KPRIET
Learn Beyond

B.E.– Civil Engineering

Curriculum and Syllabi

Regulations 2019

I. Vision and Mission of the Institute

Vision

To become a premier institute of academic excellence by imparting technical, intellectual and professional skills to students for meeting the diverse needs of the industry, society, the nation and the world at large.

Mission

- Commitment to offer value-based education and enhancement of practical skills
- Continuous assessment of teaching and learning process through scholarly activities
- Enriching research and innovative activities in collaboration with industry and institute of repute
- Ensuring the academic process to uphold culture, ethics and social responsibility

II. Vision and Mission of the Department

Vision

To develop competent Civil Engineers to create infrastructure with technology in demand that leads to nation building

Mission

The Mission of the Department is to

- Provide holistic education to students to enhance technical knowledge and skills
- Indoctrinate augmented contents to meet the requirements of stakeholders
- Promote research and consultancy activities in collaboration with industries
- Foster ethical and moral values with leadership qualities

III. Program Educational Objectives (PEOs)

The Program Educational Objectives (PEOs) of the Civil Engineering (CE) represent major accomplishments that the graduates are expected to achieve after three to five years of graduation.

PEO1: Graduates will attain adequate knowledge in the core areas of Civil Engineering with good communication and presentation skills and excel in their chosen profession

PEO2: Graduates will become successful Civil Engineers by applying their technical and managerial skills and disseminate the knowledge with confidence in various disciplines of Civil Engineering as a responsible citizen

PEO3: Graduates will initiate an active programme for life long professional achievement and expertise through continuous development

IV. Program Outcomes (POs)

Graduates of Civil Engineering will be able to

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

PO 3 Design/ development of solutions: Design solutions for complex civil 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.

PO 4 Conduct investigations 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.

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

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

PO 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.

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

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

PO 10 Communication: Communicate effectively on complex engineering activities with the engineering community and with 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.

PO 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.

PO 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.

V. Program Specific Outcomes (PSOs)

Graduates of Civil Engineering will be able to

PSO 1: Design, construct and provide sustainable solutions through consultancy service.

PSO 2: Execute projects, prepare reports and practice professional licensure.

VI. PEO/PO Mapping

Following three levels of correlation should be used:

1: Low

2: Medium

3: High

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	3	3	2	2	2	2	2	3	3	2
PEO2	3	3	3	3	3	2	1	2	2	3	3	3
PEO3	3	3	3	3	3	2	2	2	1	3	3	3

VII. Mapping of Course Outcomes with Program Outcomes

SEM	Subject	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
SEM I	Language Elective I*	-	-	-	-	-	✓	✓	-	✓	✓	-	-	-	-
	Calculus and Differential Equations	✓	✓	-	-	-	-	-	-	-	-	-	✓	-	-
	Engineering Physics	✓	✓	✓	-	-	-	-	-	-	-	-	✓	-	-
	Engineering Chemistry I	✓	✓	-	-	-	-	✓	-	✓	✓	-	✓	-	-
	Basics of Mechanical Engineering	✓	✓	✓	✓	-	✓	-	-	-	-	-	✓	-	-
	Engineering Graphics	✓	✓	-	-	✓	-	-	-	-	✓	-	✓	✓	-
	Workshop (Civil)	✓	-	✓	✓	✓	-	-	-	✓	✓	-	✓	✓	✓
SEM II	Language Elective II**	-	-	-	-	-	✓	✓	✓	✓	✓	-	✓	-	-
	Complex Variables and Laplace Transforms	✓	✓	-	-	-	-	-	-	-	-	-	✓	✓	-
	Physics for Civil Engineers	✓	✓	✓	-	-	✓	-	-	-	-	-	✓	-	-
	Basics of Electrical Engineering	✓	✓	✓	✓	✓	✓	✓	-	-	-	✓	✓	-	-
	Problem Solving using Python Programming	✓	✓	✓	-	-	-	-	✓	✓	✓	-	✓	-	-
	Building Materials	–	✓	✓	–	✓	–	✓	–	–	✓	–	–	✓	✓
	Engineering Mechanics	✓	✓	✓	-	✓	-	-	✓	-	✓	✓	✓	✓	✓
SEM III	Fourier Analysis and Partial Differential Equations	✓	✓	-	-	-	-	-	-	-	-	-	✓	-	-
	Concrete Technology	✓	✓	✓	-	-	✓	-	✓	-	✓	-	✓	✓	✓
	Strength of Materials I	✓	✓	✓	✓	✓	✓	–	–	–	–	–	✓	✓	✓
	Fluid Mechanics	✓	✓	-	✓	-	-	✓	✓	-	✓	-	✓	✓	✓
	Engineering Survey	✓	✓	✓	✓	✓	✓	-	✓	✓	-	-	✓	✓	✓
	Strength of Materials Laboratory	✓	✓	-	✓	✓	-	-	-	✓	✓	-	✓	✓	✓
	Survey Laboratory	✓	✓	-	-	✓	-	-	-	✓	✓	✓	✓	✓	✓

	Aptitude and Soft Skill	✓	✓	–	–	✓	–	–	–	✓	✓	✓	✓	✓	✓
SEM IV	Numerical Methods	✓	✓	-	-	-	-	-	-	-	-	-	✓	-	-
	Strength of Materials II	✓	✓	✓	✓	✓	✓	–	–	–	–	–	✓	✓	✓
	Applied Hydraulics and Hydraulic Machinery	✓	✓	–	✓	–	–	✓	✓	–	✓	–	✓	✓	✓
	Soil Mechanics	✓	✓	-	✓	-	✓	✓	✓	✓	✓	-	✓	✓	✓
	Highway Engineering	✓	✓	✓	✓	✓	✓	–	✓	–	✓	–	–	✓	–
	Concrete and Highway Laboratory	✓	✓	✓	✓	✓	-	-	-	✓	✓	-	✓	✓	✓
	Soil Mechanics Laboratory	✓	✓	✓	✓	-	-	-	-	✓	✓	-	✓	✓	✓
	Numerical Aptitude & Verbal Ability I	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-
SEM V	Design of RC Elements	✓	✓	✓	✓	-	-	-	-	-	-	-	✓	✓	✓
	Structural Analysis I	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
	Total Quality Management	✓	✓	✓	-	-	-	-	-	✓	✓	✓	-	-	✓
	Computer Aided Drafting Laboratory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Survey Camp	✓	✓	✓	-	✓	-	-	-	✓	✓	✓	✓	✓	✓
	Numerical Aptitude & Verbal Ability II	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-
SEM VI	Water Supply and Wastewater Engineering	✓	✓	✓	-	-	✓	✓	-	-	✓	-	✓	✓	✓
	Design of Steel Structures	✓	✓	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓
	Structural Analysis II	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
	Environmental Engineering Laboratory	✓	✓	✓	✓	-	✓	✓	-	✓	✓	-	✓	✓	✓
	Technical Seminar	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	-	✓	✓	✓
SEM VII	Construction Project Management	✓	-	-	-	✓	✓	✓	✓	-	-	✓	✓	-	-
	Estimation and Quantity Surveying	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓	✓	✓
	Computer Aided Analysis and Design Laboratory	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓

	Mini Project	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Project work	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TRACK I	Structural Dynamics and Earthquake Engineering	✓	✓	✓	✓	–	✓	✓	–	✓	✓	–	✓	✓	✓
	Prestressed Concrete Structures	✓	✓	✓	-	-	✓	-	-	-	✓	-	✓	-	✓
	Foundation Engineering	✓	✓	✓	-	-	✓	✓	-	-	✓	-	✓	✓	✓
	Prefabricated Structures	✓	✓	✓	-	-	-	-	-	-	-	✓	-	✓	✓
	Repair and Rehabilitation of Structures	✓	✓	✓	-	-	✓	✓	-	-	✓	✓	-	✓	✓
	Structural Design and Drawing	✓	✓	✓	✓	✓	✓	-	-	✓	✓	-	✓	✓	✓
	Air Pollution and Management	✓	✓	✓	–	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
	Industrial Waste Water Engineering	✓	✓	✓	–	–	–	✓	–	–	✓	✓	✓	✓	✓
	Municipal Solid Waste Management	✓	-	-	-	-	✓	✓	-	-	✓	-	✓	✓	✓
	Hydrology	✓	✓	✓	-	-	-	✓	-	-	-	-	-	✓	✓
	Irrigation Engineering	✓	✓	✓	✓	-	✓	✓	-	✓	-	-	✓	✓	✓
TRACK II	Construction Techniques, Equipment and Practices	✓	-	-	-	✓	-	✓	-	✓	✓	✓	✓	-	-
	Construction Planning & Scheduling	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	✓
	Safety Engineering	✓	-	✓	✓	✓	✓	-	✓	✓	-	✓	✓	✓	✓
	Quality Control and Assurance	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	2	✓	✓
	Building Services	✓	-	-	-	-	✓	✓	✓	-	-	✓	-	✓	✓
	Urban Planning and Management	✓	✓	-	-	-	-	✓	-	-	✓	-	1	✓	✓
	Railways, Airports and Harbor Engineering	✓	✓	✓	✓	–	✓	–	✓	✓	–	–	–	✓	–
	Traffic Engineering and Management	✓	✓	✓	✓	–	–	✓	–	–	–	–	–	–	–
	GIS & Remote Sensing	✓	✓	-	-	✓	-	-	-	-	✓	-	✓	✓	✓
	Comprehension I	✓	✓	✓	–	–	✓	✓	–	–	–	–	–	–	–

TRACK III	Comprehension II	✓	✓	✓	–	–	✓	✓	–	–	–	–	–	–	–
	AI in Civil Engineering	✓	✓	✓	✓	✓	✓	–	✓	–	✓	-	–	✓	–
	Green Building Design	✓	-	-	-	-	✓	✓	✓	-	-	✓	✓	✓	✓
	Building Information Modelling	✓	–	✓	–	✓	–	–	–	✓	✓	✓	✓	✓	✓
	Principles of Architecture	✓	–	✓	–	✓	✓	–	✓	✓	–	✓	✓	–	–
	Disaster Mitigation & Management	✓	✓	✓	✓	-	-	-	-	-	✓	-	✓	-	-

B.E. CIVIL ENGINEERING

REGULATIONS – 2019

CHOICE BASED CREDIT SYSTEM

CURRICULUM FOR I - VIII SEMESTERS

SEMESTER I

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1		Language Elective I*	HSM	1	0	2	2
2	U19MA101	Calculus and Differential Equations	BS	3	1	0	4
3	U19PH101	Engineering Physics	BS	2	0	2	3
4	U19CY101	Engineering Chemistry I	BS	2	0	2	3
5	U19MEG03	Basics of Mechanical Engineering	ES	3	0	0	3
PRACTICALS							
6	U19MEG01	Engineering Graphics	ES	1	0	4	3
7	U19CE101	Workshop (Civil)	ES	0	0	4	2
			TOTAL	**12**	**1**	**14**	**20**

* **U19LE101-Basic English / U19LE102-Communicative English**

SEMESTER II

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1		Language Elective II**	HSM	1	0	2	2
2	U19MA201	Complex Variables and Laplace Transforms	BS	3	1	0	4
3	U19PH203	Physics for Civil Engineers	BS	3	0	0	3
4	U19EEG02	Basics of Electrical Engineering	ES	3	0	0	3
5	U19CSG01	Problem Solving using Python Programming	ES	2	0	2	3
6	U19CE201	Building Materials	ES	3	0	0	3
7	U19CE202	Engineering Mechanics	ES	3	1	0	4
			TOTAL	**18**	**2**	**4**	**22**

**** U19LE201- Advanced Communicative English/ U19LE20* Other languages**

SEMESTER III

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1	U19MA303	Fourier Analysis and Partial Differential Equations	BS	3	1	0	4
2	U19CE301	Concrete Technology	PC	3	0	0	3
3	U19CE302	Strength of Materials I	PC	3	0	0	3
4	U19CE303	Fluid Mechanics	PC	3	0	0	3
5	U19CE304	Engineering Survey	PC	3	0	0	3
PRACTICALS							
6	U19CE305	Strength of Materials Laboratory	PC	0	0	4	2
7	U19CE306	Survey Laboratory	PC	0	0	4	2
8	U19CE307	Aptitude and Soft Skill	EEC	0	0	2	1
			TOTAL	**15**	**1**	**10**	**21**

SEMESTER IV

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1	U19MA403	Numerical Methods	BS	3	0	0	3
2	U19CE401	Strength of Materials II	PC	3	1	0	4
3	U19CE402	Applied Hydraulics and Hydraulic Machinery	PC	3	0	2	4
4	U19CE403	Soil Mechanics	PC	3	0	0	3
5	U19CE404	Highway Engineering	PC	3	0	0	3
PRACTICALS							
6	U19CE405	Concrete and Highway Laboratory	PC	0	0	4	2
7	U19CE406	Soil Mechanics Laboratory	PC	0	0	4	2
8	U19CA001	Numerical Aptitude & Verbal Ability I	EEC	0	0	2	1
			TOTAL	**15**	**1**	**12**	**22**

SEMESTER V

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1	U19CE501	Design of RC Elements	PC	3	1	0	4
2	U19CE502	Structural Analysis I	PC	3	1	0	4
3	U19CE503	Total Quality Management	HSM	3	0	0	3
4		Professional Elective I	PE	3	0	0	3
5		Open Elective I	OE	3	0	0	3
PRACTICALS							
6	U19CE504	Computer Aided Drafting Laboratory	PC	0	0	4	2
7	U19CE505	Survey Camp*	PC	0	0	0	1
8	U19CA002	Numerical Aptitude & Verbal Ability II	EEC	0	0	2	1
			TOTAL	**15**	**2**	**6**	**21**

*Two Weeks during IV semester vacation

SEMESTER VI

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1	U19CE601	Water Supply and Wastewater Engineering	PC	3	0	0	3
2	U19CE602	Design of Steel Structures	PC	3	1	0	4
3	U19CE603	Structural Analysis II	PC	3	1	0	4
4		Professional Elective II	PE	3	0	0	3
5		Professional Elective III	PE	3	0	0	3
6		Open Elective II	OE	3	0	0	3
PRACTICALS							
7	U19CE604	Environmental Engineering Laboratory	PC	0	0	4	2
8	U19CE605	Technical Seminar	EEC	0	0	2	1
			TOTAL	**18**	**2**	**6**	**23**

SEMESTER VII

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1	U19CE701	Construction Project Management	HSM	3	0	0	3
2	U19CE702	Estimation and Quantity Surveying	PC	3	0	0	3
3		Professional Elective IV	PE	3	0	0	3
4		Open Elective III	OE	3	0	0	3
5		Open Elective IV	OE	3	0	0	3
PRACTICALS							
6	U19CE703	Computer Aided Analysis and Design Laboratory	PC	0	0	4	2
7	U19CE704	Mini Project	EEC	0	0	2	1
			TOTAL	**15**	**0**	**6**	**18**

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SEMESTER VIII

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1		Professional Elective V	PE	3	0	0	3
2		Professional Elective VI	PE	3	0	0	3
PRACTICALS							
3	U19CE801	Project work	EEC	0	0	20	10
			TOTAL	**6**	**0**	**20**	**16**

INDUSTRIAL INTERNSHIP

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19CEI01	Industrial Training / Internship * (4 Weeks)	EEC	0	0	0	2
			TOTAL	**0**	**0**	**0**	**2**

*Four Weeks during any semester vacation from III to VI Semester

TOTAL CREDITS: 165

PROFESSIONAL ELECTIVES (PE)

TRACK I

STRUCTURAL ENGINEERING						
Sl.No.	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
1	U19CEP01	Structural Dynamics and Earthquake Engineering	3	0	0	3
2	U19CEP02	Prestressed Concrete Structures	3	0	0	3
3	U19CEP03	Foundation Engineering	3	0	0	3
4	U19CEP04	Prefabricated Structures	3	0	0	3
5	U19CEP05	Repair and Rehabilitation of Structures	3	0	0	3
6	U19CEP06	Structural Design and Drawing	3	0	0	3
ENVIRONMENTAL ENGINEERING						
7	U19CEP07	Air Pollution and Management	3	0	0	3
8	U19CEP08	Industrial Waste Water Engineering	3	0	0	3
9	U19CEP09	Municipal Solid Waste Management	3	0	0	3
10	U19CEP10	Hydrology	3	0	0	3
11	U19CEP11	Irrigation Engineering	3	0	0	3

TRACK II

CONSTRUCTION MANAGEMENT						
Sl.No.	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
1	U19CEP12	Construction Techniques, Equipment and Practices	3	0	0	3
2	U19CEP13	Construction Planning & Scheduling	3	0	0	3
3	U19CEP14	Safety Engineering	3	0	0	3
4	U19CEP15	Quality Control and Assurance	3	0	0	3
5	U19CEP16	Building Services	3	0	0	3
INFRASTRUCTURE ENGINEERING						
6	U19CEP17	Urban Planning and Management	3	0	0	3
7	U19CEP18	Railways, Airports and Harbor Engineering	3	0	0	3
8	U19CEP19	Traffic Engineering and Management	3	0	0	3
9	U19CEP20	GIS & Remote Sensing	3	0	0	3

TRACK III

COMPREHENSIVE COURSES						
Sl.No.	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
1	U19CEP21	Comprehension I	3	0	0	3
2	U19CEP22	Comprehension II	3	0	0	3
VALUE ENGINEERING COURSES						
3	U19CEP23	AI in Civil Engineering	3	0	0	3
4	U19CEP24	Green Building Design	3	0	0	3
5	U19CEP25	Building Information Modelling	3	0	0	3
6	U19CEP26	Principles of Architecture	3	0	0	3
7	U19CEP27	Disaster Mitigation & Management	3	0	0	3

HUMANITIES AND SCIENCES (HSM)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19LE101	Basic English	HSM	1	0	2	2
2	U19LE102	Communicative English	HSM	1	0	2	2
3	U19LE201	Advanced Communicative English	HSM	1	0	2	2
4	U19CE503	Total Quality Management	HSM	3	0	0	3
5	U19CE701	Construction Project Management	HSM	3	0	0	3

BASIC SCIENCES (BS)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19MA101	Calculus and Differential Equations	BS	3	1	0	4
2	U19PH101	Engineering Physics	BS	2	0	2	3
3	U19CY101	Engineering Chemistry I	BS	2	0	2	3
4	U19MA201	Complex Variables and Laplace Transforms	BS	3	1	0	4
5	U19PH203	Physics for Civil Engineers	BS	3	0	0	3
6	U19MA303	Fourier Analysis and Partial Differential Equations	BS	3	1	0	4
7	U19MA403	Numerical Methods	BS	3	0	0	3

ENGINEERING SCIENCES (ES)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19MEG03	Basics of Mechanical Engineering	ES	3	0	0	3

2	U19MEG01	Engineering Graphics	ES	1	0	4	3
3	U19CE101	Workshop (Civil)	ES	0	0	4	2
4	U19EEG02	Basics of Electrical Engineering	ES	3	0	0	3
5	U19CSG01	Problem Solving using Python Programming	ES	2	0	2	3
6	U19CE202	Engineering Mechanics	ES	3	1	0	4
7	U19CE201	Building Materials	ES	3	0	0	3

PROFESSIONAL CORE (PC)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	U19CE301	Concrete Technology	PC	3	0	0	3
2.	U19CE302	Strength of Materials I	PC	3	0	0	3
3.	U19CE303	Fluid Mechanics	PC	3	0	0	3
4.	U19CE304	Engineering Survey	PC	3	0	0	3
6.	U19CE305	Strength of Materials Laboratory	PC	0	0	4	2
7.	U19CE306	Survey Laboratory	PC	0	0	4	2
8.	U19CE401	Strength of Materials II	PC	3	1	0	4
9.	U19CE402	Applied Hydraulics and Hydraulic Machinery	PC	3	0	2	4
10.	U19CE403	Soil Mechanics	PC	3	0	0	3
11	U19CE404	Highway Engineering	PC	3	0	0	3
12	U19CE405	Concrete and Highway Laboratory	PC	0	0	4	2
13	U19CE406	Soil Mechanics Laboratory	PC	0	0	4	2
14	U19CE501	Design of RC Elements	PC	3	1	0	4
15	U19CE502	Structural Analysis I	PC	3	1	0	4
16	U19CE504	Computer Aided Drafting Laboratory	PC	0	0	4	2
17	U19CE505	Survey Camp*	PC	0	0	0	1
18	U19CE601	Water Supply and Wastewater Engineering	PC	3	0	0	3
19	U19CE602	Design of Steel Structures	PC	3	1	0	4
20	U19CE603	Structural Analysis II	PC	3	1	0	4
21	U19CE604	Environmental Engineering Laboratory	PC	0	0	4	2
22	U19CE702	Estimation and Quantity Surveying	PC	3	0	0	3
23	U19CE703	Computer Aided Analysis and Design Laboratory	PC	0	0	4	2

PROFESSIONAL ELECTIVES (PE)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
PROFESSIONAL ELECTIVES I							
1	U19CEP03	Foundation Engineering	PE	3	0	0	3
2	U19CEP11	Irrigation Engineering	PE	3	0	0	3
3	U19CEP10	Hydrology	PE	3	0	0	3
4	U19CEP12	Construction Techniques, Equipment and Practices	PE	3	0	0	3
5	U19CEP20	GIS & Remote Sensing	PE	3	0	0	3
PROFESSIONAL ELECTIVES II							
1	U19CEP02	Prestressed Concrete Structures	PE	3	0	0	3
2	U19CEP07	Air Pollution and Management	PE	3	0	0	3
3	U19CEP23	AI in Civil Engineering	PE	3	0	0	3
4	U19CEP16	Building Services	PE	3	0	0	3
5	U19CEP18	Railways, Airports and Harbor Engineering	PE	3	0	0	3
PROFESSIONAL ELECTIVES III							
1	U19CEP04	Prefabricated Structures	PE	3	0	0	3
2	U19CEP21	Comprehension I	PE	3	0	0	3
3	U19CEP17	Urban Planning and Management	PE	3	0	0	3
4	U19CEP14	Safety Engineering	PE	3	0	0	3
5	U19CEP26	Principles of Architecture	PE	3	0	0	3
PROFESSIONAL ELECTIVES IV							
1	U19CEP06	Structural Design and Drawing	PE	3	0	0	3
2	U19CEP08	Industrial Waste Water Engineering	PE	3	0	0	3
3	U19CEP22	Comprehension II	PE	3	0	0	3
4	U19CEP19	Traffic Engineering and Management	PE	3	0	0	3
PROFESSIONAL ELECTIVES V							
1	U19CEP01	Structural Dynamics and Earthquake Engineering	PE	3	0	0	3
2	U19CEP13	Construction Planning & Scheduling	PE	3	0	0	3
3	U19CEP25	Building Information Modelling	PE	3	0	0	3
4	U19CEP24	Green Building Design	PE	3	0	0	3
PROFESSIONAL ELECTIVES VI							
1	U19CEP05	Repair and Rehabilitation of Structures	PE	3	0	0	3

2	U19CEP09	Municipal Solid Waste Management	PE	3	0	0	3
3	U19CEP15	Quality Control and Assurance	PE	3	0	0	3
4	U19CEP27	Disaster Mitigation & Management	PE	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	U19CE307	Aptitude and Soft Skill	EEC	0	0	2	1
2	U19CA001	Numerical Aptitude & Verbal Ability I	EEC	0	0	2	1
3	U19CA002	Numerical Aptitude & Verbal Ability II	EEC	0	0	2	1
4	U19CE605	Technical Seminar	EEC	0	0	2	1
5	U19CE704	Mini Project	EEC	0	0	2	1
6	U19CE801	Project Work	EEC	0	0	20	10
7	U19CEI01	Industrial Training / Internship I (4 Weeks)	EEC	0	0	0	2

VIII. Scheme of Credit distribution – Summary

S.No	Stream	Credits/Semester								Credits	%	Suggested by AICTE
		I	II	III	IV	V	VI	VII	VIII			
1.	Humanities and Social Sciences including Management (HSM)	2	2	-	-	3	-	3	-	10	6%	12
2.	Basic Sciences (BS)	10	7	4	3	-	-	-	-	24	15%	25
3.	Engineering Sciences(ES)	8	13	-	-	-	-	-	-	21	13%	24
4.	Professional Core (PC)	-	-	16	18	11	13	5	-	63	38%	48
5.	Professional Elective (PE)	-	-	-	-	3	6	3	6	18	11%	18
6.	Open Electives (OE)	-	-	-	-	3	3	6	-	12	7%	18
7.	Employability Enhancement Courses (EEC)	-	-	1	1	1	1	1	10	15	10%	15
8.	Industrial Training/ Internship	-	-	-	-	-	-	-	-	2		
9.	Mandatory Non-Credit Course (MNC)	-	-	-	-	-	-	-	-	-	-	-
Total		**20**	**22**	**21**	**22**	**21**	**23**	**18**	**16**	**165**	**100**	**160**

SEMESTER I

U19LE101	BASIC ENGLISH	Category: HSM			
		L	T	P	C
		1	0	2	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To read the text, understand and write the meaning under Technical, Business, Social and Academic contexts.
- To listen and comprehend monologues, dialogues and discussions.
- To speak effectively with appropriate use of words and participate in discussions.

UNIT I BASICS FOR COMMUNICATION 9

Regular & Irregular Verbs – Modal Verbs – Prepositions – Tenses – Subject Verb Agreement – Spotting Errors – Homonyms & Homophones – Phrasal Verbs – Single word substitute – Word formation – Reported Speech

UNIT II LISTENING 9

Listening for specific Information – Listening to short texts – Listening to product description and process – Listening to formal and informal Conversations – Listening to announcements – Listening Comprehension

UNIT III SPEAKING 9

Introducing oneself – Seeking and sharing information – JAM – Enquiry – Asking for clarification – Describing a place, person, process, product and experience – Current affairs – Making presentations

UNIT IV READING 9

Reading for information – Skimming – Scanning – Predicting the content – Reading comprehension – Reading short texts – Proof reading(editing)

UNIT V WRITING 9

Memo – Email – Letter writing (formal and informal) – Dialogue writing – Descriptive writing – Instructions – Filling forms of application - Paraphrasing

LIST OF EXPERIMENTS

1. Listening for information
2. Listening to announcements
3. Listening to stories
4. Song based listening
5. Listening to conversations
6. Self Introduction
7. Just a Minute
8. Story narration
9. Picture description
10. Movie review

Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: 30 Periods Total: 45 Periods

TEXT BOOKS:

1. Mindscapes: “English for Technologist and Engineers”, Orient BlackSwan, 2014
2. Sudharshana N P and Savitha C, “English for Technical Communication”, Cambridge University Press, 2016

REFERENCES:

1. Murphy, Raymond, “Intermediate English Grammar”, Cambridge University Press, 2009
2. Means, Thomas L, “English and Communication for Colleges”, Cengage 2017
3. “Using English: A Coursebook for Undergraduate Engineers and Technologists” Orient BlackSwan, 2017

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Use appropriate vocabulary required for spoken and written communication	Remember
CO2	Comprehend and answer questions and take part in conversations	Understand
CO3	Participate in discussions and presentations	Apply
CO4	Understand the meaning of the content present in letters, reports and newspaper	Understand
CO5	Draft letters, e-mails and make notes with appropriate use of words	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO2	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO3	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO4	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO5	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO	-	-	-	-	-	2	1	-	3	3	-	-	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER I

U19LE102	COMMUNICATIVE ENGLISH	Category: HSM			
		L	T	P	C
		1	0	2	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To develop the ability to read, write and comprehend various texts.
- To enhance the listening skills to understand conversations and deliberations on diverse contexts.
- To make effective presentations and demonstrate concepts within a team.

