	0	0	3	40	60	100
23CEE03	Air Pollution and Control Engineering	PE	3	0	0	3	40	60	100
23CEE04	Water Resources Systems Engineering	PE	3	0	0	3	40	60	100
23CEE05	Integrated Water Resources Management	PE	3	0	0	3	40	60	100
23CEE06	Hospital Waste Management	PE	3	0	0	3	40	60	100
23CEE07	Municipal Solid Waste Management	PE	3	0	0	3	40	60	100
23CEE08	Participatory Water Resources Management	PE	3	0	0	3	40	60	100
23CEE09	Air Pollution Management	PE	3	0	0	3	40	60	100
23CEE10	Industrial Waste Management	PE	3	0	0	3	40	60	100
23CEE11	Environmental and Social Impact Assessment	PE	3	0	0	3	40	60	100
23CEE12	Geo-Environmental Engineering	PE	3	0	0	3	40	60	100
23CEE13	Urban Environment Management	PE	3	0	0	3	40	60	100
23CEE14	Water Quality and Management	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**	**ESE**	**Total**
23CEE21	Building Services	PE	3	0	0	3	40	60	100
23CEE22	Disaster Management	PE	3	0	0	3	40	60	100
23CEE23	Industrial Structures	PE	3	0	0	3	40	60	100
23CEE24	Maintenance, Repair and Rehabilitation of Structures	PE	3	0	0	3	40	60	100

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23CEE25	Design of Pre stressed Concrete Structures	PE	3	0	0	3	40	60	100
23CEE26	Experimental Analysis of Stress	PE	3	0	0	3	40	60	100
23CEE27	Bridge Structures	PE	3	0	0	3	40	60	100
23CEE28	Storage Structures	PE	3	0	0	3	40	60	100
23CEE29	Ground Improvement Techniques	PE	3	0	0	3	40	60	100
23CEE30	Cost Effective Construction and Green Building	PE	3	0	0	3	40	60	100
23CEE31	Tall Buildings	PE	3	0	0	3	40	60	100
23CEE32	Prefabricated Structures	PE	3	0	0	3	40	60	100
23CEE33	Rock Mechanics	PE	3	0	0	3	40	60	100
23CEE34	Reinforced Soil Structure	PE	3	0	0	3	40	60	100
23CEE35	Geotechnical Exploration and Instrumentation	PE	3	0	0	3	40	60	100
23CEE36	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**	**ESE**	**Total**
23CEE41	Construction Planning and Scheduling	PE	3	0	0	3	40	60	100
23CEE42	Modern Construction Materials	PE	3	0	0	3	40	60	100
23CEE43	Housing Planning and Management	PE	3	0	0	3	40	60	100
23CEE44	Construction Project Management	PE	3	0	0	3	40	60	100
23CEE45	Economic and Finance Management in Construction	PE	3	0	0	3	40	60	100
23CEE46	System Integration in Construction	PE	3	0	0	3	40	60	100
23CEE47	Contract Laws and Regulation	PE	3	0	0	3	40	60	100
23CEE48	Resource Management and Control in Construction	PE	3	0	0	3	40	60	100
23CEE49	Quality Control and Assurance in Construction	PE	3	0	0	3	40	60	100
23CEE50	Design of Energy Efficient Building	PE	3	0	0	3	40	60	100
23CEE51	Project Formulation and Appraisal	PE	3	0	0	3	40	60	100
23CEE52	Project Safety Management	PE	3	0	0	3	40	60	100
23CEE53	Railway, Airport, Docks and Harbor Engineering	PE	3	0	0	3	40	60	100

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23CEE54	Advanced Construction Techniques	PE	3	0	0	3	40	60	100
23CEE55	Sustainable Construction and Lean Construction	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	ESE	Total
23CEO01	Energy Conservation and Management	OE	3	0	0	3	40	60	100
23CEO02	Environment and Agriculture	OE	3	0	0	3	40	60	100
23CEO03	Renewable Energy Sources	OE	3	0	0	3	40	60	100
23CEO04	Vibration and Noise Control	OE	3	0	0	3	40	60	100
23CEO05	Climate Change and its Impacts	OE	3	0	0	3	40	60	100
23CEO06	Green Building Design	OE	3	0	0	3	40	60	100
23CEO07	Selection of Materials	OE	3	0	0	3	40	60	100
23CEO08	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	ESE	Total
23CEA01	Drafting and Documentation of Construction Projects	PC	1	0	0	1	100	0	100
23CEA02	3D Modeling Techniques of BIM	PC	1	0	0	1	100	0	100
23CEA03	3D Modelling of Buildings	PC	1	0	0	1	100	0	100
23CEA04	Total Station Survey	PC	1	0	0	1	100	0	100
23CEA05	Vasthu	PC	1	0	0	1	100	0	100
23CEA06	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	ESE	Total
23CEB01	Autocad	OE	2	0	2	1	100	0	100
23CEB02	Revit Architecture	OE	2	0	2	1	100	0	100
23CEB03	E tabs	OE	2	0	2	1	100	0	100
23CEB04	3DX Max	OE	2	0	2	1	100	0	100
23CEB05	Stadd Pro.	OE	2	0	2	1	100	0	100

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23CEB06	Primavera	OE	2	0	2	1	100	0	100
23CEB07	Drone Survey	OE	2	0	2	1	100	0	100
23CEB08	Tekla	OE	2	0	2	1	100	0	100

MANDATORY COURSES (MC)									
Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	ESE	Total
23MC001	Induction Programme	OE	2	0	0	0	100	0	100
23MC002	Environmental Sciences	OE	2	0	0	0	100	0	100
23MC003	Interpersonal Skills	OE	2	0	0	0	100	0	100
23MC004	Indian Constitution	OE	2	0	0	0	100	0	100
23MC005	Yoga and Value for Holistic Development	OE	0	0	0	0	100	0	100
23MC006	Soft Skills	OE	0	0	2	0	100	0	100
23MC007	Indian Knowledge System	OE	2	0	0	0	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**

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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

23CE101	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 – hypersthenes andaugite, 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

Text Books:

1. Varghese, P.C., "Engineering Geology for Civil Engineering" Prentice Hall of India LearningPrivateLimited,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				

Passed in Board of Studies Meeting

Approved in Academic Council Meeting

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23MA102	MATRICES AND CALCULUS (Common to all B.E/B.Tech Programmes)	L	T	P	C
		3	1	0	4
Nature of Course	Basic Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Introduce the concept of orthogonal transformation to convert the square matrix into diagonal form.
2. Acquaint the student with mathematical tools needed in evaluating derivatives and differentiation of one variable.
3. Familiarize the functions of two variables, Taylor series and Jacobian techniques
4. Impart knowledge of double integral techniques in evaluating volume of the solid.
5. Learn the Green's theorem, Stoke's theorem and the Divergence theorem to compute integrals

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO 1	Apply the concept of orthogonal reduction for diagonalization of the given matrix	Apply
CO 2	Execute the rules of differentiation to differentiate the functions.	Apply
CO 3	Demonstrate the maxima and minima for a given function with two variables	Apply
CO 4	Apply integration to compute area and volume using multiple integrals	Apply
CO 5	Interpret the Green's theorem, Stokes' theorem and Divergence theorem to evaluate integrals.	Apply

Course Contents

Module – I MATRICES **9+3**

Eigen values and Eigenvectors of a real matrix – Characteristic Equation- Properties - Cayley Hamilton Theorem - Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic Forms.

Module – II DIFFERENTIAL CALCULUS **9+3**

Functions of single Variable -Limits and Continuity - Derivatives - Differentiation rules(sum, product, quotient, chain rule) – Implicit differentiation-Logarithmic differentiation-Maxima and Minima of function of one variable –Taylors series.

Module – III FUNCTIONS OF TWO VARIABLES **9+3**

Limits and Continuity –Partial differentiation–Homogeneous functions and Euler's theorem– Jacobians –Partial differentiation of implicit functions–Taylor's series– Maxima and minima – Lagrange's method of multipliers.

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Module – IV **MULTIPLE INTEGRALS** 9+3

Double integrals – Change of order of Integrations- Double integrals in polar coordinates – Areaenclosed by plane curves – Triple integrals – Volume of solids.

Module – V **VECTOR CALCULUS** 9+3

Gradient and directional derivative — Divergence and curl — Green's, Gauss divergence and Stoke's theorems — Verification andapplicationinevaluatingline, surfaceandvolumeintegrals (cube, rectangular parallelepiped).

Total : 60 Periods

Text Books

1. B.K.Pal and K.Das , "Engineering Mathematics", Volume-1, 10th Edition, U.N.Dhur and Sons private limited,2020
2. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 44th Edition, 2019.

Reference Books

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 1st Edition, 2018
2. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics Semester II", Laxmi Publications, 8th Edition 2015.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References

1. **NPTEL**-https://nptel.ac.in/courses/111105035
2. **NPTEL**-https://nptel.ac.in/courses/111104144
3. **NPTEL**- https://nptel.ac.in/courses/111105122

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
CO 1	3	2	2										1	
CO 2	3	3	2										1	
CO 3	3	1	1										1	
CO 4	3	2	1										1	
CO 5	3	2	2										1	
	3-High				2-Medium				1-Low					

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Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply			
	Attendance	5	

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

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Passed in Board of Studies Meeting 17.03.23 *Passed in Academic Council Meeting 27.04.23*

23LET07 **தமிழர் மரபு** LTPC 1 0 0 1

அலகு I **மொழி மற்றும் இலக்கியம்:** 3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II **மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை:** 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:** 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV **தமிழர்களின் திணைக் கோட்பாடுகள்:** 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

TEXT BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

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REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23LET07 **HERITAGE OF TAMILS** **L T P C**
1 0 0 1

UNIT I LANGUAGE AND LITERATURE **3**

Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE **3**

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS **3**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS **3**

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE **3**

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23LEE01	COMMUNICATIVE ENGLISH Common to all B.E./B.Tech Programmes	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Sciences				
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	Understand
CO2.	Communicate with clarity using intentional vocabulary in English	Apply
CO3.	Articulate perfectly and express their opinions confidently	Apply
CO4.	Accomplish listening and reading skills for life long learning	Apply
CO5.	Comprehend, interpret and present data	Understand

Course Contents:

MODULE I BASIC GRAMMAR AND USAGE 9

Grammar: Parts of Speech – Verb (Primary & Modal Auxiliary) – Prefixes and Suffixes **Listening:** Listening Skills: Importance and Types of Listening – Barriers of Listening - Listening to short monologues **Speaking:** Introducing oneself – Role play **Reading:** Types of Reading – Intensive reading – Extensive Reading – Reading Comprehension **Writing:** Permission letter (Industrial Visit) – Informal letter – Dialogue writing

MODULE II APPLICATIONS OF LANGUAGE SKILLS 9

Grammar: Tenses (Present, Past and Future) – Different Forms of a word – Types of Questions **Listening:** Listening strategies – Listening to Announcements **Speaking:** Likes and dislikes- Movie Reviews – **Reading:** Skimming - Scanning - Reading Newspaper and Articles **Writing:** Inviting Dignitaries – Accepting Invitation – Declining Invitation.

MODULE III CONVERSATIONAL SKILLS 9

Grammar: If conditionals – Numerical Adjectives **Listening:** - Listening to Telephone calls and taking notes – Listening Lectures **Speaking:** Technical Presentation – Group Discussion **Reading:** Reading Magazines - Cloze Test **Writing:** Calling for Quotation – Complaint Letter – Process Description

MODULE IV GRAMMATICAL ACCURACY COMPETENCE 9

Grammar: Subject verb agreement – Discourse markers - One word substitution **Listening:** Listening and gap filling – Listening and Match the answers **Speaking:** Narrating Story - Asking and giving directions **Reading:** Rearranging Jumbled sentence - Note making **Writing:** Instructions – Hints Developing – Report Writing (Fire and Accident Report)

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MODULE V TECHNICAL WRITING SKILLS **Grammar:** Homophones and Homonyms - Abbreviation and Acronyms **Listening:** Listening announcements – Listening and Summing up **Speaking:** Impromptu speech – Presentation at a business meeting **Reading:** Reading and summarizing articles **Writing:** Paragraph Writing – Checklist – Story writing.

Total: 45 Periods

Laboratory Components

S.No.	List of Exercises	CO Mapping	RBT
1	Self Introduction	1	Understand
2	Movie Review	2	Apply
3	Group Discussion	3	Apply
4	Asking and Giving Directions	4	Apply
5	Impromptu Speech	5	Apply
6	Listening to short monologues	1	Understand
7	Listening to Announcement	2	Understand
8	Listening Telephone calls	3	Understand
9	Listening and Gap Filling	4	Apply
10	Listening and Match the answers	4	Apply

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication",Tata McGraw Hill Publishing company Limited,New Delhi, 2nd Edition, 2018.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books:

1. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press,USA,13thEdition,2018.
2. Norman Whitby, Business Benchmark – "Pre-Intermediate to Intermediate, Students Book", Cambridge University Press, 1st Edition, 2006.
3. Dhanavel S. P., "English and Soft Skills", 1stEdition, Orient Black Swan Private Limited, Hyderabad, 1st Edition, 2010.

Web References:

1. https://www.englishclub.com/grammar/
2. https://learnenglish.britishcouncil.org
3. https://www.indiabix.com/verbal-ability/questions-and-answers/
4. https://www.elllo.org
5. https://englishforeveryone.org/Topics/Reading-Comprehension.html

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Mapping of Course Outcomes (CO) with Programming 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										3	1	2	2		
CO2										3	1	2	2		
CO3										3	1	2	2		
CO4										3	1	2	2		
CO5										3	1	2	2		
	3	High			2	Medium				1	Low				

Summative assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) [50 marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	-	-	-		-	-
Understand	40	40	40		40	40
Apply	60	60	60		60	60
Analyse	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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Passed in Academic Council Meeting on 27.04.23

23CH102	CHEMISTRY FOR MATERIALS SCIENCE (Common to AERO, AGRI, CIVIL, MECH, PCT and SF)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	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. Provide knowledge about the basic principles, preparatory methods and applications of nanomaterials.
3. Understand the causes and control measures of corrosion.
4. Learn about the nature, types of the soil and suitable fertilizers for different types of soil.
5. Gain knowledge about fuels and calorific value of solid fuel, liquid fuel and gaseous fuel.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Develop innovative and eco-friendly method for water purification to meet the growing industrial demand.	Apply
CO 2	Discuss the basic principles, synthesis and applications of nanomaterials	Understand
CO 3	Demonstrate the importance of protection of metals from corrosion.	Understand
CO 4	Identify the nature of the soil and to decide fertilizer for a particular soil depending on its nature	Understand
CO 5	Classify fuels based on their efficiency of combustion.	Apply

Course Contents

Module – I WATER ANALYSIS AND WATER TREATMENT 9

Water analysis: Sources of water, hard water and soft water, Hardness of water, acidity, alkalinity, pH value. Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD). Water treatment: Definition, Zeolite process, Conditioning methods: Internal conditioning (Phosphate, Calgon) and external conditioning (Demineralization), Desalination, Reverse-osmosis (RO).

Module – II NANOCHEMISTRY 9

Basics: Distinction between molecules, nanomaterials and bulk materials, Size-dependent properties, Types of nanomaterials: Definition, properties, and uses of nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis: Sol-Gel and laser ablation methods. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

Module – III CORROSION AND ITS CONTROL 9

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

Module – IV SOIL CHEMISTRY& FERTILIZER 9

Types of soil: saline soil, acidic soil and alkaline soil, submerged soil, salt affected and calcareous soil. Characteristics and Reclamation. Effect of N, P, K, Secondary nutrients and micronutrients on plant growth and development. Importance of nitrogenous fertilizers. Green manuring: definition and examples.

Module – V FUELS AND COMBUSTION 9

Solid fuel: Coaland its varieties, analysis of coal: proximate and ultimate with their significance. Manufacture of metallurgical coke (Otto-Hoffmann method).Liquid fuel: petroleum oil. Knocking: octane number. Diesel: cetane number. Gaseous fuels - Water gas and Liquefied Petroleum Gas. Combustion: Introduction, Calorific value: Gross and net calorific value, Dulong's formula and problems..

Total : 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Determination of hardness of water.	3	Apply
2	Determination of chloride content in water sample.	3	Apply
3	Conductometric titration of strong acid versus strong base.	3	Apply
4	Determination of strength of HCl by pH metry.	3	Apply
5	Estimation of copper in brass by EDTA method.	3	Apply
6	Determination of rate of corrosion by weight loss method	3	Apply
7	Estimation of strength of iron by potentiometric titration	3	Apply
8	Determination of strength of acids in a mixture of acids using conductivity meter	3	Apply

Total Periods: 30

Text Books

1. Dr. A. Ravikrishnan, "Engineering Chemistry" Sri Krishna Hitech Publishing Company, Chemistry, 2021.
2. N. Krishnamurthy, "Engineering Chemistry" PHI Learning, 4th Edition, 2020.
3. Dr.Sunita Rattan. Publisher, S.K. Kataria& Sons. Edition, Reprint, 2020

Reference Books

1. S. S. Dara, "A Text Book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018
2. B.S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
3. Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2017

Additional References

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

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Passed in Board of Studies Meeting on 17.03.2023 Passed in Academic Council Meeting on 27.04.2023

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
CO 1	3	2									1			
CO 2	3	2									1			
CO 3	3	1									1			
CO 4	3	2									1			
CO 5	3	2									1			
	3-High				2-Medium				1-Low					

Summative Assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) [50]
	Theory				Practicals	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20]	
Remember	20	20	20		-	30
Understand	25	25	25		40	60
Apply	5	5	5		60	10
Analyze	-	-	-		-	
Evaluate	-	-	-		-	
Create	-	-	-		-	

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23ME101	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				
Prerequisites	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 view 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.

Module -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

Module –II Projection of Lines and Plane Surface (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.

Module –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.

Module- 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

Module -V Isometric 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.

TOTAL: (15+60) Periods

TEXT BOOKS

1. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 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

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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**	**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 marks]**
	Theory				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	10	10	10		20	20
Understand	20	20	20		40	40
Apply	20	20	20		40	40
Analyse						
Evaluate						
Create						

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23CE102	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

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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 joining components. Plumbing requirements of high rise buildings	**CO1**	**Apply**
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

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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	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				

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23MC101	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 to

1. To nurture the character and behavior as a student.
2. To have broad understanding of society andrelationships.
3. To impart interpersonal and softskills.
4. To inspire the students in the field ofengineering.
5. To provide exposure toindustries.

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 behaviour	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

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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 Hours: 45

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					

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23MA202	MATHEMATICAL FOUNDATIONS FOR ENGINEERING (Common to all B.E. / B.Tech Programme)	L	T	P	C
		3	1	0	4
Nature of Course	Basic Sciences				
Pre requisites	Fundamentals of Basic Mathematics				

Course Objectives

The course is intended to

1. Understand the curvature and calculate the radius of curvature, centre, evolutes, involutes.
2. Acquire the mathematical skills required to solve ordinary differential equations.
3. Familiarizethe concepts of Laplace transform and its inverse.
4. Gain knowledge of analytic approach to analyse the conformal mapping.
5. Obtainthe knowledge of evaluatng contour integrals using residue theorem.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the circle of curvature, evolutes and involutes of the curves.	Apply
CO2	Demonstrate various techniques to solve ordinary differential equations.	Apply
CO3	Select Laplace transform to standard functions and solve initial value problems / differential equations .	Apply
CO4	Find an analytic function ,when its real or imaginary part is known	Apply
CO5	Classify the Singularities and its corresponding Residues for the given function	Apply

Course Contents:

Module – I	APPLICATION OF DIFFERENTIAL CALCULUS	12
Curvature – Curvature in Cartesian co-ordinates - Centre and Radius of curvature- Circle of curvature- Evolutes and Involutes.		
Module – II	**ORDINARY DIFFERENTIAL EQUATION**	**12**
Higher order linear differential equations with constant coefficients – Method of variation of parameters – non-Homogenous equation - Euler and Legendre Equations.		
Module – III	**LAPLACE TRANSFORMS**	**12**
Laplace transform –Transform of elementary functions –Properties –Transforms of derivatives and integrals -Transform of periodic functions. Inverse Laplace transform –Statement and applications of Convolution theorem - Method of solving second order ordinary differential equations with constant coefficients by using Laplace transform technique.		