UNIT I BASICS FOR COMMUNICATION 9

Active and Passive – Conditionals – Reported speech – Degrees of comparison – Phrases and clauses – Idioms – Kinds of sentences – Connectives and Discourse markers – Purpose statements

UNIT II LISTENING 9

Listening to TED talks – Listening to product description – Listening to orations – Listening to news – Radio based listening

UNIT III SPEAKING 9

Group discussion – Extempore – Technical seminar – Product and process description – Role play – Conversation and etiquettes – Short group conversation – Narrating a story – Formal and informal discussions

UNIT IV READING 9

Pre-reading and Post-reading – Intensive reading – Extensive reading – Newspaper reading – Reading longer texts – Reviewing company profile – Reading strategies – Interpreting visual graphics

UNIT V WRITING 9

Interpreting charts and graphs – Recommendations – Minutes of meeting – Job application and cover letter – Report writing – Drafting circulars (Business contexts)

LIST OF EXPERIMENTS

1. Listening to TED talks
2. Listening to product description
3. Listening to news
4. Radio based listening
5. Listening to oration
6. Self Introduction
7. Role play
8. Extempore
9. Presentation
10. Group discussion

Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: 30 Periods Total: 45 Periods

TEXT BOOKS:

1. Mindscapes: English for Technologist and Engineers", Orient BlackSwan, 2014
2. Sudharshana N P and Savitha C, "English for Technical Communication", Cambridge University Press, 2016

REFERENCES:

1. Murphy, Raymond, "Intermediate English Grammar", Cambridge University Press, 2009
2. Means, Thomas L, "English and Communication for Colleges", Cengage 2017
3. "Using English: A Coursebook for Undergraduate Engineers and Technologists" Orient BlackSwan, 2017

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Make use ofrelevant vocabulary in formal and informal contexts	Apply
CO2	Infer and exhibit the ability to listen various professional interactions	Understand
CO3	Express views and perceptions in a technical forum	Understand
CO4	Interpret a given text and relate the content effectively	Understand
CO5	Frame coherent and cohesive sentences in select contexts	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO2	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO3	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO4	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO5	-	-	-	-	-	2	1	-	3	3	-	-	-	-
CO	-	-	-	-	-	2	1	-	3	3	-	-	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER I

U19MA101	CALCULUS AND DIFFERENTIAL EQUATIONS	Category: ES			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Understand the concepts of matrices and calculus which will enable them to model and analyze physical phenomena involving continuous change
- Apply and summarize the methodologies involved in solving problems related to fundamental principles of calculus
- Develop confidence to model mathematical pattern and give appropriate solutions

UNIT I MATRICES 9 + 3

Eigenvalues and Eigenvectors – Properties (without proof) – Cayley Hamilton theorem (without proof) – Diagonalization using orthogonal transformation – Applications : Elastic membrane

UNIT II DIFFERENTIAL CALCULUS 9 + 3

Curvature – Radius of curvature (Cartesian form only) – Center of curvature – Circle of curvature – Evolute and Envelope of plane curves

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9 + 3

Partial derivatives – Total derivative – Jacobians – Taylor's series expansion – Extreme values of functions of two variables – Lagrange multipliers method

UNIT IV INTEGRAL CALCULUS 9 + 3

Evaluation of definite and improper integrals – Applications of definite integrals – Surface areas – Volume of revolutions

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 9 + 3

Second and Higher order linear differential equations with constant coefficients – variable coefficients – Euler-Cauchy equation – Legendre's equation – Method of variation of parameters – Applications

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition Wiley India Pvt Ltd, New Delhi, 2018
2. Grewal B S, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2017

REFERENCES:

1. Bali N P and Dr Manish Goyal, "A text book of Engineering Mathematics", 12th edition, Laxmi Publications,2016
2. Thomas G B and Finney R L, "Calculus and Analytic Geometry", 14th edition, Pearson Education India, 2018
3. Maurice D Weir, Joel Hass, Christopher Heil, "Thomas Calculus", 14th edition, Pearson Education, India, 2018
4. James Stewart, "Calculus: Early Transcendental", 7th Edition, Cengage Learning, New Delhi, 2015

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Apply the knowledge of matrices with the concepts of eigenvalues to study their problems in core areas	Apply
CO2	Study the behavior of a function at infinity, knowledge on curvature with its properties in cartesian form	Apply
CO3	Develop competency in applying the idea of Lagrange multipliers to find extreme of functions with constraints	Apply
CO4	Compute area and volume using definite and improper integrals	Apply
CO5	Model the problems, when the particle changes with respect to its velocity, acceleration using higher order differential equations	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	1	-	-
CO	3	2	-	-	-	-	-	-	-	-	-	1	-	-
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER I

U19PH101	ENGINEERING PHYSICS	Category: ES			
		L	T	P	C
		2	0	2	3

PRE–REQUISITES:

- Higher secondary physics

COURSE OBJECTIVES:

- To understand the concepts of surface tension, flow of liquids, heat transfer and thermal conductivity of materials
- To acquire the knowledge of ultrasonic waves and its production methods with its industrial and medical applications
- To understand the fundamental principles of laser and fiber optics with their applications

UNIT I PROPERTIES OF LIQUIDS **6**

Surface tension – Determination of surface tension by Jaeger's method – Effect of temperature on surface tension – Viscosity – Coefficient of viscosity – Streamline and turbulent flow – Stokes law and terminal velocity – Poiseuille's equation for the flow of a liquid through a capillary tube and experimental determination

UNIT II HEAT **6**

Modes of heat transfer – Thermal properties(solids and liquids) – Specific heat capacity, thermal capacity, thermal diffusivity and coefficient of linear thermal expansion – Lee's disc method for the determination of thermal conductivity – Heat conduction through compound media(series and parallel) – Solar water heater

UNIT III ULTRASONICS **6**

Properties of ultrasonic waves – Production of ultrasonic waves – Magnetostrictive generator – Piezoelectric generator – Acoustic grating – Applications – SONAR – Cavitation – Drilling and welding – Non destructive testing(flaw detection) – Medical applications(fetus heart movement)

UNIT IV LASER **6**

Laser characteristics – Spatial and Temporal coherence – Einstein coefficient and its importance – population inversion – optical resonator – Pumping methods – Nd-YAG laser – CO_2 laser – Material processing(drilling, welding) – Medical applications in ophthalmology

UNIT V FIBRE OPTICS **6**

Fiber optic cable – Features – Total internal reflection – Numerical aperture and acceptance angle – Classification of optical fibers based on refractive index, modes and materials – Fiber optical communication – Medical endoscopy

LIST OF EXPERIMENTS

1. Determination of viscosity of the given liquid using Poiseuille's flow method
2. Determination of thermal conductivity of a bad conductor using Lee's disc method
3. Determination of velocity of sound and compressibility of a liquid using Ultrasonic interferometer
4. Determination of particle size of lycopodium powder using laser light
5. Determination of wavelength of a given laser source
6. Determination of acceptance angle and numerical aperture of an optical fiber using laser source
7. Determination of dispersive power of prism using spectrometer
8. Determination of refractive index of a liquid using spectrometer

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: 30 Periods Total: 60 Periods

TEXT BOOKS:

1. Bhattacharya D K. and Poonam Tandon, “Engineering Physics”, Oxford University Press, 2016
2. Pandey B K. and Chaturvedi S, “Engineering Physics”, Cengage Learning India, 2013

REFERENCES:

1. Arumugam M, “Engineering Physics”, Anuradha Publishers, 2014
2. Murugeshan R, “Properties of Matter”, S. Chand and Company Ltd, 2012
3. Gaur R. K. and Gupta S. L., “Engineering Physics”, Dhanpat Rai Publishers, 2016
4. https://nptel.ac.in/downloads/104104085/(Laser)
5. https://nptel.ac.in/courses/122107035/8(Ultrasonics)

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Explain the concept of surface tension and viscosity of liquids	Understand
CO2	Interpret the thermal properties of materials and apply to the field of engineering	Understand
CO3	Illustrate the production methods of ultrasonic waves and use it for the field of engineering and medicine	Understand
CO4	Demonstrate the types of laser for various industrial and medical applications	Understand
CO5	Classify the fiber optic cable and study its engineering applications	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO	3	2	1	-	-	-	-	-	-	-	-	1	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER I

U19CY101	ENGINEERING CHEMISTRY I	Category: ES			
		L	T	P	C
		2	0	2	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To inculcate the fundamentals of water technology and electrochemistry
- To gain basic knowledge of corrosion of metals and change of phases in alloys
- To acquire knowledge about the preparation, properties and applications of nanomaterials

UNIT I WATER **6**

Hardness of water – types – problems in hardness calculations – estimation of hardness by EDTA – boiler feed water – boiler trouble (scale, sludge, priming, foaming and caustic embrittlement) – softening methods – internal treatment (phosphate & calgon) – external treatment (deionization process) – desalination of water- reverse osmosis.

UNIT II ELECTROCHEMISTRY **6**

Electrochemical cells – types – galvanic cells – redox reactions – EMF – concept of electrode potential - electrodes (Standard Hydrogen and Calomel electrode) – Nernst equation (derivation only) - electrochemical series and its applications – estimation of iron by potentiometry, determination of pH by pH metry.

UNIT III CORROSION AND ITS CONTROL **6**

Types – chemical corrosion – electrochemical corrosion (galvanic & differential aeration) – factors influencing corrosion – corrosion control methods – sacrificial anode and impressed current method – protective coating – electroplating – Ni plating.

UNIT IV PHASE RULE AND ALLOYS **6**

Phase rule – explanation of terms – advantages and limitations of phase rule – application of phase rule to one component system (water) – reduced phase rule – two component system (simple eutectic system - Lead – silver system) – alloys – definition – purpose of making alloys –ferrous (stainless steel), heat treatment – non-ferrous alloys (Brass -Dutch metal, German Silver) - composition, properties and uses.

UNIT V NANOCHEMISTRY AND ITS APPLICATIONS **6**

Types – properties of nanomaterials – size dependent properties – general methods of synthesis – top down (laser ablation and CVD) – bottom up (solvothermal and precipitation) – Application of nanotechnology (medicine, electronics, defence and agriculture)

LIST OF EXPERIMENTS

1. Determination of total, permanent and temporary hardness of a given sample water by EDTA method
2. Determination of chloride content in the water sample
3. Estimation of ferrous ion by potentiometric titration
4. Determination of strength of HCl by pH metric method
5. Determination of corrosion rate by weight loss method
6. Electroplating of Cu and electroless plating of Cu
7. Estimation of Copper in Brass by EDTA method

8. Determination of phase and degrees of freedom in $CuSO_4$. $5H_2O$ / KI and water / $FeCl_3$. $12H_2O$ / phenol-water
9. Preparation of nano ruby (Al_2O_3-Cr) by combustion method
10. Preparation of nano ZnO by co-precipitation method

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: 30 Periods Total: 60 Periods

TEXT BOOKS:

1. Jain P C and Monika Jain, "Engineering Chemistry", 16th edition, Dhanpat Rai Publishing Company, Pvt. Ltd., New Delhi, 2015
2. Vairam S, Kalyani P and Suba Ramesh, "Engineering Chemistry", 2nd edition, Wiley India Pvt. Ltd, New Delhi, 2013

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International Pvt. Ltd, New Delhi, 2014
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India, Pvt. Ltd, Delhi, 2015
3. Shikha Agarwal, "Engineering Chemistry, Fundamentals and Applications", Cambridge University Press, 2019

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Apply the principles of water technology in treatment of industrial and domestic water and estimate the various constituents of industrial water	Apply
CO2	Describe the utilization of electrochemical principles for chemical cells and determine experimentally the EMF of the cells	Understand
CO3	Outline the corrosion process and prevention methods that is adopted in industries	Understand
CO4	Examine the number of phases, components and variants in different heterogeneous systems, construct the phase diagrams and ferrous alloys, composition and applications and relate the change in properties due to heat treatment	Understand
CO5	Classify the different nanomaterials, recall their properties and relate them to applications.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	2	-	1	1	-	1	-	-
CO2	3	1	-	-	-	-	2	-	1	1	-	1	-	-
CO3	3	1	-	-	-	-	2	-	1	1	-	1	-	-
CO4	3	1	-	-	-	-	2	-	1	1	-	1	-	-
CO5	3	1	-	-	-	-	2	-	1	1	-	1	-	-
CO	3	1	-	-	-	-	2	-	1	1	-	1	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER I

U19MEG03	BASICS OF MECHANICAL ENGINEERING (for B.E Civil Engineering)	Category: ES			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- The students will familiar with basic mechanical elements, energy sources and power plants
- The students will aware the principles of refrigeration & air conditioning
- The students will know industrial safety aspects

UNIT I BASIC MECHANICAL ELEMENTS 9

Basic Concepts and demonstration of Bearings -Gears - Belt drives – Chain drives, cable drives, chain block-Conveyers - Shafts, keys, spline shafts- Springs - Fasteners - screws, bolts, nuts and their specifications

UNIT II ENERGY RESOURCES 9

Renewable and Non-Renewable energy resources

UNIT III BASICS OF POWER PLANT AND BOILERS 9

Classification of power Plants, Working principle of steam, Gas, Diesel, Hydroelectric and Nuclear Power plants, Working principle of Boilers, types of boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

UNIT IV REFRIGERATION AND AIR CONDITIONING 9

Terminology of Refrigeration and Air Conditioning. Principle of vapor compression and absorption system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner

UNIT V INDUSTRIAL ENGINEERING 9

Introduction to safety engineering- Evolution of Safety, Improvements Required, Safety Organization, Safety Functions, Workplace Operations Requiring Safety, Safety Benefits

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Basant Agarwal and C.M. Agarwal, “Basics of Mechanical Engineering”, Wiley India Pvt. Ltd, New Delhi, 2011
2. Venugopal K. and Prabhu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2010

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010
2. ShanthaKumar SRJ., “Basic Mechanical Engineering” Hi-tech Publications, Mayiladuthurai, 2010
3. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2016
4. Rai. G.D., "Non Conventional Energy Sources", Khanna Publishers, New Delhi, 2011

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Recognize various mechanical elements like bearings, gears, springs, shaft, belts and fasteners	Remember
CO2	Discuss about various renewable and non-renewable energy resources	Remember
CO3	Understand the construction and working principles of different power plants and its subsystems.	Understand
CO4	Explain the working of RAC system	Understand
CO5	Recall various industrial safety requirements	Remember

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	-	-	-	-	1	-	-
CO2	3	2	1	1	-	1	-	-	-	-	-	1	-	-
CO3	3	2	1	1	-	1	-	-	-	-	-	1	-	-
CO4	3	2	1	1	-	1	-	-	-	-	-	1	-	-
CO5	3	2	1	1	-	1	-	-	-	-	-	1	-	-
CO	3	2	1	1	-	1	-	-	-	-	-	1	-	-
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER I

U19MEG01	ENGINEERING GRAPHICS	Category: ES			
		L	T	P	C
		1	0	4	3

PRE-REQUISITES

- Nil

COURSE OBJECTIVE

- The students will be exposed to standards and conventions followed in preparation of engineering drawings
- The students will understand the concepts of orthographic and isometric projections using CAD software
- The students will develop the ability of producing engineering drawings and conveying the information through drawings using CAD software

BASICS OF ENGINEERING DRAWING AND CAD (Not for examination) **3**

Introduction, drawing instruments and its uses, sheet layout, BIS conventions, lines, lettering and dimensioning practices lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. agency, parallelism, inclination and perpendicularity.

UNIT I CONICS, SPECIAL CURVES AND PROJECTION OF POINTS **3+12**

Construction of parabola, ellipse and hyperbola using eccentricity method, construction of involutes for squares and circles, Construction of Tangent and normal to the above curves. Introduction, method of projection, planes of projection, reference line and notations. Orthographic Projection of points: Points in all the four quadrants.

UNIT II PROJECTION OF STRAIGHT LINES AND SURFACES. **3+12**

Projection of straight lines**:** Lines inclined to HP/VP plane, inclined to both HP and VP planes (straight lines are assumed to be in first quadrant only)**.** Projection of planes**:** Projection of square, rectangle, pentagon, hexagon and circular plane – inclined to both the plane by change of position method.

UNIT III PROJECTIONOFSOLIDS **3+12**

Introduction, projection of solids: prisms, pyramids, cylinders and cones with axis inclined to both the planes. (Solids resting on HP only)

UNIT IV DEVELOPMENT OF LATERAL SURFACES OF SOLIDS **3+12**

Introduction, Cutting plane, sectional views of right regular solids resting with base on HP: prisms, pyramids, cylinder and cone and true shapes of the sections.

Development of lateral surfaces of right regular prisms, pyramids, cylinders, cones resting with base on HP only. Development of their frustums and truncations.

UNIT V ORTHOGRAPHIC AND ISOMETRICPROJECTIONS **3+12**

Orthographic projection: Simple machine components using free hand sketching.

Isometric projection: Simple Solid exercises and combination of solids.

Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: –60 Periods Total: 75 Periods

TEXT BOOKS

1. ND Bhat & VM Panchal, Engineering Drawing, Charotar Publishing House, Gujarat, 51st edition, 2013.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2010.

REFERENCE BOOKS

1. Natarajan K.V., —A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2017.

2. Sam Tickoo, AutoCAD 2013 for Engineers and Designers, Dreamtech Press, 2013.
M.H. Annaiah & Rajashekar Patil, Computer Aided Engineering Drawing, New Age
3. International Publishers, 4th Edition, 2012
4. Basant Aggarwal, Engineering Drawing, Tata McGraw Hill Education Private Limited, 1st Edition, 2010.
5. D.M. Kulkarni, A.P. Rastogi, A.K. Sarkar, Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi, Revised Edition, 2010.

COURSE OUTCOMES (CO)

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Sketch curves, orthographic projections of points as per BIS conventions.	Apply
CO2	Illustrate the orthographic projections of straight lines and plane surfaces	Apply
CO3	Depict the orthographic projections of solids, lateral surfaces of frustums, truncated solids and its development	Apply
CO4	Translate pictorial and isometric views of simple objects to orthographic views	Apply
CO5	Convert the orthographic views into isometric projections	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	-	-	3	-	-	-	-	1	-	1	1	-
CO2	3	2	-	-	3	-	-	-	-	1	-	1	1	-
CO3	3	2	-	-	3	-	-	-	-	1	-	1	1	-
CO4	3	2	-	-	3	-	-	-	-	1	-	1	1	-
CO5	3	2	-	-	3	-	-	-	-	1	-	1	1	-
CO	3	2	-	-	3	-	-	-	-	1	-	1	1	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER I

U19CE101	WORKSHOP(CIVIL)	Category: ES			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To Provide hands on experience in fitting, carpentry, sheet metal and lathe shop
- To provide practical training on household wiring and electron circuits
- To offer real time activity on plumbing connections in domestic applications

LIST OF EXPERIMENTS

1. Center Line marking
   a. Study on Centre line marking for building components - Foundations
   b. Study on Centre line marking for building components - Columns
2. Test on Construction materials
   a. Determination of Water absorption Test on Bricks
   b. Experimental Preparation of concrete and Mortar for construction
   c. Determination of Specific gravity of Fine aggregate and Coarse aggregate
3. Electrical Wiring
   a. Study of Electrical Materials and Wiring components,
   b. Experimental verification of Wiring circuit for a lamp using single- and two-way switches.
   c. Experimental verification of Wiring circuit for fluorescent lamps.
   d. Experimental verification of Measurement of resistance to earth of an electrical equipment
4. Plumbing works
   a. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings
   b. Study of pipe connections requirements for pumps and turbines
   c. Construct a plumbing line for water supply
   d. Study on Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components
   e. Demonstration of plumbing requirements of high-rise buildings
5. Study of Building Drawing
   a. Identification of various building components from the building drawing- FSI Plan area, Carpet area

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 30 Periods Total: 30 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Develop a centre line for different building components	Apply
CO2	Study the properties of construction materials	Understand
CO3	Construct and demonstrate electrical wiring circuits.	Apply
CO4	Understand the plumbing requirements and construct the basic pipe connections for water supply	Understand
CO5	Identify the building components from building drawing.	Remember

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	2	3	2	-	-	-	3	1	-	2	3	3
CO2	2	-	2	3	2	-	-	-	3	1	-	2	3	3
CO3	2	-	2	3	2	-	-	-	3	1	-	2	3	3
CO4	2	-	2	3	2	-	-	-	3	1	-	2	3	3
CO5	2	-	2	3	2	-	-	-	3	1	-	2	3	3
CO	2	-	2	3	2	-	-	-	3	1	-	2	3	3
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER II

U19LE201	ADVANCED COMMUNICATIVE ENGLISH	Category: HSM			
		L	T	P	C
		1	0	2	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Foster their ability to develop communicative strategies and skills.
- Strengthen the learners to evocate their listening skills and enhance writing ability.
- Exhibit proactive reading strategies and speaking techniques.

UNIT I LANGUAGE ADEPTNERS **9**

Cloze test – Sentence completion – Relative clause – Transformation of sentences – Common errors – Discourse markers – Formal and Informal expressions – Framing questions – Figures of speech

UNIT II LISTENING **9**

Listening to announcements – Interviews – Group discussions– Dialogues – News items – Documentaries – IELTS – GRE – TOEFL based listening

UNIT III SPEAKING **9**

Real life situations through role play – Language use – Pronunciation, Stress and Intonation – Narrating events – Presentation – Group discussion

UNIT IV READING **9**

Reading strategies – Reading comprehension – Reading short stories – Journal articles – Inferring editorial column – Cloze reading

UNIT V WRITING **9**

Book review – Guided writing – Writing gadget review – Free writing – Rephrasing – Interpreting text – Email writing – Process description

LIST OF EXPERIMENTS

1. Listening for announcements
2. Listening to dialogues
3. Listening to documentaries
4. Listening to interviews
5. IELTS based listening
6. Role play
7. Product description
8. Group discussion
9. Book review
10. General presentation

Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: 30 Periods Total: 45 Periods

TEXT BOOKS:

1. K N Shoba, Lourdes JoavaniRayen. “Communicative English”. Cambridge University Press, 2017
2. Sudharshana N P and Savitha C, “English for Technical Communication”, Cambridge University Press, 2016

REFERENCES:

1. Murphy, Raymond, “Intermediate English Grammar”, Cambridge University Press, 2009
2. Means, Thomas L, “English and Communication for Colleges”, Cengage 2017
3. “Using English: A Coursebook for Undergraduate Engineers and Technologists” Orient BlackSwan, 2017

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Inculcate effective reading strategy	Understand
CO2	Express opinions in real life situations	Understand
CO3	Construct academic and professional writing	Apply
CO4	Impart the listening ability in self learning	Apply
CO5	Adept to the needs of the second language learner in a grammatical context	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	2	-	2	-	3	-	1	-	-
CO3	-	-	-	-	-	2	-	-	2	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO5	-	-	-	-	-	-	2	2	-	3	-	1	-	-
CO	-	-	-	-	-	2	2	2	2	3	-	1	-	-
Correlation levels:	1: Slight (Low)					2: Moderate (Medium)				3: Substantial (High)				

SEMESTER II

U19MA201	COMPLEX VARIABLES AND LAPLACE TRANSFORMS	Category: ES			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Understand the vector calculus, which extends the basic concepts of differential calculus to vector functions
- Use the concepts of complex analysis, in the study of heat flow, fluid dynamics and electrostatics
- Apply and summarize the mathematical aspects of time domain to frequency domain using Laplace transform and Inverse Laplace transform vice versa

UNIT I MULTIPLE INTEGRALS 9 + 3

Double integrals – Change of order of integration – Triple integrals – Applications: Area and volume

UNIT II VECTOR CALCULUS 9 + 3

Gradient – Divergence and curl – Directional derivative– Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem – Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds

UNIT III LAPLACE TRANSFORM 9 + 3

Laplace transform – Conditions for existence – Transform of elementary functions – Standard properties (statement only) – Transforms of unit step function – impulse function – Periodic function – Initial and Final value theorems – Convolution theorem(without proof) – Inverse Laplace transform – Standard properties (statement only) – Second order linear differential equations with constant coefficients

UNIT IV COMPLEX DIFFERENTIATION 9 + 3

Analytic functions: Cauchy-Riemann equations (Cartesian form) and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions – Bilinear transformations

UNIT V COMPLEX INTEGRATION 9 + 3

Complex integration – Statement and applications of Cauchy's Integral theorem and Cauchy's Integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Cauchy's Residue theorem

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition Wiley India Pvt Ltd, New Delhi, 2018
2. Grewal B S, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2017

REFERENCES:

1. Bali N P and Dr Manish Goyal, "A text book of Engineering Mathematics", 12th edition, Laxmi Publications,2016
2. Thomas G B and Finney R L, "Calculus and Analytic Geometry", 14th edition, Pearson Education India, 2018
3. James Stewart, "Calculus:Early Transcendental", 7th Edition, Cengage Learning, New Delhi, 2015

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Calculate the area and volume of a body on the basis of analysis done with one/two dimensions of a body	Apply
CO2	Apply the theoretical aspects of vector integral calculus in Electro Magnetic Theory and Field	Apply
CO3	Apply the concepts of Laplace transform with their properties in Circuit Theory and Control Systems	Apply
CO4	Identify the complex functions and their mapping in certain complex planes	Apply
CO5	Differentiate and integrate functions represented as power series expansions, including Taylor series, and solve related problems	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO5	3	3	-	-	-	-	-	-	-	-	-	1	1	-
CO	3	2	-	-	-	-	-	-	-	-	-	1	1	-
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER II

U19PH203	PHYSICS FOR CIVIL ENGINEERS	Category: BS			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To gain the concept of thermal performance, acoustics and lighting designs for buildings
- To gain the knowledge of the properties and applications of smart materials
- To acquire the idea of natural and manmade hazards that affects the buildings

UNIT I THERMAL PROPERTIES OF BUILDINGS 9

Heat transfers through fenestrations, thermal insulation and its benefits – Heat gain and heat loss estimation – Factors affecting the thermal performance of buildings – Thermal measurements – Thermal comfort – Shading devices – Central heating – Principles of natural ventilation – Ventilation measurement – Smoke tube method, velocity meter method – Design of natural ventilation

UNIT II ACOUSTICS 9

Classification of sound – Decibel – Weber-Fechner law – Sabine's formula – Derivation using growth and decay method – Absorption coefficient and its determination – Factors affecting acoustics of buildings – Remedies – Sound absorbing materials – Noise and its measurements – Sound insulation and its measurements

UNIT III LIGHTING DESIGNS 9

Radiation quantities – Spectral quantities – Relationship between luminescence and radiant quantities – Hemispherical reflectance and transmittance – Photometry: Cosines law, Inverse square law – Vision – Photobic, mesophic, scotopic visions – Colour – Luminous efficiency function – Visual field glare, colour – Day light calculations – Day light design of windows – Principle of artificial lighting

UNIT IV SMART MATERIALS 9

Composites – Definition and classification – Properties and applications of fiber reinforced plastics(FRP) and fiber reinforced metals(FRM) – Metallic glasses – Shape memory alloys – Ceramics – Types, properties and applications(High alumina ceramics)

UNIT V NATURAL AND MAN MADE HAZARDS 9

Seismology and seismic waves – Earth quake ground motion – Magnitude and intensity – Cyclone and flood hazards – Fire hazards and fire protection – Fire proofing of materials – Fire safety regulations and fire fighting equipment – Prevention and safety measures

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Severns W. H. and Fellows J. R., "Air Conditioning and Refrigeration", John Wiley and Sons, London, 1988
2. Stevens W. R., "Building Physics: Seeing in the Artificial Environment", Pergaman Press, 2013

REFERENCES:

1. Budinski K. G. and Budinski M. K., "Engineering Materials Properties and Selection ", Prentice Hall, 2009

2. Damodarasamy S. R. and Kavitha S., “Basics of Structural Dynamics and a Seismic Design”, PHI Learning Pvt Ltd, 2009
3. Brain Culshaw, “Smart Structures and Materials” Boston: Artech House, London, 2004

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Describe the modes of heat transfer through various fenestrations	Understand
CO2	Study the basic properties of sound waves and applying it for the design of various buildings	Understand
CO3	Outline the spectral quantities of light and use it to model different architectures	Understand
CO4	Understand the properties of new smart materials and utilizing it for engineering applications	Understand
CO5	Discuss the different types of natural and manmade hazards and its importance of conservation	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	1	-	-	-	-	-	1	-	-
CO2	3	2	1	-	-	1	-	-	-	-	-	1	-	-
CO3	3	2	1	-	-	1	-	-	-	-	-	1	-	-
CO4	3	2	1	-	-	1	-	-	-	-	-	1	-	-
CO5	3	2	1	-	-	1	-	-	-	-	-	1	-	-
CO	3	2	1	-	-	1	-	-	-	-	-	1	-	-
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER II

U19EEG02	BASICS OF ELECTRICAL ENGINEERING (Common to B.E. – Civil Engineering, Computer Science and Engineering)	Category: ES			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge on basics of electrical circuits and machines
- To understand the operating principles of measuring instruments
- To explain the concept of illumination and domestic utilization of electrical energy

UNIT I BASIC CONCEPTS OF ELECTRIC CIRCUITS 9

Active elements - DC and AC sources - Passive elements - Elements in series and parallel connections - Star and delta conversion - Ohm's law and Kirchhoff's laws - Mesh and Nodal analysis - Power, power factor and energy

UNIT II DC AND AC MOTORS 9

Construction, principle of operation, characteristics and applications: DC motors - Single phase and three phase induction motors. **(Qualitative Analysis only)**

UNIT III MEASURING INSTRUMENTS AND PROTECTING DEVICES 9

Construction and working: MC meter- PMMC meter, MI meter- attraction and repulsion type, Wattmeter-Single element - Electrodynamo meter type - single phase energy meter. **(Qualitative Analysis only)**

UNIT IV ILLUMINATION 9

Importance of lighting – properties of good lighting scheme - types of lamps - lighting calculations - basic design of illumination schemes for residential, street lighting and factory lighting

UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY 9

Types of fuses - switches - MCB, relays and cables - Grounding - Earthing - Types - Need for grounding and earthing - Lightning arrestors - types -Residential and industrial wiring - Installed and Generation Capacity of electricity in TN and India. **(Qualitative Analysis only)**

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Sudhakar A. and Shyam Mohan S.P., "Circuits and Network Analysis and Synthesis", 5th edition, McGraw Hill Education, New Delhi, 2017
2. Rajput R.K., "Electrical Machines", 6th edition, Laxmi Publications, 2016
3. Sawhney A.K., "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Co, 2010

REFERENCES:

1. Wadhwa C.L., "Generation, Distribution and Utilization of Electrical Energy", New Age International Pvt. Ltd, 2015
2. Sunil S. Rao, "Switchgear and Protection", 2nd edition, Khanna Publishers, 2018
3. Uppal S.L., "Electrical Wiring, Estimating and Costing", 8th edition, Khanna Publishers, 2018

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Apply basic laws to solve an electric network	Apply
CO2	Interpret the operating principles, characteristics and applications of DC motors and induction motors	Understand
CO3	Explain the construction and operation of measuring instruments	Understand
CO4	Estimate the lighting calculations for good illumination	Apply
CO5	Discuss the concept of electrical wiring with protection schemes	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	2	1	1	1	1	-	-	-	2	1	-	-
CO5	3	2	1	-	1	1	1	-	-	-	2	1	-	-
CO	3	2	1.4	1	1	1	1	-	-	-	2	1	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER II

U19CSG01	PROBLEM SOLVING USING PYTHON PROGRAMMING	Category: ES			
		L	T	P	C
		2	0	2	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn basics of computers and problem-solving techniques
- To understand syntax and semantics of python programming
- To develop simple python programs

UNIT I COMPUTER BASICS AND PROBLEM-SOLVING STRATEGIES 6

Introduction to Computers: Characteristics – Classification – Applications – Components – Hardware and Software – Algorithms – Algorithmic building blocks – Notations: Pseudo code– Flow chart – Programming language – Programming Paradigms – Computational thinking

UNIT II LANGUAGE BASICS 6

Python interpreter and interactive mode – Tokens – Data types – Numbers and math functions – Input and Output operations – Comments – Reserved words – Indentation – Operators and expressions – Precedence and associativity – Type conversion – Debugging – Common errors in Python – Classes and objects

UNIT III CONTROL STATEMENTS, FUNCTIONS AND MODULES 6

Selection/Conditional branching statements: if – if-else – Nested-if – elif statements – Iterative statements: while – for loop – break – continue and pass statements – Functions: Function Definition and Function call – Variable scope and Lifetime – Return statement – Lambda functions or Anonymous functions – Recursion – Modules and Packages

UNIT IV PYTHON DATA STRUCTURES 6

Strings: Slicing – Immutability – Built-in string methods and functions – Concatenating – Appending and Multiplying strings – String modules – Regular expressions – List: Creation – Accessing values– Slicing – List methods – In-built functions for Lists – Tuples: Creation – Operations on tuples– Traversing – Indexing and Slicing – Tuple assignment – In-built functions for tuples – Sets: Creation– Operations – Dictionaries: operations and methods

UNIT V EXCEPTION AND FILE HANDLING 6

Exceptions: Errors and Exceptions – Handling exception – Built-in and User-defined exceptions – Files: Types – Operations: Open– Read – Write – Close

LIST OF EXPERIMENTS

1. Algorithms, flowchart and pseudo code
2. Language basics
3. Input and output statements
4. Looping and decision-making statements
5. String operations
6. Recursive functions
7. Python data structures
8. Searching and Sorting
9. Generating histogram

10. File and exception handling

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: 30 Periods Total: 60 Periods

TEXT BOOKS:

1. Reema Thareja, “Python programming: Using problem solving approach” 1st edition, Oxford University Press, 2017
2. Roland Backhouse, “Algorithmic Problem Solving”, 1st edition, John Wiley & Sons, 2011

REFERENCES:

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, O’Reilly Publishers, 2016
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, “Programming and Problem Solving with Python”, 1st edition, McGraw Hill Education, 2018
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”. 1st edition, Pearson India Education Services Pvt. Ltd., 2016

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Interpret computer basics and algorithmic solutions for a given problem	Understand
CO2	Demonstrate the usage of data types, operators and expressions in python programming	Apply
CO3	Design python programs using functions, modules and packages	Apply
CO4	Develop programs using python data structures	Apply
CO5	Demonstrate the usage of exceptions and file handling	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	2	2	2	-	2	-	-
CO2	3	3	2	-	-	-	-	2	2	2	-	2	-	-
CO3	3	3	3	-	-	-	-	2	2	2	-	2	-	-
CO4	3	3	2	-	-	-	-	2	2	2	-	2	-	-
CO5	3	3	2	-	-	-	-	2	2	2	-	2	-	-
CO	3	2	2	-	-	-	-	2	2	2	-	2	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER II

U19CE201	BUILDING MATERIALS	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire knowledge of Properties of Stones and Bricks
- To comprehend the Types, Grades and Properties of Cement and Concrete
- To understand the Properties of Modern Materials used in Construction

UNIT I STONES – BRICKS 9

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks

UNIT II CEMENT – AGGREGATES 9

Cement – Ingredients – Manufacturing process – Types and Grades – Tests on cement – Aggregates –Natural and Manufactured aggregates – Test on aggregates

UNIT III TIMBER AND OTHER MATERIALS 9

Timber – Market forms – Industrial timber– Plywood – Veneer – Thermocol – Panels of laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminum composite panel – Market forms

UNIT IV BUILDING FINISHES 9

Plastering – types – cement mortar plastering – Paints –interiors– exteriors– paints for special use; weather shield – water proof paint –Varnishes – Bitumen

UNIT V MODERN MATERIALS 9

Glass – Ceramics – Fibre glass reinforced plastic–Composite materials – Types – Applications of laminar composites – Fibre textiles– Geomembranes and Geotextiles for earth reinforcement

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Varghese.P.C, “Building Materials”, PHI Learning Pvt. Ltd, New Delhi, 2015
2. Rajput. R.K., “Engineering Materials”, S. Chand and Company Ltd., 2008

REFERENCES:

1. Gambhir.M.L., “Concrete Technology”, 3rd Edition, Tata McGraw Hill Education, 2004
2. Duggal.S.K., “Building Materials”, 4th Edition, New Age International, 2008
3. Gambhir. M.L., & Neha Jamwal., “Building Materials, products, properties and systems”, Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Understand the manufacturing process, tests and uses of stone and bricks.	Understand
CO2	Know the typical and potential applications of cement and aggregates.	Understand
CO3	Understand the applications of timbers and other materials.	Understand
CO4	Identify the potential of building finishes.	Understand
CO5	Choose the appropriate modern materials available in construction industry.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	–	3	3	–	3	–	2	–	–	3	–	–	3	3
CO2	–	3	3	–	3	–	2	–	–	3	–	–	3	3
CO3	–	3	3	–	3	–	2	–	–	3	–	–	3	3
CO4	–	3	3	–	3	–	2	–	–	3	–	–	3	3
CO5	–	3	3	–	3	–	2	–	–	3	–	–	3	3
CO	–	3	3	–	3	–	2	–	–	3	–	–	3	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER II

U19CE202	ENGINEERING MECHANICS	Category: ES			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire knowledge of static equilibrium of particles and rigid bodies
- To comprehend the effect of friction on equilibrium
- To understand the laws of motion, kinematics of motion and their interrelationship

UNIT I STATICS OF PARTICLES 9 + 3

Introduction – Laws of Mechanics, Parallelogram and triangular Laws of forces – Coplanar Forces Resolution and Composition of forces – Free body diagram – Equilibrium of a particle – Lami's theorem – Equilibrium of a particle in space

UNIT II STATICS OF RIGID BODIES 9 + 3

Principle of transmissibility – Moment of force about a point – Varignon's theorem – Moment of a couple – Equivalent couple – Moment of force about an axis – Coplanar non–concurrent forces acting on rigid bodies – Resultant and equilibrium – Resolution of a given force into force couple system – Equilibrium in three dimensions – Reactions and supports

UNIT III FRICTION AND APPLICATION OF STATICS 9 + 3

Friction–Frictional forces–Laws of coulomb's friction–simple contact friction–Ladder fiction–Belt friction–Rolling resistance–Truss–Analysis of Truss–Method of joints and method of sections

UNIT IV PROPERTIES OF SURFACE AND SOLIDS 9 + 3

Determination of areas and volumes–Pappus Guldinus theorem–Radius of gyration–First moment of area and centroid of sections–Rectangle, Circle ,triangle from integration– T section, I section, Angle section, Hollow section–Second and product moments of plane area–Rectangle, Circle from integration–T section, I section, Hollow section and Angle section–Parallel axis and Perpendicular axis theorem–Polar moment of inertia

UNIT V DYNAMICS OF PARTICLES 9 + 3

Kinematics: Displacement, velocity and acceleration and their relationship–Relative motion–Rectilinear motion–Projectile motion

Kinetics: Newton's law, D'Alemberts Principle–Principle of work Energy equation of particles–Impulse and momentum–Impact of Elastic bodies

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. N.H.Dubey., "Engineering Mechanics–Statics and Dynamics", Tata Mc Graw Hill Private Ltd.NewDelhi 2013
2. Palanisamy M.S. and Nagan.S ."Engineering Mechanics – Statics and Dynamics", Tata Mc Graw Hill Private Ltd. New Delhi 2011

REFERENCES:

1. Bansal R.K., "Engineering Mechanics", Lakshmi Publications Private Ltd, New Delhi 2017
2. Beer F.P and Johnson Jr.E.R, "Vector Mechanics for Engineers–Statics and Dynamics", Mc Graw Hill International Edition 2010

3. Hibbler R C., “Engineering Mechanics”, Vol.1 Statics, Vol.2 Dynamics, Pearson Education Asia Pvt Ltd.2010
4. Rajasekaran S and Sankarasubramanian G, “Engineering Mechanics–Statics and Dynamics”, Vikas Publishing House Pvt. Ltd., New Delhi, 2012

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Apply the fundamental concepts in determining the effect of forces on a particle.	Apply
CO2	Make use of various principles in the determination of effect of forces in a rigid body	Understand
CO3	Explain the concepts of different types of static frictions and Analyse the truss members by different methods.	Understand
CO4	Compute centroid and second moment of area for different sections.	Apply
CO5	Examine the different types of motions in dynamics of particles and apply the principles of kinetics in solving problems in dynamics	Apply

COURSE ARTICULATION MATRIX:

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

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SEMESTER III

U19MA303	FOURIER ANALYSIS AND PARTIAL DIFFERENTIAL EQUATIONS	Category: ES			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Apply Fourier series for periodic signals
- Apply and summarize the mathematical aspects that contribute to the solution of One Dimensional Wave and Heat equation
- Understand the concept of transform techniques in the field of engineering

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Formation of Partial Differential Equations – Solutions of standard types of first order partial differential equations – Lagrange's linear equation –Solution methods for second order homogeneous equations with constant coefficients

UNIT II FOURIER SERIES 9 + 3

Dirichlet's conditions – Full range Fourier series – Odd and Even functions – Half range series – Parseval's Identity – Harmonic analysis

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Fourier series solution – Vibrations of strings – one dimensional wave equation – one dimensional equation of heat conduction

UNIT IV FOURIER TRANSFORM 9 + 3

Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's Identity

UNIT V Z – TRANSFORM 9 + 3

Z-transforms – Elementary properties – Inverse Z-transform – Initial and Final value theorems(statement only) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z - transform

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. Grewal B S "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2017
2. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, 1st Edition, Oxford University Press, New Delhi, 2015
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, New Delhi, 2018

REFERENCES:

1. Bali N P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014
2. Peter V.O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage, New Delhi, 2016
3. James G, "Advanced Modern Engineering Mathematics, 3rd Edition, Pearson Education, 2011

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Use Partial Differential Equation through mathematical models	Apply
CO2	Identify the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series	Apply
CO3	Apply Fourier series as a tool for One Dimensional Wave and Heat equations	Apply
CO4	Analyze the spectral characteristics of signals using Fourier Transforms	Apply
CO5	Apply Z- transform for analyze of discrete-time signals and systems	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	1	-	-
CO	3	2	-	-	-	-	-	-	-	-	-	1	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER III

U19CE301	CONCRETE TECHNOLOGY	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Building Materials

COURSE OBJECTIVES:

- To learn the tests to be carried out on various concrete making materials as per IS codal provisions and to understand their properties
- To study the properties of fresh and hardened concrete
- To know about various methods of mix design for concrete

UNIT I CONSTITUENT MATERIALS 9

Cement: Types of cement – Special cements – Chemical composition and Properties – Hydration of cement – Tests on physical properties of cement consistency – Setting time- soundness-strength – BIS and EN Specifications. Aggregates: Classification – Characteristics affecting Concrete Properties – Tests on aggregates – Natural Sand and crushed aggregate (M-sand & P-sand) – BIS specifications. Water: General requirements – Tolerable concentrations of impurities – Quality of water for use in concrete – Use of sea water and its effects

UNIT II CHEMICAL AND MINERAL ADMIXTURES 9

Chemical Admixtures: Accelerators – Retarders – Plasticizers – Super plasticizers – Water proofers – Mineral Admixtures: Fly Ash – Micro and Nano Silica – Ground Granulated Blast Furnace Slag and Metakaoline – Effects on concrete properties

UNIT III PROPORTIONING OF CONCRETE MIX 9

Mix Design: Principles of Mix Proportioning – Factors in the choice of mix Properties – Physical properties of materials required for Mix Design – Quality Control – Design Mix and Nominal Mix – BIS Method of Mix Design – Mix Design Examples – Durability consideration as per IS code

UNIT IV PROPERTIES OF FRESH AND HARDENED CONCRETE 9

Fresh Concrete: Workability – Factors affecting workability – Tests – Segregation and Bleeding. Hardened Concrete: Factors affecting Strength – Curing – Methods of curing – Tests – Compressive strength – Split tensile strength – Flexural strength – Modulus of elasticity – In situ strength determination – Rebound Hammer test – Pulse velocity method. Durability of concrete – Water absorption – Permeability – Corrosion test – Acid resistance

UNIT V SPECIAL CONCRETE AND CONCRETING METHODS 9

Special Concrete: High strength concrete – High Performance concrete – Lightweight & Heavy weight concrete – Self-compacting concrete – Fibre reinforced concrete – Polymer concrete – Foam concrete – Ready mix concrete Hot & cold weather concreting – Precast concrete – Prestressed Concrete – SIFCON – Self Healing Concrete and Bacterial Concrete

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Bhavikatti S S, “Concrete Technology”, I.K.International Publishing House Pvt. Ltd, New Delhi, 2015
2. Shetty M S, “Concrete Technology”, 7th edition, S.Chand and Company Limited, New Delhi, 2013

REFERENCES:

1. Neville A M, “Properties of Concrete”, 5th edition, Pearson India, New Delhi, 2016
2. Gambhir M L, “Concrete Technology”, Tata Mc. Graw Hill Publishers, New Delhi, 2013
3. Santhakumar A R, “Concrete Technology”, OXFORD University Press India, New Delhi, 2009

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the various requirements of cement aggregate and water for making concrete	Understand
CO2	Apply admixtures to enhance the properties of concrete	Apply
CO3	Design the concrete mix for various strength using IS method	Apply
CO4	Evaluate the strength and durability parameters of concrete	Analyze
CO5	know the importance and application of special concrete and special concreting methods	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	3	-	2	-	-
CO3	3	2	-	-	-	1	-	-	-	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	2	2
CO5	3	2	-	-	-	-	-	-	-	-	-	-	2	2
CO	3	2	3	-	-	1	-	1	-	3	-	2	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER III

U19CE302	STRENGTH OF MATERIALS I	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Engineering Mechanics

COURSE OBJECTIVES:

- To learn the fundamental concepts of stress, strain and deformation of solids
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations
- To understand the theory of torsion on shafts and springs and to analyze plane and space trusses

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid and deformable bodies – Stability, Strength and Stiffness – Axial and Shear stresses – Deformation of simple and compound bars – Thermal stresses – Biaxial state of stress – Elastic constants – Volumetric strain – Stresses at a point – Stresses on inclined planes – Principal stresses and principal planes – Mohr's circle of stress

UNIT II BENDING OF BEAMS 9

Beams – Types and transverse loading on beams – Shear force and bending moment in beams – Cantilever beams – Simply supported beams and over hanging beams – Theory of simple bending – Bending stress distribution – Shear stress distributions – Load carrying capacity – Proportioning of sections – Flitched beams

UNIT III DEFLECTION OF BEAMS 9

Slope and deflection of beams – Double Integration method – Macaulay's method – Moment area method – Conjugate Beam method

UNIT IV TORSION AND SPRINGS 9

Theory of simple torsion – Stresses and deformation in circular (solid and hollow shafts) – Stepped shafts – Shafts fixed at both ends – Leaf springs – Stresses in helical springs – Deflection of springs – Design of carriage springs

UNIT V ANALYSIS OF PLANE TRUSSES 9

Stability and equilibrium of plane frames – Perfect frames – Types of trusses – Analysis of forces in truss members – Method of joints – Method of tension co–efficient – Method of sections – Graphical method

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Rajput R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2015
2. Rattan. S. S, "Strength of Materials", Tata McGraw Hill Education Private Limited, New Delhi, 2012
3. Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2010

REFERENCES:

1. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van Nos Reinbhold, New Delhi 1999
2. Vazirani.V.N and Ratwani.M.M, "Analysis of Structures", Vol I Khanna Publishers, New Delhi,1995

3. Junnarkar.S.B. and Shah.H.J, “Mechanics of Structures”, Vol I, Charotar Publishing House, New Delhi 2016
4. Singh. D.K., “Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2016

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Understand the concepts of stress and strain, principal stresses and principal planes	Understand
CO2	Determine shear force and bending moment in beams and understand the concept of theory of simple bending	Apply
CO3	Calculate the deflection of beams by different methods and selection of method for determining slope or deflection	Apply
CO4	Analyze stresses and deformation in shafts and springs	Analyze
CO5	Analyze the pin jointed plane and space trusses	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	–	–	–	–	–	2	2	2
CO2	3	3	2	2	2	2	–	–	–	–	–	2	2	2
CO3	3	3	2	2	2	2	–	–	–	–	–	2	2	2
CO4	3	3	3	2	2	2	–	–	–	–	–	2	2	2
CO5	3	3	2	2	3	2	–	–	–	–	–	2	2	2
CO	3	3	2	2	2	2	–	–	–	–	–	2	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER III

U19CE303	FLUID MECHANICS	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic properties of the fluids
- To gain the knowledge about fluid statics, fluid kinematics and dynamics
- To analyze and appreciate the complexities involved in solving the fluid flow problems

UNIT I UNIT–I: PROPERTIES OF FLUIDS AND HYDROSTATICS 9

Basic concepts of fluid mechanics – Fluid properties like density, specific weight, specific volume, specific gravity, viscosity, surface tension, compressibility, capillarity – Types of fluids – Total pressure and centre of pressure on submerged surfaces

UNIT II FLUID KINEMATICS AND DYNAMICS 9

Fluid Kinematics – Classification of fluid flows – Continuity equation– Stream line, streak line, path line – Potential function and stream function.