Module – IV	ANALYTIC FUNCTIONS	12
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping : w = a+z, az, 1/z – Bilinear transformation.		
Module – V	**COMPLEX INTEGRATION**	**12**
Line integral - Cauchy's integral theorem –Cauchy's integral formula – Taylor's and Laurent's series — Singularities — Residues — Residue theorem — Application of residue theorem for evaluation of real integrals.		
		Total: 60 Periods

Text Books:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2019.
2. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons (Asia) Limited, 10th Edition, 2016.

Reference Books:

1. Bali.N.P and ManishGoyal N.P, "A text book of Engineering Mathematics", Laxmi Publications, 6th Edition, 2015.
2. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, 1st Edition, 2018.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References:

1. https://onlinecourses.nptel.ac.in/noc24_ma12/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma10/preview
3. https://onlinecourses.nptel.ac.in/noc24_ma37/preview

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	3
CO1	3	3	3												
CO2	3	3	2												
CO3	3	2	2												
CO4	3	3	3												
CO5	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	Tutorial Class /Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Exam			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
Analyze				
Evaluate				
Create				

23ME201	**Engineering Mechanics (Common to Mechanical, Aeronautical, Agriculture, Civil, Safety and Fire Engineering)**	**L**	**T**	**P**	**C**
		3	**2**	**0**	**4**
Nature of course	Engineering Science				
Pre requisites	Fundamentals of Physics and Mathematics				

Course Objectives

The course is intended to

1. Develop the capacity among students to predict the effect of forces and motion.
2. Make the students to understand the vector and scalar representation of forces and moment and the static equilibrium of particles.
3. Understand the effect of friction on equilibrium, laws of motion, motion kinematics and the interrelationship.
4. Make the students to understand the properties of surfaces and solids, prediction of behavior of particles and rigid bodies under the motion.
5. Make the students to familiar in laws of friction and applications of friction.

Course Outcomes

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

COs. No.	**Course Outcome**	**Bloom's Level**
CO 1	Illustrate the Scalar and Vector representation of forces and moments.	Understanding
CO 2	Identify the Equilibrium of rigid bodies.	Apply
CO 3	Determination of properties of Surfaces and solids.	Apply
CO 4	Calculate dynamic effect of forces exerted in rigid bodies.	Apply
CO 5	Examine the laws of friction and its effects.	Apply

Course Contents

Module –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 particle in a space - principle of transmissibility.

Module –II Equilibrium of Rigid Bodies **12**

Free body diagram - Types of supports -action and reaction forces - stable equilibrium – Moments and Couples - Moment of force about a point and an axis - Varigon's theorem - Equilibrium of Rigid bodies in two and three dimensions.

Module–III Properties of Surfaces and Solids **12**

Centroid and centre of gravity of masses - Centroid of lines and areas - Rectangular, circular, triangular areas by integration - T section, I section, - Angle section, Hollow section by using standard formula - Pappus Theorem - Parallel axis and perpendicular axis theorem -Principal moment of inertia.

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Module– IV Dynamics of Particles **12**

Displacement, Velocity and acceleration and their relationship - Relative motion - Curvilinear motion Newton's laws of motion - Work Energy Equation- lmpulse and Momentum - lmpact of elastic bodies.

Module –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 - General Plane motion of simple rigid bodies - cylinder and fly wheel dynamics.

Total : 60 Periods

Text Books

1. Rajasekaran, S. and Sankarasubramanian. G, 'Fundamentals of Engineering 17 Mechanics",Vikas Publishing House Pvl. Ltd., New Delhi, 2009.
2. Kumar, K.L., 'Engineering Mechanics", Tata McGraw-Hill Publishing Company, New Delhj, 3rd Revised Edition, 2008.

Reference Books

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (ln Sl 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.

Online Resources

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

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**
CO 1	3	2		1								2	3		
CO 2	3	2		1								2	3		
CO 3	3	2		1								2	3		
CO 4	3	2		1								2	3		
CO 5	3	2		1								2	3		
	3-High					**2- Medium**						**1-Low**			

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

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination (60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember	10	10	10	30
Understand	20	10	10	30
Apply	20	30	30	40
Analyze				
Evaluate				
Create				

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23LET08	தமிழரும் தொழில்நுட்பமும் TAMILS AND TECHNOLOGY (Common to all B.E. / B.Tech Programme)	L	T	P	C
		1	0	0	1
Nature of Course	Humanities and Sciences				
Pre requisites	Tamil				

Course Objectives

The course is intended to

1. Introduce students to the great technology of ancient Tamil society.
2. Realize the contribution of various technologies for the development of governing area.
3. Highlighting the different manufacturing technology to make the coins, jewels, stones, art etc.
4. Know the role of agriculture, water management system and food processing.
5. Learn about the Scientific Tamil and Tamil computing of the past and how it has evolved over the generations.

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO 1	Remember the life style and technology of the Sangam people.	Remember
CO 2	Get an updated knowledge of ancient designing and construction of House, Temple, hero stones etc.	Understand
CO 3	Learnt the speciality of manufacturing technology types and usages.	Understand
CO 4	Gain the knowledge on production of agricultural products based on the ancient technologies.	Understand
CO 5	Understand the evaluation of Tamil language through the digital system.	Understand

Course Contents (in Tamil)

அலகு - I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	2
சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில் நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.		
அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	2
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு கட்டிடக் கலை – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.		

அலகு - III	உற்பத்தித் தொழில் நுட்பம்	2
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சின்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் -நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.		
அலகு - IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	2
அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழிகள் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார்.		
அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	2
அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின் பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.		
		Total : 10 Periods

Course Contents (in English)

Module – I	WEAVING AND CERAMIC TECHNOLOGY	2
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		
Module – II	DESIGN AND CONSTRUCTION TECHNOLOGY	2
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.		
Module – III	MANUFACTURING TECHNOLOGY	2
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins as source of history - Minting of Coins – Beads making-industries Stone beads –Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.		
Module – IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	2
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea – Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		
Module – V	SCIENTIFIC TAMIL & TAMIL COMPUTING	2

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Vrtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.
Total : 10 Periods

பார்வை நூல்கள் (TEXT-CUM-REFERENCE BOOKS)

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நகரிகம் (தொல்லியல் துறைவெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

23LEE02	ADVANCED COMMUNICATIVE ENGLISH (Common to all B.E. / B.Tech Programme)	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Communicative English				

Course Objectives

The course is intended to

1. Hone professional communication skills, including email etiquette and formal presentation.
2. Develop advanced vocabulary and collocation for official communication.
3. Communicate effectively and actively in social interactions.
4. Improve writing skills such as project and report writing for various purposes.
5. Foster collaborative communication abilities through group discussion in diverse contexts.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Communicate professionally in various contexts.	Understand
CO 2	Make use of common English phrases and vocabulary.	Understand
CO 3	Integrate basic English communication skills at a personal and a professional level in day-to- day interaction.	Apply
CO 4	Implement listening, reading and writing skills in real - life situations	Apply
CO 5	Decipher collaborative communication skills through diversified contexts.	Understand

Course Contents

Module – I	TECHNICAL VOCABULARY AND USAGE	9
Grammar: Technical Vocabulary (Synonyms and antonyms) - Articles - Reported Speech - **Listening**: Listening to video lectures (TED / INK Talks) **Speaking**: Describing pictures, places – Speaking practice to improve pronunciation **Reading**: Critical reading from the given text **Writing**: Job Application with Resume - E mail writing.		
Module – II	**EFFECTIVE OFFICIAL COMMUNICATION**	**9**
Grammar: Collocation – Question tags – Prepositions **Listening**: Listening to telephonic conversation **Speaking:** Role plays – Telephonic Etiquette and telephonic phrases **Reading:** Company profile - Advertisement (job / product) **Writing:** – Preparing Memo – Prepare Circular, Agenda and Minutes – Placing Order – Prepare Advertisement.		
Module – III	**TECHNICAL LANGUAGE SKILLS FOR CONVERSATION**	**9**
Grammar: Degrees of Comparison – Conjunctions **Listening:** Sports commentaries – Animated short stories **Speaking:** Asking for and giving directions – Describing simple process **Reading**: Reading and understand technical vocabulary **Writing:** Letter to the Editor – Review of Favourite Movie / Book – Recommendations.		

Module – IV	LANGUAGE FOR BUSINESS CORRESPONDENCE	9
Grammar: Idioms and Phrases – Single line definitions Phrasal verbs **Listening:** Listening to informal communication **Speaking:** Narrating personal experience **Reading:** Speed reading – reading passage within the time limit **Writing:** Project writing – Report writing (Accident and Survey) – Preparing welcome address and vote of thanks.		
Module – V	**VERBAL ABILITY FOR WRITING**	**9**
Grammar: Verbal Analogy – Cause and effect expressions **Listening:** Listening to Iconic Speeches - debate and reviewing the performance **Speaking:** Group communication skills – Discussing social issues and current affairs **Reading:** Short story – critical reading **Writing:** Itinerary –Interpretation of charts (Flow chart and Pie chart) - Essay Writing and Paragraph.		
		Total : 45 Periods

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Describing Picture / Place	1	Understand
2	Listening	1	Understand
3	Role Play	2	Understand
4	Prepare Circular, Agenda & Minutes	2	Understand
5	Asking and Giving Directions	3	Apply
6	Narrate a Favourite Movie / Book	3	Apply
7	Welcome Address	4	Apply
8	Vote of Thanks	4	Apply
9	Discussing Social Issues	5	Understand
10	Interpretation of Charts	5	Understand
		Total	**15 Periods**

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication", Tata McGraw Hill Publishing Company Limited, New Delhi, 8th Edition, 2020.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books

1. Dr. Krishnakumar TP, "Rudiments of Communication Skills", Buddha Publication, 1st Edition, 2023.
2. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press, USA, 13th Edition, 2018.
3. Dhanavel S. P., "English and Soft Skills", 1st Edition, Orient Black Swan Private Limited, Hyderabad, 2010.

Web References:

1. https://nptel.ac.in/courses/111104031
2. https://nptel.ac.in/courses/111106139
3. https://nptel.ac.in/courses/111105134

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
CO 1									1	3	1		2	
CO 2									1	3	1		2	
CO 3									1	3	1		2	
CO 4									1	3	1		2	
CO 5									1	3	1		2	
	3-High				2-Medium				1-Low					

Summative assessment						
Bloom's Level	Continuous Assessment (IAE)					Final Examination (FE) [50marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	25				4	10
Understand	25	25	25		8	20
Apply		25	25		8	20
Analyse						
Evaluate						
Create						

23LEJ06	JAPANESE	L	T	P	C
		2	0	2	3
Nature of Course	HSS				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Read & Write Hiragana and Katakana (Japanese Alphabets) letters.
2. Use words and phrases of greeting in Japanese, identify names of objects and do a self-introduction using short and simple sentences.
3. Demonstrate the use of time-related words, verb conjunctions and make light conversation asking for directions and answering questions.
4. Express their likes and dislikes, hobbies, describe the locations of different things and demonstrate counting in Japanese.
5. Demonstrate the minimum day to day conversation and describe their ability and experiences.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1.	Read & Write Hiragana and Katakana (Japanese Alphabets) letters	Understand
CO2.	Identify names of objects and do self-introduction using short and simple sentences	Apply
CO3.	Demonstrate the use of time-related words	Apply
CO4.	Articulate their likes and dislikes, hobbies and describe the locations of different things	Apply
CO5.	Express day to day conversation and describe their ability to share their experiences	Understand

Course Contents

Module – I		9
INTRODUCTION- はじめまして – ALPHABET - Hiragana - NUMBERS- すうじ- Classroom Words- きょうしつのことば – LISTENING		
Module – II		**9**
ALPHABET-Katakana - BASIC SENTENCE- じぶんのなまえ – COUNTRY NAMES- くにのなまえ- SAYING AGE- なんさいですか - LISTENING		
Module – III		**9**
SAYING MONTH- なにつき – SAYING BIRTHDAY- たんじょうび – KAZOKU- かぞく – KNOWINGTHINGS- あ/こ/そ – LISTENING		

Module – IV		**9**
PRONOUNS - ADJECTIVES - SAYING TIME, SHOPPING – LISTENING		
Module – V		**9**
SELF INTRODUCTION - MY TOWN - Watashino machi - GO, COME, RETURN - BASIC VERBS – TRANSPORT – LISTENING		
		Total : 45 Periods

Text Books

1. Minna no Nihongo – Elementary Japanese 1
2. Minna no Nihongo- Translation & Grammar Notes 1
3. Gateway to Japan Japanese Language school e-handouts / e-course materials.

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50 marks]**
	Theory Marks				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE - III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	50				4	10
Understand		20	20		8	20
Apply		30	30		8	20
Analyse						
Evaluate						
Create						

23PH202	MATERIALS PHYSICS (Common to Aero, Agri, Civil, FT, Mech, PCT & SF)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Fundamentals of Basic Physics				

Course Objectives

The course is intended to

1. Impart knowledge in production of laser and their applications in engineering and medical field.
2. Understand on the concept and properties of matter like elasticity and its applications.
3. Provide a valuable theoretical introduction and an overview of the fundamental structures of the crystal physics.
4. Apply the concepts of thermal conductivity to solve the thermal coefficients.
5. Give an idea on new engineering materials like shape memory alloys, metallic glasses and nanomaterials.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Compare the types of lasers for various industrial applications.	Understand
CO 2	Study the elastic behavior and working of torsional pendulum.	Understand
CO 3	Account for how crystalline materials are studied using miller indices, including concepts like coordination number and packing factor.	Understand
CO 4	Demonstrate the thermal conductivity of good and bad conductors.	Apply
CO 5	Explain a conceptual understanding about the properties of new engineering materials like shape memory alloys, metallic glasses and nanomaterials.	Apply

Course Contents

Module – I	LASER PHYSICS	9
Lasers: Introduction- characteristics of laser - population of energy levels, Einstein's A and B coefficients derivation - resonant cavity - semiconductor lasers: homojunction and heterojunction - Applications of lasers - particle size determination and holography.		
Module – II	**PROPERTIES OF MATTER**	**9**
Elasticity - stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever - uniform and non-uniform bending - I-shaped girders.		
Module – III	**CRYSTAL PHYSICS**	**9**
Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures.		

Module – IV	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 – thermal insulation - applications: heat exchangers in refrigerators, ovens and solar water heaters.		
Module – V	**MODERN ENGINEERING MATERIALS**	**9**
Metallic glasses – preparation, properties and applications – Shape memory alloys – Types, characteristics and applications – Nanomaterials – preparation– Physical Vapour Deposition (PVD) - sol gel method, properties and applications. Carbon Nano Tube (CNT) –properties and applications.		
		Total : 45 Periods

Laboratory Components (Any Five)

S.No	List of Experiments	CO Mapping	RBT
1	Determination of wavelength and particle size of the given Laser beam.	CO1	Apply
2	Determination of numerical aperture and acceptance angle of an optical fiber.	CO1	Apply
3	Determination of the rigidity modulus of a given wire by using Torsion pendulum.	CO2	Apply
4	Determination of Young's modulus of a material by non-uniform bending method.	CO2	Apply
5	Determination of Young's modulus of a material by uniform bending method.	CO2	Apply
6	Determination of thermal conductivity of a bad conductor by Lee's Disc method.	CO4	Apply
		Total	**15 Periods**

Text Books

1. Bhattacharya, D.K and Poonam, T. "Engineering Physics", Oxford University Press, 2nd edition, 2015.
2. M.N. Avadhanulu, M.N. &Kshirsagar PG. "A Text book of Engineering Physics", S.Chand and company, Ltd., New Delhi, 10th edition, 2014.
3. Singh Dheeraj Kumar, "Nanomaterials", Springer International Publishing, 1st Edition, 2023.

Reference Books

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, 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-bending-6aMRx

4. https://nptel.ac.in/courses/113106093

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
CO 1	3	1												
CO 2	3	1												
CO 3	3	2	2											
CO 4	3	2	2											
CO 5	3													
	3-High				2-Medium				1-Low					

Summative Assessment						
Bloom's Level	Continuous Assessment (IAE)					Final Examination (FE) [50marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	10	10	10			20
Understand	35	35	35		40	60
Apply	5	5	5		60	10
Analyse						10
Evaluate						
Create						

23CS203	PROBLEM SOLVING USING PYTHON (Common to AERO, CIVIL, FT, MECH, PCT, S&F)	L	T	P	C
		3	0	2	4
Nature of Course	Engineering Sciences				
Prerequisites	Mathematical and Logical Knowledge				

Course Objectives

The course is intended

1. Learn the basics of algorithmic problem solving.
2. Think logically and write algorithms and draw flow charts for problems.
3. Make use of python functions and call them.
4. Utilize the Python data structures — lists, tuples, dictionaries and files.

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO 1	Recall algorithmic solutions to simple computational problems and read,write, execute by simple python programs	Remember
CO 2	Classify and Read, Write, Execute by hand simple python programs.	Understand
CO 3	Structure simple python programs for solving problems.	Understand
CO 4	Examine simple Python programs using conditionals and loops for solving problems	Apply
CO 5	Show the python string functions and lists	Apply
CO 6	Practice the compound data using python Tuples, Dictionaries, Files and Packages.	Apply

Course Contents

MODULE – 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.

MODULE – II Introduction of Python Programming 9

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

MODULE – 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, recursion.

MODULE – IV Strings, 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.

MODULE – V Tuples, Dictionaries, Files and Packages 9

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

Total : 45 Periods

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Write a algorithm & draw flowchart for simple Computational problems.	CO1	Apply
2	Write a program to perform different arithmetic operations on numbers in python.	CO1	Apply
3	Write a python program to implement the various control structures.	CO2	Apply
4	Write a python program for computational problems using recursive function.	CO2	Apply
5	Demonstrate use of list for data validation.	CO3	Apply
6	Develop a python program to explore string functions.	CO3	Apply
7	Write a python program to find a given number is ODD or EVEN	CO4	Apply
8	Write a python class to reverse a string word by word	CO4	Apply
9	Develop python programs to perform operations on dictionaries.	CO5	Apply
10	Write a python program to read and write into a file.	CO5	Apply

Text Books

1. Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 1st Edition 2021.
2. Dr. R. Nageswara Rao, "Core Python Programming", Dream tech Press, 1st Edition 2019.

Reference Books

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2nd Edition 2021.
2. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 1st Edition 2020.
3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2nd Edition 2019.
4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 1st Edition 2015.

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Additional References

1. **Python Research Association of India** - https://www.araiindia.com/services/technology-and-products
2. **NPTEL** - https://nptel.ac.in/courses/107/106/107106088/
3. **MOOC Courses** - https://www.mooc-list.com/tags/automotive-engineering

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	3	2	3							3	3	3	3
CO2	3	3	3	2	3							3	3	3	3
CO3	3	3	3	2	3							3	3	3	3
CO4	3	3	3	2	3							3	3	3	3
CO5	3	3	3	2	3							3	3	3	3
CO6	3	3	3	2	3							3	3	3	3
	3	High				2	Medium					1	Low		

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

Passed in Board of Studies

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23CE201	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 Out comes

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

CO.No.	Course Out come	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, Orientationand Complete Joinery Details (Paneled and Glazed Doors and Windows).	**CO1**	**Apply**
2	**Buildings with Load Bearing Walls**	**CO2**	**Apply**

	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 Auto cad 2005 and Autocad LT 2005"– BPB Publications, 2nd edition, 2009

References:

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, BIM Hand book: A Guideto building information modeling for Owners, Managers, Designers, Engineers,andContractors,JohnWileyandSons.Inc.,2011.
2. Marimuthu V.M., Murugesan R. and Padmini S., Civil Engineering Drawing-I, PratheebaPublishers,2008.