Fluid Dynamics – Euler's equation, Bernoulli's equation and its application. Flow Measurements – Discharge measurement in pipes using Pitot tube, Venturimeter and Orifice meter

UNIT III FLOW THROUGH PIPES 9

Development of Laminar flow through circular pipe (Hagen Poiseulle's equation) – Darcy-Weisbach formula– major and minor losses of flow in pipes – Pipes in series and in parallel

UNIT IV BOUNDARY LAYERS 9

Boundary layer – Laminar and turbulent boundary layer – Displacement, energy and momentum thickness – Separation of boundary layer –Methods of controlling boundary layer separation

UNIT V DIMENSIONAL ANALYSIS 9

Units and dimensions – Dimensional homogeneity – Rayleigh's method and Buckingham Pi-theorem – Dimensionless parameters – Similitude and model studies

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Bansal R.K., "Fluid Mechanics and Hydraulics Machines", 5th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2018
2. Modi P.N and Seth " Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi. 2013

REFERENCES:

1. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", DhanapatRai and Sons, Delhi, 2011
2. Jain A. K. "Fluid Mechanics", Khanna Publishers, 2010
3. Roberson J.A and Crowe C.T.,"Engineering Fluid Mechanics", Jaico Books Mumbai, 2010
4. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw Hill, 2000

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the basics Knowledge of fluid properties and Fluid in statics.	Understand
CO2	Understand and solve the problem related to Fluid Kinematics and Dynamics	Understand
CO3	Learn types of flow and losses of flow in pipes	Understand
CO4	Understand and solve the boundary layer problems	Understand
CO5	Gain knowledge about dimensional and model analysis and apply it in solving the fluid flow problems	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	1	-	1	-	-	-	-
CO2	3	3	-	-	-	-	-	1	-	1	-	1	3	-
CO3	3	3	-	1	-	-	1	1	-	1	-	1	3	1
CO4	3	3	-	1	-	-	1	1	-	1	-	1	3	1
CO5	3	3	-	1	-	-	1	1	-	1	-	1	3	1
CO	3	3	-	1	-	-	1	1	-	1	-	1	3	1
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER III

U19CE304	ENGINEERING SURVEY	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To study the various methods of surveying
- To understand the concept of control and astronomical survey
- To learn the modern surveying techniques

UNIT I FUNDAMENTALS OF SURVEYING 9

Principles – Ranging and Chaining – Compass Surveying – Bearing – Plane Table Surveying - Leveling Principles – Booking – Reduction – Errors

UNIT II THEODOLITE AND TACHOMETRIC SURVEYING 9

Theodolite survey – Horizontal and Vertical angle Measurements and Distance – Tangential and Stadia tachometric – Analytical lens

UNIT III CONTROL SURVEYING AND CURVES 9

Horizontal and Vertical control – methods – Triangulation – Satellite station – Elements of Simple curve, setting out – Compound, Reverse and Transition Curve

UNIT IV HYDROGRAPHIC AND ASTRONOMICAL SURVEYING 9

Introduction – Tides – MSL – Sounding methods – Three point problem – Astronomical Surveying – Field observations and determinations of Azimuth by altitude and hour angle methods

UNIT V MODERN SURVEYING 9

Total Station – Accessories – Advantages and Applications, Working principles, Procedure, Errors. GPS – Concept –Different Segments – Space control and user segments – Satellite configuration – Signal structure orbit determination and representation

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Dr. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain, “Surveying (Volume –I and II)”, Lakshmi Publications, 17th Edition, 2016
2. Duggal S K., “Surveying”, Vol-I and II, MC Graw Hill Education (India) Private Limited, 4th Edition, 2013

REFERENCES:

1. Basak N N, “Surveying & Levelling”, Tata McGraw-Hill Education,2nd Edition, 2014
2. Venkatramaiah, “Text book of Surveying”, University press, New Delhi, 2014
3. Bhavikatti, S.S., “Surveying and Levelling, Vol. I and II”, I.K. International, 2nd Edition, 2016
4. Madhu, N, Sathiskumar, R and Satheesh Gobi, “Advanced Surveying: Total Station, GIS and Remote Sensing”, Pearson India, 2nd Edition, 2017

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Use of various surveying instruments.	Understand
CO2	Perform angular measurement, elevation and distance of an object.	Apply
CO3	Set out the curves.	Apply
CO4	Understand the concept of astronomical survey.	Apply
CO5	Understand the modern and GPS surveying.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	-	1	1	-	-	1	3	2
CO2	3	2	2	1	1	1	-	1	1	-	-	1	3	2
CO3	3	2	2	1	1	1	-	1	1	-	-	1	3	2
CO4	3	2	2	1	1	1	-	1	1	-	-	1	3	2
CO5	3	2	2	1	1	1	-	1	1	-	-	1	3	2
CO	3	2	2	1	1	1	-	1	1	-	-	1	3	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER III

U19CE305	STRENGTH OF MATERIALS LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To expose the students to the testing of different materials under the action of various forces
- To determination of their characteristics experimentally

LIST OF EXPERIMENTS

1. Tension test on metal specimen
2. Compression test on wooden specimen
3. Shear test on metal specimen
4. Torsion test on metal specimen
5. Impact tests on metal specimen (Izod and Charpy)
6. Hardness tests on metal specimen (Rockwell and Brinell Hardness Tests)
7. Deflection test on metal beam
8. Bending test – Verification of Maxwell's reciprocal theorem
9. Test on closed coil helical springs
10. Test on carriage springs

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 30 Periods Total: 30 Periods

REFERENCES

1. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
2. IS1786-2008 (Fourth Revision, Reaffirmed 2013), 'High strength deformed bars and wires for concrete reinforcement – Specification', 2008.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Find the mechanical behaviour of ductile and brittle materials due to axial, flexural and shear loading conditions	Apply
CO2	Determine the mechanical behaviour of ductile and brittle materials due to impact and torsional loading conditions	Apply
CO3	Examine the mechanical properties of wooden materials.	Apply
CO4	Develop the stress-strain curve for steel material	Apply
CO5	Determine the deflection of different sections for various loading conditions and behaviour of springs subjected to tension and compression	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	3	2	-	-	-	3	3	-	2	2	2
CO2	3	3	-	3	2	-	-	-	3	3	-	2	2	2
CO3	3	3	-	3	2	-	-	-	3	3	-	2	2	2
CO4	3	3	-	3	2	-	-	-	3	3	-	2	2	2
CO5	3	3	-	3	2	-	-	-	3	3	-	2	2	2
CO	3	3	-	3	2	-	-	-	3	3	-	2	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER III

U19CE306	SURVEY LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To provide practical knowledge on basic survey instruments
- To provide practical training on survey equipments
- To have adequate knowledge to carryout triangulation and field work

LIST OF EXPERIMENTS

1. Aligning, Ranging, Chaining and marking by perpendicular offsets.
2. Study of Bearings and Determination of Included angle by Prismatic Compass.
3. Determination of Reduced Level by Check and Fly leveling.
4. Determination of Longitudinal and Cross sectioning.
5. Measurement of Horizontal angle by Repetition and Reiteration Method.
6. Determination of RL of object – Base of the object is accessible and inaccessible.
7. Determination of tacheometric constant.
8. Determination of Distance and Elevation by Stadia Method.
9. Determination of Distance and Elevation by tangential tacheometry Method.
10. Determination of Area by Total Station.
11. Measuring horizontal and Vertical angle.
12. Traversing using GPS.
13. To determine latitude and longitude and locate the Laboratory location.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 60 Periods Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	setup the foundation by chaining. .	Analyze
CO2	determine the direction and area of the given survey lines.	Analyze
CO3	find the amount of cutting and filling for any project and prepare contour.	Analyze
CO4	determine the horizontal angle, elevation and vertical angle distance using tangential and stadia tacheometry.	Analyze
CO5	find the horizontal, vertical angle, heights and distance using total stations.	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	2	-	-	-	3	1	1	2	3	
CO2	3	3	-	-	2	-	-	-	3	1	1	2	3	
CO3	3	3	-	-	2	-	-	-	3	1	1	2	3	2
CO4	3	3	-	-	2	-	-	-	3	1	1	2	3	2
CO5	3	3	-	-	2	-	-	-	3	1	1	2	3	2
CO	3	3	-	-	2	-	-	-	3	1	1	2	3	2
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)						3: Substantial (High)			

SEMESTER III

U19CE307	APTITUDE AND SOFT SKILL	Category: EEC			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To bridge the gap between corporates requirements and student's knowledge and skillsets
- To guide and provide right module of training that meets the industry needs and improve their employability skills

UNIT I NUMERICAL APTITUDE I 6

Number Theory – History of Numbers –HCF & LCM – Divisibility rule – Finding the unit place, Averag

UNIT II NUMERICAL APTITUDE II 6

Logical Reasoning – Number and alpha series, coding and decoding – Inserting the missing character

UNIT III LEADERSHIP SKILLS 6

Expectation settings and Gathering – Goal setting – Time management – Interview Etiquettes

UNIT IV SOFT SKILLS I 6

Breaking shy Barriers – Testing shy barriers – Vocabulary to begin with -Vocabulary

UNIT V SOFT SKILLS II 6

Reading Skill – Communication skill – Creative thinking - Online Typing (Email writing)

Contact Periods:

Lecture: - Periods Tutorial: - Periods Practical: 30 Periods Total: 30 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Enhance and improve employable and organizational skills.	Apply
CO2	Ability to communicate effectively with coworkers, employers, clients and customers, friends and family members.	Apply
CO3	Improve Personal and professional effectiveness.	Apply
CO4	Increased efficiency and leadership skills to improve team results.	Apply
CO5	Gaining the ability to recognize symptoms of stress and learning management strategies.	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	–	–	2	–	–	–	3	1	1	1	3	2
CO2	3	3	–	–	2	–	–	–	3	1	1	1	3	2
CO3	3	3	–	–	2	–	–	–	3	1	1	1	3	2
CO4	3	3	–	–	2	–	–	–	3	1	1	1	3	2
CO5	3	3	–	–	2	–	–	–	3	1	1	1	3	2
CO	3	3	–	–	2	–	–	–	3	1	1	1	3	2
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)						3: Substantial (High)			

SEMESTER IV

U19MA403	NUMERICAL METHODS	Category: ES			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Understand the concepts of direct and iterative method for solving algebraic and transcendental equations using numerical methods of interpolation
- Obtain the solution of differentiation and integration using standard numerical techniques in solving kinematics simulation and composite materials
- Understand the concepts of ordinary and partial differential equations in elastic beams and elastic bars using numerical techniques

UNIT I SYSTEM OF EQUATIONS 9

Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Gauss Seidel method

UNIT II INTERPOLATION 9

Interpolation with equal intervals – Newton's forward and backward difference formulae – Interpolation with unequal intervals – Lagrange interpolation

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Evaluation of double integrals by Trapezoidal rule

UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations

UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference method – Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Burden R L and Faires J D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016
2. Grewal B S and Grewal J S, "Numerical Methods in Engineering and Science", 10th Edition, Khanna Publishers, , New Delhi, 2015

REFERENCES:

1. Jain M K, Iyengar S R K., Jain R K, "Numerical Methods for Scientific and Engineering computation", 6th Edition, New Age international publishers, 2019
2. Sastry S S, "Introductory Methods of Numerical Analysis", 5th Edition, PHI Learning Pvt. Ltd, , 2015
3. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers", 7th Edition Tata McGraw-Hill, New Delhi, 2017

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Identify the basic concepts of solving algebraic and transcendental equations	Apply
CO2	Apply interpolation methods for given discrete data set	Apply
CO3	Utilize differentiation and integration methods for finite difference and finite element method	Apply
CO4	Solve initial value problems of ordinary differential equations using numerical techniques	Apply
CO5	Use finite difference techniques, implicit and explicit methods for solving boundary value problem of partial differential equations	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO	3	2	-	-	-	-	-	-	-	-	-	1	-	-
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)				3: Substantial (High)							

SEMESTER IV

U19CE401	STRENGTH OF MATERIALS II	Category: PC			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Strength of Materials I

COURSE OBJECTIVES:

- To know the method for finding slope and deflection of beams and trusses using energy theorems
- To understand the concept of analyzing indeterminate beams
- To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material

UNIT I ENERGY PRINCIPLES 9+3

Strain energy and strain energy density – Strain energy in axial force, Shear, Flexure and Torsion – Castigliano's Theorems – Principle of virtual Work – Application of energy theorems for computing deflections in beams – Maxwell's reciprocal theorem

UNIT II INDETERMINATE BEAMS 9+3

Concept of analysis – Propped cantilever and fixed beams – Fixed end moments and reactions due to lateral loads – Theorem of three moments – Analysis of continuous beams – Shear force and bending moment diagrams

UNIT III COLUMNS 9+3

Eccentrically loaded short columns – Middle Third Rule – Core section – Columns of unsymmetrical Sections – Euler's theory of long columns – Critical loads for prismatic columns with different end conditions - Rankine Gordon formula for eccentrically loaded columns

UNIT IV THIN AND THICK CYLINDERS, THEORIES OF FAILURES 9+3

Thin cylinders and shells – Under internal pressure – Deformation of thin cylinders and shells–Thick cylinders – Compound cylinders – Theories of failure – Principal stress – Principal strain – Shear stress – Strain energy and Distortion energy theories – Applications – Analysis of stress - limited to two dimensions

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS 9+3

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear centre – Curved beams – Winkler Bach formula – Stress concentration, Fatigue and Residual stress

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. Rajput R.K., "Strength of Materials (Mechanics of Solids)", S. Chand & Company Ltd., New Delhi, 2015
2. Rattan S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011

REFERENCES:

1. Kazimi S.M.A., "Solid Mechanics", Tata McGraw–Hill Publishing Co., New Delhi, 2003
2. Bansal. R.K., "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2018
3. Egor P Popov., "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles	Apply
CO2	Analyze propped cantilever, fixed beams and continuous beams for external loadings and support settlements	Analyze
CO3	Find the load carrying capacity of columns and stresses induced in columns	Apply
CO4	Determine the stresses induced in cylinders, principal stresses and planes for an element in three–dimensional state of stress and study various theories of failure	Apply
CO5	Determine the stresses due to unsymmetrical bending of beams of symmetrical and unsymmetrical sections	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	–	–	–	–	–	2	2	2
CO2	3	3	2	2	3	2	–	–	–	–	–	2	2	2
CO3	3	3	2	2	2	2	–	–	–	–	–	2	2	2
CO4	3	2	2	2	2	2	–	–	–	–	–	2	2	2
CO5	3	2	2	2	2	2	–	–	–	–	–	2	2	2
CO	3	3	2	2	3	2	–	–	–	–	–	2	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER IV

U19CE402	APPLIED HYDRAULICS AND HYDRAULIC MACHINERY	Category: PC			
		L	T	P	C
		3	0	2	4

PRE–REQUISITES:

- Fluid Mechanics

COURSE OBJECTIVES:

- To introduce various hydraulic engineering problems like open channel flows and hydraulic machines
- To understand the components, function and uses of pumps and turbines
- To verify the principles studied in theory by performing the experiments in lab

UNIT I UNIFORM FLOW **9**

Open channel flow: Definition, classification - Chezy's and Manning's equation - Flow through rectangular, Trapezoidal and Circular channels - Hydraulically most efficient channel section

UNIT II GRADUALLY VARIED FLOW **9**

Nonuniform flow - Dynamic equation for gradually varied flow - Flow profiles in prismatic channels - Computation of the length of the backwater curve and afflux

UNIT III RAPIDLY VARIED FLOW **9**

Rapidly Varied Flow - Hydraulic Jump -Types – Rapidly varied unsteady flows (positive and negative surges)

UNIT IV TURBINES **9**

Impact of Jet on flat and curved plates – Classification of Turbines – Pelton wheel – Francis turbine – Kaplan turbine

UNIT V PUMPS **9**

Classification of Pumps - Centrifugal pump - Multistage pump - Reciprocating pump

LIST OF EXPERIMENTS

1. Calibration of Rotameter
2. Calibration of Venturi meter / Orifice meter
3. Bernoulli's Experiment
4. Determination of friction factor in pipes
5. Determination of minor losses
6. Characteristics of Centrifugal pumps
7. Characteristics of Submersible pump
8. Characteristics of Reciprocating pump
9. Characteristics of Pelton wheel turbine
10. Characteristics of Francis turbine/Kaplan turbine

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: 30 Periods Total: 75 Periods

TEXT BOOKS:

1. Chandramouli P.N., "Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017

2. Modi P.N and Seth., “Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2019
3. Subramanya K., "Flow in open channels", Tata McGraw Hill, New Delhi, 2019

REFERENCES:

1. Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, 5th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2018
2. Ven Te Chow., “Open Channel Hydraulics", McGraw Hill, New York, 2009
3. Ramamirtham., S., “Fluid Mechanics and Hydraulics and Fluid Machines”, Dhanapat Rai and Sons, Delhi, 2011
4. Rajput, R. K., “A Text Book of Fluid Mechanics”, S. Chand & Co., New Delhi, 2006

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Apply the knowledge of fluid mechanics in addressing problems in open channels	Apply
CO2	Solve problems in uniform, gradually varied flows in steady state	Apply
CO3	Solve problems in rapidly varied flows in steady state conditions	Apply
CO4	Understand the principles, working and application of turbines	Understand
CO5	Understand the principles, working and application of pumps	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	–	–	–	–	–	1	–	1	–	–	–	–
CO2	3	3	–	–	–	–	–	1	–	1	–	1	3	
CO3	3	3	–	1	–	–	1	1	–	1	–	1	3	1
CO4	3	3	–	1	–	–	1	1	–	1	–	1	3	1
CO5	3	3	–	1	–	–	1	1	–	1	–	1	3	1
CO	3	3	–	1	–	–	1	1	–	1	–	1	3	1
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER IV

U19CE403	SOIL MECHANICS	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To know the general properties and classifications of soil
- To understand the consolidation and compaction effects of the soil
- To analyze the effective stress and shear strength in the soil

UNIT I SOIL AND ITS PROPERTIES 9

Origin and Historical development of soil engineering – Soil structure – Phase relationship in soil – Index properties of soil – Classifications of soil

UNIT II PERMEABILITY AND SEEPAGE 9

One dimensional flow through soil – Permeability – Darcy's Law – Field and laboratory permeability tests – Factors affecting permeability – Flow through stratified soils – Uplift pressure and piping – Seepage – Seepage flow – Introduction to flow nets – Quick sand phenomenon

UNIT III COMPACTION AND CONSOLIDATION 9

Compaction – Proctor's test – Moisture – Density relations – Field compaction methods – Factors affecting compaction – California Bearing Ratio (CBR) test – Consolidation – Terzaghi's theory of one dimensional consolidation – Laboratory test – Determination of co-efficient of consolidation

UNIT IV STRESS DISTRIBUTION AND SHEAR STRENGTH 9

Stresses in soils – Concept of effective and neutral stresses – Stress distribution in soil media – Boussinesq and Westergards equation – Pressure bulb – Shear strength – Tests on shear strength of cohesive and cohesion less soil – Mohr coulomb's theory and its failure

UNIT V SOLPE STABILITY 9

Stability of slopes – Factor of safety – Bishop method – Use of stability number – Friction circle method – Newmark's influence chart – Infinite slopes and finite slopes – Slope protection measures

Contact Periods:

Lecture: 45 Periods Tutorial: – Period Practical: – Period Total: 45 Periods

TEXT BOOKS:

1. Punmia B.C, "Soil Mechanics and Foundations'', Laxmi Publications Pvt. Ltd., 2000
2. Murthy V.N.S, "Soil Mechanics and Foundation engineering'', CBS publishers & Distributors, 2005

REFERENCES:

1. Terzaghi K, Peck R.B, "Soil Mechanics in Engineering Practice'', John Wiley Ltd., 1967
2. Lambe T.W, Whitman, "Soil Mechanics", John Wiley Ltd., 1979
3. Capper and Cassie, "Soil Mechanics'', McGraw Hill, 1971

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the basics Knowledge of soil and its classification	Understand
CO2	Know the permeability and seepage flow in the soil	Understand
CO3	Understand the compaction and consolidation process in the soil	Understand
CO4	Analyze the stress in the soil	Analyze
CO5	Illustrate the slope stability of the soil	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	1	-	1	-	1	-	-	-	3	-	-
CO2	3	3	-	1	-	1	-	1	-	-	-	-	3	-
CO3	3	3	-	-	-	1	-	1	1	1	-	1	3	-
CO4	3	3	-	1	-	-	-	1	-	-	-	1	3	1
CO5	3	3	-	1	-	-	1	1	-	1	-	1	3	1
CO	3	3	-	1	-	1	1	1	1	1	-	1	3	1
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER IV

U19CE404	HIGHWAY ENGINEERING	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- NIL

COURSE OBJECTIVES:

- To understand the concept of Highway planning and alignment
- To give an overview about pavement, design, construction and maintenance as per IRC standards
- To provide exposure to pavement evaluation and strengthening

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9

Scope of Highway Engineering - History of Road construction–Highway Development and planning in India– National transport policy 2005 – Road development plan vision 2021 – Rural road development plan vision 2025 – Highway administration and organizations – Highway Hierarchy - On-going Highway projects in India - Highway Alignment –Factors controlling alignment – Engineering surveys for Highway alignment - Classification of Urban and Rural Roads - Cross sections of different Class of Roads – Preparation of Highway Detailed Project Report – Leading Highway construction companies in India- Highway Financing

UNIT II GEOMETRIC DESIGN OF HIGHWAY 9

Geometric design elements – Highway cross sectional elements – Sight Distance - Design of Horizontal Alignment – Super elevation –PIEV Theory - Extra Widening on Curves – Horizontal transition curves - Design of Vertical Alignments – Gradients & Curves - Geometric Design of Hill Roads (IRC Standards only) - Case study of Indian Highways

UNIT III STRUCTURALDESIGN OF HIGHWAY PAVEMENTS 9

Flexible pavements – Components and functions – Factors affecting design and performance of flexible pavements – Stresses in flexible pavements – Flexible pavement design methods

Rigid pavements – Components and functions – Factors affecting design and performance of CC Pavements –Stresses in Rigid pavements –Plain dowelled and continuously reinforced concrete pavement – Continuously reinforced concrete pavements (CRCP)

UNIT IV HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9

Materials used in Highway construction – Desirable properties and testing of Highway materials (Soil, Aggregate and Bitumen) – Portland cement and Cement concrete

Features of Highway construction – Components of highway pavement – Highway embankment and sub grade – Earth excavation - Mass Haul diagram– Construction of Flexible pavements – Low volume roads - Cement concrete pavements - Highway drainage –– Construction machineries

UNIT V PAVEMENT MAINTENANCE EVALUATION AND STRENGTHENING 9

Importance of Highway maintenance – Objectives of Highway maintenance – Types of maintenance - Defects in Flexible pavements – Types of failures, Causes and Treatment - Defects in Rigid pavements – Types of failures, Causes and Treatment - Maintenance Management System (MMS) – Maintenance techniques – Evaluation of highway pavements – Techniques for pavement evaluation – Strengthening of pavements (Overlays) – Preparation of surface for the overlays (Design procedure only)

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Khanna K., Justo C E G, “Highway Engineering”, Khanna Publishers, Roorkee, 2019
2. Kadiyali L.R., “Principles and Practice of Highway Engineering”, Khanna Technical Publications, New Delhi, 2019
3. Subramanian K.P., “Highways, Railways, Airport and Harbour Engineering”, SciTech Publications (India), Chennai, 2018

REFERENCES:

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

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Gain knowledge on highway planning and alignment	Understand
CO2	Do geometric design of roads and various aspects of highway Engineering	Understand
CO3	Design various types of pavements as per IRC standards	Understand
CO4	Know various materials used in pavement construction and practices followed in pavement construction	Understand
CO5	Gain knowledge on pavement maintenance and evaluation of strength of the pavement	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2	–	–	–	–	–	–	–	–	–
CO2	3	1	2	1	2	1	–	1	–	1	–	–	3	–
CO3	3	3	2	3	3	1	–	1	–	1	–	–	3	–
CO4	3	1	1	1	3	1	–	1	–	1	–	–	3	–
CO5	3	3	2	1	3	1	–	1	–	1	–	–	3	–
CO	3	2	2	1	3	1	–	1	–	1	–	–	2	–
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER IV

U19CE405	CONCRETE AND HIGHWAY LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Building Materials, Concrete Technology, Highway Engineering

COURSE OBJECTIVES:

- To perform tests on concrete and highway materials such as cement, fine & coarse aggregates and bitumen
- To carryout concrete mix design based on standard procedures and test the properties of fresh and hardened concrete

LIST OF EXPERIMENTS

1. TESTS ON CEMENT

   Fineness, Normal consistency, Initial and Final Setting times, Specific gravity, Compressive strength, Soundness (demonstration only)
2. TESTS ON FINE AGGREGATE

   Grain size distribution, Specific gravity, Bulk density, Bulking & Water absorption
3. TESTS ON COARSE AGGREGATE

   Grain size distribution, Specific gravity, Bulk density, Water absorption, Crushing & Impact values, Flakiness & Elongation, Los Angeles Abrasion test
4. CONCRETE MIX PROPORTIONING APPROACHES
5. TEST ON FRESH CONCRETE

   Workability tests on concrete: Slump test, Compaction factor test, Flow table test, Vee-Bee Consistometer
6. TESTS ON HARDENED CONCRETE

   Compressive strength, Split tensile strength, Flexure test on beams, Modulus of elasticity
7. NON-DESTRUCTIVE TESTING: EXISTING BEAM, COLUMN & SLABS
8. TESTS ON BRICKS

   Crushing strength, water absorption and efflorescence
9. TESTS ON BITUMEN

   Specific gravity, Penetration test, Viscosity test, Softening point test, Ductility test, Benkelman beam (demonstration only)
10. EXERCISE

    Design of M35 Grade of Concrete mix with F or C type flyash using BIS Method

    Determination of bitumen characteristics

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 60 Periods Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Conduct tests on cement as per IS codes of practice	Analyze
CO2	Examine and analyze tests on fine and coarse aggregates according to IS codes of Practice	Analyze
CO3	Conduct tests on fresh and hardened cement / concrete and brick as per IS codes of practice	Analyze
CO4	Analyze various tests on bitumen and its grades as per IS codes	Analyze
CO5	Prepare the laboratory reports on the interpretation of experimental results	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	3	2	-	3	3	3
CO2	3	3	3	2	2	-	-	-	3	2	-	3	3	3
CO3	3	3	3	2	2	-	-	-	3	2	-	3	3	3
CO4	3	3	3	2	2	-	-	-	3	2	-	3	3	3
CO5	3	3	3	2	2	-	-	-	3	2	-	3	3	3
CO	3	3	3	2	2	-	-	-	3	2	-	3	3	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER IV

U19CE406	SOIL MECHANICS LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Soil Mechanics

COURSE OBJECTIVES:

- To gain adequate knowledge in assessing index properties of the soil
- To examine the engineering properties of the soil
- To classify the soil by conducting laboratory tests

LIST OF EXPERIMENTS

1. Specific gravity of soil solids
2. Grain size distribution – Sieve analysis
3. Grain size distribution – Hydrometer analysis
4. Liquid limit and Plastic limit tests
5. Shrinkage limit and Differential free swell tests
6. Permeability determination (constant head and falling head methods)
7. One dimensional consolidation test (Determination of Co-efficient of consolidation only)
8. Direct shear test in cohesionless soil
9. Unconfined compression test in cohesive soil
10. Laboratory vane shear test in cohesive soil
11. Tri-axial compression test in cohesionless soil (Demonstration only)
12. California Bearing Ratio Test
13. Field density Test (Sand replacement method and core cutter method)
14. Determination of moisture – density relationship using standard Proctor compaction test
15. Determination of relative density (Demonstration only)
16. Determination of index properties of cohesive soil

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 60 Periods Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Classify soils based on assessing the index properties of soils	Analyze
CO2	Experiment with the swelling characteristics of soils by conducting appropriate tests	Analyze
CO3	Identify the moisture – density relationship of soils	Analyze
CO4	Discover the engineering properties of cohesive soils by conducting appropriate tests	Analyze
CO5	Examine the engineering properties of cohesionless soils by conducting appropriate tests	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	2	-	-	-	-	3	-	-	1	3	3
CO2	3	1	1	2	-	-	-	-	3	-	-	1	3	3
CO3	3	1	1	2	-	-	-	-	3	1	-	1	3	3
CO4	3	1	1	2	-	-	-	-	3	1	-	1	3	3
CO5	3	1	1	2	-	-	-	-	3	1	-	1	3	3
CO	3	1	1	2	-	-	-	-	3	1	-	1	3	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER IV

UI9CA001	NUMERICAL APTITUDE AND VERBAL ABILITY - I	Category: EEC			
		L	T	P	C
		1	0	0	1

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of coding, decoding, interpreting and applying
- To comprehend the basics concepts of logical reasoning and verbal reasoning

UNIT I CODING AND DECODING **3**

Clocks & calendars – Alpha numeric series – Coding & decoding – Blood relations – Odd man out – Direction

UNIT II DATA INTERPRETATION **3**

Syllogism – Order and ranking – Puzzles – Cubes and dices – Statements – Assumptions and conclusions – Seating arrangements – Data sufficiency – Data interpretation

UNIT III GRAMMAR **3**

Parts of speech (Nouns – Pronouns – Verbs – Adjectives – Adverbs – Prepositions – Conjunctions – Interjections) – Gerunds – Phrases and clauses

UNIT IV WRITING **3**

Tenses – Active and passive voice (Tense usage) – Reported speech – Verbal ability (Vocabulary and Reasoning)

UNIT V READING **3**

Cloze test – Sentence formation – Para jumbles – Passage formation – Spotting errors – Verbal analogies

Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: – Periods Total: 15 Periods

TEXT BOOKS:

1. "R S Aggarwal – Quantitative Aptitude for Competitive Examinations", 17th Edition S Chand Publishing, New Delhi, 2017
2. "R S Aggarwal – Objective General English", S Chand Publishing, New Delhi, 2017

REFERENCES:

1. Abhijit Guha – Quantitative Aptitude for Competitive Examination, McGraw Hill Education (India) Private Limited, 5th Edition, 2015
2. R S Aggarwal - A Modern Approach to Verbal & Non-Verbal Reasoning, S Chand Publishing, New Delhi, 2017

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Apply the concept of coding and decoding for numerical reasoning and data interpretation through Graphs and Charts	Apply
CO2	Choose appropriate words / phrases for the sentences and present comprehensively	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO	3	-	-	-	-	-	-	-	-	3	-	-	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER V

U19CE501	DESIGN OF RC ELEMENTS	Category: PC			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic concepts of Limit state design
- To learn the economical design concepts of structural members
- To know the design methodologies by limit state design for beams, slabs, column and footings

UNIT I INTRODUCTION TO LIMIT STATE METHOD 9+3

Concept of limit state method – Analysis and design of singly and doubly reinforced rectangular and flanged beams

UNIT II DESIGN OF SLABS 9+3

Design of different types of slabs – One-way slab – Two-way slab – Staircase

UNIT III DESIGN OF COMPRESSION MEMBERS 9+3

Design of column for axial load – Uniaxial bending – Biaxial bending

UNIT IV DESIGN OF FOOTING 9+3

Design of isolated footing, wall footing and combined footing (Rectangular/ Trapezoidal)

UNIT V ANALYSIS AND DESIGN OF MULTI – STOREY BUILDING 9+3

Load calculation – Analysis and design of Multi-storey building (dead, live load and lateral loads)

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. Varghese.P.C., “Limit State Design of Reinforced Concrete”, 2nd Edition, PHI Learning Pvt. Ltd, 2008
2. Subramanian.N., “Design of Reinforced Concrete Structures”, Oxford University Press, New Delhi, 2014
3. Punmia.B.C., Ashok K. Jain and Arun K. Jain, “Limit State design of Reinforced Concrete”, Laxmi Publications (P) Ltd., New Delhi, 2016

REFERENCES:

1. Unnikrishna Pillai and Devdas Menon., “Reinforced Concrete Design (Third Edition)”, Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 3rd Edition, 2017
2. Krishna Raju.N., “Structural Design and Drawing – Reinforced Concrete and Steel”, Universities Press, 2019
3. Devadoss Menon and Pillai S., “Reinforced Concrete Design”, McGraw Hill Education India Private Limited; 3rd edition 2009
4. IS 456: 2000 Plain and Reinforced Concrete – Code of practice

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K – Level
CO1	Apply the usage of IS codes in design of reinforced concrete	Apply
CO2	Identify the types and design of beams and slabs	Apply
CO3	Design uniaxial and biaxial bending of column	Analyze
CO4	Design simple footings and combined footings	Analyze
CO5	Analyse and design the Multi – storey building	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	2	-	-	-	-	-	-	-	3	2	3
CO2	3	3	-	3	-	-	-	-	-	-	-	3	2	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO4	3	-	-	2	-	-	-	-	-	-	-	3	2	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO	3	3	3	3	-	-	-	-	-	-	-	3	2	3
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER V

U19CE502	STRUCTURAL ANALYSIS I	Category: PC			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Engineering Mechanics, Strength of Materials I, Strength of Materials II

COURSE OBJECTIVES:

- To understand the basic theory and concepts of structural analysis
- To calculate energy and classical methods for the analysis of buildings
- To analyse and demonstrate arches, cables and suspension bridges

UNIT I FUNDAMENTAL CONCEPTS AND STRAIN ENERGY METHOD 9+3

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

UNIT II SLOPE DEFLECTION METHOD 9+3

Displacement method concept – Slope deflection equations – Fixed end moments – Analysis of continuous beams – Sinking of Supports – Analysis of single storey and single bay rectangular vertical frames with and without sway

UNIT III MOMENT DISTRIBUTION METHOD 9+3

Basic concepts – Stiffness factor, Distribution factor and Carry over factors – Fixed end moments – Analysis of continuous beams – Sinking of Supports – Analysis of single storey and single bay rectangular vertical frames with and without sway

UNIT IV ARCHES 9+3

Three hinged arch – Two hinged arch – Parabolic and semicircular arches – Concentrated loads – Uniform loads – Temperature effects – Determination of Reaction, Normal Thrust, Radial shear and Bending Moment

UNIT V CABLES AND SUSPENSION BRIDGES 9+3

Components and their Functions – Analysis of cable under concentrated loads and UDL – Shape of cable under self-weight – Anchorage of suspension cables – Bending Moment and Shear Force in three hinged stiffened girders – Max Bending Moment due to single concentrated load and UDL – Two hinged stiffened girders

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. Vaidyanathan R., Perumal P., “Comprehensive Structural Analysis”, Vol I and II, Laxmi Publications, 2019
2. Punmia B.C., “Theory of Structures”, Laxmi Publications, 2017

REFERENCES:

1. NegiL.S, Jangid R.S., “Structural Analysis”, Tata McGraw-Hill Publications, 2004
2. Bhavikatti S.S., “Structural Analysis”, Vol.I and II, Vikas Publishing House Pvt.Ltd.,2013
3. Punmia B.C., “Strength of Materials and Mechanics of Structures” Vol.II, StandardPublishers,2007

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Analyze the continuous beams and plane frames by strain energy method	Analyze
CO2	Analyze the continuous beams and rigid frames by slope defection method	Analyze
CO3	Understand the concept of moment distribution beams and frames with and without sway	Analyze
CO4	Analyze different types of arches	Analyze
CO5	Calculate forces on suspension bridges with stiffening girders	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO2	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO3	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO4	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO5	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO	3	3	3	3	3	-	-	-	3	2	1	2	2	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER V

U19CE503	TOTAL QUALITY MANAGEMENT	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand quality management principles
- To identify total quality management tools and techniques
- To apply the knowledge on quality management system and process

UNIT I INTRODUCTION **9**

Introduction – Need for quality – Evolution of quality – Definitions of quality – Dimensions of product and service quality – Basic concepts of TQM – TQM Framework – Contributions of Deming, Juran and Crosby – Barriers to TQM – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention

UNIT II TQM PRINCIPLES **9**

Leadership – Quality Statements, Strategic quality planning, Quality Councils – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal – Continuous process improvement – PDCA cycle, 5S, Kaizen – Supplier partnership – Partnering, Supplier selection, Supplier Rating

UNIT III TQM TOOLS AND TECHNIQUES I **9**

The seven traditional tools of quality – New management tools – Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types

UNIT IV TQM TOOLS AND TECHNIQUES II **9**

Quality Circles – Cost of Quality – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures

UNIT V QUALITY MANAGEMENT SYSTEM **9**

Introduction – Benefits of ISO Registration – ISO 9000 Series of Standards – Sector-Specific Standards – AS 9100, TS16949 and TL 9000 – ISO 9001 Requirements – Implementation – Documentation – Internal Audits – Registration – Environmental Management System – Introduction – ISO 14000 Series Standards – Concepts of ISO 1400 – Requirements of ISO 1400 – Benefits of EMS

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Dale H. Besterfiled, Carol B. Michna, Glen H. Besterfield, Mary B.Sacre, Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia Indian Reprint Sixth Impression, 2013
2. Juran J.M, Gryna F.M., “Quality Planning and Analysis”, Tata McGraw Hill Publishing Limited, New Delhi, 1995

REFERENCES:

1. James R. Evans and William M. Lindsay., "The Management and Control of Quality", Cengage Learning, 2012
2. JanakiramanB and Gopal R.K., "Total Quality Management Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006
3. SuganthiL and Anand Samuel., "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Perceive the basic knowledge in quality management concepts	Understand
CO2	Understand the TQM concepts like customer focus, employee focus leadership styles, motivation strategy	Understand
CO3	Use the basic and new seven management tools, quality concepts like six sigmas in product and process development	Understand
CO4	Explore industrial applications of quality function deployment, Taguchi quality concepts	Understand
CO5	Gain the knowledge on various ISO standards and quality systems and the possibilities of applying them to various types of industries	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	-	-	-	-	2	2	2	-	-	1
CO2	2	2	1	-	-	-	-	-	2	2	2	-	-	1
CO3	2	2	1	-	-	-	-	-	2	2	2	-	-	1
CO4	2	2	1	-	-	-	-	-	2	2	2	-	-	1
CO5	2	2	1	-	-	-	-	-	2	2	2	-	-	1
CO	2	2	1	-	-	-	-	-	2	2	2	-	-	1
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER V

U19CE504	COMPUTER AIDED DRAFTING LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Engineering Graphics

COURSE OBJECTIVES:

- To learn about the basic commands in AutoCAD
- To have adequate knowledge to draw the plan, elevation and sectional view of Framed and Steel Structures

LIST OF EXPERIMENTS

1. Site plan, floor plan, elevation and section drawing of small residential buildings
2. Drawing of complete joinery details (Panelled and Glazed Doors and Windows)
3. Preparation of approval drawing for local body (Residential building – Flat and pitched roof)
4. Detailed working drawing for single storey and double storey Residential buildings – site plan, foundation plan, floor plans, Cross section, elevation, staircase plan – (Load bearing and framed structures)
5. Residential Building: Interior plan for Hall, Dining, Kitchen, Bed room, Bath room W/C and Toilet (2D only)
6. Preparation of plan, elevation and section of industrial buildings – Workshop (steel structure)
7. Preparation of plan, elevation and section of institutional buildings (school, college – framed structure)

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 60 Periods Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Prepare approval drawing for local body	Apply
CO2	Prepare plan, elevation and section of single storey and multi-storied residential building	Apply
CO3	Able to draft interior plan for residential building	Apply
CO4	Prepare the plan and other drawings of the industrial building	Apply
CO5	Prepare the plan and other drawings of the institutional buildings	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	–	–	–	3	–	–	3	1	1	1	3	2
CO2	3	3	–	–	3	–	–	–	3	1	1	1	3	–
CO3	3	3	–	–	3	–	–	–	3	1	1	1	3	2
CO4	3	3	3	3	–	–	1	1	3	1	1	1	3	2
CO5	3	3	3	3	–	–	1	1	3	1	1	1	3	2
CO	3	3	3	3	3	3	1	1	3	1	1	1	3	2
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER V

U19CE505	SURVEY CAMP (Two Weeks during IV Semester Vacation)	Category: PC			
		L	T	P	C
		0	0	0	1

PRE–REQUISITES:

- Engineering Survey, Survey Laboratory

COURSE OBJECTIVES:

- To get practical training in survey field works, traverse and contour the given area

The students are divided into teams and they will carry out each exercise in survey camp. The camp is to be conducted on a large area of not less than 40 acres which is to be located outside the college campus.

LIST OF EXPERIMENTS

1. Triangulation
2. Radial Contouring
3. Square Contouring
4. Longitudinal sectioning
5. Cross sectioning
6. Traversing – Total station
7. Traversing – GPS
8. Sun and star observation using azimuth

Apart from above exercise, students may be given other survey exercises based on the site condition.

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 30 Periods Total: 30 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Apply the knowledge in contouring the area	Analyze
CO2	Develop the LS and CS of the area	Analyze
CO3	Survey using total station	Analyze
CO4	Survey using GPS	Analyze
CO5	Demonstrate the field work using survey instruments	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	3	3	3	3	3	3
CO2	3	3	3	-	3	-	-	-	3	3	3	3	3	3
CO3	3	3	3	-	3	-	-	-	3	3	3	3	3	3
CO4	3	3	3	-	3	-	-	-	3	3	3	3	3	3
CO5	3	3	3	-	3	-	-	-	3	3	3	3	3	3
CO	3	3	3	-	3	-	-	-	3	3	3	3	3	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER V

U19CA002	NUMERICAL APTITUDE AND VERBAL ABILITY - II	Category: EEC			
		L	T	P	C
		1	0	0	1

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of number system, profit and loss and infer time, speed and distance
- To write sentences with appropriate grammatical structure in a professional context

UNIT I NUMBER SYSTEMS 3

Divisibility tests (Divisibility factor – Prime factor – Divisibility rules – Finding unit digit) – LCM & HCF (Listing multiples, Prime Factorization, Division method, etc.) – Number System (Numbers, Prime, Composite, Co-prime, numbers) – Percentage (Percentage – Fractions of percentages– Expenditure – Price – Consumption – Population – Depreciation)

UNIT II PROFIT AND LOSS 3

Profit, Loss & Discounts – (CP, SP, MP, Profit, Loss, Discount) – Ratio & Proportion (Compounded Ratio – Mean – Proportional – Componendo.– Dividendo – Directly proportional – Inversely proportional), Age problems (Various techniques to solve age problems)

UNIT III AVERAGES AND ALLIGATIONS 3

Averages (Simple average, weighted average) – Mixture and Alligations (Various techniques to solve mixtures and alligations) – Boats and streams (Downstream, upstream, average speed)

UNIT IV PERMUTATION AND COMBINATION 3

Time & work (Problems on time, work and effectively) – Permutations & combinations (Arrangements & selections, together and not together problems) – Probability (Coins, card, dice) Logarithms (Log function, common log, natural log, binary log, laws of logarithms) – Areas and volumes

UNIT V WRITING 3

Reading comprehension – Letter writing – Email writing – Creative writing – Resume building

Contact Periods:

Lecture: 15 Periods Tutorial: – Periods Practical: – Periods Total: 15 Periods

TEXT BOOKS:

1. "R S Aggarwal – Quantitative Aptitude for Competitive Examinations", 17th Edition S Chand Publishing, New Delhi, 2017
2. "R S Aggarwal – Objective General English", S Chand Publishing, New Delhi, 2017

REFERENCES:

1. "R S Aggarwal - A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand Publishing, New Delhi, 2017
2. "Abhijit Guha – Quantitative Aptitude for Competitive Examination", McGraw Hill Education (India) Private Limited, 5th Edition, 2015
3. "Arun Sharma – How to prepare for Quantitative Aptitude for CAT", 8th edition McGraw Hill Education, Chennai, 2018

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Use basics of counting through permutation and combination for arrangement of tasks	Apply
CO2	Draft letters, emails and make notes with appropriate use of words	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO	3	-	-	-	-	-	-	-	-	3	-	-	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER VI

U19CE601	WATER SUPPLY AND WASTE WATER ENGINEERING	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To identify the sources of water and its demand
- To provide adequate knowledge about the water treatment processes and its design
- To provide adequate information on sewage treatment plant design and disposal techniques

UNIT I SOURCES OF WATER AND ITS CONVEYANCE 9

Sources of water – Quantitative and qualitative studies – Physical, chemical and biological characteristics of water Types of demand and their contribution – Rate of consumption – Forecasting the Population – Drinking Water quality – BIS and WHO standards – Intakes – Channels and pipes for conveying water – Laying, joint and testing of pipes

UNIT II WATER TREATMENT AND DISTRIBUTION 9

Objectives – Unit operations and processes – Principles, functions, design and drawing of screens, flocculators, sedimentation tanks, sand filters and disinfection – Advanced water treatment. Distribution systems – Analysis of distribution networks – House service connection – Plumbing systems in buildings

UNIT III PLANNING AND DESIGN OF SEWERAGE SYSTEMS 9

Sources of wastewater generation – Effects – Characteristics and composition of sewage – Sampling – Analysis – Estimation of sanitary sewage flow – Estimation of storm runoff – Effluent standards – Hydraulics of flow in sewers – Objectives – Design period – Design of sanitary and storm sewers – Pipe Materials and Pipe Appurtenances – Drainage in buildings – Plumbing systems for drainage

UNIT IV SEWAGE TREATMENT 9

Objective – Primary treatment – Secondary treatment – Principles, Functions, Design of Screens, Grit chamber, Primary Sedimentation Tanks, Activated Sludge Process, Trickling Filter and Oxidation Ditches, UASB – waste stabilisation ponds – Construction, Operation & Maintenance of Wastewater Treatment Plants

UNIT V SEWAGE DISPOSAL 9

Standards for Disposal – Methods – Dilution – Self-purification of surface water bodies – Oxygen sag curve – Sludge characterization – Thickening – Design of gravity thickener – Sludge digestion – Standard rate and High rate digester design – Biogas recovery – Sludge Conditioning and Dewatering – Sludge drying beds- Ultimate residue disposal – Advances in Sludge Treatment and disposal

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

TEXT BOOKS:

1. Garg, S.K. “Water Supply Engineering”, Vol. I & II Khanna Publishers, New Delhi, 2016
2. Garg, S. K. “Wastewater Engineering”, Vol. II Khanna Publishers, New Delhi, 2016
3. Punmia, B. C., Ashok Jain and Arun Jain, “Water Supply Engineering”, Laxmi Publications (P) Ltd., New Delhi, 2014

4. Punmia, B. C., Jain, A.K., and Jain, A. K.., “Wastewater Engineering”, Vol. II, Laxmi Publications, 2014

REFERENCES:

1. “Manual on Water Supply and Treatment”, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999
2. “Manual on Sewerage and Sewage Treatment Systems”, Part A, B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013
3. Metcalf and Eddy, “Wastewater Engineering – Treatment and Reuse”, Tata McGraw Hill Company, New Delhi, 2015

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Classify the sources of water with its quality and demand	Understand
CO2	Design the water treatment plant units and distribution network	Apply
CO3	Understand the wastewater generation and design the sanitary and storm sewers	Understand
CO4	Design the sewage treatment plant units	Apply
CO5	Outline the safe disposal of sewage and sludge	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	-	-	1	2	-	-	-	-	-	2	2
CO2	3	3	3	-	-	1	2	-	-	3	-	1	2	2
CO3	3	2	3	-	-	1	2	-	-	2	-	1	2	2
CO4	3	2	3	-	-	1	2	-	-	3	-	1	1	1
CO5	3	3	3	-	-	1	2	-	-	-	-	-	2	2
CO	3	2	3	-	-	1	2	-	-	3	-	1	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER VI

U19CE602	DESIGN OF STEEL STRUCTURES	Category: PC			
		L	T	P	C
		3	0	2	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To know the connections in steel structures
- To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections
- To design the structural system for roof trusses as per current codal provisions

UNIT I INTRODUCTION AND BOLTED CONNECTION 9+6

Fundamental Concepts of limit state design of structures – Different types of rolled steel sections available to be used in steel structures – Stress-Strain relationship for mild steel – Connections Behavior of bolted joints – Design strength of ordinary black bolts – high strength friction grip bolts Pin connections – Simple connections – Eccentric bolted connections – Rivet connection

UNIT II WELDED CONNECTION 9+6

Advantages of welding – Types and properties of welds – Types of joints – Welded specifications – Design of welded joints subjected to axial load – Eccentric welded connections

UNIT III TENSION AND COMPRESSION MEMBERS 9+6

Types of tension members – Design of strands – Slenderness ratio – Displacement of tension members – Behavior of tension members – Modes of failure, factors affecting strength of tension members – Angles under tension – Design of tension members – Lug angles – Splices – Possible failure modes – Classification of cross–section – Behavior of compression members – Effective length – Radius of gyration and slenderness of compression members – Allowable stresses in compression – Design of axially loaded compression members – Built up compression members – Laced and Battened columns – Eccentrically loaded columns

UNIT IV DESIGN OF FLEXURAL MEMBERS 9+6

Beam types – Section classifications – Lateral stability of beams – Allowable stress in bending – Shear and Bearing stresses – Effective length of compression flange – Laterally supported and unsupported beams – Design of built up beams

UNIT V FOUNDATION AND TRUSSES 9+6

Allowable stress in bearing – Slab base – Gusset base – Types of trusses – Economical spacing of roof trusses – loads on roof trusses – Estimation of wind load on roof trusses as per IS : 875 Design of members of roof truss and joints – Design of purlins

LIST OF EXPERIMENTS

1. Detailing of Bolted connections – Lap and Butt Joint
2. Detailing of Bolted connections – Lap and Butt Joint
3. Detailing of Bolted connections – Eccentric Connections (In plane and Out of Plane)
4. Detailing of Welded connections
5. Detailing of Bolted connections – Eccentric Connections (In plane and Out of Plane)
6. Detailing of Tension members – Plate and angle
7. Detailing of Compression members – Double Symmetry sections

8. Detailing of Compression members – Angle Struts
9. Detailing of Slab base and gusseted base
10. Detailing of Flexural members

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: 30 Periods Total: 75 Periods

TEXT BOOKS:

1. Subramanian.N., “Design of Steel Structures”, Oxford University Press, New Delhi, 2013
2. Gambhir. M.L., “Fundamentals of Structural Steel Design”, McGraw Hill Education India Pvt. Ltd., 2013

REFERENCES:

1. Sai Ram. K.S., “Design of Steel Structures”, Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2nd Edition, 2015
2. Shiyekar., M.R., “Limit State Design in Structural Steel”, Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013
3. Bhavikatti. S.S., “Design of Steel Structures by Limit State Method as per IS: 800 – 2007”, IK International Publishing House Pvt. Ltd., 2012
4. IS 800:2007, General Construction in Steel - Code of Practice (Third Revision), Bureau of Indian Standards, New Delhi, 2007 & SP 6 (1) Hand book on structural Steel Sections

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Understand the mechanical properties of bolts, rivets and design of simple bolted connections	Apply
CO2	Understand the welding procedures and design of welded connections	Apply
CO3	Compute the design strength of tension and compression members	Analyze
CO4	Select the suitable size and shape of beams according to design criteria	Analyze
CO5	Compute the design loads on steel trusses as per IS codal provisions	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	–	–	–	2	1	–	2	2
CO2	3	3	2	2	2	–	–	–	–	2	1	–	2	2
CO3	3	3	2	2	2	–	–	–	–	2	1	–	2	2
CO4	3	3	2	2	2	2	–	–	2	2	1	2	2	2
CO5	3	3	2	2		2	–	–	2	2	–	–	2	2
CO	3	3	2	2	2	2	–	–	2	2	1	2	2	2
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER VI

U19CE603	STRUCTURAL ANALYSIS II	Category: PC			
		L	T	P	C
		3	1	0	4

PRE–REQUISITES:

- Engineering Mechanics, Strength of Materials I, Strength of Materials II, Structural Analysis I

COURSE OBJECTIVES:

- To understand the concept of influence lines
- To calculate classical methods for the analysis of buildings
- To explain plastic analysis of beams and rigid frames

UNIT I ROLLING LOADS AND INFLUENCE LINES FOR DETERMINATE BEAMS 9+3

Single concentrated load moving on the span – UDL longer than the span – UDL shorter than the span – Two concentrated loads – Series of concentrated loads – Influence lines for reactions, shear force, bending moment and Load Position for Absolute maximum Bending Moment

UNIT II INFLUENCE LINES FOR INDETERMINATE STRUCTURES 9+3

Muller Breslau's principle – Application of Muller Breslau's principle to indeterminate beams

UNIT III MATRIX FLEXIBILITY METHOD 9+3

Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of static indeterminacy

UNIT IV MATRIX STIFFNESS METHOD 9+3

Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of kinematic indeterminacy

UNIT V PLASTIC ANALYSIS 9+3

Statically indeterminate structures – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Static and kinematic methods – Upper and lower bound theorems – Plastic analysis of indeterminate beams and frames

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Total: 60 Periods

TEXT BOOKS:

1. Reddy C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co, 2013
2. VaidayanathanR and PerumalP., "Comprehensive Structural Analysis", Vol.I and II, Laxmi publications, 2019

REFERENCES:

1. Negi L.S and Jangid R.S., "Structural Analysis", Tata McGraw - Hill Publishing Company, New Delhi, 2004
2. RamamurthamS, "Theory of structures", DhanpatRai& Sons, New Delhi, 2013
3. Punmia B.C, "Strength of Materials and Mechanics of Structures", Vol. II, Standard publishers, 2007

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Estimate the shear force and bending moment for beam with moving loads	Analyze
CO2	To find the influence lines for the indeterminate structures	Analyze
CO3	Analyze the indeterminate plane frames and continuous beams matrix flexibility method	Analyze
CO4	Understand the concept of matrix stiffness method for continuous beams and frames	Analyze
CO5	Execute plastic analysis of beam and frames	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO2	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO3	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO4	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO5	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO	3	3	3	3	3	-	-	-	3	2	1	2	2	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER VI

U19CE604	ENVIRONMENTAL ENGINEERING LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To know the procedure for quantifying quality parameter for water and sewage
- To understand the effect of water if it exceeds the permissible limits

LIST OF EXPERIMENTS

1. Determination of pH of water
2. Determination of turbidity of waste water
3. Determination of total dissolved solids, total suspended solids and total solids in waste water
4. Determination of acidity and alkalinity in water
5. Determination of total hardness in water
6. Determination of coagulant dose in water
7. Determination of chlorides in water
8. Determination of BOD in waste water
9. Determination of COD in waste water
10. Determination of Ammonium nitrogen in waste water
11. Determination of Available chlorine in water
12. Determination of Potassium and Sodium in waste water(demonstration only)
13. Determination of Phosphorous and Nitrate in waste water(demonstration only)
14. Determination of Heavy metal(Arsenic , Iron) in waste water(demonstration only)
15. Determination of Water quality for drinking purpose as per Indian Standards

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 60 Periods Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	perform experiments to analyze the characteristics relating to water and wastewater	Analyze
CO2	statistically analyze and interpret laboratorial results. .	Analyze
CO3	understand the water and wastewater sampling procedures and sample preservations in the field.	Understand
CO4	apply the laboratorial results to problem identification, quantification, and basic environmental design and technical solutions.	Apply
CO5	evaluate the impact of water and wastewater treatment on the society and environment	Evaluate

REFERENCES:

1. Lab Manual, ISO 14001, Environmental Management, Regulatory Standards for Drinking Water and Sewage disposal.
2. Clair Sawyer and Perry McCarty and Gene Parkin, “Chemistry for Environmental Engineering and Science”, McGraw-Hill Series in Civil and Environmental Engineering, 2003
3. Guide manual: Water & wastewater analysis, Central Pollution Control Board, Govt. of India.
4. APHA standard methods for the examination of water and wastewater –20th edition

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	-	2	-	-	-	3	1	1	2	2	2
CO2		1	-	-	2	-	-	-	3	1	-	2	2	-
CO3	1	1	-	-		-	-	-	3	1	-	2	2	2
CO4	1		3	3	2	1	3	1	3	1	1	2	2	2
CO5	1	1	3	3	2	1	3	1	3	1	1	2	2	2
CO	1	1	3	3	2	1	3	1	3	1	1	2	2	2
Correlation levels:			1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)			

SEMESTER VI

U19CE605	TECHNICAL SEMINAR	Category: EEC			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To work on a specific technical topic in Structural Engineering and acquire the skills of written and oral presentation.
- To acquire writing abilities for seminars and conferences

STRATEGY

The students will work for two hours per week guided by a group of staff members. They will be asked to give a presentation on any topic of their choice related to Structural Engineering and to engage in discussion with the audience. A brief copy of their presentation also should be submitted. Similarly, the students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will defend their presentation. Evaluation will be based on the technical presentation and the report and also on the interaction shown during the seminar

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 30 Periods Total: 30 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Tend to face an audience and to tackle any problem during group discussion in the Interviews	Apply
CO2	Acquire writing abilities for seminars and conferences	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	2	2	-	3	3	3	-	3	2	2
CO2	3	1	1	1	2	2	-	3	3	3	-	3	2	2
CO	3	1	1	1	2	2	-	3	3	3	-	3	2	2
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER VII

U19CE701	CONSTRUCTION PROJECT MANAGEMENT	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To study the project lifecycle in construction
- To understand the concept of quality, material and safety management
- To understand the project monitoring and control systems

UNIT I INTRODUCTION 9

Introduction – Project Life Cycle – Types of Construction – Selection of Professional Services – Construction Project Characteristics – Role of Project Managers – Leadership and Motivation for the Project Team.