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 Out comes (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 [50marks]**	**End Semester Examination [50marks]**
Remember		
Understand	30	30
Apply	70	70
Analyze		
Evaluate		
Create		

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

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23MC202	ENVIRONMENTAL SCIENCES (Common for all branches)	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	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 biodiversity.
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 the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Explain the knowledge about ecosystem and environment	Understand
CO 2	Interpret the ecological balance and preservation of bio diversity	Understand
CO 3	Demonstrate various types of pollution in order to control pollution	Apply
CO 4	Classify the energy sources for the conservation of non conventional energy sources	Understand
CO 5	Identify the nature and management of e-waste and solid waste	Apply

Course Contents

Module – 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).		
Module – 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 Biodiversity: In-Situ and Ex-Situ conservation of biodiversity.		
Module – 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.		
Module – IV	**NON-CONVENTIONAL ENERGY RESOURCES**	**6**
Introduction, Types, Working and Applications of: Solar Energy- Photovoltaic (PV) solar energy, Wind Energy-Onshore wind power- and Geo Thermal Energy-Geo thermal power plant.		

Module – V	ENVIRONMENTAL MANAGEMENT	6
Sustainable Development, Waste Management: Types, sources and disposal of municipal, industrial solid Waste, Role of Information technology in Environment and Human. COVID-19 and JN-1 Virus.		
		Total : 30 Periods

Activity Components

S.No	List of Experiments	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

Text Books

1. AnubhaKaushik and C.P. Kaushik, "Environmental Science and Engineering, New Age International Publishers, New Delhi, 2nd Edition, 2019.
2. V. Kumar, "An Introduction to Green Chemistry" Vishal publishing Co. Reprint Edition, 2020.

Reference Books

1. Santosh Kumar Garg and Rajeshwari Garg "Ecological and Environmental Studies", Khanna Publishers, Nai Sarak, Delhi, 2nd Edition, 2019.
2. Masters, Gilbert M, "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2nd Edition, 2020.

Web References:

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) and Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1		3					1					3		
CO 2		3					3					1		
CO 3		3					2					3		
CO 4		2					3					2		
CO 5		3					3					2		
	3-High				2-Medium				1-Low					

Summative Assessment					
Bloom's Level	Continuous Assessment				
	IAE-I [20]	IAE-II [20]	IAE-III [20]	Attendance [20]	Activity [20]
Remember	20	20	15		
Understand	30	25	25		
Apply		5	10		
Analyze					
Evaluate					
Create					

23MA301	TRANSFORMS AND BOUNDARY VALUE PROBLEMS (Common to Aero, Agri, Civil, ECE, EEE, FDT, Mech, PCT, S&F)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Foundations of Mathematics				

Course Objectives

The course is intended to

1. Learn about linear and non-linear partial differential equations and obtain their solutions using various techniques.
2. Gain familiarity with Fourier series.
3. Orient Fourier series techniques to solve one dimensional wave and heat equations.
4. Provide the concept of Fourier transforms and its inverse.
5. Introduce the concept of Z-transforms and difference equations.
6. Utilize advanced mathematical techniques to solve complex boundary value problems, reflecting mastery in mathematical transformations.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify linear and non-linear partial differential equations.	Apply
CO2	Construct the Fourier series of a given function and apply in the field of Engineering.	Apply
CO3	Interpret solutions of one dimensional wave and heat equations.	Apply
CO4	Implement Fourier transforms in engineering field .	Apply
CO5	Illustrate the Z-transforms and difference equations.	Apply
CO6	Develop mathematical techniques to solve the boundary value problems.	Apply

Course Contents:

Module – I	PARTIAL DIFFERENTIAL EQUATIONS	9
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 - linear partial differential equations of second order with constant coefficients of homogeneous equations.		
Module – II	**FOURIER ANALYSIS**	**9**
Dirichlet's Conditions - Fourier series for periodic functions - Expansion of periodic functions with period $(0, 2\pi)$ and period $(-\pi, \pi)$ – Half Range Series - Root mean square value - Parseval's identity – Harmonic Analysis.		

Module – III	FOURIER TRANSFORMS	9
Statement of Fourier integral theorem – Fourier transforms pair: Fourier transforms and Inverse Fourier transforms – Fourier sine transforms -Fourier cosine transforms – Transforms of simple functions – Convolution Theorem - Parseval's identity.		
Module – IV	**Z - TRANSFORMS AND DIFFERENCE EQUATIONS**	**9**
Z-transforms - Properties – Inverse Z-transform: Partial fraction method and Convolution theorem - Formation of difference equations –Solution of difference equations using Z – transform.		
Module – V	**APPLICATIONS TO PARTIAL DIFFERENTIAL EQUATIONS**	**9**
Classification of second order Partial differential equations – Method of separation of variables – Solutions of one dimensional wave equation – Solutions of one dimensional heat equation – Application to Boundary value problems.		
		Total: 45 Periods

Text Books:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., 3rd edition, 2016.
2. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2021.
3. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 2014.

Reference Books:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Lakshmi Publications Pvt Ltd, 9th Edition, 2017.
2. Ramana.B.V,"Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing Company Limited, 4th Edition, 2017.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Publications, 10th Edition, 2023.

Additional References:

1. https://archive.nptel.ac.in/courses/111/101/111101153
2. https://www.youtube.com/watch?v=ygOjw0_Kh8k.
3. https://archive.nptel.ac.in/courses/111/106/111106111.

Laboratory Components using MATLAB:

S.No	List of Experiments	CO Mapping	RBT
1	Solutions of Clauirat's form	1	Apply
2	Solution of second order homogeneous differential equations with constant coefficients	1	Apply
3	Fourier Series in $(0,2\pi)$	2	Apply
4	Harmonic Analysis in Fourier Series	2	Apply

5	Fourier Transform	3	Apply
6	Inverse Fourier Transform	3	Apply
7	Z - Transform	4	Apply
8	Inverse Z - Transform	4	Apply
9	One dimensional wave equation	5	Apply
10	One dimensional heat equation	5	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	3
CO1	3	2	1										2		
CO2	3	2	2										2		
CO3	3	2	1										2		
CO4	3	2	1										1		
CO5	3	3	2										2		
CO6	3	2	2										2		
	3	High				2	Medium					1	Low		

Bloom's Level	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
	Theory			Practical			
	IAE I (5)	IAE II (10)	IAE III (10)	Attendance [5]	Rubric based [10]	Model Exam [10]	
Remember	10	10	10				10
Understand	10	10	10		40	40	30
Apply	30	30	30		60	60	60
Analyze							
Evaluate							
Create							

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23UH001	UNIVERSAL HUMAN VALUES (Common to all B.E. / B.Tech Programme)	L	T	P	C
		3	0	0	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Encourage respect for the inherent dignity and worth of all individuals, regardless of differences in race, ethnicity, gender, religion, or socioeconomic status.
2. Cultivate empathy and compassion towards others, promoting understanding and solidarity across diverse communities.
3. Promote peaceful coexistence and harmony among individuals and communities.
4. Foster a sense of responsibility towards the environment and future generations, promoting sustainable practices and conservation efforts.
5. Hold and celebrate cultural diversity, recognizing the richness and value of different traditions, languages, and perspectives.
6. Contribute to the realization of universal human values and create a more just, compassionate, and sustainable world.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Embrace values such as empathy, tolerance, and respect can lead to decreased conflict and violence, both at interpersonal and societal levels.	Understand
CO 2	Support values like equality, justice, and human rights can lead to more equitable societies, where everyone has access to opportunities and resources	Understand
CO 3	Emphasize values such as empathy, compassion, and honesty fosters healthier and more meaningful relationships among individuals and groups.	Apply
CO 4	Grasp values of environmental stewardship and responsibility contributes to sustainable development practices that preserve natural resources.	Apply
CO 5	Celebrate cultural diversity and promoting values of inclusivity and acceptance enriches societies by fostering creativity, innovation, and mutual understanding	Understand
CO 6	Create a world that is more just, compassionate, and sustainable for all.	Apply

Course Contents

Module – I	NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION	9

Purpose and motivation for the course, recapitulation from Universal Human Values-I - Self-Exploration – what is it? – Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration – Continuous Happiness and Prosperity-A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility - the basic requirements for fulfilment of aspirations of every human being with their correct priority – Understanding Happiness and Prosperity correctly -

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A critical appraisal of the current scenario – Method to fulfil the above human aspirations: understanding and living in harmony at various levels.		
Module – II	**UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF!**	**9**
Understanding human being as a co-existence of the sentient 'I' and the material 'Body' – Understanding the needs of Self ('I') and 'Body'- happiness and physical facility – Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) – Understanding the characteristics and activities of 'I' and harmony in 'I' – Understanding the harmony of I with the Body : Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health.		
Module – III	**UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN- HUMAN RELATIONSHIP**	**9**
Understanding values in human - human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship – Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship – Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals – Visualizing a universal harmonious order in society-Undivided Society, Universal Order- from family to world family.		
Module – IV	**UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE-WHOLE EXISTENCE AS COEXISTENCE**	**9**
Understanding the harmony in the Nature – Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature – Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence.		
Module – V	**IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS**	**9**
Natural acceptance of human values – Definitiveness of Ethical Human Conduct – Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics – Case studies of typical holistic technologies, management models and production systems – Strategy for transition from the present state to Universal Human Order: **a.** At the level of individual: as socially and ecologically responsible engineers, technologists and managers **b.** At the level of society: as mutually enriching institutions and organizations		
		Total : 45 Periods

Text Books

1. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.
2. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
3. A N Tripathy, Human Values, New Age International Publishers, 2003.

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
3. Human Values, A. N. Tripathi, New Age Intl.Publishers, NewDelhi, 2004.

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Web References

1. https://www.studocu.com/in/document/i-k-gujral-punjab-technical-university/universal-human-values/uhv-complete-notes/46743542.
2. https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1Kyqtez iTbTjN1So
3. https://www.youtube.com/watch?v=Ff0LUTOCuLE&list=PLWDeKF97v9SO8vvjC1Kyqtez iTbTjN1So&index=16

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
CO 1									1	2	1		1	
CO 2									1	2	1		1	
CO 3									1	2	1		1	
CO 4									1	2	1		1	
CO 5									1	2	1		1	
	3-High				2-Medium				1-Low					

Formative assessment			
Bloom's Level	Continuous Assessment (IAE)		Total marks
	Assessment component	Marks	
Remember	Online Quiz	5	15
Understand	Tutorial class/Assignment	5	
	Attendance	5	

Summative assessment				
Bloom's Level	Continuous Assessment (IAE)			Final Examination [60 marks]
	Theory Marks			
	IAE-I [5]	IAE-II [10]	IAE-III [10]	
Remember	20	10	10	10
Understand	30	20	20	20
Apply		20	20	20
Analyse				
Evaluate				
Create				

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23CE301	Mechanics of Solids I	L	T	P	C
		3	0	0	3
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 simply supported beams and Cantilever Beams.	Apply
CO3	Assess the shear force and bending moment in over hanging beams	Apply
CO4	Calculate the slope and deflection of beams by various methods.	Apply
CO5	Apply theory of torsion in analysis of circular shafts and helical springs.	Apply
CO6	Analyze plane trusses.	Analyze

Module - I Stress, Strain and Deformation of Solids 9

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.

Module - II Shear Force and Bending Moment 9

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.

Module - III Deflection of Beams 9

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.

Module - IV Torsion **9**

Theory of Torsion – Assumption and derivation of tensional equation - 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 – Disc springs – springs in series and parallel.

Module - V Analysis of Trusses **9**

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

Total: 45 Periods

Text Book:

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, 2018

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	3	3									3	3	
CO2	3	3	3									3	3	
CO3	3	3	3									3	3	
CO4	3	3	3									3	3	
CO5	3	3	3									3	3	
CO6	3	3	3									3	3	
3	**High**				**2**	**Medium**					**1**	**Low**		

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

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Summative Assessment				
Bloom's category	**Continuous Assessment Tests**			**Final Examination (60)**
	IAE 1 - (5)	**IAE 2 - (10)**	**IAE 3 - (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	15	15	15	30
Analyse	15	15	15	30
Evaluate				
Create				

23CE302	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. Understand the concepts of Fluid statics, Buoyancy and floatation.
3. Impart knowledge on Fluid Kinematics and Dynamics.
4. Acquire knowledge about dimensional analysis and model studies.
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	Demonstrate Fluid Properties, fluid pressure and its measurement.	Understand
CO2	Summarize the centre of pressure, buoyancy and meta centre.	Understand
CO3	Illustrate the types of flow in fluid kinematics.	Understand
CO4	Interpret the equation of motion in fluid dynamics.	Apply
CO5	Implement Rayleigh's method and Buckingham Pi theorem in dimensional analysis.	Apply
CO6	Compare laminar and turbulent boundary layer.	Understand

Module - I Properties, Fluid pressure and its measurement 9

Dimensions and units - Fluid properties – Types of fluid – Hydrostatic law; Pascal's law – Atomospheric, Absolute, Gauge and Vacuum pressures – Measurement of pressure by various types of manometers and mechanical gauges.

Module - II Fluid Statics, Buoyancy and Floatation 9

Total pressure on plane and curved surfaces - Centre of pressure for vertical and inclined, plane surfaces - Buoyancy and Meta centre - Determination of Meta centric height – Analytical and experimental methods - Conditions of equilibrium of submerged and floating bodies.

Module - III 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 - venturimeter, orifice meter and Pitot tube- linear momentum equation and its application to pipe bend.

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Module - IV Dimensional Analysis and Model Studies **9**

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

Module - 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

Text Book:

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, 2004.

2 Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2014.

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	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
CO6	3	3	2	3								3		2
3	**High**				**2**	**Medium**					**1**	**Low**		

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

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

23CE303	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 surveying.	Apply
CO3	Describe the height of instrument method in leveling.	Understand
CO4	Illustrate the rise and fall method in levelling.	Understand
CO5	Interpret the leveling application in various construction field works.	Apply
CO6	Identify the applications of theodolite surveying in construction site work.	Understand

Module - 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 – Laser instruments – Applications.

Module - II Compass 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.

Module - III Levelling 9

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

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Module - 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 – Earth work calculations – Capacity of reservoirs - Mass haul diagrams.

Module - 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

Course Content:

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	Study of levels and leveling staff	CO3	Understand
6	Fly leveling using Dumpy level	CO3	Apply
7	Check leveling	CO3	Apply
8	LS and CS	CO4	Apply
9	Contouring	CO5	Apply
10	Study of Theodolite	CO6	Understand

Total: 30 Periods

Text Book:

1 Punmia.B.C., Ashok K Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2022

2 Bannister and S. Raymond, "Surveying", 9 th Edition, Longman 2021.

Reference Books:

1 James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2021.

2 Arora K R. "Surveying Vol I & II", Standard Book house, 10th Edition 2023 standard book house Publication.

Additional References:

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

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

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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	3	3	3	3	3				3			3	3	2
CO2	3	3	3	3	3				3			3	3	2
CO3	3	3	3	3	3				3			3	3	2
CO4	3	3	3	3	3				3			3	3	2
CO5	3	3	3	3	3				3			3	3	2
CO6	3	3	3	3	3				3			3	3	2
3	**High**				**2**	**Medium**					**1**	**Low**		

Summative Assessment						
Bloom's category	**Continuous Assessment Tests**					**Final Examination (50)**
	Theory				**Practical**	
	IAE 1 - (5)	**IAE 2 - (10)**	**IAE 3 - (10)**	**Attendance (5)**	**Rubric Based CIA (20)**	
Remember	10	10	10		10	20
Understand	10	10	10		20	40
Apply	30	30	30		20	40
Analyse						
Evaluate						
Create						

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23CE304	Construction Materials and Technology	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 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 and bricks.	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 metals in construction.	Analyze
CO5	Select suitable surface finishing materials in construction.	Analyze
CO6	Identify modern construction materials for advanced construction.	Understand

Module - I Stones–Bricks **9**

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work - Types of stone masonry – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Types of Brick masonry – Bricks for special use – Refractory bricks – Fly ash brick - Hollow bricks – Interlocking bricks.

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

Lime – Lime mortar – Cement–Ingredients – Manufacturing process –Types and Grades – Properties of cement and Cement mortar – Hydration – Tests on cement – Aggregates – Properties - Types & Tests on fine and coarse aggregates.

Module - III Concrete **9**

Concrete – Ingredients – W/C Ratio – Admixtures – PCC – RCC - Grades – Manufacturing Process – Batching plants– Types of mixing –Types of transporting concrete - Types of compaction, Methods of curing, Ready Mix Concrete - Concrete blocks – Light weight concrete blocks.

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

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

Module - V Modern Materials **9**

Glass – Ceramics– Sealants for joints – UPVC - Fibre glass reinforced plastic– Ever wood WPC Clay products – Refractories – Composite materials –Types – Applications of laminar composites – Fibretextiles.

Total: 45 Periods

Course Content:

S. No.	Name of the Experiment	CO Mapping	RBT
1	**Test on Bricks and Blocks:** i) Determination of compressive strength of bricks and blocks. ii) Determination water absorption of bricks and blocks. iii) Determination of Efflorescence of bricks.	CO1	Apply
2	**Test on Fine Aggregate:** i) Sieve analysis of fine aggregate. ii) Determination of specific gravity and bulk density. iii) Determination of Bulking of sand.	CO2	Apply
3	**Test on Coarse Aggregate:** i) Determination of impact value ii) Determination of elongation index iii) Determination of flakiness index iv) Determination of aggregate crushing value	CO2	Apply
4	**Test on Fresh Concrete:** i) Determination of workability by conducting slump test ii) Determination of workability by conducting compaction factor test iii) Determination of workability by conducting flow test iv) Determination of workability by conducting Vee-Bee consistency test.	CO3	Apply
5	**Test on Hardened Concrete:** i) Determination of compressive strength of cube and cylinder ii) Determination of flexural strength	CO4	Apply
6	**Study on timber and other materials:** i) Study on properties by using models of various types of wood, plywood, veneer, thermacole ii) Study on properties by using models of various types of steel, aluminum, copper, brass	CO5	Apply
7	**Study on Modern materials:** Study on properties by using models of ceramic tiles, clay tiles	CO6	Apply

Total: 30 Periods

Text Book:

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.

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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		3									2
CO2	3	3	3		3									2
CO3	3	3	3		3									2
CO4	3	3	3		3									2
CO5	3	3	3		3									2
CO6	3	3	3		3									2
3	**High**				**2**	**Medium**					**1**	**Low**		

Summative Assessment						
Bloom's category	**Continuous Assessment Tests**					**Final Examination (50)**
	Theory				**Practical**	
	IAE 1 - (5)	**IAE 2 - (10)**	**IAE 3 - (10)**	**Attendance (5)**	**Rubric Based CIA (20)**	
Remember	10	10	10		10	20
Understand	10	10	10		20	40
Apply	30	30	30		20	40
Analyse						
Evaluate						
Create						

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23MC003	INTERPERSONAL SKILLS (Common to all B.E. / B.Tech Programme)	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. Evaluate current relationships and their communication style.
2. Identify ways for improving important relationships.
3. Explore how the Bible correlates with principles from the chapter.
4. Describe how the communication processes impacts our ability to effectively communicate.
5. Identify challenges that may arise from interpersonal communication.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Practice interpersonal communication skills to influence and build good relationships.	Remember
CO 2	Identify and pursue personal learning goals.	Understand
CO 3	Give evident feedback.	Apply
CO 4	Reveal group dynamics and amiable behaviour.	Apply
CO 5	Emphasis the communication process.	Understand

Course Contents

Module – I	FUNDAMENTALS OF INTERPERSONAL COMMUICATION	6
Facts of communication and Interpersonal communication - culture and gender - Communication and Self disclosure - Presentation of Interpersonal perception - Learning goals - Feeling and feedback.		
Module – 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.		
Module – 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.		
Module – IV	**TRANSACTIONS**	6
Different types of transactions - Building Positive Relationship - Managing Conflict - Connecting across Difference -Factors hampering Interpersonal interactions - Assertiveness in communication.		

Module – V	ESSENTIAL INTERPERSONAL COMPETENCIES	6
Behaviour - understanding limiting behaviour - Interpersonal and small and lateral thinking-Win -Win attitude - Positive thinking - Stress feedback - Personal Evaluation of Interpersonal Relationship Skills group behavior - Critical management - Assertive		
		Total : 30 Periods

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: Mccraw-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.