UNIT II PROJECT FORMULATION 9

Project Feasibility study – Contractor – types of contract – Time value of money – Net present value – Benefit Cost ratio – Public Project – BOOT, BOT, BOLT

UNIT III POJECT NETWORK ANALYSIS 9

Project Plan – Types – Defining Project activities – Work breakdown structure – Resources leveling – CPM – PERT – Precedence networks for construction.

UNIT IV MATERIAL, LABOUR AND SAFETY MANAGEMENT 9

Labour Productivity – Factors Affecting Job-Site Productivity – Labour Relations in Construction – Materials Management – Material Procurement and Delivery – Inventory Management – Safety Management – Importance – Causes of accident – Responsibility and Safety measures.

UNIT V COST AND QUALITY CONTROL MANAGEMENT 9

Construction quality – Quality control and quality assurance in projects – ISO standards – Project monitoring and control system – Updating – Earned value methods – Schedule, time, progress control – Cost control and techniques.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Kumar Neeraj Jha., “Construction Project Management-Theory and Practice”, Person Publications - Dorling Kindersley (India) Pvt ltd., 2012.
2. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000

REFERENCES:

1. Gaholt, B.M. Dhir, P.S., “Construction Project management”, New Age International Publishers; Second edition, 2018.
2. Sharma. S.C, “Construction Engineering and Management”, Khanna Publishers, Delhi,2015.
3. Barbara J. Jackson, “Construction Management”, JumpStart, Wiley Publishers, Third Edition, 2020.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the project lifecycle and role of project manager.	Understand
CO2	Study the types of contract and public private partnership in project.	Understand
CO3	Understand the network analysis in project.	Understand
CO4	Explain the material and safety management in construction.	Understand
CO5	Study the project monitoring and control system in construction.	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	2	3	3	1	-	-	3	2	-	-
CO2	3	-	-	-	2	3	3	1	-	-	3	2	-	-
CO3	3	-	-	-	2	3	3	1	-	-	3	2	-	-
CO4	3	-	-	-	2	3	3	1	-	-	3	2	-	-
CO5	3	-	-	-	2	3	3	1	-	-	3	2	-	-
CO	3	-	-	-	2	3	3	1	-	-	3	2	-	-
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)						3: Substantial (High)			

SEMESTER VII

U19CE702	ESTIMATION AND QUANTITY SURVEYING	Category: PC			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Computer Aided Drafting Laboratory

COURSE OBJECTIVES:

- To prepare detailed estimates of various items of work
- To understand rate analysis and the process of preparation of bills
- To understand the methods of valuation of land and building

UNIT I ESTIMATE OF BUILDING 9

Introduction – General items of work in building – Standard units – Principles of working out quantities for detailed and abstract estimates – Methods of estimates of buildings – Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc

UNIT II ESTIMATE OF INFRASTRUCTURES 9

Estimation of septic tank, soak pit – Sanitary and water supply installations – Plumbing and water supply pipe line – Sewer line – Estimate of bituminous and cement concrete roads – Estimation of retaining walls – Culverts

UNIT III ANALYSIS OF RATES AND SPECIFICATIONS 9

Analysis of Rates: Purpose – Schedule of rates – Factors affecting rates – Importance – Materials for different items of work – Rates of materials and labour – Analysis of Rates for cement concrete, R.C.C., brick masonry, Stone masonry, Hollow block masonry, Plastering, Painting, Flooring, Road works, Sanitary Works, Water supply works and Electrical work. Specifications: Specifications – Purpose and basic principles – General and detailed specifications – Detailed specifications for various items of work

UNIT IV TENDER AND CONTRACTS 9

Tender: Tender notices – Types – Prequalification of contractors – Pre-bid meeting – Drafting – Model tenders – Procedure for submission and opening of tender – Acceptance and rejection of tender – Tender validity period – E-tendering. Contracts: Contract – Type of contract – Contract laws – FIDIC – Contract conditions – Drafting of contract documents – Arbitration and legal requirements

UNIT V VALUATION AND REPORT 9

Valuation: Necessity – Purpose of valuation – Types – Valuation methods – Market value – Scrap Value – Salvage value – Annuity - Capitalized value – Sinking fund – Depreciation – Value of building – Rent fixation – Mortgage – Lease. Report: Principles for report preparation – Report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Dutta B N, “Estimating and Costing in Civil Engineering”, 27th edition, UBS Publishers & Distributors Pvt. Ltd, Noida, 2016
2. Rangwala C, “Estimating, Costing and Valuation”, 17th edition, Charotar Publishing House Pvt. Ltd, Gujarat, 2017

REFERENCES:

1. Vazirani V N, Chandola S P, “Estimating and costing”, 6th edition, Khanna Publishers, Delhi, 2015
2. Chakraborti M, “Estimating Costing Specification and Valuation in Civil Engineering”, 24th edition, Jain Book, India, 2012
3. Standard schedule of rates and standard data book by Public Works Department

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Estimate of quantities for residential building and calculate the quantities for various items of work	Apply
CO2	Prepare a detailed estimate for different types of structures	Apply
CO3	Analyze the rates of work quantities and labour	Analyze
CO4	Analyze the different types of contracts, tender document for building	Analyze
CO5	Identify the different methods of valuation and summarize the estimate report for a work	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	1	2	2	2	-
CO2	3	3	2	-	-	-	-	-	-	1	2	2	2	-
CO3	3	3	2	-	-	-	-	-	-	1	2	2	2	2
CO4	3	-	-	-	-	-	-	-	-	1	2	2	2	2
CO5	3	-	-	-	-	-	-	-	-	1	2	2	2	2
CO	3	3	2	-	-	-	-	-	-	1	2	2	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER VII

U19CE703	COMPUTER AIDED ANALYSIS AND DESIGN LABORATORY	Category: PC			
		L	T	P	C
		0	0	4	2

PRE–REQUISITES:

- Structural Analysis I, Structural Analysis II, Design of RC Elements

COURSE OBJECTIVES:

- To analysis and design of various structural elements
- To analyse and design of arches, cables & suspension bridges

LIST OF EXPERIMENTS

1. Analysis and Design of Simply supported beam & Cantilever beam
2. Analysis and Design of Fixed beam & Propped Cantilever beam
3. Analysis and Design of Continuous beam
4. Analysis and Design of single storey & single bay rectangular vertical frames without sway
5. Analysis and Design of single storey & single bay rectangular vertical frames with sway
6. Analysis and Design of Multi-storey frame
7. Analysis and Design of trusses (Pratt, Warren, Lattice and North light Truss)
8. Analysis and Design of Two & Three hinged arches
9. Analysis and Design of Cantilever bridges
10. Analysis and Design of Suspension bridges & Short span bridges

Contact Periods:

Lecture: – Periods Tutorial: – Periods Practical: 60 Periods Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Analyze and design the various structural components	Analyze
CO2	Analyze and design the multi storey frame	Analyze
CO3	Analyze and design the steel trusses	Analyze
CO4	Analyze different types of arches	Analyze
CO5	Calculate forces on suspension bridges with stiffening girders	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO2	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO3	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO4	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO5	3	3	3	3	3	-	-	-	3	2	1	2	2	3
CO	3	3	3	3	3	-	-	-	3	2	1	2	2	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SEMESTER VII

U19CE704	MINI PROJECT	Category: PC			
		L	T	P	C
		0	0	2	1

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To develop the ability to identify and solve a specific in the field of Civil Engineering
- To train the students in preparing project reports and to face reviews and viva voce examination

STRATEGY

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 2 Periods Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Identify the leading problems related to Civil Engineering	Understand
CO2	Apply the principles in Civil Engineering	Apply
CO3	Involve in individual and team work with good oral, written and Graphical communications	Apply
CO4	Gain practical professional experience in Civil Engineering	Analyze
CO5	Analyze the solution for the problem identified in Civil Engineering	Analyze

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	2	2	2	2	1	3	3	1	3	2	2
CO2	3	1	1	2	2	2	2	1	3	3	1	3	2	2
CO3	3	1	1	2	2	2	2	1	3	3	1	3	2	2
CO4	3	1	1	2	2	2	2	1	3	3	1	3	2	2
CO5	3	1	1	2	2	2	2	1	3	3	1	3	2	2
CO	3	1	1	2	2	2	2	1	3	3	1	3	2	2
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SEMESTER VIII

U19CE801	PROJECT WORK	Category: PC			
		L	T	P	C
		0	0	20	10

PRE–REQUISITES:

- Mini Project

COURSE OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same
- To train the students in preparing project reports and to face reviews and viva voce examination

STRATEGY

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 20 Periods Total: 300 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Involve in individual and team work with good oral, written and Graphical communications	Apply
CO2	Apply the principles in Civil Engineering	Apply
CO3	Gain practical professional experience in Civil Engineering	Analyze
CO4	Investigate the leading problems related to Civil Engineering	Evaluate
CO5	Develop the solution for the problem identified in Civil Engineering	Create

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	2	2	2	3	3	2	3	3	3
CO2	3	2	2	3	2	2	2	2	3	3	2	3	3	3
CO3	3	2	2	3	2	2	2	2	3	3	2	3	3	3
CO4	3	2	2	3	2	2	2	2	3	3	2	3	3	3
CO5	3	2	2	3	2	2	2	2	3	3	2	3	3	3
CO	3	2	2	3	2	2	2	2	3	3	2	3	3	3
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP01	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Design of RC elements

COURSE OBJECTIVES:

- To understand the behavior of dynamic loading
- To introduce the basics of Earthquake Engineering
- To discuss codal provisions and their application on different types of structures

UNIT I INTRODUCTION AND SINGLE DEGREE OF FREEDOM SYSTEM 9

Introduction to structural dynamics – Importance of structural dynamics – Types of dynamic loads – Methodology of dynamic analysis – Single Degree of Freedom, Idealisation of structure as Single degree of freedom – Natural frequency – Viscous damping – Free and Forced vibration of damped and undamped structures – Response to harmonic and periodic forces

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM 9

Equation of motion for multiple degree of freedom – Eigen values and Eigen Vectors – Response to free and forced vibration of undamped and damped MDOF systems

UNIT III INTRODUCTION ABOUT EARTHQUAKE ENGINEERING 9

Basic Seismology – General features of Tectonics of Seismic Regions – Basic Terminology – Earthquake intensity and magnitude – Earthquake ground motion – Past Earthquakes – Seismographs

UNIT IV EARTHQUAKE RESPONSE 9

Earthquake Response to Elastic and Inelastic Buildings – Application to Response Spectrum Theory – Base excitation motion – Ground motion parameters – Modal response contribution – Modal participation factor – Response history – Spectral analysis – IS codal provisions for the determination of lateral loads

UNIT V DESIGN CONCEPTS 9

Seismic design concepts – Design spectrum – Earthquake resistant design for simple framed structures as per IS: 1893 codal provisions – Ductile detailing of reinforced concrete frames as per IS: 13920

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Anil K. Chopra., “Dynamics of Structures - Theory and applications to Earthquake Engineering”, Prentice - Hall of India Pvt. Ltd. New Delhi, 2005
2. Pankaj Agarwal., “Earthquake Resistant Design of Structures”, Prentice - Hall of India Pvt. Ltd. New Delhi, 2012

REFERENCES:

1. Mukhopadhyay, M., “Structural Dynamics”, Ane Books, India, 2006
2. Craig, R.R., and Andrew J.K. “Structural Dynamics - An Introduction to computer Methods”, John Wiley & Sons, 2006
3. Duggal, S.K., “Earthquake Resistant Design of Structures”, Oxford university press, 2007
4. Jaykrishna., “Elements of earthquake engineering”, Saritha Prakasan, Naunchandi, Meerut

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Explain the concepts of single degree of freedom with free vibration	Understand
CO2	Analyze the multi degree of freedom with free and forced vibration	Analyze
CO3	Apply the basics of Earthquake Engineering	Apply
CO4	Calculate the effect and response on the structure	Analyze
CO5	Interpret the suitable application of codal provisions	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	–	–	–	–	–	–	–	–	–	3	2
CO2	3	3	3	–	–	–	–	–	–	–	–	–	3	2
CO3	3	3	3	2	–	1	1	–	1	2	–	2	3	2
CO4	3	3	3	2	–	1	1	–	1	2	–	2	3	2
CO5	3	3	3	–	–	1	–	–	1	–	–	2	3	2
CO	3	3	3	2	–	1	1	–	1	2	–	2	3	2
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP02	PRESTRESSED CONCRETE STRUCTURES	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the basic principle and types of prestressing
- To design the prestressed concrete structural elements
- To understand the various time dependent factors

UNIT I INTRODUCTION **9**

Principles – Pretensioning – Post tensioning – Advantages and Types of prestressing – Systems of prestressing – Comparison of prestressed concrete with reinforced concrete – Materials – Characteristics of concrete and high tensile steel - Theory and behaviour of prestressed concrete beams in bending – calculating fibre stresses for various section (Rectangle, I, T) of simply supported beam due to prestressing force, dead load and external live load - Stress method – Moment of resistance method – Load balancing method. Losses of prestress – Estimation of crack width

UNIT II DESIGN FOR FLEXURE AND SHEAR **9**

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE **9**

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long-term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS **9**

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design

UNIT V MISCELLANOUS STRUCTURES **9**

Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing - Merits and demerits of partial prestressing

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Krishna Raju N, "Prestressed concrete", 6th Edition, Tata McGraw Hill Company, 2018.
2. Pandit G S and Gupta S P, "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012

REFERENCES:

1. Dayaratnam P, "Prestressed Concrete Structures", Oxford and IBH, 2013
2. Lin T Y and Ned H Burns, "Design of Prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., 2013
3. IS1343:1980, “Code of Practice for Prestressed Concrete, Bureau of Indian Standards”, New Delhi, 2012

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand about the general mechanical behaviour of prestressed concrete and analyse the section	Understand
CO2	Design the prestressed concrete member subjected to flexure and shear	Apply
CO3	Explain about anchorage zone stresses and design the anchorage reinforcement	Understand
CO4	Analyse the composite member for stresses and deflection	Analyze
CO5	Design the tension and compression member	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	1	-	-	-	1	-	2	-	-
CO2	3	2	3	-	-	1	-	-	-	1	-	2	-	1
CO3	3	2	3	-	-	1	-	-	-	1	-	2	-	1
CO4	3	2	3	-	-	1	-	-	-	1	-	2	-	1
CO5	3	2	-	-	-	-	-	-	-	1	-	2	-	1
CO	3	2	3	-	-	1	-	-	-	1	-	2	-	1
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP03	FOUNDATION ENGINEERING	Category: PE			
		L	T	P	E
		3	0	0	3

PRE–REQUISITES:

- Soil Mechanics

COURSE OBJECTIVES:

- To impart knowledge on site investigation
- To understand the type and behavior of soil
- To learn the different types of foundations

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Introduction – Methods of exploration – Depth and spacing of boreholes – Soil sampling – Samplers (split spoon, thin-wall, Stationary piston) – Penetration tests (SPT, SCPT) – Data interpretation - Strength parameters - Bore log report. Choice of foundation – Basic definitions – Requirements of foundation – Plate load test – Types of foundations

UNIT II SHALLOW FOUNDATIONS 9

Introduction – Depth of foundation – Codal recommendations – Bearing Capacity of shallow foundation – Types of failure – Terzaghi's theory, BIS formula Bearing Capacity from SPT, SCPT, and plate load test. Determination of Settlement of foundations on cohesive and cohesionless deposits – Total and differential settlements – Allowable settlement – Codal provision – Remedies to minimize total and differential settlements – Modulus of sub-grade reaction

UNIT III PILE FOUNDATIONS 9

Introduction – Types – Factors influencing the selection of pile – Static formulae, dynamic formulae (ENS & Hiley's), Correlations with SPT data – Negative skin friction – Pile load test - Uplift capacity - Group action of piles – Settlement of pile groups in sand and clays – Piled-raft concept

UNIT IV SPECIAL FOUNDATIONS 9

Introduction – Clay minerals – Identification of expansive soils – Swell pressure tests – Field conditions favor swelling – Causes & consequences of swelling & shrinkage – Design of foundation on expansive soils – Under-reamed piles – Concept of CNS layer – Problematic soils in India - Foundations for bridge piers, transmission towers, chimneys (theory only)

UNIT V EARTH PRESSURE 9

Introduction – Earth pressure – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Critical failure plane – Earth pressure on retaining walls of simple configurations – Stability analysis of retaining walls – Codal provisions – Effect of excavation – Effect of lateral spreading and tunneling on adjacent foundations.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Ranjan, G., Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International P. Ltd., Publishers, New Delhi, 3rd Edition, 2016
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017
3. Swamy Saran, "Analysis and Design of Substructures", Oxford and IBH Publishing Co. P. Ltd., 2006

REFERENCES:

1. Das, B.M., “Principles of Foundation Engineering”, Cengage Learning, 8th Edition, 2014
2. Bowles, J.E., “Foundation Analysis and Design”, McGraw Hill Education, 5th Edition, 2015
3. Varghese, P.C., “Design of Reinforced Concrete Foundations”, PHI Learning P. Ltd., New Delhi, 2009

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the concept of site investigation, methods and soil sampling	Understand
CO2	Apply the theoretical knowledge to compute final bearing capacity and settlement for shallow foundations	Apply
CO3	Examine the load carrying capacity of pile and design of pile as per coding provision	Analyze
CO4	Inspect field problems and implement solutions on expansive soils	Analyze
CO5	Analyse the earth retaining structures	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	1	-	1	3	3
CO2	3	3	1	-	-	1	-	-	-	1	-	-	-	3
CO3	3	3	1	-	-	1	-	-	-	1	-	-	-	3
CO4	3	2	-	-	-	-	1	-	-	1	-	1	3	3
CO5	3	2	1	-	-	-	1	-	-	1	-	-	-	3
CO	3	2	1	-	-	1	1	-	-	1	-	1	3	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP04	PREFABRICATED STRUCTURES	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Prestressed Concrete Structures, Design of RC elements

COURSE OBJECTIVES:

- To understand the principles of prefabrication
- To identify the economical sections and different type of joints
- To design prefabricated component and structural connections

UNIT I INTRODUCTION **9**

Need for prefabrication – Principles - comparison of precast construction method and in-situ method – Materials – Modular coordination – Standardization - Systems – Production – Transportation – Erection

UNIT II PREFABRICATED COMPONENTS **9**

Behavior of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT III DESIGN PRINCIPLES **9**

Design of Structural components- Disuniting of structures - Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation

UNIT IV JOINT IN STRUCTURAL MEMBERS **9**

Joints for different structural connections – Dimensions and detailing – Design of expansion joints - Jointing Materials

UNIT V DESIGN FOR ABNORMAL LOADS **9**

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994

REFERENCES:

1. Joseph A. Edminister, Mahmood Nahvi, “Electric Circuits”, 5th edition, Schaum’s outline series, Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009
3. IS: 15916 -2011, Building Design and Erection using Prefabricated Concrete – Code of Practice
4. IS 11447:1985 - Code of practice for construction with large panel prefabricates

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Explain the details of production, transportation and erection of prefabrication systems	Understand
CO2	Understand the behaviour and construction sequence of prefabricated slabs, walls and columns	Understand
CO3	Design the economical cross section of prefabricated structures	Understand
CO4	Identify the different types of connections between structural members	Apply
CO5	Understand the concept of progressive collapse	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	-	2	-	2	2
CO2	3	3	2	-	-	-	-	-	-	-	2	-	2	2
CO3	3	3	3	-	-	-	-	-	-	-	2	-	2	2
CO4	3	3	2	-	-	-	-	-	-	-	2	-	2	2
CO5	3	2	2	-	-	-	-	-	-	-	2	-	2	2
CO	3	2	2	-	-	-	-	-	-	-	2	-	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP05	REPAIR AND REHABILITATION OF STRUCTURES	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Concrete Technology

COURSE OBJECTIVES:

- To study the available techniques adapted for repairing structure
- To understand the damage assessment, repair and rehabilitation of structures
- To obtain knowledge on quality of concrete, durability aspects, corrosion and causes of deterioration in structures.

UNIT I MAINTENANCE AND EVALUATION 9

Facets and categories of maintenance – Procedure for evaluating damaged structure – Condition assessment of concrete structures under exposure conditions – Visual survey, on-site and laboratory testing – Non-destructive tests (NDT) – Inspection and monitoring – Quality assurance of concrete –Case studies

UNIT II CRACKS AND DETERIORATION OF STRUCTURES 9

Cracks: Types and causes of cracks – Characteristics of cracks – Measurement and interpretation of cracks – Crack repair and ceiling
Deterioration: Types of deterioration – Physical deterioration – Chemical deterioration – Deterioration due to water leakage, fire and ageing – Visual deterioration of structures

UNIT III SPECIAL CONCRETES AND REPAIR MATERIALS 9

Special Concretes: Smart concrete – Glass reinforced concrete – Fiber reinforced concrete – Translucent Concrete – Bendable concrete – Graphic Concrete – Mass concrete – Lightweight Concrete – Self compacting Concrete – Concrete made with industrial wastes

Repair Materials**:** Criteria for durable concrete repair – Selection of repair materials – Different types of repair materials and their application – Repair techniques – Case studies

UNIT IV CORROSION 9

Introduction – Various forms of Corrosion – Corrosion of steel in concrete – Corrosion Inhibitors - Corrosion Resistant Steels – Coatings to Reinforcement – Cathodic Protection – Corrosion control and protection of concrete structures

UNIT V RETROFITTING OF STRUCTURES 9

Design philosophy of strengthening structures – Conventional and advanced techniques – Repair of structures distressed due to corrosion, fire, leakage, earthquake – SHM (Structural Health monitoring) – Advanced techniques to enhance the seismic resistance of structures – Demolition – Case Studies

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Shetty. M. S, “Concrete Technology-Theory and Practice”, Chand and Company Publishers, 2018
2. Varghese. P.C, “Maintenance Repair and Rehabilitation & Minor works of building”, Prentice Hall India Private Ltd, 2014
3. Dodge Woodson. R, “Concrete Structures - Protection, Repair and Rehabilitation”, Butterworth-Heinemann, Elsevier, New Delhi 2012

REFERENCES:

1. Vidivelli .B, “Rehabilitation of Concrete Structures”, Standard Publishers Distribution, 2009
2. Handbook on “Seismic Retrofit of Buildings”, CPWD and Indian Buildings Congress, Narosa Publishers, 2008
3. Handbook on “Repair and Rehabilitation of RCC Buildings”, Director General works CPWD, Govt of India, New Delhi, 2002

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Recognize physical investigation and suggest approaches to repair the damaged structure	Remember
CO2	Identify the cracks and deterioration of concrete in structures	Understand
CO3	Apply suitable materials for repair and rehabilitation of structures	Apply
CO4	Understand the corrosion mechanism and its protection from concrete structures	Understand
CO5	Implement techniques for retrofitting and strengthening of structural elements	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	2	1	-	-	-	2	-	1	2
CO2	3	2	2	-	-	-	1	-	-	-	2	-	1	2
CO3	3	2	2	-	-	-	1	-	-	2	2	-	1	2
CO4	3	2	-	-	-	2	1	-	-	-	-	-	1	2
CO5	3	2	-	-	-	-	-	-	-	2	2	-	1	2
CO	3	2	2	-	-	2	1	-	-	2	2	-	1	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP06	STRUCTURAL DESIGN AND DRAWING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Design of RC Elements
- Design of steel structures

COURSE OBJECTIVES:

- To provide a solid background on the principles of structural engineering design
- To gain knowledge on designing and detailing of retaining walls, flat slabs and liquid retaining structures
- To acquire the knowledge on designing and detailing of bridge components and industrial structures

UNIT I RETAINING WALLS 9

Reinforced concrete Cantilever and Counter fort retaining walls – Horizontal backfill with surcharge – Design of shear Key – Design and Drawing

UNIT II FLAT SLAB AND BRIDGES 9

Design of Flat slabs with and without drops by direct design method of IS code – Design and drawing – IRC specifications and loading – RC Solid slab bridge – Steel foot-over bridge – Design and Drawing

UNIT III LIQUID STORAGE STRUCTURES 9

RCC water tanks – On ground, Elevated Circular, Underground Rectangular Tanks – Hemispherical bottomed steel water tank – Design and Drawing

UNIT IV INDUSTRIAL STRUCTURES 9

Structural steel framing – Steel roof trusses – Roofing elements – Beam columns – Codal provisions – Design and Drawing

UNIT V GIRDERS AND CONNECTIONS 9

Plate girders – Behaviour of components – Deign of welded Plate Girder – Design of Industrial Gantry Girders – Design of Eccentric Shear and Moment Resisting Connections

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

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

REFERENCES:

1. Krishnamurthy D., “Structural Design and Drawing”, Vol. I, II and III, CBS Publishers, 2010
2. Duggal S.K., “Limit State Design of Steel Structures”, McGrew Hill Education, 2017

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Design and draw reinforced concrete cantilever and counter fort retaining walls	Apply
CO2	Design and draw flat slab and reinforced concrete solid slab bridge as per codal provisions	Apply
CO3	Design and draw reinforced concrete and steel water tanks	Apply
CO4	Design and detail various steel roof trusses	Apply
CO5	Design and detail plate girders and industrial gantry girders	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	2	-	-	3	2	-	2	2	2
CO2	3	3	2	3	3	2	-	-	3	2	-	2	2	2
CO3	3	3	2	2	3	2	-	-	3	2	-	2	2	2
CO4	3	3	2	2	3	2	-	-	3	2	-	2	2	2
CO5	3	3	2	2	3	2	-	-	3	2	-	2	2	2
CO	3	3	2	2	3	2	-	-	3	2	-	2	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP07	AIR POLLUTION AND MANAGEMENT	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To discuss the types of air pollutants, source, characteristics and the effects of air and noise pollution
- To expose the various Air Pollution dispersion models and control measures
- To impart knowledge on the principle and design control of Indoor/ particulate/ gaseous air pollutant and its emerging trends

UNIT I SOURCE AND EFFECTS OF AIR POLLUTANTS 9

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Effects of air pollution on human beings, materials, vegetation, animals – Global warming – Ozone layer depletion, Sampling and analysis of pollutants

UNIT II DISPERSION OF POLLUTANTS 9

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications – Emission Standards: Types, Variant Forms of emission standards, means for implementing emission Standards

UNIT III AIR POLLUTION CONTROL 9

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment – Gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries – Engineering control concepts: Process Change, Fuel change, Pollution removal, Disposal of pollutants, Pollution prevention and case studies

UNIT IV AIR QUALITY MANAGEMENT 9

Air Quality Criteria and Standards: Air Quality Criteria, Conversion of effects data, Conversion of Physical data, Conversion of biological data and criteria to standards – Air quality monitoring – Preventive measures – Air pollution control efforts – Zoning – Ambient Air Pollutants: Analysis and measurement of particulates and gaseous pollutants – Indoor air pollutants – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment

UNIT V NOISE POLLUTION 9

Sources of noise pollution – Effects – Assessment – Standards – Control methods – Prevention – Air and noise pollution modelling software

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Yerramilli, Anjaneyulu., “Air Pollution: Prevention and Control Technologies”. India, BS Publications, 2019
2. Rao C.S., “Environmental Pollution Control Engineering”. India, New Age International (P) Limited, 2020
3. “Air Pollution: Sources, Impacts and Controls”. United Kingdom, CAB International, 2019

REFERENCES:

1. Cheremisinoff, Paul N, “Air Pollution Control and Design for Industry”. United States, CRC Press, 2018
2. Bhatia S. C., “Industrial Pollution and Its Control” (2 Vol). India, Woodhead Publishing India Pvt Limited, 2017
3. Vallero, Daniel A., “Fundamentals of Air Pollution”. Netherlands, Elsevier Science, 2014
4. De Visscher, Alex, “Air Dispersion Modeling: Foundations and Applications”. Germany, Wiley, 20 13

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Categorize the various type of Air Pollutants coming out from different sources	Understand
CO2	Demonstrate dispersion of pollutants, meteorological factors and dispersion models	Apply
CO3	Choose appropriate control equipment to minimize the air pollution problems in industries	Understand
CO4	Analyse and manage the major air pollutants in the ambient air	Analyze
CO5	Identify appropriate measures to noise pollution problems	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	–	2	–	–	1	1	–	–	1	–	2	2	–
CO2	3	2	2	–	–	1	1	–	1	1	–	2	2	–
CO3	3	2	2	–	–	1	1	–	–	1	1	2	2	2
CO4	3	2	2	–	–	1	1	–	1	1	1	2	2	2
CO5	3	2	2	–	1	1	1	–	–	1	1	2	2	2
CO	3	2	2	–	1	1	1	–	1	1	1	2	2	2
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP08	INDUSTRIAL WASTE WATER ENGINEERING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To discuss the source and characteristics of Industrial wastewater
- To deliberate the Preliminary treatment of industrial wastewater from different industries
- To provide knowledge on disposal options for specific pollutants arising out of industrial processes

UNIT I INTRODUCTION 9

Basic theories of industrial wastewater management – Sources of pollution – Physical, Chemical, Organic & Biological properties of industrial Wastes – Difference between industrial & municipal wastewater – Effects of industrial effluents on sewers and Natural water Bodies – Inplant survey – Composite sampling – Tolerance limits for effluent discharges into inland surface water's public sewers and on land for irrigation – Standards

UNIT II VOLUME AND STRENGTH REDUCTION 9

Pre & Primary Treatment – Equalization, Proportioning, Neutralization, recovery and recycling of waste products and bye products, Oil separation by Floating – Waste reduction – Volume reduction–Strength reduction – Joint treatment of industrial wastes and domestic sewage – Discharge into water bodies, consequent problems

UNIT III CHARACTERISTICS AND COMPOSITION 9

Characteristics and Composition of wastewater and Manufacturing Processes of Industries like Sugar, Distilleries, Dairy, Textiles, Tanneries, fertilizer, Food processing Industries, Steel, and Petroleum refineries – Case studies

UNIT IV TREATMENT OF INDUSTRIAL WASTE 9

Waste Treatment Methods – Nitrification and De–nitrification – Phosphorous removal – Heavy metal removal – Membrane Separation Process – Special Treatment Methods – Disposal of treated wastewater

UNIT V COMBINED TREATMENT 9

Common Effluent Treatment Plants (CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Karia G. L, Christian R, "Wastewater Treatment: Concepts and Design Approach" India: PHI Learning, 2013
2. Tchobanoglous G, Burton F. L, Stensel H. D, "Wastewater Engineering: Treatment and Resource Recovery", United Kingdom: McGraw–Hill Education, 2014
3. Metcalf & Eddy, "Wastewater Engineering: Treatment and reuse". Tata McGraw–Hill, 2015

REFERENCES:

1. Rao C. S, "Environmental Pollution Control Engineering". India, New Age International, 2007

2. Qasim Syed R, “Wastewater Treatment Plants: Planning, Design, and Operation”, Second Edition. United States, CRC Press, 2017
3. Bhatia S. C, “Industrial Pollution and Its Control” (2 Vol) India, Woodhead Publishing India Pvt Limited, 2017
4. Bhatia B. S, “A Comprehensive Book on Industrial Waste and Its Management” The Readers Paradise, 2020

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Identify the properties of industrial wastewater	Understand
CO2	Interpret the industrial process, water utilization and waste reduction	Understand
CO3	Examine the characteristics and composition of industrial wastewater	Understand
CO4	Choose appropriate treatment method for industrial wastewater	Analyze
CO5	Design the effluent treatment plant for any industry	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	–	–	–	1	–	–	1	1	2	2	–
CO2	3	2	2	–	–	–	1	–	–	1	1	2	2	–
CO3	3	2	2	–	–	–	1	–	–	1	1	2	2	2
CO4	3	2	2	–	–	–	1	–	–	1	1	2	2	2
CO5	3	2	2	–	–	–	1	–	–	1	1	2	2	2
CO	3	2	2	–	–	–	1	–	–	1	1	2	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP09	MUNICIPAL SOLID WASTE MANAGEMENT	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire knowledge on the reduction, segregation and storage of wastes at source
- To study the importance of transfer stations and processing technologies for resource recovery
- To enumerate and describe different disposal and treatment methods for municipal solid waste

UNIT I SOURCES AND TYPES 9

Sources and types of municipal solid waste – Waste generation rates – Factors affecting generation, composition, characteristics – Methods of sampling – Effects of improper disposal of solid wastes – Public health and environmental effects – Elements of solid waste management – Municipal solid waste rules – Role of NGO's, EPA

UNIT II SOURCE REDUCTION, WASTE STORAGE AND RECYCLING 9

Source reduction of waste – Reduction, Reuse, Recycling and Recover – Segregation of wastes at source – Onsite storage methods – Materials used for containers – public health & economic aspects of storage - Case studies under Indian conditions

UNIT III COLLECTION AND TRANSFER 9

Methods of Collection – types of vehicles – Vehicle time management - Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions

UNIT IV PROCESSING OF WASTES 9

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions

UNIT V WASTE DISPOSAL 9

Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas – Landfill bioreactor – Dumpsite Rehabilitation

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

TEXT BOOKS:

1. William, A. Worrell., P. Aarne Vesilind., "Solid Waste Engineering", Cengage Learning, 2012
2. John Pitchel., "Waste Management Practices-Municipal, Hazardous and industrial", CRC Press, Taylor and Francis, New York, 2014
3. Ramachandra, T. V., "Management of Municipal Solid Waste", TERI Press, New Delhi, 2009

REFERENCES:

1. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation", Government of India, New Delhi, 2014
2. George Tchobanoglous and Frank Kreith., "Handbook of Solid waste management", McGraw Hill, New York, 2002

3. Marc J. Rogoff and Francois Screve., “Waste to Energy Technologies and Project Implementation”, Second Edition, Noyes Publication, USA, 2011

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Classify the sources and types of municipal solid wastes	Understand
CO2	Understand the on-site storage methods and its processes in solid waste management	Understand
CO3	Explain the methods of collection involved in solid waste management	Understand
CO4	Demonstrate the off-site processing techniques in solid waste management	Understand
CO5	Summarize the various disposal methods of solid wastes	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	2	1	-	-	1	-	-	-	-
CO2	3	-	-	-	-	2	1	-	-	1	-	1	2	-
CO3	3	-	-	-	-	2	1	-	-	1	-	1	2	-
CO4	3	-	-	-	-	2	1	-	-	1	-	-	-	-
CO5	3	-	-	-	-	2	1	-	-	1	-	1	2	1
CO	3	-	-	-	-	2	1	-	-	1	-	1	2	1
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP10	HYDROLOGY	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the science that deals with the waters
- To determine the methods of precipitation and flood routing
- To identify the types of aquifer and methods of artificial recharge

UNIT I INTRODUCTION TO HYDROLOGY **9**

Definition and scope – hydrologic cycle – Hydrometeorology – Indian Monsoon system – Types and forms of precipitation – Adequacy of rain gauges – Recording and Non-recording rain gauges

UNIT II HYDROLOGIC PROCESS **9**

Estimation of missing rainfall data – Mean precipitation over an area – Frequency analysis – Rainfall hyetograph – Rainfall mass curve – Double mass curve techniques. Estimation and measurement of Evaporation – Evapotranspiration and Infiltration

UNIT III HYDROGRAPHS **9**

Definition of runoff – factors affecting runoff and its components – Hydrograph analysis – Components of hydrograph – Methods of base flow separation – Unit hydrograph and Stream flow measurements

UNIT IV FLOODS AND FLOOD ROUTING **9**

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

UNIT V GROUND WATER HYDROLOGY **9**

Definition and types of aquifer – Darcy’s law, Methods of artificial recharge - Dupuit‘s assumptions – Confined Aquifer – Unconfined aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Subramanya. K, “Engineering Hydrology”, Tata McGraw Hill, New Delhi, 2013
2. Jayaram Reddy.P, “Hydrology”, Tata McGraw Hill, New Delhi, 2011
3. Ragunath.H, “Hydrology”, Wiley Eastern Limited, New Delhi, 2010

REFERENCES:

1. Chow V T and Maidment, “Hydrology for Engineers”, McGraw Hill Inc., Ltd., 2000
2. VenTe Chow, “Hand book of Applied Hydrology”, McGraw Hill Book Co., Inc., New York, 1964
3. Singh V P, “Hydrology”, McGraw Hill Inc., Ltd., 2000

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Explain the importance of Hydrological cycle and the measurement and analysis of rainfall data.	Understand
CO2	Estimate the losses in evaporation, evapotranspiration and infiltration for a catchment area	Understand
CO3	Compute the quantity of runoff generated from a catchment	Apply
CO4	Infer the concept of hydrological extremes such as Flood and Drought and management strategies	Apply
CO5	Apply the concepts of groundwater for water resources management	Apply

COURSE ARTICULATION MATRIX:

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

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PROFESSIONAL ELECTIVE

U19CEP11	IRRIGATION ENGINEERING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Water Supply and Waste Water Engineering

COURSE OBJECTIVES:

- To understand the basic types of irrigation, irrigation standards and crop water assessment
- To describe various types of hydraulic structure including dams, spillways and dissipaters
- To design the components of irrigation canal including canal drops and cross drainage works

UNIT I IRRIGATION PRACTICES 9

Need for Irrigation in India – Scope, National Water Policy – Physical properties of soil that influence soil moisture characteristics – Concept of soil water potential and its components, Crop water requirements – Irrigation Scheduling – Irrigation efficiencies – Duty – Delta – Base period – Surface and Subsurface methods of Irrigation – Standards for irrigation water – Water logging and consequences – Salinity and alkalinity - Reclamation

UNIT II IRRIGATION METHODS 9

Systems of irrigation – Irrigation and its types: Gravity irrigation – Lift irrigation – Well irrigation – Tube well irrigation – Infiltration galleries – Sewage irrigation – Supplemental irrigation – Advantages and disadvantages of irrigation – Environmental impacts of irrigation

UNIT III DAMS 9

Necessity of storage reservoirs – Types of dams – Earthen dams: types – Description – Causes of failure and protection measures – Gravity dam – Types – Description – Causes of failure and protection measures – Spillways – Types – Description – Causes of failure and protection measures

UNIT IV DIVERSION AND IMPOUNDING STRUCTURES 9

Introduction – Types of diversion head work – Causes of failure – Bligh's, Lane's and Khosla's theories – Design of glacis weir – Design of vertical weir – Silt control devices – Appurtenances – Fish ladder, divide wall, under & scouring sluices, canal head regulator

UNIT V CANAL IRRIGATION 9

Classification of canals – Alignment of canals – Design of rigid boundary canals Lacey's and Tractive force concepts in canal design, lining of canals –Design procedure for -Canal regulators – River Training works - Canal drops – Cross drainage works – Canal Outlet-Escapes, Lining and maintenance of canals

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Punmia B.C and Pande B.B Lal, "Irrigation and Water Power Engineering", 16th edition, Laxmi Publications (P) Ltd, New Delhi, 2016
2. Santhosh Kumar Garg, "Irrigation Engineering and Hydraulic Structures", 19th edition, Khanna Publishers Pvt. Ltd, New Delhi, 2013

REFERENCES:

1. Punmia B. C., Ashok Kumar Jain., Arun Kumar Jain and Pande Brij Basi Lal, "Irrigation and Water Power Engineering", 16th edition, ", Laxmi Publications (P) Ltd, New Delhi, 2012

2. Sharma R K and Sharma T K, “Irrigation Engineering”, S. Chand and company, New Delhi, 2007
3. Asawa G L, “Irrigation and Water Resources Engineering”, New Age International Publishers, New Delhi, 2005

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Find the quality of irrigation water and frequency of irrigation for various crops	Apply
CO2	Identify and apply the appropriate irrigation methods	Understand
CO3	Design the principles of gravity and earth dams and their component parts	Apply
CO4	Classify the canals and design the impounding structures for irrigation purpose	Apply
CO5	Understand the functions of regulating and cross drainage works	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	-	2	-	-	-	-	-	2	-	-
CO2	3	-	-	3	-	2	2	-	-	-	-	-	-	2
CO3	3	2	3	-	-	2	2	-	2	-	-	-	2	2
CO4	3	-	3	-	-	2	-	-	2	-	-	-	2	2
CO5	3	-	3	-	-	2	-	-	2	-	-	-	2	2
CO	3	2	3	-	-	2	2	-	2	-	-	2	2	2
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP12	CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To create awareness of the various construction techniques and practices
- To identify the equipment needed for different types of construction activities
- To understand the methods and techniques involved in demolition of structures

UNIT I SUB STRUCTURE CONSTRUCTION 9

Box jacking – Pipe jacking – Diaphragm wall – Cofferdam – Piling techniques – Caisson – Cable anchoring and grouting – Dewatering for underground open excavation

UNIT II SUPER STRUCTURE CONSTRUCTION 9

Vacuum dewatering of concrete flooring – Continuous concreting operation techniques – Erection techniques – Launching techniques – Pre-stressing – Aerial transporting

UNIT III CONSTRUCTION PRACTICES 9

Sequence of activities in construction – Bond in masonry – Damp proof course – Construction joint – Centering – Shuttering – Scaffolding – Bar bending – Temporary shed – Water proof – Roof finish – Acoustic and fire protection

UNIT IV EQUIPMENT IN CONSTRUCTION 9

Equipment for earthwork – Foundation work –Material handling equipment – Concreting – Dredging, trenching and tunneling

UNIT V DEMOLITION OF STRUCTURES 9

Demolition techniques – Machines – Explosives – Robotic Machines – Demolition Sequence – Dismantling Techniques – Safety Precautions

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Sankar, S.K., and Saraawati, S., “Construction Technology”, Oxford University press, New Delhi, 2008.
2. Peurifoy, R.L., Clifford J. Schexnayder, Aviad Shapira., "Construction Planning, Equipment and Methods", McGraw Hill Education, 2010.
3. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.

REFERENCES:

1. Deodhar, S.V., “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 2012.
2. Velumani, P., “Construction Techniques and Practices”, SIA Publishers & Distributers Pvt Ltd, 2020.
3. Sharma S.C., “Construction Equipment and Management”, Khanna Publishers New Delhi, 2019.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Explain the techniques involved in substructure construction	Understand
CO2	Explain the techniques involved in superstructure construction	Understand
CO3	Outline the construction practices involved in site	Understand
CO4	Compare the different equipments used in construction for various activities	Understand
CO5	Identify the demolition methods, sequence and safety precaution involved in demolishing the building	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	2	-	2	-	3	3	3	3	-	-
CO2	2	-	-	-	2	-	2	-	3	3	3	3	-	-
CO3	2	-	-	-	2	-	2	-	3	3	3	3	-	-
CO4	2	-	-	-	2	-	2	-	3	3	3	3	-	-
CO5	2	-	-	-	2	-	2	-	3	3	3	3	-	-
CO	2	-	-	-	2	-	2	-	3	3	3	3	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP13	CONSTRUCTION PLANNING AND SCHEDULING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To give an overview about construction planning
- To know about scheduling techniques and monitoring of cost control in construction
- To learn about management of quality, safety and organization

UNIT I CONSTRUCTION PLANNING 9

Basic concepts in the development of construction plans – choice of technology and construction method – Defining work tasks – Defining precedence relationships among activities – Estimating activity durations – Estimating resource requirements for work activities – Coding systems

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 9

Construction Schedules – Critical Path Method – PERT method – Work breakdown schedule – Scheduling calculations – float – presenting project schedules – Scheduling for Activity – on – Node and with leads, lags, and windows – Scheduling with resource constraints and precedence – Use of advanced scheduling techniques – Scheduling with uncertain durations – Calculations for Monte Carlo schedule simulation – Crashing and time/Cost trade-offs – Improving the scheduling process

UNIT III COST CONTROL, MONITORING AND ACCOUNTING 9

Cost control problem – Project budget – Forecasting for activity cost control – Sources of fund financial accounting systems and cost accounts – control of project cash flows – Schedule control – Schedule and budget updates – Relating cost and schedule information

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety concerns in Construction – Organizing for quality and safety – Work and Material Specifications – Total Quality Control – Quality Control by Statistical methods – Statistical Quality Control with sampling by attributes – Statistical Quality Control with sampling by variables – Safety Standards

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information – Accuracy and use of information – Computerized organization and use of information – Organizing information in databases – Relational model of databases – Other conceptual models of databases – Centralized Database Management Systems – Databases and applications programs – Information Transfer and Flow

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Virendra Kumar Paul, “A handbook for Construction Project Planning and Scheduling”, Copal Publishing Company Ltd, 2017
2. Jimmie Hinze, “Construction Planning and Scheduling”, Pearson Publishing Company Ltd., 2013

REFERENCES:

1. Thomas E. Glavinich, “Construction Planning and Scheduling”, University of Kansas, second edition, 2017

2. Halpin, D. W., “Financial and Cost Concepts for Construction Management”, John Wiley & Sons, New York, 2009
3. Chitkara, K.K., “Construction Project Management Planning, Scheduling and Controlling”, Tata McGraw Hill Publishing Company Ltd., 2008

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Identify the choice of technology and construction method through construction planning	Understand
CO2	Know how to identify techniques and preparing the procedures in scheduling	Understand
CO3	Enable them to comprehend the fundamentals of contract administration, costing and budgeting	Understand
CO4	Make them capable to analyze and appreciate contemporary project management tools	Analyze
CO5	Study the information and accuracy of construction projects	Remember

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	2	-	2	1	-	3	3	-	3	1	-	-
CO2	1	3	2	3	2	1	-	3	3	-	3	1	1	1
CO3	1	-	2	-	2	1	-	3	3	3	3	1	1	1
CO4	1	3	2	3	2	1	-	3	3	-	3	1	1	1
CO5	1	-	2	3	2	1	-	3	3	3	3	1	1	1
CO	1	3	2	3	2	1	-	3	3	3	3	1	1	1
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP14	SAFETY ENGINEERING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To give an overview about the safety considerations
- To study safety aspects in various construction areas and protective measures
- To gain knowledge in equipment safety and fire safety

UNIT I PRE-CONSTRUCTION CONSIDERATIONS 9

Planning and scheduling – On-site safety – Basic checklist – Pre contract activities – Pre construction meeting – Underground electrical hazards – Risk assessment for construction

UNIT II CONSTRUCTION PROTECTIVE MEASURES 9

Basic personal protective equipment and clothing – Foot protection, Head protection, Hearing protection – Trenches and excavations – General requirements, Sloping and shoring requirements – Additional excavation requirements – Working with heights

UNIT III HEIGHT WORKS 9

Safe access and egress – Safe use of ladders – Scaffoldings, requirement for safe work platforms, stairways, gangways and ramps – Fall prevention and fall protection, safety belts, safety nets, fall arrestors, controlled access zones, working on fragile roofs, work permit systems – Erection of structural frame work, road works, safety in high rise construction

UNIT IV TRUSSES AND ROOF WORK 9

Trusses – Instruction for truss installers, Truss erection Roof Work – Roof Jacks and toe – Holds (Slide guards) Scaffolds – Guardrails for scaffolds Toe boards for scaffolds – Wood scaffold erection guidelines – Design and erection requirements for job – Constructed wood scaffolds Scaffold planks – Other types of scaffolds, Ladder – Jack scaffolds Trestle scaffolds, Shore and lean – to scaffolds – Rolling scaffolds

UNIT V EQUIPMENT SAFETY AND DEMOLITION 9

Electrical power tools and records, Safe work procedures - Safe assembly point-Hand tool ergonomics -Factors affecting tool use - Crane safety - Safe work procedures - demolition-demolition techniques - Fire hazards and preventing methods, implosion

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Patrick X.V. Zou., “Strategic Safety Management in Construction and Engineering” John Wiley &Sons Publications, 2015
2. Allen St John Hot., “Construction Safety” John Wiley &Sons Publications, 2005

REFERENCES:

1. J Grimaldi Simonds., “Safety Management” AITBS Publishers, New Delhi 2001
2. Louis J. Di Berardinis., Handbook of occupational safety and health, Wiley Publications, 1999
3. V.J. Davies. K. Tomasin., “Construction Safety Handbook” 1996

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Explain the concepts of preconstruction considerations	Understand
CO2	Understand the basic safety measures in construction	Understand
CO3	Identify the safety aspects in height works	Understand
CO4	Study the safety aspects in truss and roof area	Remember
CO5	Understand the equipment safety procedures	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	3	2		3	-	3	3	-	2	-	-	-
CO2	1	-	3	2	2	3	-	3	3	-	2	-	3	2
CO3	1	-	3	2	2	3	-	3	3	-	2	-	3	2
CO4	1	-	3	2	2	3	-	3	3	-	2	-	3	2
CO5	1	-	3	2	2	3	-	3	3	-	2	-	3	2
CO	1	-	3	2	2	3	-	3	3	-	2	-	3	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP15	QUALITY ASSURANCE AND CONTROL	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To give an overview about the quality management and systems
- To study quality control systems
- To gain knowledge in quality improving techniques

UNIT I QUALITY MANAGEMENT 9

Introduction – Definitions and objectives – Factor influencing construction quality – Responsibilities and authority – Quality plan – Quality management guidelines – Quality circles

UNIT II QUALITY SYSTEMS 9

Introduction – Quality system standard – ISO 9000 family of standards – Requirements – Preparing quality system documents – Quality related training – Implementing a quality system – six sigma process – lean sigma process – Third party certification

UNIT III QUALITY PLANNING 9

Quality policy, Objectives and methods in construction industry – Consumers satisfaction, Ergonomics – Time of completion – Statistical tolerance – Taguchi"s concept of quality – Codes and standards – Documents – Contract and construction programming – Inspection procedures – Processes and products – Total QA / QC program and cost implication

UNIT IV QUALITY ASSURANCE AND CONTROL 9

Objectives – Regularity agent, Owner, design, contract and construction-oriented objectives, Methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, Factors Influencing construction quality – Critical, major failure aspects and Failure mode analysis – Stability methods and tools, Optimum design – Reliability testing, Reliability coefficient and reliability prediction

UNIT V QUALITY IMPROVEMENT TECHNIQUES 9

Selection of new materials – Influence of drawings, detailing, specification, standardization – Bid preparation – Construction activity, Environmental safety, Social and Environmental factors – Natural causes and speed of Construction – Life cycle costing – Value engineering and Value analysis

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Abdul razzak rumane., "Quality Management in construction projects" Taylor and Francis group Pvt Ltd., 2016
2. Dale H Besterfield., "Total Quality Management" Pearson Publishing Company Ltd., 2011

REFERENCES:

1. Steve McCabe., "Quality Improvement Techniques in Construction", Addison Wesley Longman Ltd, England, 1998
2. John L. Ashford., The Management of Quality in Construction, E & F.N. Spon, 1989

3. J.W., Hand *Book* of Management Consulting Services, McGraw Hill, New York, 1986

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the concepts of Quality management	Understand
CO2	Understand the concepts in quality management system.	Understand
CO3	Study about the Feasibility in planning and quality procedures	Understand
CO4	Identify the quality assuring and control systems	Analyze
CO5	Understand quality techniques to be followed in improving the construction field	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	2	2	3	-	3	2	3	2	2	-	-
CO2	1	2	-	2	2	3	-	3	2	3	2	2	-	-
CO3	1	-	3	2	2	3	-	3	2	3	2	2	2	3
CO4	1	2	-	2	2	3	-	3	2	3	2	2	2	3
CO5	1	-	3	2	2	3	-	3	2	3	2	2	2	3
CO	1	2	3	2	2	3	-	3	2	3	2	2	2	3
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP16	BUILDING SERVICES	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge on building services
- To know the various types of mechanical and electrical services
- To understand the importance of fire protection and green buildings

UNIT I INTRODUCTION TO BUILDING SERVICES 9

Definitions – Objective and uses of services – Applications of services for different types building – Classification of building services – Types of services and selection of services – Natural and artificial lighting – Principles and factors – Arrangement of luminaries, Distribution of illumination factors – Necessity of Ventilation – Types – Natural and Mechanical – Factors to be considered in the design of Ventilation

UNIT II ELECTRICAL SERVICES AND LAYOUT 9

Electrical services in the building – Technical terms and symbols for electrical installations and accessories of wiring – Systems of wiring like wooden casing, cleat wiring, CTS wiring conduit wiring – Types of insulation – Electrical layout for residence, small work shop, show room, school building etc.,