Web References:

1. https://nptel.ac.in/courses/111104031
2. https://nptel.ac.in/courses/111106139
3. https://nptel.ac.in/courses/111105134

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Presentation of Interpersonal perception	1	Remember
2	Non-Verbal Communication	2	Understand
3	Negotiation tactics	3	Apply
4	Managing Conflict	4	Apply
5	Stress Management	5	Understand

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
CO 1										3	2	1	2	
CO 2										3	2	1	2	
CO 3										3	2	1	2	
CO 4										3	2	1	2	
CO 5										3	2	1	2	
	3-High				2-Medium				1-Low					

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment 1 (50 Marks)	Assessment 2 (50 Marks)
Remember	20	20
Understand	10	10
Apply	20	20
Analyse		
Evaluate		
Create		

23MA402	STATISTICAL AND NUMERICAL METHODS (Common to Aero, Agri, Civil, Food, Mech, PCT & S&F)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Foundations of Mathematics				

Course Objectives

The course is intended to

1. Acquaint with the knowledge of testing of hypothesis for small and large samples
2. Familiarize with the basic concept on types of design of experiments used in the field of engineering
3. Introduce the basic concepts of algebraic and transcendental equations.
4. Acquire the concept of numerical techniques of differentiation and integration.
5. Study the numerical techniques in solving ordinary differential equations.
6. Equip student with the ability to analyze data and solve mathematical problems using Statistical techniques and numerical algorithm.

Course Outcomes

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

CO1	Interpret the testing of hypothesis for small and large samples.	Apply
CO2	Explain the basic concepts of classifications of design of experiments in the field of engineering.	Apply
CO3	Demonstrate the algebraic and transcendental equations.	Apply
CO4	Apply the numerical techniques of interpolation and error approximations in various intervals in real life situations.	Apply
CO5	Execute the numerical techniques for solving first and second order ordinary differential equations.	Apply
CO6	Create new statistical techniques and numerical algorithms for data analysis and problem solving.	Apply

Course Contents:

Module – I	TESTING OF HYPOTHESIS	9
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 for single mean and difference of means, Chi-square - Contingency table (test for independent) -Goodness of fit.		
Module – II	**DESIGN OF EXPERIMENTS**	**9**
One way and two way classifications – completely randomized design – Randomized block design – Latin square design.		
Module – III	**SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS**	**9**
Solution of linear system of equations – Gauss elimination method – Gauss Jordan method - Iterative methods of Gauss Jacobi method and Gauss Seidel method– Eigen values of a matrix by Power method		

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Module – IV	INTERPOLATION AND NUMERICAL INTEGRATION	9
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.		
Module – V	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**9**
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 predictor corrector methods for solving first order equations.		
		Total: 60 Periods

Text Books:

1. Gupta S.C and Kapoor V.K., Fundamentals of Mathematical Statistics", Sultan chand & sons, New Delhi, 12th Edition, 2020
2. Grewal B.S, and Grewal J.S " Numerical methods in engineering and science "Khanna Publishers, 10th Edition, 2015.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

Reference Books:

1. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, New Delhi, 3rd Edition, 2017
2. Burden, R.L and Faires, J.D, "Numerical Analysis", Cengage Learning, 9th Edition, 2016.
3. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, 8th Edition, 2016.

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
3. https://www.researchgate.net/publication/349657530_Statistics_and_Numerical_Methods

Laboratory Components using MATLAB:

S.No	List of Experiments	CO Mapping	RBT
1	Student's t - test	1	Apply
2	Chi – Square test	1	Apply
3	One way classification	2	Apply
4	Two way classification	2	Apply
5	Gauss Elimination Method	3	Apply
6	Gauss Seidel Method	3	Apply

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7	Lagrange's Interpolation Formula	4	Apply
8	Simpson's 1/3 rd rule	4	Apply
9	Euler's Method	5	Apply
10	Runge – Kutta Method	5	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	3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	2		
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2		
CO3	3	3	1	-	-	-	-	-	-	-	-	-	1		
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2		
CO5	3	3	2	-	-	-	-	-	-	-	-	-	2		
CO6	3	2	3	-	-	-	-	-	-	-	-	-	2		
	3	High				2	Medium					1	Low		

Bloom's Level	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
	Theory			Practical			
	IAE I (5)	IAE II (10)	IAE III (10)	Attendance [5]	Rubric based [10]	Model Exam [10]	
Remember	10	10	10				10
Understand	10	10	10		40	40	30
Apply	30	30	30		60	60	60
Analyze							
Evaluate							
Create							

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23CE401	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 Fresh and Hardened Concrete.	Apply
CO2	Recognize the effect of chemical admixtures on properties of concrete.	Understand
CO3	Implement the concept and procedure of mix design as per IS guidelines.	Apply
CO4	Select the various special concretes with respect to its performance and wide applications in modern construction.	Understand
CO5	Assess the strength of concrete by conducting Non Destructive tests.	Apply
CO6	Illustrate the durability aspects of concrete.	Understand

Module - I 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.

Module - 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.

Module - 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.

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Module - IV Special Concretes **9**

Light weight concretes – foam concrete – self compacting concrete – vacuum concrete – High strength concrete – Fiber reinforced concrete – Ferro cement – Ready mix concrete – SIFCON – Shotcrete – Polymer concrete – High performance concrete – Geopolymer Concrete.

Module - V Non-Destructive Test and Durability of Concrete **9**

Non – destructive tests: Rebound hammer-Ultra sonic pulse velocity test – Pullout test – Durability of concrete – Mechanism of corrosion – Causes and effects – Permeability of concrete – Shrinkage – Acid resistance – Chloride attack- Remedial measures.

Total: 45 Periods

Text Book:

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, 2019

Reference Books:

1 Job Thomas, "ConcreteTechnology", Cengage Learning India Pvt. Ltd., Delhi, 2019

2 IS383–1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011

3 Kumar P Mehta., Paulo J M Monterio., "Concrete – Microstructure, Properties and Materials", Mc Graw Hill Education (India) Private Limited, New Delhi, 2022

Additional Reference Book:

1 IS456–2000: Indian Standard specification for plain and reinforced concrete, 2000

2 IS4926–2003: Indian Standard specification for ready–mixed concrete, 2003

3 IS1542-1992 : Indian standard specification for sand for plaster, 1992

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	3	3	3	3									2
CO2	3	3	3	3	3									2
CO3	3	3	3	3	3									2
CO4	3	3	3	3	3									2
CO5	3	3	3	3	3									2
CO6	3	3	3	3	3									2
	3	**High**			**2**	**Medium**					**1**	**Low**		

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

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

23CE402	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 soils and its properties.

2 Study about stress development in the soil.

3 Know about the stress distribution and 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	Assess the stress distribution in soil.	Apply
CO4	Identify the settlement in soils.	Apply
CO5	Determine the shear strength of soil.	Apply
CO6	Analyze the stability of slopes.	Understand

Module - I Soil Classification and Compaction 9

Nature of soil – phase relationships – Soil description and classification for engineering purposes – their significance – Index properties of soils – BIS Classification system; Soil compaction: Theory – comparison of laboratory and field compaction methods – Compaction – Proctor's test – Moisture – density relations-Factors influencing compaction behavior of soils.

Module - 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.

Module - 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.

Module - IV Shear Strength **9**

Shear strength of cohesive and cohesionless soils – Mohr – Coulomb failure theory – shear strength - Direct shear, Tri axial compression, UCC and Vane shear tests – Pore pressure parameters – Factors influences shear strength of soil, Cyclic mobility – Liquefaction.

Module - V Slope Stability **9**

Slope failure mechanisms – Infinite slopes and finite slopes - Total stress analysis for saturated clay – Fellenius method, Friction circle method – Use of stability number –– Slope protection measures.

Total: 45 Periods

Text Book:

1 Gopal Ranjan, "Basic and Applied Soil Mechanics" New Age International, New Delhi, 2022

2 Punmia,B.C.,"Soil Mechanic sand Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.

Reference Books:

1 Mc Carthy, D.F., "Essentials of Soil Mechanics and Foundations : Basic Geotechnics". Prentice – Hall, 2014

2 PurushothamaRaj.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 Reference Book:

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	3	3			2					3		2
CO2	3	3	3	3			2					3		2
CO3	3	3	3	3			2					3		2
CO4	3	3	3	3			2					3		2
CO5	3	3	3	3			2					3		2
CO6	3	3	3	3			2					3		2

3 High 2 Medium 1 Low

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

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

23CE403	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.	Understand
CO2	Analyze propped cantilever, fixed beams and continuous beams using theorem of three moment equation for external loadings and support settlements.	Apply
CO3	Assess the load carrying capacity of columns.	Apply
CO4	Measure stresses induced in cylindrical and Spherical shells.	Apply
CO5	Determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure	Apply
CO6	Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beams	Analyze

Module - 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.

Module - 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.

Module - 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.

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Module - 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.

Module - 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 Book:

1 Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain"SMTS –I Strength of Materials", 12th Edition,Lakshmi publications. New Delhi,2022.

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 2021.

2 Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2019.

3 Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2019.

Additional Reference Book:

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	3	3	3	3								3	
CO2	3	3	3	3	3								3	
CO3	3	3	3	3	3								3	
CO4	3	3	3	3	3								3	
CO5	3	3	3	3	3								3	
CO6	3	3	3	3	3								3	

3	High	2	Medium	1	Low

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

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Summative Assessment				
Bloom's category	**Continuous Assessment Tests**			**Final Examination (60)**
	IAE 1 - (5)	**IAE 2 - (10)**	**IAE 3 - (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	15	15	15	30
Analyse	15	15	15	30
Evaluate				
Create				

23CE404	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.

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 of GPS surveying.	Understand
CO5	Set out Simple, Compound and Reverse curves.	Apply
CO6	Implement Hydrographic surveying.	Apply

Module - I Control Surveying 9

Horizontal and vertical control – Methods – specifications – triangulation – base line – instruments and accessories – corrections – satellite stations – reduction to centre – trigonometrical leveling Single and reciprocal observations – traversing – Gale's table.

Module - 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.

Module - 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.

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Module - 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.DGPS survey.

Module - V Advanced Surveying **9**

Route surveys for highways, railways and waterways -Simple, Compound, Reverse,Transition and Vertical curves – Setting out Methods – Hydrographic surveying – Tides - MSL- Sounding methods – Drone Surveying – Laser applications – Lidar survey.

Total: 45 Periods

Course Content:

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 measurment.	CO2	Apply
4	Triangulation and single plane methods.	CO2	Apply
5	Filed work using total station.	CO3	Apply
6	Tangential system – Stadia system	CO3	Apply
7	Subtense system.	CO3	Apply
8	Setting out works - Circular Curve.	CO4	Apply
9	Setting out works - Transition curve.	CO5	Apply
10	Setting out works – Foundation marking.	CO6	Apply

Total: 30 Periods

Text Book:

1 James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7thEdition, McGraw Hill, 2022.

2 Bannister and S.Raymond, "Surveying", 7th Edition, Longman 2019.

Reference Books:

1 Alfred Leick, "GPS satellite surveying", John Wiley & SonsInc, 2018.

2 Guocheng Xu, "GPS Theory, Algorithms and Applications", Springer - Berlin, 2022.

3 Satheesh Gopi, rasathish kumar, N. madhu, “Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2021

Additional Reference Book:

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

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

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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	3	3	3	3	3				3				3	
CO2	3	3	3	3	3				3				3	
CO3	3	3	3	3	3				3				3	
CO4	3	3	3	3	3				3				3	
CO5	3	3	3	3	3				3				3	
CO6	3	3	3	3	3				3				3	
3	**High**				**2**	**Medium**					**1**	**Low**		

Summative Assessment						
Bloom's category	**Continuous Assessment Tests**					**Final Examination (50)**
	Theory				**Practical**	
	IAE 1 - (5)	**IAE 2 - (10)**	**IAE 3 - (10)**	**Attendance (5)**	**Rubric Based CIA (20)**	
Remember	10	10	10		10	20
Understand	10	10	10		20	40
Apply	30	30	30		20	40
Analyse						
Evaluate						
Create						

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23CE405	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 Flow measurement in hydraulic sections.	Apply
CO2	Identify the Flow though pipe sections.	Understand
CO3	Illustrate flow in open channels, hydraulic jump and backwater curve.	Apply
CO4	Explain the performance of reaction turbines.	Understand
CO5	Express the performance characteristics of radial flow turbines.	Understand
CO6	Recognize the operating characteristics of pumps.	Understand

Module - I Flow Measurement 9

Velocity measurement – Pitot tube- Current meter – Discharge measurement – Orifices – mouthpieces – notches and weirs – Rectangular-triangular – Cippletti weir – submerges weir – Time of emptying reservoir through orifices.

Module - II Flow through Pipes 9

Energy losses in pipes – Darchy Weisbach's formula – flow through pipes in series – flow through parallel pipes – flow through branched pipes-equivalent pipe – Water hammer in pipes – Laminar flow through circular pipes – Hagen Poiseuilles equation – turbulent flow through circular pipes –Velocity distribution.

Module - III Flow in open channels 9

Types of flow in channels – velocity distribution – Chezy's formula – Manning's flormula; Most economical channel section. Computation in uniform flow – specific energy and critical depth – hydraulic jump and backwater curves.

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Module - IV Impact of Jets and 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.

Module - V Pumps **9**

Classification of Pumps – 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 Components:

S. No.	Name of the Experiment	CO Mapping	RBT
1	**Flow Measurement:** i) Calibration of Rotameter ii) Calibration of Venturimeter / Orificemeter iii) Flow through variable duct area - Bernoulli's Experiment iv) Flow through Rectangular Notch v) Flow through Triangular Notch	CO1	Apply
2	i) Determination of friction factor in pipes ii) Determination of minor losses	CO2	Apply
3	**Determination of Meta centric Height**	CO3	Apply
4	**Impulse and Reaction turbines:** i) Characteristics of Pelton wheel turbine ii)Characteristics of Francis turbine	CO4	Apply
5	**Axial Flow Turbines:** i) Characteristics of Kaplan turbine	CO5	Apply
6	**Pumps:** i) Characteristics of Centrifugal pumps ii) Characteristics of Submersible pump iii) Characteristics of Reciprocating pump	CO6	Apply

Total: 30 Periods

Text Book:

1 Modi P.N and Seth.S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2014.

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 Reference Book:

1 https://nptel.ac.in/courses/105/105/105105203/

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

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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	3	3		3			2				3	2		2
CO2	3	3		3			2				3	2		2
CO3	3	3		3			2				3	2		2
CO4	3	3		3			2				3	2		2
CO5	3	3		3			2				3	2		2
CO6	3	3		3			2				3	2		2
3 High					**2 Medium**						**1 Low**			

Summative Assessment						
Bloom's category	**Continuous Assessment Tests**					**Final Examination (50)**
	Theory				**Practical**	
	IAE 1 - (5)	**IAE 2 - (10)**	**IAE 3 - (10)**	**Attendance (5)**	**Rubric Based CIA (20)**	
Remember	10	10	10		10	20
Understand	10	10	10		20	40
Apply	30	30	30		20	40
Analyse						
Evaluate						
Create						

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23CE406	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 intension, 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 tests.	Apply
CO5	Select the metals by conducting hardness tests.	Apply
CO6	Recognize the deflection behavior of springs.	Understand

S. No.	Name of the 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 (Rock well and Brinell Hardness Tests)	CO5	Apply

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8	Compression test on Helical spring	CO6	Understand
9	Tension Test on Helical Spring	CO6	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 Reference Book:

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	3	3	3								3	
CO2	3	3	3	3	3								3	
CO3	3	3	3	3	3								3	
CO4	3	3	3	3	3								3	
CO5	3	3	3	3	3								3	
CO6	3	3	3	3	3								3	

3	High		2	Medium	1	Low

Bloom's Level	Summative Assessment Based on continuous and End Semester Examination	
	Rubrics Based continuous Assessment (60 Marks)	End Semester Examination (40 Marks)
Remember		
Understand		
Apply	60	40
Analyze		
Evaluate		

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23MC005	YOGA AND VALUES FOR HOLISTIC DEVELOPMENT (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory Course				
Pre requisites	Fundamentals of Yoga				

Course Objectives

The course is intended to

1. Know the various types of yoga and their benefits.
2. Practice essential yoga postures and techniques.
3. Give mental clarity and focus through the practice of pranayama.
4. Incorporate relaxation technique into their daily routine works.
5. Use meditation to reduce stress and anxiety.
6. Promote positive health, prevention of stress related health problems and rehabilitation through Yoga.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Balance their full potential and confidence.	Understand
CO 2	Understand the knowledge of fundamental yoga postures.	Understand
CO 3	Realize the enhanced the functions of inner organs.	Understand
CO 4	Achieve a deep state of relaxation and release physical and mental tension.	Understand
CO 5	Cultivate a sense of calm and well-being.	Understand
CO 6	Experience enhanced flexibility, strength and balance as well as reduced stress.	Understand

Course Contents

Module – I	INTRODUCTION TO YOGA	6
Foundations of Yoga - History and Development of Yoga - Etymology and Definitions, Misconceptions, Aim and Objectives of Yoga, True Nature and Principles of Yoga - Introduction to Vedas – Upanishads - Prasthanatrayee - Purushartha Chatushtaya.		
Module – II	**POSTURES (ASANA)**	**6**
Trikonasana - Ardha-Kati – Chakrasana – Tadasana - Vrikshasana - Padmasana, Simhasana - Paschimottanasana, Uttanpadasana – Salabhasana - Shavasana Pawanmuktasana - Anti-Rheumatic Series - Digestive / Abdominal Group - Energy Bock Series - Back Strengthening Exercises - Sun Salutation (Surya Namaskar) - Classical Sequence.		
Module – III	**BREATHING**	**6**
The Foundations - Abdominal Breathing - Thoracic (mid-chest) breathing - Clavicular (upper chest breathing) - The Complete Yoga Breath, Pranayama Techniques - Breathing Ratios - Nadi Shodhana (Alternate Nostril Breathing) - Ujjayi (the 'whispering breath' or the 'psychic breath') - Bhramari (Humming Bee breath).		

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Module – IV	RELAXATION	6
Quick Relaxation techniques - Tense & Relax - Short Yoga Nidra (Power Nap) - Extended Shavasana - Yoga Nidra – Sankalpa.		
Module – V	**MEDITATION**	**6**
Develop a good, comfortable sitting posture - Kaya Sthairyam (Body Stillness) - Om Chanting - Trataka (Concentrated Gazing).		
		Total : 30 Periods

Text Books

1. Stephen Sturges, The Yoga Book. Motilal Banarsidass, Delhi, 2004.
2. Singh S.P & Yogi, Foundation of Yoga, Standard Publication, New Mukesh Delhi, 2010.
3. Sahay G.S. HathaYoga Pradeepika of Svatmarama, MDNIY Publication, 2013.

Reference Books

1. Bhat, Krishna K. The Power of Yoga: SuYoga Publications Mangalore,2006.
2. Fenerstein, George, The Yoga Tradition: It's History, Literature, Philosophy practice, Bhavana Books and Prints, 2002.
3. Tiwari, O.P, Asana Why and How? Kaivalyadhama, Lonavla, 2011.

Web References:

1. https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf.
2. https://edukemy.com/blog/upsc-ncert-notes-indian-polity-state-legislature/#Organization_and_Composition_of_State_Legislature
3. https://blog.ipleaders.in/dpsp-and-fundamental-rights/

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment 1 (50 Marks)	Assessment 2 (50 Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

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SEMESTER V

23CE501	DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS	L	T	P	C
		3	0	0	3
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 beams.
3. Make students familiar with the codal provisions for the design of slab and staircase.
4. Impart knowledge on the basic design of R.C.C columns.
5. Design the various types of footings

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Apply the various design methodologies for the design of RC elements.	Apply
CO2	Analysis and design the flanged beams under Shear, flexure and torsion by limit state method	Analyze
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 the footing by limit state method.	Evaluate

Course Contents:

Module I	INTRODUCTION	9
Objective of structural design-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 and doubly reinforced rectangular beams by Limit State Method.		
Module II	**DESIGN OF BEAMS**	**9**
Analysis and design of Flanged beams for Shear, flexure and torsion - Design of RC members for combined Bending, Shear and Torsion		
Module III	**DESIGN OF SLABS AND STAIRCASE**	**9**
Design of cantilever, one way simply supported and continuous slabs - Two way slab- Design of continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.		
Module IV	**DESIGN OF COLUMNS**	**9**
Types of columns –Design of Axially Loaded short columns–Design of Slender columns- Design of Biaxial bending using design aids (SP 16)..		
Module V	**DESIGN OF FOOTINGS**	**9**
Design of wall footing– Design of axially and eccentrically loaded, Rectangular footings – Design of Combined Rectangular footing for two columns only.		

TOTAL: 45 PERIODS

Text Books:

1. Gambhir M. L., "Fundamentals of Reinforced Concrete Design", McGraw Hill Education India Pvt. Limited, 2017.

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2. Sinha S. N., "Reinforced Concrete Design", Tata McGraw-Hill, New Delhi, 2002.
3. N. Krishna Raju, "Design of Reinforced Concrete Structures", CBS Publishers and Distributors Pvt. Ltd., New Delhi, 4th Edition, 2019.
4. Varghese P.C., "Limit State Design of Reinforced Concrete", 3rd Edition, PHI Learning Pvt. Ltd., New Delhi, 2022.
5. Subramanian,N.,"Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2014.

Reference Books:

1. Ramachandra,"Limit state Design of Concrete Structures", Standard Book House, New Delhi.
2. Unnikrishnan Pillai and Devdas Menon, "Reinforced Concrete Design", 4th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2020.
3. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Reinforced Concrete Structures (Vol. 1)", 8th Edition, Laxmi Publications Pvt. Ltd., New Delhi, 2023.
4. H. J. Shah, "Reinforced Concrete (R.C.) Design", 11th Edition, Charotar Publishing House Pvt. Ltd., Anand, 2024.
5. Jack C. McCormac and Russell H. Brown, "Design of Reinforced Concrete", 10th Edition, Pearson Education, New Jersey, 2023.
6. IS 456: 2000, "Plain and Reinforced Concrete - Code of Practice".
7. IS 875 (1-5): 1987, "Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures".
8. SP 16: 1980, "Design Aids for Reinforced Concrete to IS 456:1978".
9. SP 34: 1987, "Handbook of concrete reinforcement and detailing".
10. National Building Code of India 2016 (NBC 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	3						1	2				1
CO2	3	2	3						1	2				1
CO3	3	2	3						1	2				1
CO4	3	2	3						1	2				1
CO5	3	2	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	

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Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember				
Understand	10			20
Apply	10			10
Analyze		25		20
Evaluate		25	50	50
Create				

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23CE502	STRUCTURAL ANALYSIS I	L	T	P	C
		3	0	2	4
Nature of the Course	Professional core				
Pre requisites	Strength of materials				

Course Objectives

The course is intended to

1. Understand the basic concepts of the 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 the 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	Apply the Strain Energy method to determine responses in structures.	Apply
CO2	Apply the concept of moving loads and influence lines for simple structures.	Apply
CO3	Analyse indeterminate beams using Müller-Breslau's principle to develop influence lines	Analyze
CO4	Analyse the structures by the slope deflection method	Analyze
CO5	Analyse the structures by the moment distribution method	Analyze

Course Contents:

Module – 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).		
Module – 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.		
Module – III	**INFLUENCE LINE 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.		
Module – IV	**SLOPE DEFLECTION METHOD**	**9**
Slope deflection equations–Joint equilibrium conditions-Analysis of continuous beams and rigid frames (with and without sway		
Module – 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

CHAIRMAN-BOARD OF STUDIES

TEXTBOOKS:

1. S.S. Bhavikatti, "Structural Analysis – Vol. 1", 6th Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2021.
2. S.S. Bhavikatti, "Structural Analysis – Vol. 2", 5th Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2021.
3. Punmia B. C., Ashok Kumar Jain & Arun Kumar Jain, "Theory of structures (SMTS 2)", Laxmi Publications, New Delhi, 2017.

REFERENCE BOOKS:

1. Negi L. S. and Jangid R. S., "Structural Analysis", Tata McGraw Hill Publishing Co. Ltd., 2004.
2. C.S. Reddy, "Basic Structural Analysis", 4th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2021.
3. R.C. Hibbeler, "Structural Analysis", 10th Edition, Pearson Education, New Delhi, 2023.
4. Bhavikatti S. S., "Matrix Methods of Structural Analysis", I.K. International Publishing House Pvt. Ltd., New Delhi, 2014.
5. Vaidyanathan R., Perumal P. & Abdul Aleem M. I., "Structural Analysis, Vol. 3", Laxmi Publications, New Delhi, 2020.
6. T.S. Thandavamoorthy, *"Structural Analysis – I"*, 2nd Edition, Oxford University Press, New Delhi, 2020.
7. Devdas Menon, *"Structural Analysis"*, 2nd Edition, Oxford University Press, New Delhi, 2021.
8. K.U. Muthu, M. Natarajan, A. Ganesan, N. Vijaya Chandar and B. Madhavan, *"Basic Structural Analysis"*, 2nd Edition, I.K. International Publishing House Pvt. Ltd., New Delhi, 2020.

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	3	3	2						2		3	3	
CO2	3	3	3	2						2		3	3	
CO3	3	3	3	2						2		3	3	
CO4	3	3	3	2						2		3	3	
CO5	3	3	3	2						2		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	

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Summative Assessment				
Bloom's Level	**Continuous Assessment**			**End Semester Examination (ESE) (100)**
	Theory			
	IAE -1 (5)	**IAE-2 [10]**	**IAE-3 (10)**	
Remember	10	10	10	10
Understand	10			10
Apply	30	20		30
Analyze		20	40	50
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23CE503	Environmental Engineering I	L	T	P	C
		3	0	2	4
Nature of Course	Professional core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Gain knowledge about the physical, chemical, and biological characteristics of water.
2. Impart knowledge on the 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 the source of water and its characteristics.	Understand
CO2	Analyse the structure of drinking water supply systems, focusing on water transport, treatment, and distribution	Analyse
CO3	Identify the unit operations and processes in water treatment.	Analyse
CO4	Recognize the water quality criteria, standards, and their relation to public health.	Apply
CO5	Illustrate the requirements of water distribution and supply in buildings.	Apply

Course Contents:

Module - 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 - Characterization and standards- Impact of climate change - Integration of Smart Technologies in Water Supply Systems		
Module - 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		
Module - 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.		
Module - IV	**Advanced Water Treatment**	**9**
Principles and functions of Aeration - Iron and manganese removal, demineralization - Water softening - Desalination – Defluorination - Membrane Systems - Recent advances.		
Module -V	**Water Distribution and Supply to Buildings**	**9**
Requirements of water distribution - Layout of water distribution system - Components -Service reservoirs -		

CHAIRMAN-BOARD OF STUDIES

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 I & Vol II", Khanna Publishers, New Delhi, 2022
2. B.C. Punmia, Ashok Jain and Arun Jain, *"Water Supply Engineering (Environmental Engineering – Vol. I)"*, 10th Edition, Laxmi Publications Pvt. Ltd., New Delhi, 2023.
3. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, *"Environmental Engineering"*, Reprint Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2022.

Reference Books:

1. Punmia B.C., Jain A.K. & Jain A.K., "Environmental Engineering - I & II", 2nd Edition, Laxmi Publications, New Delhi, 2022
2. S.N. Kaushik, *"Environmental Engineering: Water Supply Engineering"*, 1st Edition, Standard Publishers Distributors, New Delhi, 2021.
3. CPHEEO, *"Manual on Water Supply and Treatment Systems – Part A: Engineering, Planning, Design & Implementation"*, Central Public Health and Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Government of India, New Delhi, 4th Edition, December 2023.
4. CPHEEO, *"Manual on Water Supply and Treatment Systems – Part B: Operation and Maintenance"*, Central Public Health and Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Government of India, New Delhi, 2nd Edition, December 2023.
5. CPHEEO, *"Manual on Water Supply and Treatment Systems – Part C: Management"*, Central Public Health and Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Government of India, New Delhi, 1st Edition, December 2023.
6. CPHEEO, *"Manual on Sewerage and Sewage Treatment Systems – Part A: Engineering"*, Central Public Health and Environmental Engineering Organisation, Ministry of Housing & Urban Affairs, Government of India, New Delhi, 3rd Edition (revised & updated), 2013.
7. CPHEEO, *"Manual on Sewerage and Sewage Treatment Systems – Part B: Operation and Maintenance"*, Central Public Health and Environmental Engineering Organisation, Ministry of Housing & Urban Affairs, Government of India, New Delhi, 1st Edition, 2013.
8. CPHEEO, *"Manual on Sewerage and Sewage Treatment Systems – Part C: Management"*, Central Public Health and Environmental Engineering Organisation, Ministry of Housing & Urban Affairs, Government of India, New Delhi, 1st Edition, 2013.
9. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.
10. American Public Health Association, American Water Works Association, Water Environment Federation. Lipps WC, Braun-Howland EB, Baxter TE, eds. Standard Methods for the Examination of Water and Wastewater. 24th ed. Washington DC: APHA Press; 2023

References:

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

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Laboratory Components

S.No	Name of the Experiment	CO Mapping	RBT
1	Determination of pH	CO1	Apply
2	Determination of Conductivity	CO1	Apply
3	Determination of Turbidity	CO2	Apply
4	Determination of suspended, settleable, volatile and fixed solids	CO2	Apply
5	Determination of Hardness	CO2	Apply
6	Determination of Optimum Coagulant dosage	CO3	Apply
7	Determination of Alkalinity	CO4	Apply
8	Determination of Acidity	CO4	Apply
9	Determination of Chloride	CO4	Apply
10	DeterminationBOD for the given sample	CO4	Apply

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	1			3		1			3		2
CO2	3	3	1	2			3		1			3		2
CO3	3	2	3	2			3		1			3		2
CO4	3	2	3	2			3		1			3		2
CO5	3	2	1	2			3		1			3		2
	3	High				2	Medium					1	Low	

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

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23CE504	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	Evaluate
CO4	Estimate the load carrying capacity of piles and settlement of pile groups	Apply
CO5	Analyse the lateral earth pressure on retaining wall	Analyze

Course Contents:

Module – 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 report and Selection of foundation.		
Module – 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 (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.		
Module – 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		
Module – IV	**PILE FOUNDATION**	**9**
Types of piles and their functions – Micro piles- Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Lifting of building- Uplift capacity- Group		

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capacity by different methods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Cohesive – expansive – non expansive – Cohesionless soils – Codal provisions.		
Module – 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-Soil Nailing – Stability analysis of retaining walls – Codal provisions.		

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Varghese.P.C, "Foundation Engineering", Prentice Hall of India Pvt. Ltd., New Delhi, (9th Printing) 2012
2. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2017 (Reprint).
3. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2022 (Reprint).
4. 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 McGraw Hill 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", Bureau of 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 symmetrical static 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 Indian Standards, New Delhi.
10. IS Code 2911 (Part 4) : 1979 (Reaffirmed 1997) "Load Test on Piles", Bureau of Indian Standards, New Delhi.
11. IS Code 1904: 1986 (Reaffirmed 1995) "Design and Construction of Foundations in Soils", Bureau of Indian Standards, New Delhi.

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12. IS Code 2131: 2025 “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 sampling for 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 Type of Wall” , Bureau of Indian Standards, New Delhi.
16. IS Code 14458 (Part 2) : 1998 “Retaining Wall for Hill Area – Guidelines, Design of Retaining/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	3	1	2	3		2								2
CO2	3	2	2	3		2								2
CO3	3	2	3	3		2								2
CO4	3	2	3	3		2								2
CO5	3	1	2	3		2								2
	3	High				2	Medium					1	Low	

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

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23CE505	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 equipment's using total station.
3. Familiarize on leveling 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	Utilize the traversing method to determine quantities prior to and following project execution.	Apply
CO2	Use methods for calculating area and estimating time	Apply
CO3	Employ techniques to evaluate surface gradients and determine elevations.	Apply
CO4	Carry out curve alignment and marking operations in the field.	Apply
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 acre's 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.

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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 90m.	CO1	Apply
3	Coordination method to calculate Area	CO2	Apply
4	Foundation Marking and column foundation marking.	CO2	Apply
5	Fixing gradient for a pipeline.	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 Linear Every 45 Degree. and Length not less than 60 Meter on each Radial Line 65 (ii). Block Level/By squares of size at least 100m x 100m ,20m interval.	CO5	Apply
9	Study in Advanced equipment DGPS	CO5	Apply

Total:45 Periods

Text Books:

1. B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, *"Surveying – Vol. I"*, 17th Edition, Laxmi Publications Pvt. Ltd., New Delhi, 2023.
2. B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, *"Surveying – Vol. II"*, 16th Edition, Laxmi Publications Pvt. Ltd., New Delhi, 2023.
3. S.K. Duggal, *"Surveying – Vol. I"*, 5th Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2021.
4. S.K. Duggal, *"Surveying – Vol. II"*, 4th Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2021.

Reference Books:

1. N.N. Basak, *"Surveying and Levelling"*, 2nd Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2019.
2. R. Subramanian, *"Surveying and Levelling"*, 2nd Edition, Oxford University Press, New Delhi, 2020.
3. R. Subramanian, *"Surveying and Levelling – II"*, 2nd Edition, Oxford University Press, New Delhi, 2020.
4. A.M. Chandra, *"Plane Surveying"*, 3rd Edition, New Age International Publishers, New Delhi, 2021.
5. A.M. Chandra, *"Higher Surveying"*, 3rd Edition, New Age International Publishers, New Delhi, 2021.
6. Wolf, Paul R. and Charles D. Ghilani, *"Elementary Surveying: An Introduction to Geomatics"*, 14th Edition, Pearson Education, New Delhi, 2022.
7. Dr. K.R. Arora, *"Surveying – Volume I (in SI Units)"*, Standard Book House, New Delhi, 17th Edition, 2019.
8. Dr. K.R. Arora, *"Surveying – Volume II (in SI Units)"*, Standard Book House, New Delhi, 15th Edition, 2018.

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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				2				3	3
CO2	3	2	3		3				2				3	3
CO3	3	3	3		3				2				3	3
CO4	3	2	3		3				2				3	2
CO5	3	3	3		3				2				3	2
	3	High				2	Medium					1	Low	

Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [50marks]**	**End Semester Examination (ESE) [50marks]**
Remember		
Understand		
Apply	50	100
Analyze		
Evaluate		
Create		

CHAIRMAN-BOARD OF STUDIES

PROFESSIONAL ELECTIVES (PE)

STREAM–I

ENVIRONMENTAL AND WATER RESOURCE ENGINEERING

CHAIRMAN-BOARD OF STUDIES

23CEE01	HYDROLOGY	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
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 hydrographs.
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 the hydrologic cycle, hydrometeorology, and the 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 groundwater and the hydraulics of subsurface flows.	Apply
CO4	Apply the flood control and frequency studies of floods by various methods	Apply
CO5	Illustrate the various types of aquifers and tests in groundwater hydrology	Apply

Course Contents:

Module 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 - Remote Sensing and GIS Applications in Rainfall and Hydrologic Analysis		
Module II	**ABSTRACTION FROM PRECIPITATION**	**9**
Losses from precipitation – Evaporation process – Evaporation reducing balls - Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall		
Module 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		
Module 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 - Real-Time Flood Forecasting and Early Warning Systems – Underground water storage		
Module 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:

CHAIRMAN-BOARD OF STUDIES

1. P.N. Modi, “Irrigation Water Resources and Water Power Engineering”, Standard Book House, New Delhi, 11th Edition, 2020
2. B.C. Punmia, P.B.B. Lal,A.K. Jain and A.K. Jain, “Irrigation and Water Power Engineering”, Standard Publishers, 17th Edition, 2021.
3. Jayarami Reddy P., “Hydrology”, Tata McGraw Hill Education Private Ltd., New Delhi, 2008
4. Das Madan Mohan and Saikia Mimi Das, “Hydrology”, 2nd Edition, PHI Learning Private Limited, New Delhi, 2024

REFERENCES:

1. K. Subramanya, “Engineering Hydrology”, Tata McGraw Hill Pub. Co., New Delhi, 5th Edition, 2020
2. H M Raghunath, “Hydrology: Principles, Analysis and Design”, New Age International,4th Edition, 2022
3. Ven Te Chow, Maidment D.R. and Mays L. W., “Applied Hydrology”, McGraw Hill International Book Company, 2010.
4. David Keith Todd, “Groundwater Hydrology”, John Wiley & Sons Inc., 2007.

Additional References:

1. https://nptel.ac.in/courses/105101214

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					3		2
CO2	3	2		3			3					3		2
CO3	3	3		3			3					3		2
CO4	3	2		3			3					3		2
CO5	3	3		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	

CHAIRMAN-BOARD OF STUDIES

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	20
Understand	40			20
Apply		40	40	60
Analyse				
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE02	Ground Water Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Environmental and Water Resource Engineering				

Course Objectives

The course is intended to

1. Gain knowledge on Hydrogeological 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	State the aquifer properties and its dynamics.	Remember
CO2	Solve well design and practical problems.	Apply
CO3	Demonstrate a model for groundwater management.	Apply
CO4	Describe the importance of groundwater quality concepts and legislations.	Understand
CO5	Execute the conservation measures of groundwater.	Apply

Course Contents:

Module 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.		
Module 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.		
Module 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 - Artificial Recharge Techniques and Managed Aquifer Recharge (MAR)		
Module 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		
Module 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, 2011.

REFERENCES:

CHAIRMAN-BOARD OF STUDIES

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2012
2. Bear J., “Hydraulics of Groundwater”, Dover Publications, New York, 2012
3. Karanth KR., “Ground Water Assessment, Development & Management”, Tata Mc Graw Hill Co. Ltd., New Delhi, 2004
4. Rastogi A.K., Numerical Groundwater Hydrology, 2011.

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	1				2	2					3		2
CO2	3	2				2	3					3		2
CO3	3	2				2	3					3		2
CO4	3	1				2	3					3		2
CO5	3	1				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**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	30	10	10	20
Understand	20	20	20	20
Apply		20	20	60
Analyse				
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

3CEE03	Air Pollution and Control Engineering	L	T	P	C
		3	0	2	4
Nature of Course	Professional Elective				
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.	Analyse
CO4	Select control equipment for gaseous contaminants.	Apply
CO5	Interpret sources, types, and control of indoor air pollutants.	Apply

Course Contents:

Module 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- Effects of air pollutants on the atmosphere, soil & water bodies -Ambient Air Quality and Emission standards –Air pollution indices – emission invertories.		
Module – II	**METERROLOGY**	**9**
Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.		
Module – 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.		
Module – 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		
Module – 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. NoeldeNevers,"Air Pollution Control Engineering",Wave land press,Inc 2017.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies" , Allied Publishers (P) Ltd.,India 2002.

Reference Books:

1. David H.F.Liu,BelaG.Liptak,"AirPollution",Lweis Publishers,2000.
2. Arthur C. Stern,"Air Pollution (Vol.I–Vol.VIII)",Academic Press,2006.
3. WayneT.Davis,"Air Pollution Engineering Manual",John Wiley & Sons, Inc,2000.
4. M.N Rao and HVN Rao,"AirPollution",TataMcgraw 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) 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					2		3
CO2	3	3			3		3					2		3
CO3	3	3			3		3					2		3
CO4	3	3			3		3					2		2
CO5	3	3			3		3					2		2
	3	High				2	Medium					1	Low	

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 Level	**Continuous Assessment**			**End Semester Examination (ESE) (60)**
	Theory			
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	
Remember	10	10	10	20
Understand	40	20	10	30
Apply			30	30
Analyze		20		20
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE04	Water Resources Systems Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
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. Collect Physical and Socio-Economic data for analysing the water resources system
3. Gain knowledge on the analysis of water resources systems 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 fundamental concepts, needs, and significance of planning in water resource systems and describe the issues and processes involved.	Understand
CO2	Collect, organize, and interpret physical and socio-economic data for water resources system analysis, considering environmental, conservation, and multipurpose project requirements.	Apply
CO3	Formulate and solve water resources system analysis problems using linear and non-linear programming, including defining objective functions, constraints, and optimality conditions.	Apply
CO4	Apply dynamic programming and stochastic decision-making techniques to optimize water resources system operations under varying conditions and uncertainties.	Apply
CO5	Explain and implement simulation principles, sensitivity analysis, and advanced mathematical models for evaluating and improving water resources system performance.	Apply

Course Contents:

Module I	**INTRODUCTION**	**9**
Planning, Meaning and Significance. Need for water resources systems planning, Issues in planning. Planning process.		
Module II	**PLANNING FOR WATER RESOUCES DEVELOPMENT**	**9**
Statement of objectives. Data requirements. Project formulation. Environmental considerations in planning, Systems analysis. Pitfalls in project planning. Conservation and augmentation of water resources. Multipurpose projects. Functional requirements in multi-purpose project. Compatibility of multipurpose uses.		
Module III	**WATER RESOURCES SYSTEMS**	**9**
Concepts of systems engineering in water resources. Objective function, Production function and optimality conditions. Linear, non-linear and dynamic programming, Sensitivity analysis, Stochastic models, Statistical decision theory. Application of water resources systems engineering to practical problems.		
Module IV	**ECONOMIC ANALYSIS OF WATER RESOURCES SYSTEM**	**9**
Principles of Engineering Economy, Capital, Interest and Interest Rates, Time Value of Money, Depreciation, Benefit Cost Evaluation, Discounting Techniques, Economic and Financial Evaluation, Socio-Economic		

Analysis.		
Module V	**ADVANCED OPTIMIZATION TECHNIQUES**	**9**
Integer and parametric linear programming - Goal programming models with applications Discrete differential dynamic programming and incremental dynamic programming - Linear decision rule models with application - Stochastic dynamic programming models		

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.
2. Jain S.K. and Singh V.P., "Water Resources Systems Planning and Management", 2nd Edition, Elsevier Science, 2023

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
6. Loucks D.P. and van Beek E., "Water Resource Systems Planning and Management: An Introduction to Methods, Models, and Applications", Springer Cham, 2017

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					2		2
CO2	3	2	2	2			2					2		2
CO3	3	3	3	3			2					3		3
CO4	3	2	3	2			2					3		3
CO5	3	3	3	3			3					3		2
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**

CHAIRMAN-BOARD OF STUDIES

Remember	Online Quiz	5	15
Understand	Class Presentation/Power point presentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	10
Understand	40			20
Apply		40	40	70
Analyse				
Evaluate				
Create				

CHAIRMAN - BOARD OF STUDIES

23CEE05	Integrated Water Resources Management	L	T	P	C
		3	0	2	4
Nature of Course	Professional Elective				
Pre requisites	Environmental and Water Resource Engineering				

Course Objectives

The course is intended to

1. Know about the frame work of integrated water resources management
2. Gain knowledge on contextualizing 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	Explain the concepts, objectives, principles, and evolution of Integrated Water Resources Management and its relevance in modern water resource planning.	Understand
CO2	Analyze the integration of IWRM with Sustainable Development Goals and assess institutional, bureaucratic, and developmental frameworks at global, regional, and local scales.	Analyze
CO3	Apply IWRM principles to address emerging water management issues such as climate change impacts, irrigation, flood and drought management, and pollution control.	Apply
CO4	Evaluate linkages between water and public health, and assess the health impacts of water resource development projects using suitable methodologies and case studies.	Evaluate
CO5	Apply and analyze water management approaches in agriculture, including blue–green water concepts, water footprint, virtual water trade, irrigation efficiency, automation, and pricing policies for sustainable food and water security.	Analyze

Course Contents:

Module – I	IWRM FRAME WORK	9
Definition – Objectives – Principles - Evolution of IWRM - IWRM relevance in water resources management– Paradigm shift: Processes and prospective outcomes.		
Module – II	**CONTEXTUALIZING IWRM**	**9**
Unformulations - SDG goals – IWRM in Global, Regional and Local water partnership – Institutional transformation-Bureaucraticreforms-Inclusive development		
Module – III	**EMERGING ISSUES IN WATER MANAGEMENT**	**9**
Emerging Issues -– Drinking water management in the context of climate change - IWRM and irrigation - Flood –		

CHAIRMAN-BOARD OF STUDIES

Drought – Pollution – Linkages between water, health and poverty		
Module – IV	**WATER AND HEALTH WITHIN THE IWRM CONTEXT**	**9**
Links between water and health; options to include water management interventions for health- Health protection and promotion in the context of IWRM – Global burden of Diseases -Health impact assessment of water resourses development projects-Case studies.		
Module – V	**AGRICULTURE IN THE CONCEPT OF IWRM**	**9**
Water for food production: ' blue' versus 'green' water debate -Water foot print -Virtual water trade for achieving global water and food security – Irrigation efficiencies, irrigation methods – Automation in irrigation using AI - current water pricing policy – scope to relook pricing.		

TOTAL: 45 PERIODS

Text Books:

1. V. Thomas Cech, Principles of water resources: history, development, management and policy, 4th ed. John Wiley and Sons Inc., New York, 2018.
2. P. Mollinga, et al., Integrated Water Resources Management, Water in South AsiaVolume I, Sage Publications, 2006.
3. Sithamparanathan, Rangasamy, A., and Arunachalam, N., "Ecosystem Principles and Sustainable Agriculture", Scitech Publications (India) Pvt.Lt, Chennai, 1999.

Reference Books:

1. Mersha A., "Integrated Water Resources Management: A Systems Perspective of Water Governance and Hydrological Conditions", Routledge, London, 2021
2. CechThomas V., Principles of Water Resources: History, Development, Management and Policy. John Wiley and Sons Inc., New York. 2003.
3. Murthy,J.V.S.,"Water shed Management in India",Wiley Eastern Ltd.,NewYork,1995.
4. Dalte, S.J.C., "Soil Conservation and Land Management", International Book Distribution, India, 1986.
5. Adamowski J., Zyla C., Ganem Cuenca E., Medema W. and Reig P., "Integrated and Adaptive Water Resources Planning, Management and Governance", Water Resource Publications, Colorado, 2021

Additional References:

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

CHAIRMAN-BOARD OF STUDIES

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					3		2
CO2	3	2	1				3					3		2
CO3	3	2	1				3					3		2
CO4	3	2	1				3					3		2
CO5	3	3	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**			**End Semester Examination (ESE) (60)**
	IAE-I [5]	**IAE-II [10]**	**IAE III (10)**	
Remember	10	10	10	10
Understand	40			20
Apply		20		30
Analyse		20	20	20
Evaluate			20	20
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE11	Environmental and Social Impact Assessment	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
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:

Module 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.		
Module 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.		
Module 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		
Module 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 - Sustainable Livelihood Assessment in Project Impact Zones		
Module 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, L.W., "Environmental Impact Assessment", McGraw Hill, New York. 1996
2. Lawrence, D.P., "Environmental Impact Assessment - Practical solutions to recurrent problems", Wiley-Interscience, New Jersey. 2003
3. 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.
4. Morris P. &Therivel R., "Methods of Environmental Impact Assessment", Routledge, London, 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. Sadler B. & McCabe M., "Environmental Impact Assessment Training Resource Manual", UNEP, Nairobi, 2002
3. Ministry of Environment, Forests & Climate Change, Government of India, "EIA Notification and Sectoral Guides", New Delhi, 2010
4. Petts J., "Handbook of Environmental Impact Assessment", Vols. I & II, Blackwell Science, New York, 1998
5. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

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					2		3
CO2	3	2			3		3					2		3
CO3	3	3			2		3					2		3
CO4	3	2			3		3					2		2
CO5	3	3			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	

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Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	20
Understand	40	10	10	30
Apply			20	30
Analyze				
Evaluate			10	
Create		30		20

CHAIRMAN-BOARD OF STUDIES

23CEE13	URBAN ENVIRONMENT MANAGEMENT	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. Understand the complexities of urban environmental issues and challenges.
2. Analyze the impact of urbanization on the environment and human health.
3. Develop skills in urban planning, management, and sustainability.
4. Learn about urban environmental policies, regulations, and governance.
5. Apply tools and techniques for urban environmental assessment, monitoring, and mitigation.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Analyze and identify the environmental challenges facing urban areas, including air and water pollution, waste management, and climate change..	Analyze
CO2	Understand the principles of urban planning and management, including land use planning, transportation systems, and green infrastructure.	Understand
CO3	Students will learn about sustainable urban development strategies, including sustainable transportation, energy-efficient buildings, and waste reduction and recycling.	Understand
CO4	Understand the role of policy and governance in urban environmental management, including laws, regulations, and community engagement.	Understand
CO5	Develop analytical and problem-solving skills to assess and address urban environmental challenges.	Apply

Course Contents:

Module I	URBAN ENVIRONMENTAL ISSUES	9
Urbanization- Population growth scenario -Migration – Pollution of surface water resources – Rivers, tanks, channels - Ground water exploitation – Waste water -Characteristics -Pollution problems – Solid waste -Air pollution – CPCB norms.		
Module II	**URBAN MASTER PLANS**	**9**
Planning and organizational aspects -Urban waste resources management – Water in urban ecosystem -Urban water resources planning and organization aspects -Storm water management practices -Types of storage -Magnitude of storage -Storage capacity of urban components – Percolation ponds -Temple tanks -Rainwater harvesting -Urban water supply – Demand estimation – Population forecasting -Source identification – Conservation techniques – Integrated urban water planning – Smart city project planning – Green Building – LEED certification – Green audit		
Module III	**URBAN WASTEWATER MANAGEMENT**	**9**
Sewage generation -Storm drainage estimation -Industry contribution -Wastewater collection system -Separate and combined system -Hydraulic design of sewer and storm drain -Wastewater treatment -Disposal methods -Concept of decentralization – 3R concepts.		
Module IV	**MUNICIPAL SOLID WASTE MANAGEMENT**	**9**
Sources of solid waste -Characteristics -Rate of generation -Segregation at source -Collection of solid waste -Methods of collection -Route analysis -Transfer and transfer stations -Processing and disposal of solid waste.		

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Module V	**CASE STUDIES**	**9**
Environmental economics- Social and physiological aspects of pollution – Successful urban management -Models-Urban management-Case studies from developed nations -Software.		

TOTAL: 45 PERIODS

Text Books:

1. Maurya, Sahab Deen. Urban environment management: A functional study. Chugh Publications, 1988
2. Stein, Stuart. *TMDLs in the urban environment: Case studies*. American Society of Civil Engineers, 2010
3. Wey W.-M. (Ed.), "Sustainable Built Environment and Urban Growth Management", MDPI Books, Basel, 2020

Reference Books:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil "Integrated Solid Waste Management", McGraw Hill Publishers, New York, 1993.
2. McGhee J., *Water Supply & Sewerage*, 6th Edition, McGraw Hill, New Delhi, 2013
3. Martin P. Wanelista and Yousef. "Storm Water Management and Operations", John Wiley and Sons, 1993. Neil S. Grigg., "Urban Water Infrastructure Planning – Management and Operations", John Wiley and Sons, 1986

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		3
CO2	3	2			3				2			3		3
CO3	3	3			2				2			3		3
CO4	3	2			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	

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

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STREAM-II : STRUCTURAL ENGINEERING

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23CEE21	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 of 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	Create
CO3	Gain the knowledge of illumination and lighting and sources	Apply
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:

Module 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.		
Module 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		
Module III	**Principles of Illumination**	**9**
Luminous flux- Candela - Solid angle illumination - Utilization factor - Depreciation factor-MSCP - MHCP - Laws of illumination - Classification of lighting - Artificial light sources –LED lightings-Daylightfactor-Luminousefficiency-Colourtemperature-Colourrendering–Special features required and minimum level of illumination required for physically handicapped and elderly in building types - Specifications of National Building Code of India.		
Module 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 - Vapourcompressioncycle-Starters-Airhandlingunits- Water piping- Chilled water plant - Vapour Absorption Machine(VAM) –Air conditioning systems for different types of buildings		
Module 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		

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smoke detectors - Fire Fighting pump and water storage - Dry and wet risers - Automatic sprinklers.

TOTAL: 45 PERIODS

Text Books:

1. S. Ramamrutham, *"Design of Reinforced Concrete Structures",* Dhanpat Rai Publishing Company, New Delhi, 17th Edition, 2022**.**
2. P. C. Varghese, *"Advanced Reinforced Concrete Design",* PHI Learning Private Limited (Eastern Economy Edition), 2nd Edition, 2013**.**
3. N. Subramanian**,***"Design of Steel Structures: Limit States Method",* Oxford University Press, New Delhi, 2nd Edition, December 2015**.**
4. D. Ramachandra and V. Gehlot**,***"Design of Steel Structures – Volume 2",* Scientific Publishers, Jodhpur & Delhi, 1st Revised Edition, 2015

Reference Books:

1. C.P. Arora, *"Refrigeration and Air Conditioning",* McGrawHill Education India, New Delhi, 4th Edition, January 2023**.**
2. A. Udhayakumar, *"A Textbook of Building Services",* Eswar Press, 2007.
3. SP 7 (2016): National Building Code of India 2016**.**

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	2	2		1	3	2		1			1	3	2
CO2	3	2	2	1	2	2	2					1	3	2
CO3	3	2	3	2	3	3	2		1			1	3	3
CO4	3	2	2	1	2	2	2					1	3	2
CO5	3	2	2	1	2	3	3		1			1	3	3
	3	High				2	Medium					1	Low	

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Totalmarks**
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**			**End Semester Examination (ESE)(60)**
	IAE- I(5)	**IAE- II(10)**	**IAE- III(10)**	
Remember	20			20
Understand	30	10	20	30
Apply		20	30	30
Analyze				
Evaluate				
Create		20		20

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23CEE23	INDUSTRIAL STRUCTURES	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Concrete Technology				

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.	Understand
CO2	Understand the functional requirements for industrial structures	Understand
CO3	Design special steel structures like bunkers, silos, crane girders, chimneys, and pre-engineered buildings.	Create
CO4	Design special RC structures like corbels, silos, bunkers, chimneys, plates and shells.	Create
CO5	Understand the principles of prefabrication and prestressing.	Understand

Course Contents:

Module I	PLANNING AND FUNCTIONAL REQUIREMENTS	9
Classification of industries and industrial structures– planning for Layout – Requirements regarding Lighting, Ventilation and Fire Safety - Protection against noise and vibration -Guidelines from factories act.		
Module II	**INDUSTRIAL BUILDINGS – STEEL**	**9**
Roofs for Industrial Buildings - Gantry girders - components of the crane system - forces - impact factor - forms of gantry girder - design of Gantry Girders - steel bunkers and silos - components of bunkers - IS code specifications - design of silo.		
Module III	**INDUSTRIAL BUILDINGS – CONCRETE**	**9**
Loads on the corbel - bearing stress - evaluation of internal forces - Design of Corbels and Nibs – Design limits of machine foundation for empirical methods.		
Module IV	**DESIGN OF COOLING TOWERS**	**9**
Loads acting on the towers-wind load calculation- Design procedure of Cooling Towers.		
Module V	**PREFABRICATION**	**9**
Principles of prefabrication and precast construction–Pre stressed precast roof trusses-Floor slabs-Wall panels-		

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Handling and erection stresses–joints in precast structures.

TOTAL: 45 PERIODS

Text Books:

1. S. Ramamrutham, *"Design of Reinforced Concrete Structures",*Dhanpat Rai Publishing Company, New Delhi, 17th Edition, 2022**.**
2. P. C. Varghese**,***"Advanced Reinforced Concrete Design",* PHI Learning Private Limited (Eastern Economy Edition), 2nd Edition, 2013**.**
3. N. Subramanian, *"Design of Steel Structures: Limit States Method",* Oxford University Press, New Delhi, 2nd Edition, December 2015**.**
4. D. Ramachandra and V. Gehlot, *"Design of Steel Structures – Volume 2",* Scientific Publishers, Jodhpur & Delhi, 1st Revised Edition, 2015

Reference Books:

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. Lyons, Stanley L. Handbook of Industrial Lighting, Butterworths, London, 1981.
4. Stanley L. Lyons, *"Emergency Lighting: For Industrial, Commercial and Residential Premises",*ButterworthHeinemann, 2013
5. fib (International Federation for Structural Concrete)**,***"Planning and Design Handbook on Precast Building Structures",* fib Bulletin No. 74, Lausanne, Switzerland, 1st Edition, September 2014.
6. PCI (Precast/Prestressed Concrete Institute)**,** *"PCI Design Handbook: Precast and Prestressed Concrete"* (MNL-120-17), 8th Edition, Chicago, USA, 2017.
7. Indian Concrete Institute, *"Handbook on Precast Concrete for Buildings",* ICI Bulletin Vol. II, Indian Concrete Institute (Tamil Nadu Centre), Chennai, 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	2			2	1		1			2	3	2
CO2	3	3	3	2	2							2	3	3
CO3	3	3	3	2								2	3	3
CO4	3	2	3	2	1							2	3	2
CO5	1	2	3	2	3				1			3	2	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'sCategory	**Internal Assessment Examination**			**End Semester Examination (ESE)(60)**
	IAE- I(5)	**IAE- II(10)**	**IAE- III(10)**	
Remember	10		10	10
Understand	40	10	10	20
Apply				20
Analyze				
Evaluate				
Create		40	30	50

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23CEE24	MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
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.	Understand
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.	Apply

Course Content:

Module I	MAINTENANCE 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 of deterioration - Sustainable Materials for Repair and Rehabilitation		
Module 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 - Use of Admixtures to Enhance Concrete Performance		
Module III	**SPECIAL CONCRETES**	**9**
Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, Highperformance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.		
Module IV	**TECHNIQUES FOR REPAIR AND PROTECTION METHODS**	**9**
Non-destructive Testing Techniques, Load Test for Stability-Epoxy injection, Sacrifier, Shoring, Underpinning, Corrosion protection techniques–Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.		
Module 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. and Jain A. K., "Concrete Technology - Theory and Practice", S. Chand and Company, Eighth Edition, 2019.
2. Dr. B. Vidivelli, *"Rehabilitation of Concrete Structures",* Standard Publishers Distributors, New Delhi, 2nd Edition, January 2021

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3. Varghese.P.C Urban Environment Management Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd 2014 Latest revision: 1st Edition, published April 2014 by Pearson (PHI Learning), with reprints available as late as 2023–24 .
4. R. Dodge Woodson,*"Concrete Structures: Protection, Repair and Rehabilitation",*ButterworthHeinemann (Elsevier), London, 2nd Edition, 2019.

REFERENCES:

1. DovKominetzky.M.S.,-Design and Construction Failures, Galgotia, Publications Pvt.Ltd.,2001
2. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And Rehabilitation of Concrete Structures, Allied Publishers, 2004.
3. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.
4. Central Public Works Department, *"Handbook on Repair and Rehabilitation of RCC Buildings"*, Director General (Works), CPWD, Government of India, New Delhi, Updated Reprint, 2011.

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	2	3	3	2		2							2
CO2	3	2	3	3	2		2							2
CO3	3	2	3	3	2		2							2
CO4	3	2	3	3	2		2							2
CO5	3	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	

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Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	20
Understand	40	10	10	20
Apply		30	30	60
Analyse				
Evaluate				
Create				

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23CEE27	BRIDGE STRUCTURES	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Concrete Technology				

Course Objectives

The course is intended o

1. To impart knowledge on important types of bridge structures.
2. To know the selection 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'sLevel
CO1	Understand the concept of bridges and their components.	Understand
CO2	Design the substructure including pier and pier cap and well elements.	Create
CO3	Design the superstructure of bridge using different methods.	Create
CO4	Understand and design the Precast bridges.	Understand
CO5	Able to design the steel bridges.	Apply

Course Contents:

Module 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.		
Module II	**Design of Substructure**	**9**
Design of piers and abutments-forces-combinations-design principles of foundations- piers, Soil nailing, well, piles (detailed designs not expected). Bearings:- Design of elastomeric bearings, steel bearings-Flexible concrete.		
Module III	**Concrete Bridges**	**9**
Analysis and design of T - beam bridges. Principles of design of Balanced Cantilever bridges. Flexible concrete, Design of skew slab culverts. R.C. Bridges: - box culverts - Pigeaud curves - Courbon's theory - Hendry Jaegar method		
Module IV	**Pre-Stressed Concrete Bridges**	**9**
Basic principles-General Design requirements-Mild steel reinforcement in prestressed concrete member-Concrete cover and spacing of prestressing steel-Slender beams-Composite Section- Propped-Design of Propped Composite Section-Un propped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.		
Module 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

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Text Books:

1. D. Johnson Victor, *"Essentials of Bridge Engineering",* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 6th Edition, 2017
2. N. Krishna Raju, *"Design of Bridges",* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 5th Edition, 2019**.**

Reference Books:

1. Dr. V. K. Raina, *"Concrete Bridge Practice: Construction, Maintenance and Rehabilitation",* 2nd Edition, Shroff Publishers & Distributors, New Delhi, May 2019**.**
2. S. P. Bindra**,***"Principles and Practice of Bridge Engineering",*Dhanpat Rai & Co. Pvt. Ltd., New Delhi, Revised & Enlarged Edition, 2012**.**
3. Indian Roads Congress, *"Standard Specifications and Code of Practice for Road Bridges – Section II: Loads and Load Combinations",* IRC 62017 (Seventh Revision, incorporating amendments up to March 2017), The Indian Roads Congress, New Delhi, First Edition (Revised), March 2017**.**
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 : 2012, *"Prestressed Concrete – Code of Practice"* (IS 1343 : 2012, Second Revision; including Amendment 1, reaffirmed 2022), Civil Engineering Department, BIS, New Delhi, 1st Edition (Revised), November 2012.

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	2	1			1	1					2	3	2
CO2	3	3	3	2	2							2	3	3
CO3	3	3	3	2	2							2	3	3
CO4	3	3	3	2	2							2	3	3
CO5	3	3	3	2	2				1			2	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	

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Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10			10
Understand	40	10	20	30
Apply			30	20
Analyze				
Evaluate				
Create		40		40

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23CEE32	PREFABRICATED STRUCTURES	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Structural Engineering				

Course Objectives

The course is intended to

1. Impart knowledge to students on modular construction, industrialized construction, and design of prefabricated elements and construction methods.
2. Ensure behavior and types of structural components.
3. Gain knowledge of design principles.
4. Enhance the fundamentals of structural joints and connection.
5. Get knowledge of design for abnormal loads.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain design principles, factory layout, and stages of loading in precast construction.	Understand
CO2	Analyse panel systems, slabs, and connections used in precast construction and design the elements.	Analyze
CO3	Evaluate types of floor systems, stairs, and roofs used in precast construction for functional and structural performance.	Evaluate
CO4	Evaluate types of walls, sealants, and joints, and apply principles for designing effective joint systems..	Evaluate
CO5	Analyse the components of industrial buildings in relation to precast construction.	Analyze

Course Contents:

Module I	**INTRODUCTION**	**9**
Need for Prefabrication – Principles of Prefabrication – Modular Coordination – Standardization – Materials – Systems – Production – Transportation – Erection.		
Module II	**PREFABRICATED COMPONENTS**	**9**
Behaviour and types of structural components – Large panel systems – Roof and floor slabs – Wall panels – Beams – Columns – Shear walls.		
Module III	**DESIGN PRINCIPLES**	**9**
Design philosophy – Design of cross-section based on efficiency of material used – Problems in design due to joint flexibility – Allowance for joint deformation.		
Module IV	**JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS**	**9**
Types of Joints –based on action of forces - 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.		
Module 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

CHAIRMAN-BOARD OF STUDIES

Text Books:

1. Bruggeling, A.S.G. and Huyghe, G.F., "Prefabrication with Concrete", A.A. Balkema Publishers, USA, 1991.
2. Maurice Levitt, *"Precast Concrete: Materials, Manufacture, Properties and Usage",* CRC Press, 2nd Edition, December 2019**.**
3. Alfred Steinle, Hubert Bachmann, and Mathias Tillmann**,***"Precast Concrete Structures"*, Ernst & Sohn (Beton-Kalender series), 2nd Edition, Berlin, March 2019**.**

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, Netherlands, Betor Verlag, 2009
4. A. S. G. Bruggeling and G. F. Huyghe, "Prefabrication with concrete", Netherlands: A. A. Balkema Publishers, 1991.
5. Glover C. W., "Structural Precast Concrete", Asia Publishing House, 1965.

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	
CO2	3	3	3	2	3							2	3	
CO3	3	3	2	2	2							2	3	
CO4	3	3	3	2	3							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	

CHAIRMAN-BOARD OF STUDIES

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	20	10	10	10
Understand	30			10
Apply				
Analyze		20	20	40
Evaluate		20	20	40
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE33	ROCK MECHANICS	L	T	P	C
		3	0	0	3
Nature of Course	ProfessionalElective				
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. Familiarize 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	Explain the behaviour of rocks under hydrostatic compression and deviatoric loading, and identify possible failure modes.	Understand
CO3	Determine in-situ stresses and select appropriate measurement techniques.	Apply
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:

Module 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.		
Module 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.		
Module 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.		
Module 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 – application of remote sensing and GIS techniques in slope stability assessment - Case studies.		
Module 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, 2nd Edition, 2010
2. Hool, E and Bray, J., “Rock Slope Engineering, Institute of Mining and Metallurgy”, U.K. the 5th Edition by Evert Hoek and Duncan Wyllie (CRC Press, 2017).

CHAIRMAN-BOARD OF STUDIES

3. Hoek E and Brown E T, "Underground Excavations in Rock", CRC Press, 2017

Reference Books:

1. Ramamurthy. T., "Engineering in Rocks for Slopes, Foundation and Tunnels", Third Edition, PHI Learning Private Limited, New Delhi, 2014.
2. Wittke W., "Rock Mechanics: Theory and Applications with Case Histories", Springer Berlin Heidelberg, 2014
3. Obvert, L. and Duvall, W., Rock Mechanics and the Design of Structures in Rock, John Wiley, 1967.
4. Bazant, Z.P., Mechanics of Geomaterials Rocks, Concrete and Soil, John Wiley and Sons, Chichester, 1985.
5. Brady, B.H.G. and Brown, E.T., "Rock mechanics for underground mining", Third Edition, Kluwer Academic Publishers, Dordrecht, 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) 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	1	1					2		2	3	2
CO2	3	3	2	2	1					2		2	3	2
CO3	3	3	3	2	2					2	1	2	3	2
CO4	3	3	3	3	2	2	2			3	2	3	3	2
CO5	3	2	3	2	2	2	2			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**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10		20
Understand	40	20	10	20
Apply		20	20	40
Analyze				
Evaluate			20	20
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE34	REINFORCED SOIL STRUCTURE	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
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. Acquire 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
CO2	Understand and differentiate various fill materials and reinforcing materials to be used in reinforced soil structures.	Analyze
CO3	Develop a detailed knowledge on soil reinforcement functions and the ability to select suitable reinforcing materials to suit the functional requirements.	Apply
CO4	Express the design criteria for use of geosynthetics in landfills.	Apply
CO5	Design various soil reinforcement and soil nailing systems for major projects.	Create

Course Contents:

Module I	**INTRODUCTION**	**9**
Historical background – Initial and recent developments – Principles – Concepts and mechanisms of reinforced soil – Factors affecting behaviour and performance of soil – Reinforcement interactions.		
Module II	**MATERIALS AND MATERIAL PROPERTIES**	**9**
Materials used in reinforced soil structures – Fill materials, reinforcing materials, metal strips, geotextile, geo-composites, geojutes, bamboo, timber – Facing elements – Properties – Methods of testing – Advantages and disadvantages – Preservation methods.		
Module III	**DESIGN PRINCIPLES AND APPLICATIONS**	**9**
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		
Module IV	**GEOSYNTHETICS AND APPLICATIONS**	**9**
Introduction–Historical background–Applications –Design criteria–Geosynthetics in roads – Design – Giroud and Noiray approach – Geosynthetics in landfills – Geosynthetic clay liner – Design of landfills – Plastic road - Barrier walls.		
Module V	**SOIL NAILING AND CASE HISTORIES**	**9**
Soil nailing– Introduction –Overview –Soil-Nail interaction – Behaviour –Designprocedure –Behaviour in seismic conditions. Performance studies of reinforced dams, 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,JohnBlackieandSonsLtd.,London,1987.
3. Jones,C.J.F.P.,EarthReinforcementandSoilStructures,Earthworks,London,1982.

CHAIRMAN-BOARD OF STUDIES

Koerner R.M., “Designing with Geosynthetics”, 6th Edition, Xlibris Corporation, Bloomington, 2012

Reference Books:

1. Ling H.I., Leshchinsky D. and Tatsuoka F., “Reinforced Soil Engineering: Advances in Research and Practice”, CRC Press, Boca Raton, 2020
2. Koerner R.M., “Geotextiles: From Design to Applications”, Woodhead Publishing (The Textile Institute), Amsterdam, 2016
3. Wu J.T.H., “Geosynthetic Reinforced Soil (GRS) Walls”, John Wiley & Sons, New Jersey, 2019
4. Reddy C.N.V.S., Saride S. and Krishna A.M. (Eds.), “Ground Improvement and Reinforced Soil Structures”, Springer, Singapore, 2021
5. Saran S., “Reinforced Soil and Its Engineering Applications”, I.K. International Publishing House Pvt. Ltd., New Delhi, 2017
6. Proc.Conference on polymer and Reinforcement,Thomas TelfordCo.,London,1984.
7. Ramanatha Ayyar, 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		3	2		2					2		2
CO2	3	3		3	2		2					2		2
CO3	3	3		3	2		2					2		2
CO4	3	3		3	2		2					2		2
CO5	3	3		3	2		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	

CHAIRMAN-BOARD OF STUDIES

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

CHAIRMAN-BOARD OF STUDIES

STREAM-III:

CONSTRUCTION ENGINEERING AND MANAGEMENT

CHAIRMAN-BOARD OF STUDIES

23CEE41	Construction Planning and Scheduling	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Building Materials and Construction.				

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 appropriate planning techniques in construction projects	Apply
CO2	Apply the suitable scheduling technique for the particular project.	Apply
CO3	Practice the modern cost account and financial systems prevalent in departments.	Apply
CO4	Summarize the quality control by statistical methods	Understand
CO5	Organize information in Centralized database Management systems	Understand

Course Contents:

Module 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.		
Module II	**SCHEDULING PROCEDURES AND TECHNIQUES**	**9**
Basics of construction scheduling - bar charts – CPM – floats - Activity-on-Node with leads/lags/windows - resource-constrained scheduling - advanced techniques - time-cost trade-offs and scheduling software applications.		
Module 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.		
Module 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		
Module 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

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Text Books:

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009.

2. Srinath,L.S., "Pert and CPM Principles and Applications", Affiliated East West Press, 2001

Reference Books:

1. Stephenson T., "Planning, Scheduling and Control of Construction Projects", American Technical Publishers, 1st Edition, 2019
2. Hinze J.W., "Construction Planning and Scheduling", 4th Edition, Pearson, 2021
3. Paul V.K., "A Handbook for Construction Planning and Scheduling", COPAL Publishing, India, 2nd Edition, 2020
4. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
5. Moder.J., Phillips. C. and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1985.
6. Willis., E.M., "Scheduling Construction projects", John Wiley and Sons, 1986..
7. 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) 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	2						3
CO2	3	2			2	2	2	2						3
CO3	3	3			2	2	2	2						3
CO4	3	2			2	2	2	2						2
CO5	3	3			2	2	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	

CHAIRMAN-BOARD OF STUDIES

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	20
Understand			40	40
Apply	40	40		40
Analyze				
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE42	Modern Construction Materials	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Construction Materials				

Course Objectives

The course is intended to

1. Understand the need for modern construction materials and compare them with conventional materials.
2. Gain knowledge of advanced concrete technologies and their specialized applications.
3. Explore the properties and uses of smart and functional materials in intelligent building systems.
4. Identify and apply innovative and eco-friendly building materials suited for sustainable construction.
5. Evaluate sustainability aspects such as lifecycle analysis and environmental impacts of construction materials.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Classify modern construction materials and analyze their performance characteristics	Analyze
CO2	Identify the properties and applications of advanced concrete	Apply
CO3	Demonstrate the smart and functional materials	Understand
CO4	Select appropriate innovative materials	Apply
CO5	Assess the environmental impact of materials through lifecycle analysis	Apply

Course Contents:

Module I	INTRODUCTION TO MODERN MATERIALS	9
Need for modern construction materials – classification – performance characteristics – sustainability aspects – comparison with conventional materials.		
Module II	**ADVANCED CONCRETE AND ITS VARIANTS**	**9**
High-performance concrete (HPC), self-compacting concrete (SCC), geopolymer concrete – fiber reinforced concrete – reactive powder concrete – translucent concrete – properties, applications, and benefits.		
Module III	**SMART AND FUNCTIONAL MATERIALS:**	**9**
Shape memory alloys – piezoelectric materials – thermochromic and photochromic materials – phase change materials – applications in smart buildings and structures.		
Module IV	**INNOVATIVE BUILDING MATERIALS**	**9**
Aerated concrete blocks – bamboo reinforced composites – recycled aggregates – light-transmitting concrete – eco-friendly bricks – materials from industrial by-products (GGBS, fly ash, etc.).		
Module V	**SUSTAINABILITY AND GREEN MATERIALS**	**9**
Green certification standards (LEED, GRIHA) – energy-efficient materials – lifecycle analysis – steam curing – carbon footprint of construction materials.		

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Shetty, M. S., "Concrete Technology" S. Chand Publication, 8th Edition, published in 2019
2. M. S. Shetty & A. K. Jain, 8th Edition (2019), Concrete Technology: Theory & Practice in 2019

REFERENCES:

1. GhambhirM.L."Concrete Technology" Tata McGraw Hill education private Limited in 20013
2. A.R. Santhakumar, Concrete Technology, Oxford University Press in 2018
3. Building Materials, P.C. Varghese, Prentice-Hall India in 2010

Additional References:

CHAIRMAN-BOARD OF STUDIES

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		2		3	2	3	2						3
CO2	3		2		3	2	3	2						3
CO3	3		2		3	2	3	2						3
CO4	3		2		3	2	3	2						2
CO5	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**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember				
Understand	10	10	10	20
Apply		40	40	60
Analyse	40			20
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE43	Housing Planning and Management	L	T	P	C
		3	0	0	3

Nature of Course	Professional Elective
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. Highlight the use of alternative materials in housing construction..
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.	Understand
CO2	Identify a suitable housing program.	Understand
CO3	Implement the planning and design of housing projects.	Apply
CO4	Analyze the potential and limitations of alternative construction materials in housing	Analyze
CO5	Identify the various sources of housing finance and project appraisal.	Apply

Course Contents:

Module 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.		
Module 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, Central government schemes in Housing planning,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		
Module 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.		
Module IV	**HOUSING CONSTRUCTION AND TECHNOLOGY**	**9**
Types of housing (individual, group housing, high-rise) – Cost-effective and sustainable construction techniques – Precast, prefabrication, modular housing – Use of alternative materials – Construction management in housing projects.		
Module 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.

CHAIRMAN-BOARD OF STUDIES

3. A.K. Jain, "Housing for All: Design, Construction and Management", Khanna Publishing House, New Delhi, 2023

.

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1. 1. S.N. Sharma & K. Dehalwar, "Fundamentals of Planning and Design of Housing", Notion Press, India, 2023
2. Wiley- Blackwell, "Neufert Architects" Data, 4 th Edition, Blackwell Publishing Ltd, 2012
3. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8 th Edition, Tata McGraw Hill Edition, 2011
4. Walter Martin Hosack, "Land Development Calculations", Mc Graw Hill 2 nd Edition, USA 2010
5. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.
6. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS Habitat, Nairobi, 1994
7. 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	2	2				3	2			1		3	2	3
CO2	2	3				2	1			1		2	2	3
CO3	3		3		3	2				2		3	3	2
CO4	2	3	2	3	3	3				1		3	3	2
CO5	2					2	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**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember				
Understand	10	10	20	40
Apply	20	20		40
Analyse			20	20
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE44	Construction Project Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Concrete Technology				

Course Objectives

The course is intended to

1. To understand the fundamentals of construction project management, including its phases and key functions..
2. To impart knowledge on various planning and scheduling techniques such as CPM, PERT, and bar charts..
3. To develop skills in cost estimation, budgeting, resource allocation, and earned value analysis.
4. To introduce concepts of contract administration, procurement processes, and risk management in construction.
5. To familiarize students with project monitoring, control techniques, and the use of modern project management tools/software.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the principles, phases, and functions of construction project management.	Understand
CO2	Apply various project planning and scheduling techniques to manage construction activities effectively	Apply
CO3	Analyze and manage cost estimates, budgets, and resources using standard tools and practices.	Analyze
CO4	Evaluate different types of contracts and implement procurement and risk management strategies.	Evaluate
CO5	Use project management software and techniques to monitor and control project performance.	Apply

Course Contents:

Module I	INTRODUCTION TO CONSTRUCTION PROJECT MANAGEMENT	9
Definition and characteristics of construction projects – Project life cycle – Objectives and functions of project management – Project environment – Stakeholders – Role of project manager – Organizational structures in project management.		
Module II	**PROJECT PLANNING AND SCHEDULING**	**9**
Work Breakdown Structure (WBS) – Planning techniques – Bar charts and Gantt charts – Network techniques: Critical Path Method (CPM), Program Evaluation and Review Technique (PERT) – Time estimates and slack – Project scheduling and sequencing.		
Module III	**RESOURCE AND COST MANAGEMENT**	**9**
Types of cost estimates – Budgeting process – Cost control methods – Earned Value Management (EVM) – Resource planning and allocation – Resource leveling and smoothing – Manpower, material, and equipment management.		
Module IV	**PROCUREMENT, CONTRACTS, AND RISK MANAGEMENT**	**9**
Procurement process – Tendering and contracting – Types of contracts – Contract management – Claims and disputes – Risk identification, assessment, and mitigation – Risk response planning.		

CHAIRMAN-BOARD OF STUDIES

Module V	**Project Monitoring, Control, and Modern Tools**	**9**
Monitoring techniques – Progress measurement and reporting – Time-cost trade-off (crashing) – Project audits and reviews – Use of project management software (MS Project/Primavera) – Introduction to Building Information Modelling (BIM) in project management.		

TOTAL: 45 PERIODS

Text Books:

1. Chitkara,K.K.Construction Project Management: Planning, Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, Latest Edition (e.g., 2021 or later).
2. Albert Lester, Project Management, Planning and Control, 7th Edition, Butterworth- Heinemann, USA, 2017.
3. Choudhury S , "Project Management", McGraw-Hill Publishing Company, New Delhi, 1988.
4. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2000.

Reference Books:

1. Corfe C. and Clip B., “Implementing Lean in Construction: Lean and the Sustainability Agenda”, CIRIA, 2013.
2. Frederick E. Gould, "Construction Project Management", Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
3. George J.Ritz , "Total Construction Project Management" - McGraw-Hill Inc, 1994
4. Shang Gao and Sui Pheng Low, “Lean Construction Management: The Toyota Way”, Springer, 2014.

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	1		3									3
CO2	3	3	1		3									3
CO3	3	3	1		2									3
CO4	3	3	1		3									2
CO5	3	3	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	

CHAIRMAN-BOARD OF STUDIES

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

CHAIRMAN-BOARD OF STUDIES

23CEE51	Project Formulation and Appraisal	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
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 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.	Apply
CO3	Perform the project appraisal.	Analyse
CO4	Assess the project financing	Apply
CO5	Analyse the private sector participation and technology transfer	Analyse

Course Contents:

Module I	PROJECT FORMULATION	9
Definition and scope of projects – Project life cycle – Project environment – Identification and formulation of projects – Project screening and preliminary analysis – Project selection criteria – Project feasibility studies: Technical, Financial, Economic, Social, and Ecological aspects.		
Module II	**PROJECT COSTING**	**9**
Project Cash Flows – Time Value of Money – Cost of Capital		
Module 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.		
Module IV	**PROJECT FINANCING**	**9**
Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios.		
Module 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

3. P. Gopalakrishnan & V. E. Ramamoorthy, *Textbook of Project Management*, Laxmi Publications, 2022.

Reference Books:

CHAIRMAN-BOARD OF STUDIES

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.
3. Shri Narendra Singh, Project Management and Control, Himalaya Publishing House (7th ed.), 2023.

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		3				3		3		3
CO2	3	2	3	2		3				3		3		3
CO3	3	3	3	3		3				3		3		3
CO4	3	2	3	2		3				3		3		2
CO5	3	3	3	3		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**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	20	10		20
Understand	30	20	10	20
Apply		20	10	20
Analyze			30	40
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23CEE52	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 impart knowledge on the importance of safety in construction projects.
2. To familiarize students with hazards and risks associated with various construction activities.
3. To develop skills in safety planning, hazard identification, and risk assessment techniques.
4. To provide understanding of safety laws, codes, and regulatory frameworks relevant to construction.
5. To study and understand the various safety concepts and requirements applied to construction projects

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the fundamentals and importance of safety in construction projects.	Understand
CO2	Identify potential hazards and apply preventive safety measures in various construction activities..	Understand
CO3	Develop and implement a safety management system including safety policies, audits, and training.	Apply
CO4	Interpret legal requirements and standards related to construction safety.	Apply
CO5	Design emergency preparedness plans and perform root-cause analysis of construction accidents.	Analyse

Course Contents:

Module I	INTRODUCTION TO CONSTRUCTION SAFETY	9
Importance of safety in construction – Definitions: accident, injury, unsafe act, unsafe condition, hazard – Need for safety – Causes of accidents in construction – Safety measures – Role of various parties (owner, contractor, worker) in ensuring safety – Costs of accidents – Accident reporting and recordkeeping.		
Module II	**SAFETY IN VARIOUS CONSTRUCTION ACTIVITIES**	**9**
Safety in excavation, trenching, scaffolding, formwork, concreting, demolition, and blasting – Safety in erection of steel structures – Working at heights and confined spaces – Material handling and lifting operations – Safety in use of construction equipment.		
Module III	**SAFETY MANAGEMENT SYSTEMS**	**9**
Elements of safety management systems – Safety policy, objectives, and planning – Hazard identification and risk assessment (HIRA) – Job Safety Analysis (JSA) – Site safety organization – Safety training and awareness – Personal Protective Equipment (PPE) – Safety audits and inspections.		
Module IV	**LEGAL PROVISIONS AND STANDARDS**	**9**
Construction safety laws in India – The Building and Other Construction Workers (BOCW) Act, 1996 – Factories Act, 1948 – Contract Labour Act – IS codes related to construction safety (IS 3764, IS 7293, IS 13367, etc.) – OSHA guidelines – Safety signage and symbols – Documentation and compliance.		
Module V	**EMERGENCY PLANNING AND CASE STUDIES**	**9**
Emergency preparedness and response – First aid – Fire prevention and control – Evacuation procedures – Accident investigation – Reporting and analysis – Case studies on major construction accidents – Lessons learned – Development of site-specific safety plan.		

Total: 45 Periods

CHAIRMAN-BOARD OF STUDIES

Text Books:

1. Jimmie W.Hinze, Construction Safety, Prentice Hall 2nd Edition, published in 2006 (original 1996; widely used updated edition)
2. David L.Goetsch, Construction Safety & Health, Pearson Education 2nd Edition, published in 2011 (with content updates, digital edition reissued in 2021)
3. Sathyanarayanan Rajendran and Mandi Kime, *Construction Project Safety–Management Best Practices Handbook*, CRC Press (Taylor & Francis), 2023.
4. Bhattacharjee S. K.,*Safety Management in Construction (Principles and Practice)*, Khanna Publishers, 2022.

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.
3. Frank R. Spellman, *Safety Engineering: Principles and Practices* (4th ed.), Bernan Press, 2024.

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	3	3	2				2	2	2		3	2		3
CO2	3	3	2				2	2	2		3	2		3
CO3	3	3	2				2	2	2		3	2		3
CO4	3	3	2				2	2	2		3	2		3
CO5	3	3	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	

CHAIRMAN-BOARD OF STUDIES

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

CHAIRMAN-BOARD OF STUDIES

23CEE53	Railway, Airport, Docks and Harbor Engineering	L	T	P	C
		3	0	0	3

Nature of Course	Professional Elective
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.	Understand
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.	Analyze
CO5	Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted	Understand

Course Contents:

Module 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.		
Module 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 – Bullet trainand Railway hyper loop train - Railway Station and yards and passenger amenities-Signaling		
Module III	**AIRPORT PLANNING**	**9**
Air transport characteristics – Drone taxi - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area - Smart Airport Technologies and Sustainable Infrastructure		
Module 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.		
Module V	**HARBOUR ENGINEERING**	**9**
Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Coastal Regulation Zone, 2011		

CHAIRMAN-BOARD OF STUDIES

TOTAL: 45 PERIODS

TEXT BOOKS:

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 Rai and 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
3. M. Santhanam, *Railways, Airports, Docks and Harbour Engineering* (ARS Publications, Chennai), Jan 2020
4. C. Venkatramaiah, *Transportation Engineering – Vol. II: Railways, Airports, Docks & Harbours, Bridges and Tunnels* (Universities Press, Hyderabad), 2015

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							3
CO2	3		3	2			2							3
CO3	3		3	2			2							3
CO4	3		3	2			2							3
CO5	3		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	

CHAIRMAN-BOARD OF STUDIES

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

CHAIRMAN-BOARD OF STUDIES

OPEN ELECTIVE COURSES FOR OTHER BRANCHES

CHAIRMAN-BOARD OF STUDIES

23CEO01	Energy Conservation and Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
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 exposure on Energy Economics.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Interpret the importance of energy, energy conservation and energy audit	Understand
CO2	Identify the suitable electrical systems.	Understand
CO3	Appraise the energy saving opportunities in thermal systems	Understand
CO4	Assess the energy conservation in major utilities	Evaluate
CO5	Analyze the different financial management techniques	Analyze

Course Contents:

Module 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.		
Module 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.		
Module 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		
Module IV	**ENERGY CONSERVATION IN MAJOR UTILITIES**	**9**
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets		
Module V	**ECONOMICS**	**9**
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept - Carbon Pricing and Emissions Trading Mechanisms		

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:

CHAIRMAN-BOARD OF STUDIES

1. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilization" Hemisphere Publ, Washington, 1988.
2. Callaghan, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.
3. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982
4. Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982.
5. 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) Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3			1	3	1	2	1			1	1		3
CO2	3	2			3		1	1	1					3
CO3	3	3			2		1	1	1					3
CO4	3	2			3		1	1	1					2
CO5	3	3	2		1		1	1	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**			**End Semester Examination (ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	20	10	10	20
Understand	30	10	10	20
Apply	30			30
Analyze				
Evaluate			30	30
Create				

CHAIRMAN-BOARD OF STUDIES

23CEO02	ENVIRONMENT AND AGRICULTURE	L	T	P	C
		3	0	0	3

Nature of Course	Professional Elective
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. Learn about modern tools and policies promoting eco-friendly agriculture.

Course Outcomes

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

CO.No.	Course Outcome	Bloom's Level
CO1	Appreciate the role of the environment in the current practice of agriculture and concerns of sustainability, especially in the context of climate change and emerging global issues.	Apply
CO2	The ecological context of agriculture and its concerns will be understood.	Understand
CO3	Get the Knowledge of Global warming and changing environment & Ecosystem changes	Understand
CO4	Collect the Knowledge of Ecological diversity, wild life and agriculture &GM crops and their impacts on the environment	Apply
CO5	Discuss the application of modern technologies and policies in promoting sustainable agriculture.	Understand

Course contents:

Module I	ENVIRONMENTAL CONCERNS	9
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		
Module 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		
Module III	**CLIMATE CHANGE**	**9**
Global warming and changing environment – Ecosystem changes – Changing blue-green-grey water cycles–Water scarcity and water shortages– Desertification		
Module IV	**ECOLOGICAL DIVERSITY AND AGRICULTURE**	**9**
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		
Module V	**EMERGING ISSUES**	**9**
Role of GIS, remote sensing, and precision agriculture - Genetically Modified Crops (GMCs) and biofertilizers - National and international environmental policies in agriculture - Role of institutions like ICAR, NABARD, FAO, and UNEP		

Total:45 Periods

Textbooks

1. M.LakshmiNarasaiah,Environment and Agriculture,Discovery Pub. House,2006.
2. ArvindKumar, Environment and Agriculture, ABH Publications, New Delhi, 2005.

Reference books

CHAIRMAN-BOARD OF STUDIES

1. T.C. Byerly, Environment and Agriculture, United States. Dept. of Agriculture. EconomicResearch 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 InstituteforAgriculturalDevelopment,1994
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacificregion;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**	**Totalmarks**
Remember	Online Quiz	5	15
Understand	Tutorial Class /Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (ESE) (60)**
	IAE1 (5)	**IAE2 (10)**	**IAE3 (10)**	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23CEO05	CLIMATE CHANGE AND ITS IMPACT	L	T	P	C
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Environmental Engineering				

Course Objectives

The course is intended to

1. To provide a comprehensive understanding of the Earth's climate system and the science behind climate change.
2. To examine the causes and consequences of global warming from environmental, social, and economic perspectives.
3. To explore the impact of climate change on natural resources, biodiversity, agriculture, and human health.
4. To introduce students to global and national frameworks, agreements, and policies aimed at combating climate change.
5. To equip students with knowledge of mitigation and adaptation strategies for promoting climate-resilient development and sustainable practices.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the fundamental concepts of Earth's climate system and climate change.	Understand
CO2	Analyze scientific evidence and global climate trends using data and models.	Analyze
CO3	Evaluate the impacts of climate change on ecosystems, agriculture, and human society.	Evaluate
CO4	Identify adaptation and mitigation strategies including renewable energy and policy mechanisms.	Apply
CO5	Interpret global and national initiatives aimed at combating climate change.	Evaluate

Course Contents:

Module I	INTRODUCTION TO CLIMATE CHANGE	9
Definition and scope - Earth's climate system - Natural and anthropogenic influences - Greenhouse gases and the greenhouse effect - Historical and projected climate change trends		
Module II	**SCIENTIFIC EVIDENCE AND CLIMATE MODELING**	**9**
Observational data: temperature, sea levels, glaciers - Climate models and projections - IPCC reports and scenarios - Climate feedback mechanisms		
Module III	**ENVIRONMENTAL AND ECOLOGICAL IMPACTS**	**9**
Impacts on water resources and hydrological cycle - Ocean warming and acidification - Biodiversity loss and ecosystem shifts - Effects on agriculture and food systems		
Module IV	**SOCIETAL AND ECONOMIC CONSEQUENCES**	**9**
Public health impacts - Climate-induced migration and displacement - Urban infrastructure – vulnerabilities - Economic risks and insurance - Environmental justice		
Module V	**MITIGATION AND ADAPTATION MEASURES**	**9**
Low-carbon technologies and energy efficiency - Carbon sequestration and clean development mechanisms - Climate-resilient infrastructure - Global policies: UNFCCC, Paris Agreement - Indian initiatives: NAPCC, SAPCC		

Total: 45 Periods

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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 Assesment				
Bloom's Category	**Internal Assessment Examination**			**End Semester Examination (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	10
Understand	40			10
Apply			20	20
Analyze		20		20
Evaluate		20	20	40
Create				

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23CEO06	Green Building Design	L	T	P	C
		3	0	0	3

Nature of Course	Professional Elective
Pre requisites	Concrete Technology, Construction Materials

Course Objectives

The course is intended to

1. To introduce the fundamental concepts and benefits of green building design.
2. To familiarize students with sustainable planning and water/energy-efficient strategies.
3. To provide an understanding of environmentally responsible material selection.
4. To emphasize indoor environmental quality for occupant health and well-being.
5. To analyse the economic viability and certification processes of green buildings.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Understand and apply principles of sustainable building design.	Apply
CO2	Analyze site planning and water efficiency strategies for green buildings.	Analyze
CO3	Evaluate energy-efficient systems and renewable energy integration in buildings.	Evaluate
CO4	Recommend eco-friendly materials and indoor environmental improvements.	Create
CO5	Assess economic aspects and certification requirements of green buildings.	Evaluate

Course Contents:

Module I	**Introduction to Green Buildings**	**9**
Definition and concepts of green buildings – Need and significance – Green building rating systems (LEED, GRIHA, IGBC, BREEAM) – Conventional vs. green buildings – Benefits and barriers.		
Module II	**Sustainable Site Planning and Water Efficiency**	**9**
Site selection criteria – Land use and landscape planning – Stormwater management – Water efficiency in building design – Rainwater harvesting – Water-efficient fixtures.		
Module III	**Energy Efficiency in Buildings**	**9**
Energy-efficient systems and materials – Passive and active solar design – HVAC systems – Building orientation – Daylighting – Use of renewable energy sources – Energy modeling and simulation.		
Module IV	**Materials and Indoor Environmental Quality**	**9**
Eco-friendly and recycled materials – Low-emitting materials – Life cycle assessment – Waste reduction – Indoor air quality – Thermal and visual comfort – Ventilation strategies.		
Module V	**Green Building Economics and Certification**	**9**
Cost-benefit analysis – Return on investment – Government incentives – Case studies of certified green buildings – Application process and documentation for green certifications.		

Total: 45 Hours

Text books

1. Kibert, Charles J. "Sustainable Construction: Green Building Design and Delivery" John Wiley & Sons, 5th Edition, 2022. ISBN: 9781119706455
2. Reddy, B.V.V. "Sustainable Building Materials and Construction" TERI Press, 1st Edition, 2016. ISBN: 9788179936576
3. Yudelson, Jerry "Green Building Fundamentals: A Practical Guide to Understanding and Applying Fundamental Sustainable Construction Practices" Routledge, 2nd Edition, 2013. ISBN: 9780415722124

Reference(s)

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1. Krishna, Jagannathan "Green Building: Principles and Practices in Residential Construction" Cengage Learning,1st Edition, 2012. ISBN: 9781111308190
2. Geoffrey Stokes "Green Building: Project Planning and Cost Estimating" RS Means, 3rd Edition, 2016.ISBN: 9781943961044
3. Gopalan, Sundarraja "Green Building: Eco-friendly Design and Construction" Oxford University Press, 1st Edition, 2015. ISBN: 9780199453221

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					3	3	2			2	3		2
CO2	3					3	3	2			2	3		2
CO3	3					3	3	2			2	3		2
CO4	3					3	3	2			2	3		2
CO5	3					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**			**(End Semester Examination ESE) (60)**
	IAE- I (5)	**IAE- II (10)**	**IAE- III (10)**	
Remember	10	10	10	10
Understand				
Apply	40			30
Analyze		20		20
Evaluate		20	20	20
Create			20	20

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ONE CREDIT COURSES

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23CEA01	DRAFTING AND DOCUMENTATION OF CONSTRUCTION PROJECTS	L	T	P	C
		3	0	2	4
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's Level
CO1	Apply basic drawing and manipulate objects	Apply
CO2	Organize drawing objects on layers	Apply
CO3	Apply multiline text and hatch objects	Apply
CO4	Measure dimensioning and working with reusable content	Understand
CO5	Develop knowledge on drawing additional objects	Apply

Course Contents:

Module – I	INTRODUCTION TO AUTOCAD	9
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		
Module – II	**DRAWING ORGANIZATION AND INQUIRY COMMANDS**	**9**
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		
Module – III	**ANNOTATING DRAWINGS**	**9**
Text and Dimensioning – Symbols and Abbreviations – Layer Management - Creating multiline text- Creating single line text - Using text styles - Editing text -Hatching objects - Editing hatch objects - Chapter exercise		
Module – IV	**DIMENSIONING**	**9**
Content center library – Configuring content centre libraries – Authoring tube & pipe parts – Publishing to content center – Create styles using published parts – Placing tube & Pipe parts.-Working with Reusable Content –Using Blocks – Working with Design center – Using Tool Platters		

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Module – V	**Creating Additional Drawing Objects**	**9**
Working with polylines –Creating special lines – Creating ellipses – Complex objects - Using tables		

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Auto CAD 2019 3 D Modeling ; Munir Hamad ,Mercury Learning and Information ; 2019
2. Auto CAD 2019 ; Zico Pramata Putra, Independently Published 2019

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	2	
CO2	3		3		3				2			1	2	
CO3	3		3		3				2			1	2	
CO4	3		3		3				2			1	2	
CO5	3		3		3				2			1	2	
	3	High				2	Medium					1	Low	

Bloom's Level	**Summative Assessment (Internal Model)**	
	Assessment I (50 Marks)	**Assessment II (50 Marks)**
Remember		
Understand	10	10
Apply	40	40
Analyze	0	0
Evaluate	0	0
Create	0	0

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23CEA02	3D MODELING TECHNIQUES OF BIM	L	T	P	C
		3	0	2	4
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 professional
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 areal life design scheme to the model
5. Prepared 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 modeling	Apply
CO2	Create a plan with Elevation views	Create
CO3	Develop knowledge on painting with colours, textures and photo matching	Apply
CO4	Create sequencing an Imation's of the projects	Create
CO5	Create attractive drawing for project communication	Create

Course Contents:

Module – I	INTRODUCTION TO AUTOCAD	9

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.

Module – II	DRAWING ORGANIZATION AND INQUIRY COMMANDS	9

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

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- Guidelines for Creating and Modifying Grids Walls and Curtain walls
- Creating generic walls
- Sketching walls
- Hosting element in walls
- 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

Module – III	**STAIRS AND RAILINGS**	**9**

- About stairs and railing
- Process for creating a staircase by component
- Process for creating a staircase by sketch
- Creating the generic railing Adding Families
- Types of stairs: Straight run, U – shaped, L-shaped
- Graphic representation and view templates

Module – IV	**ROOMS AND COLOR FILL PLANS**	**9**

Role of rooms in a 3D BIM model – Placing rooms in floor plans and 3D views – Adjusting room boundaries - Using section box tools to isolate room in 3D views- Generating colour rooms plan

Module – V	**CREATING PLAN ANNOTATION AND SCHEDULES**	**9**

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

TEXTBOOKS:

1. Sketch Up for Interior Design;LydiaCline,Wiley publishers. 2014

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2. Sketch Up for Dumies;Aidanchopra, 2017.

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	3	
CO2	3		2		3				2		3	2	3	
CO3	3		2		3				2		3	2	3	
CO4	3		2		3				2		3	2	3	
CO5	3		2		3				2		3	2	3	
	3	High				2	Medium					1	Low	

Summative Assessment			
Bloom's Level	**Assessment (50 Marks)**	**Assessment (50 Marks)**	
Remember			
Understand	10	10	
Apply	20	20	
Analyze			
Evaluate			
Create	20	20	

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23CEA03	3D MODELING OF BUILDINGS	L	T	P	C
		3	0	2	4
Nature of Course	Employability Enhancement Course				
Pre requisites	Knowledge in AutoCAD				

Course Objectives

The course is intended to

1. Gain knowledge on basics of sketch up and modeling.
2. Understand drafting and modeling.
3. Understand the painting with colors
4. Provide area 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 modeling	Understand
CO2	Create a plan with Elevation views	Create
CO3	Develop knowledge on painting with colours, textures and photo matching	Apply
CO4	Create sequencing animations of the projects	Create
CO5	Create attractive drawing for project communication	Create

Course Contents:

Module – I	SKETCH UP BASICS	9
Opening Sketch Up – Sketch Up Screen - Toolbars - Viewing Tools - Shortcut Keys - Drawing Tools – Modeling exterior walls and roof - Modeling Furniture, Cabinetry and Accessories - Faces and Edges - Stickiness - Move Tool– Groups - Modeling exercises.		
Module – II	**DRAFTING, MODELING, AND FURNISHING A FLOOR PLAN**	**9**
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.		
Module – III	**PAINTING WITH COLORS, TEXTURES AND PHOTO-MATCHING**	**9**
Paint with Native Sketch Up Materials - Paint with Textures - Put New Colors and Textures into the Model.		
Module – IV	**APPLY A REAL-LIFE DESIGN SCHEME TO THE MODEL**	**9**
Tagging spaces with room tags –Room tags-Room Boundaries –Room separation line - Generating color rooms plan		
Module – V	**ENHANCING AND PRESENTING THE MODEL**	**9**
Annotating the Model - Dimension a floor Plan - Scenes - The Walk-Through Tools - Dynamic Components - Save vs. Export		

TOTAL: 30 HOURS

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TEXTBOOKS:

1. Sketch Up for Interior Design;LydiaCline,Wiley publishers.2014
2. Sketch Up for Dumies;Aidan chopra,2017.

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			1		2	1	3	
CO2	3		2		3	2			1		2	1	3	
CO3	3		2		3	2			1		2	1	3	
CO4	3		2		3	2			1		2	1	3	
CO5	3		2		3	2			1		2	1	3	
	3	High				2	Medium					1	Low	

Summative Assessment				
Bloom's Level				
	Assessment (50 Marks)	**Assessment (50 Marks)**		
Remember				
Understand	10	10		
Apply	10	10		
Analyze	0	0		
Evaluate	0	10		
Create	30	20		

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