UNIT III MECHANICAL SERVICES IN BUILDINGS 9

Introduction of mechanical services – Lift – Definition, Types of Lifts, Design Considerations – Air Conditioning – Definition, Purpose, Principles, Temperature Control, Air Velocity Control, Humidity Control, Air Distribution system, Cleaners, Filters, Spray washers, Electric preceptors – Types of Air Conditioners, (Central type, Window Type, Split Unit)

UNIT IV FIRE PROTECTION, ACOUSTICS AND SOUND INSULATIONS 9

Introduction – Causes of fire and Effects of fire – General Requirements of Fire Resisting building as per IS and NBC 2016 – Characteristics of Fire resisting materials – Maximum Travel Distance – Fire Fighting Installations for Horizontal Exit, Roof Exit / Fire Lifts, External Stairs – Requirement of good Acoustic – various sound absolvent – Factors to be followed for noise control in residential building

UNIT V GREEN BUILDING 9

Concept of green buildings – Components of green building – Advantages and applications – Utility of solar energy in buildings – Day lighting – Building energy analysis – Lighting economics and aesthetics – Low energy and passive cooling – Green composites for buildings – Low energy approaches – Water utilization in building – Technological options for energy management

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Punmia B.C, “Building Construction”, Laxmi Publications (P) Ltd., New Delhi, 2016
2. Varghese P.C, “Building Construction”, PHI Learning, New Delhi, 2011
3. Stephen Emmit, “Advanced Construction of Buildings”, Blackwell Publishing (P) Ltd., 2019

REFERENCES:

1. Udhayakumar R, “A Text book of building services”, Eswar press, India, 2007
2. Rangwala, “Building Construction”, Charotar publishing (P) Ltd., India, 2019
3. Varghese P.C, “Building Materials”, PHI Learning, New Delhi, 2015
4. David V.Chadderton. “Building Services Engineering”, Taylor and Francis, Canada, 2013

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the various types of building services	Understand
CO2	Outline the electrical services requirements for a given building	Understand
CO3	Plan various types of mechanical services as per requirements of building	Understand
CO4	Summarize the fire protection and acoustics services of a building.	Understand
CO5	Apply green building technology aspects	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	1	2	1	-	-	2	-	2	2
CO2	2	-	-	-	-	1	2	1	-	-	2	-	2	2
CO3	2	-	-	-	-	1	2	1	-	-	2	-	2	2
CO4	2	-	-	-	-	1	2	1	-	-	2	-	2	2
CO5	2	-	-	-	-	1	2	1	-	-	2	-	2	2
CO	2	-	-	-	-	1	2	1	-	-	2	-	2	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP17	URBAN PLANNING AND MANAGEMENT	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To gain the knowledge on basic issues and planning process in urban development
- To have a preliminary understanding on plan formulation and urban financing
- To acquire the knowledge on the regulations and laws related to Urban Planning

UNIT I BASIC ISSUES 9

Definition of Human settlement, Types of settlement – Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri - urban areas, Central Business District (CBD), Classification of urban areas – Urban Administrations – Causes and Impact of Urbanisation – Trend of Urbanisation at International, National, Regional and State level

UNIT II PLANNING PROCESS AND TECHNIQUES 9

Principles of Planning – Necessity of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas - Planning survey techniques; Conducting survey; statistical methods of data analysis; report presentation; application of GIS and remote sensing techniques in urban and regional planning; Questionnaire Design Case Studies

UNIT III PLAN FORMULATION, EVALUATION AND SMART CITIES 9

Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones – Development of small town and smart cities – Case studies

UNIT IV DESIGN AND FINANCE OF URBAN DEVELOPMENT PROJECTS 9

Site Analysis, Layout Design, Urban Space, Elements and Principles of Urban Design, Project Formulation – Evaluation, Plan Implementation, Constraints, Urban Financing – Sources – Public Private Partnership, Models and Types of PPP – Case Study

UNIT V LEGISLATION, DEVELOPMENT AND MANAGEMENT OF URBAN SYSTEM 9

Town and Country Planning Act, Blueprint Preparation and Reading, DTCP Approval and Panchayat Approval, Land Acquisition and Resettlement Act, Urban Planning Standards and Regulations, Tamilnadu Slum Clearance Board, Chennai Metropolitan Development Authority, Involvement of Public, Private, NGO, CBO and Beneficiaries.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Singh V.B, “Revitalised Urban Administration in India”, Kalpaz publication, Delhi, 2001
2. Edwin S. Mills and Charles M. Becker, “Studies in Urban development”, A World Bank publication, 1986
3. George Chadwick, “A Systems view of planning”, Pergamon press, Oxford 1978

REFERENCES:

1. Thooyavan, K.R., “Human Settlements – A Planning Guide to Beginners”, M.A Publications, Chennai, 2005

2. Goel S.L., Urban Development and Management, Deep and Deep Publications, New Delhi, 2002
3. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai
4. CMDA, Second Master Plan for Chennai, Chennai 2008

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Describe basic issues in urban planning	Understand
CO2	Formulate plans for urban and rural development	Apply
CO3	Plan and analyse socio economic aspects of urban and rural planning	Apply
CO4	Illustrate the urban design and identify the urban financing source	Understand
CO5	Prepare blueprints as per the legislation	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	1	-	-	-	-	-	1	2
CO2	3	2	-	-	-	-	1	-	-	2	-	1	1	2
CO3	3	2	-	-	-	-	1	-	-	2	-	1	1	2
CO4	3	2	-	-	-	-	1	-	-	-	-	1	1	2
CO5	3	-	-	-	-	-	1	-	-	2	-	1	1	2
CO	3	2	-	-	-	-	1	-	-	2	-	1	1	2
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP18	RAILWAYS AIRPORT AND HARBOR ENGINEERING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Highway Engineering

COURSE OBJECTIVES:

- To understand the concept and the applications of Railway planning, design, construction and maintenance works
- To understand the concept and the applications of Airports planning, design, construction and maintenance works
- To understand the concept and the applications of Harbor Planning, design, construction and maintenance works

UNIT I RAILWAYS PLANNING AND MANAGEMENT 9

Railway Industry – Privatization – Financing – Competition with Road Transport – Railway Track – Permanent way and its components – Route alignment surveys – Geometric design of railways, Gradient, Super elevation, Widening of gauge on curves – Points and Crossings

UNIT II RAILWAY INFRASTRUCTURES 9

Earthwork – Stabilization of track on poor soil – Calculation of Materials required for Track laying – Construction and maintenance of tracks – Modern methods of construction & maintenance – Railway station, Station and yards – Case studies of railway stations in India – Railway Time Table – Development

UNIT III AIRPORT PLANNING AND DESIGN 9

Air transport characteristics – Airport classification – Criteria for airport site selection – Typical airport layouts – Runway Design – Wind Rose Diagram – Runway length – Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones– Runway and Taxiway Markings and Lighting

UNIT IV AIR TRANSPORT MANAGEMENT 9

Airport – Passenger Facilities and Services – Accessibility – Transport Connections – Feasibility Studies – Environmental and Social Issues – Forecasting Future Traffic – Airfield Capacity and Delay – Airport Performance, Demand Management, Multi-airport Systems – Airline Schedule Development – Pricing.

UNIT V HARBOUR PLANNING, DESIGN AND MANAGEMENT 9

Definition of Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbor – Harbour Layout and Terminal Facilities – Coastal Structures– Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Environmental concern of Port Operations – Harbour field visit

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Subramanian K.P., “Highways, Railways, Airport and Harbour Engineering”, V Scitech Publications (India), Chennai, 2018
2. Satish Chandra and Agarwal M.M, "Railway Engineering", Oxford University Press, New Delhi, 2013

3. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012

REFERENCES:

1. Robert Honjeff and Francis X.Mckelvey., “Planning and Design of Airports”, McGraw Hill, New York, 1996
2. Richard De Neufille and Amedeo Odoni., Airport Systems Planning and Design, McGraw Hill, New York, 2003
3. “Shipping and Inland Water Transport for Eleventh Five Year Plan” – Report by Planning Commission, Prentice Hall Inc., 1990

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the concept of Railway planning and its management	Understand
CO2	Gain knowledge on Railway construction and maintenance	Understand
CO3	Understand the concept of Air transport infrastructures and its operations	Understand
CO4	Understand the concepts of air transport management	Understand
CO5	Understand the conceptual design of Harbour layout and Inland water transport characteristics	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	–	2	–	1	2	–	–	–	1	–
CO2	3	2	2	1	–	2	–	–	2	–	–	–	1	–
CO3	3	2	3	1	–	2	–	1	2	–	–	–	1	–
CO4	3	2	3	1	–	2	–	1	–	–	–	–	1	–
CO5	3	1	1	1	–	1	–	–	2	–	–	–	1	–
CO	3	2	2	1	–	2	–	1	2	–	–	–	1	–
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP19	TRAFFIC ENGINEERING AND MANAGEMENT	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Highway Engineering

COURSE OBJECTIVES:

- To understand the concept and the applications of Railway planning, design, construction and maintenance works
- To understand the concept and the applications of Airports planning design, construction and maintenance works
- To understand the concept and the applications of Harbor Planning, design, construction and maintenance works

UNIT I TRAFFIC CHARACTERISTICS 9

Elements of Traffic Engineering – Design speed, volume. Highway capacity and Levels of service – Capacity of urban and rural roads – PCU concept and its limitations – Road user facilities – Parking facilities – Cycle tracks and cycle ways – Pedestrian facilities

UNIT II TRAFFIC SURVEYS 9

Conventional and Modern Methods of Traffic Survey and Studies – Volume and Capacity – Headway concepts and applications – Speed and Delay – OD survey, Parking, Accident – Level of Services (LOS)

UNIT III INTERSECTION DESIGN 9

Design of Intersection – At grade intersection – Uncontrolled, Channelization, Rotary, Traffic Signal Control – Signal Co-ordination – Grade Separated Intersection – Types and Design

UNIT IV TRAFFIC FLOW AND SIMULATION MODELS 9

Traffic stream parameters – Fundamental diagram of volume- Speed-density surface – Merging maneuvers – Traffic Flow characterization – Categories of Traffic Flow – Basics of simulation – Simulation Model &Classification – Application of Simulation in Traffic Flow Studies – Case studies of Traffic simulation model reports

UNIT V TRAFFIC SAFETY OPERATIONS AND MANAGEMENT 9

Road accidents – Street lighting – Promotion and integration of public transportation – Promotion of non-motorized transport – Traffic Sign, Road Markings, Traffic Control Aids, Street furniture, Road Arboriculture – Traffic Calming and Pricing – Area Traffic Management System – Traffic System Management (TSM) – Travel Demand Management (TDM) – Introduction to ITS

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. KadiyaliL.R., “Traffic Engineering and Transport Planning”, Khanna Publishers, Delhi, 2019
2. Khanna K., Justo C E G, “Highway Engineering”, Khanna Publishers, Roorkee, 2019

REFERENCES:

1. Wolfgang S.Homburger et.al., “Fundamentals of Traffic Engineering” 15th Edition, Institute of Transportation Studies, University of California, 2012
2. James L. Pline (Edr) “Traffic Engineering Hand Book”, Institute of Transportation Engineers, Washington DC, USA, 1999

3. Nicholas T. Garber, Lester A Hoel, “Traffic and Highway Engineering”, Revised Second Edition, ITP, California, USA, 1999
4. Thomas Curinan, “An Introduction to Traffic Engineering – A Manual for Data Collection and Analysis”, Books Cole, UK, 2001

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the concept Traffic Engineering and traffic surveys	Understand
CO2	Gain knowledge on Intersection in Urban and Rural areas	Apply
CO3	Understand the concepts of the theory of traffic flow	Understand
CO4	Understand the concepts of Traffic simulation techniques	Understand
CO5	Understand the conceptual design of developing Traffic management Systems	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	–	–	–	–	2	2	–	–	–	–	2	–
CO2	3	2	-	2	–	–	2	–	–	–	–	-	–	–
CO3	3	2	2	2	–	–	–	–	–	–	–	2	–	–
CO4	3	–	–	–	–	2	2	–	–	–	–	2	-	2
CO5	3	–	–	–	–	–	–	2	–	–	2	2	2	2
CO	3	2	2	2	–	–	2	–	–	–	–	–	–	–
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)						3: Substantial (High)			

PROFESSIONAL ELECTIVE

U19CEP20	GIS & REMOTE SENSING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To give an overview about the basic concepts and principles of various components of remote sensing and satellite image processing
- To learn the different components of GIS and map projection & coordinate system
- To provide an exposure to spatial data structures, input, output processes and its practical applications in Civil Engineering

UNIT I REMOTE SENSING SYSTEM 8

Elements of EMR - wavelength regions – energy interaction in atmosphere – Absorption – scattering- atmospheric windows – terrestrial interaction – spectral reflectance curves – active and passive remote sensing. -platforms and sensors-types of resolutions, Plank's blackbody law – displacement law and emissivity effects

UNIT II SATELLITE DATA PRODUCT AND INTERPRETATION OF SATELLITE IMAGERIES 7

Types of data product – software and hardware requirement for data processing – Elements of visual image interpretation – Digital Image processing techniques, Landuse / landcover classification

UNIT III GEOGRAPHIC INFORMATION SYSTEMS AND DATABASE 10

Map and map scale – Types of map, Digital Cartography and Evolution of GIS, Components of GIS – Software, Hardware and organization- Coordinate system – Map projection - Datums, ellipsoids, geoids, Type of data – spatial and non-spatial data, various sources of data – Coordinate Transformation, georeferencing – Database Structures – data models – spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures – Raster vs Vector Models – TIN and GRID data models.

UNIT IV DATA INPUT AND OUTPUT 10

Scanner – Raster Data Input – Raster Data File Formats – Vector Data Input – Digitiser – Raster and Vector overlay method – Reclass, Recode, Types of output data, Map Design, source of errors, types of errors, elimination, accuracies.

Data quality – Basic aspects – completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata

UNIT V GIS APPLICATIONS 10

GIS for water distribution network, sewer network, transportation network, telecom network, power network and other utilities, Site selection for larger projects based on GIS analysis, Remote Sensing data integration, Navigation and tracking using GPS and GIS, GIS database for buildings, Emergency planning, Internet GIS, AHP and weighted overlay method, Application of ArcGIS.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Chang K. T., "Introduction to Geographical Information Systems", Tata McGraw Hill, 2015

2. Jensen, John R., “Remote Sensing of the Environment”, An Earth Resource Perspective, 2nd Ed., Prentice Hall, New Jersey, 2013

REFERENCES:

1. Chandra M. and Ghosh S. K., “Remote Sensing and Geographic Information System”, Narosa Publishing House, 2017
2. Anji Reddy, “Remote Sensing and Geographical Information Systems”, BS Publications, Hyderabad, 2012
3. Elangovan K., “GIS: Fundamentals, Applications and Implementation”, New India Publishing Agency, New Delhi, 2006

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Select the type of remote sensing technique / data for required purpose	Remember
CO2	Identify the earth surface features from satellite images	Understand
CO3	Classify the maps, coordinate systems and explain GIS data models	Understand
CO4	Process spatial and attribute data and study the errors in maps	Understand
CO5	Apply GIS models for solving geospatial problems	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	1	-	-	-	-	-	-	2	-	2
CO2	3	2	-	-	1	-	-	-	-	2	-	2	2	2
CO3	3	-	-	-	1	-	-	-	-	-	-	2	-	2
CO4	3	2	-	-	1	-	-	-	-	2	-	2	2	2
CO5	3	2	-	-	1	-	-	-	-	2	-	2	2	2
CO	3	2	-	-	1	-	-	-	-	2	-	2	2	2
Correlation levels:	1: Slight (Low)				2: Moderate (Medium)						3: Substantial (High)			

PROFESSIONAL ELECTIVE

U19CEP21	COMPREHENSION I	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Calculus and Differential Equations, Complex Variables and Laplace Transforms, Fourier analysis and Partial Differential Equations, Numerical Methods, Soil Mechanics, Foundation Engineering, Engineering Mechanics, Strength of Materials I & II, Building Materials, Engineering Survey, Remote Sensing & GIS

COURSE OBJECTIVES:

- To improve strategic thinking and planning skills
- To impart comprehensive knowledge on engineering fundamentals
- To identify the need for developing newer technologies for industrial and societal needs

UNIT I ENGINEERING MATHEMATICS I 9

Linear Algebra: Matrix algebra – Systems of linear equations – Eigen values and Eigen vectors

Calculus: Functions of single variable – Limit, continuity and differentiability – Mean value theorems, local maxima and minima – Taylor series – Evaluation of definite and indefinite integrals, application of definite integral to obtain area and volume – Partial derivatives – Total derivative – Gradient, Divergence and Curl, Vector identities; Directional derivatives – Line, Surface and Volume integrals

Ordinary Differential Equation (ODE): First order (linear and non–linear) equations – Higher order linear equations with constant coefficients – Euler, Cauchy equations – Initial and boundary value problems

UNIT II ENGINEERING MATHEMATICS II 9

Partial Differential Equation (PDE): Fourier series – Separation of variables – Solutions of one dimensional diffusion equation – First and second order one–dimensional wave equation and two dimensional Laplace equation

Probability and Statistics: Sampling theorems – Conditional probability – Descriptive statistics – Mean, median, mode and standard deviation; Random Variables – Discrete and Continuous, Poisson and Normal Distribution – Linear regression

Numerical Methods: Error analysis – Numerical solutions of linear and non–linear algebraic equations – Newton's and Lagrange polynomials – Numerical differentiation – Integration by trapezoidal and Simpson's rule – Single and multistep methods for first order differential equations

UNIT III GEOTECHNICAL ENGINEERING I 9

Soil Mechanics: Three phase system and phase relationships, index properties – Unified and Indian standard soil classification system – Permeability – one dimensional flow, Seepage through soils – Two dimensional flow, flow nets, uplift pressure, piping, capillarity, seepage force – Principle of effective stress and quicksand condition; Compaction of soils – One dimensional consolidation, time rate of consolidation – Shear Strength, Mohr's circle, effective and total shear strength parameters, Stress Strain characteristics of clays and sand – Stress paths

UNIT IV GEOTECHNICAL ENGINEERING II 9

Foundation Engineering: Sub surface investigations – Drilling bore holes, sampling, plate load test, standard penetration and cone penetration tests – Earth pressure theories – Rankine and Coulomb; Stability of slopes – Finite and infinite slopes, Bishop's method – Stress distribution in soils – Boussinesq's theory; Pressure bulbs, Shallow foundations – Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table – Combined footing and raft foundation – Contact pressure – Settlement analysis in sands and clays – Deep foundations – Dynamic and static formulae, Axial load capacity of piles in sands and clays, pile load test, pile under lateral loading,

pile group efficiency, negative skin friction

UNIT V STRUCTURAL ENGINEERING I **9**

Engineering Mechanics: System of forces, free body diagrams, equilibrium equations – Internal forces in structures – Frictions and its applications – Centre of mass – Free Vibrations of undamped SDOF system

Solid Mechanics: Bending moment and shear force in statically determinate beams – Simple stress and strain relationships – Simple bending theory, flexural and shear stresses, shear Centre – Uniform torsion, Transformation of stress – Buckling of column, Combined and direct bending stresses

Construction Materials: Structural Steel – Composition, material properties and behaviour – Concrete – Constituents, mix design, short term and long term properties

Geomatics: Engineering Principles of surveying – Errors and their adjustment – Maps – Scale, coordinate system – Distance and angle measurement – Levelling and trigonometric levelling – Traversing and triangulation survey – Total station – Horizontal and vertical curves – Photogrammetry and Remote Sensing – Scale, flying height – Basics of remote sensing and GIS

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

REFERENCES:

1. Made Easy Editorial Board “GATE 2021: Civil Engineering Previous Year Solved Papers”, Made Easy Publications, 2020
2. IES Master “GATE 2021 – Civil Engineering”, IES Master Publication, 2020
3. ACE Engineering Academy, ‘GATE –2021 CIVIL Engineering Previous GATE Questions with Solutions, Subject wise & Chapter wise”, ACE Engineering Publications, 2020
4. GKP, “GATE 2021 , Guide – Civil Engineering”, GK Publications Pvt. Ltd, 2020

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Identify eigenvalues and eigenvectors and apply Laplace transform technique to solve the given ordinary differential equation	Apply
CO2	Solve Partial Differential Equations, linear, nonlinear, homogeneous and non–homogeneous, by various methods	Apply
CO3	Build adequate knowledge in assessing both physical and engineering behavior of soils, mechanism of stress transfer in two–phase systems and stability analysis of slopes	Apply
CO4	Develop the capacity to investigate the soil condition and to select and design a suitable foundation	Apply
CO5	Apply the principle of force and motion, shear force, bending moment and stress variation in structural elements	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO2	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO3	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO4	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO5	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO	3	3	3	–	–	2	2	–	–	–	–	–	–	–
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP22	COMPREHENSION II	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Water Supply and Waste Water Engineering, Air pollution and Management, Municipal Solid Waste Management, Highway Engineering, Railways, Airports and Harbor Engineering, Traffic Engineering and Management, Computer Aided RC design, Prestressed Concrete Structures, Computer Aided Structural Analysis I & II, Computer Aided Steel design, Computer applications in Project Management, Fluid Mechanics, Applied Hydraulics and Hydraulics machinery, Hydrology, Irrigation Engineering

COURSE OBJECTIVES:

- To improve strategic thinking and planning skills
- To impart comprehensive knowledge on engineering fundamentals
- To identify the need for developing newer technologies for industrial and societal needs

UNIT I ENVIRONMENTAL ENGINEERING 9

Water Quality and Treatment: Basics of water quality standards – Physical, chemical and biological parameters – Water quality index – Unit processes and operations – Water requirement – Water distribution system – Drinking water treatment

Waste water Quality and Treatment: Sewerage system design – Quantity of domestic wastewater, primary and secondary treatment – Effluent discharge standards – Sludge disposal – Reuse of treated sewage for different applications

Air Pollution: Types of pollutants, their sources and impacts – Air pollution control, air quality standards – Air quality Index and limits

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes – Engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal)

UNIT II TRANSPORTATION ENGINEERING 9

Transportation Infrastructure: Geometric design of highways – Cross sectional elements, sight distances, horizontal and vertical alignments – Geometric design of railway Track – Speed and Cant – Concept of airport runway length, calculations and corrections – Taxiway and exit taxiway design

Highway Pavements: Highway materials – Desirable properties and tests – Desirable properties of bituminous paving mixes – Design factors for flexible and rigid pavements – Design of flexible and rigid pavement using IRC codes

Traffic Engineering: Traffic studies on flow and speed, peak hour factor, accident study, statistical analysis of traffic data – Microscopic and macroscopic parameters of traffic flow, fundamental relationships – Traffic signs – Signal design by Webster's method – Types of intersections – Highway capacity

UNIT III STRUCTURAL ENGINEERING II 9

Concrete Structures: Working stress and Limit state design concepts – Design of beams, slabs, columns – Bond and development length – Prestressed concrete beams

Structural Analysis: Statically determinate and indeterminate structures by force/ energy methods – Method of superposition – Analysis of trusses, arches, beams, cables and frames – Displacement methods: Slope deflection and moment distribution methods – Influence lines – Stiffness and flexibility methods of structural analysis

Steel Structures: Working stress and Limit state design concepts – Design of tension and compression members, beams and beam – columns, column bases, Connections – Simple and

eccentric, beam–column connections, plate girders and trusses – Concept of plastic analysis – beams and frames

Construction Management: Types of construction projects – Project planning and network analysis – PERT and CPM – Cost estimation

UNIT IV WATER RESOURCES ENGINEERING I 9

Fluid Mechanics: Properties of fluids, fluid statics – Continuity, momentum and energy equations and their applications – Potential flow, Laminar and turbulent flow – Flow in pipes, pipe networks – Concept of boundary layer and its growth – Concept of lift and drag

Hydraulics: Forces on immersed bodies – Flow measurement in channels and pipes – Dimensional analysis and hydraulic similitude – Channel Hydraulics – Energy – Depth relationships, specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles

UNIT V WATER RESOURCES ENGINEERING II 9

Hydrology: Hydrologic cycle, precipitation, evaporation, evapo–transpiration, watershed, infiltration, unit hydrographs, hydrograph analysis, reservoir capacity, flood estimation and routing, surface run–off models, ground water hydrology – Steady state well hydraulics and aquifers – Application of Darcy's Law

Irrigation: Types of irrigation systems and methods – Crop water requirements – Duty, delta, evapo–transpiration – Gravity Dams and Spillways – Lined and unlined canals, Design of weirs on permeable foundation – Cross drainage structures

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

REFERENCES:

1. Made Easy Editorial Board "GATE 2021: Civil Engineering Previous Year Solved Papers", Made Easy Publications, 2020
2. IES Master "GATE 2021 – Civil Engineering", IES Master Publication, 2020
3. ACE Engineering Academy, 'GATE–2021 CIVIL Engineering Previous GATE Questions with Solutions, Subject wise & Chapter wise", ACE Engineering Publications, 2020
4. GKP, "GATE 2021 , Guide – Civil Engineering", GK Publications Pvt. Ltd, 2020

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Choose the appropriate techniques for water supply, treatment, distribution, design of sewage system, collection, conveyance, treatment and disposal of solid waste and control of air pollution	Apply
CO2	Apply geometric deign of highways, design of Flexible and Rigid Pavements and the principles of Traffic Engineering and conduct surveys	Apply
CO3	Make use of concepts of structural analysis and will be able to apply limit state design to RCC & structural steel members	Apply
CO4	Utilize the properties of the fluid, fluid kinematics, fluid dynamics to solve hydraulic engineering problems like open channel flows and hydraulic machines	Apply
CO5	Idendify the hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO2	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO3	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO4	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO5	3	3	3	–	–	2	2	–	–	–	–	–	–	–
CO	3	3	3	–	–	2	2	–	–	–	–	–	–	–
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

PROFESSIONAL ELECTIVE

U19CEP23	AI IN CIVIL ENGINEERING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- NIL

COURSE OBJECTIVES:

- To understand the concepts of Artificial Intelligent models and algorithms
- To gain the knowledge about learning methods, model analysis and Fuzzy concepts
- To know the applications of AI in Geotechnical Engineering, Structural Engineering, Construction management and Transportation Engineering

UNIT I INTRODUCTION TO ARITIFICIAL INTELLIGENCE 9

Introduction to AI – Applications of AI in Engineering – Implementation of AI in Civil Engineering – Fundamentals of AIN Networks – Genetic algorithm – Machine Learning – Regression model – Dimension Analysis – Simulation Theory – Game theory and its applications

UNIT II APPLICATION OF AI IN GEOTECHNICAL ENGINEERING 9

Expert system for Landslide hazard and risk management – Advisor on the selection of Earth retaining structures – Development of a prolonged based expert system for ground water control – Real time expert system for excavation – Knowledge based assistant for earthquake resistant design

UNIT III APPLICATION OF AI IN STRUCTURAL ENGINEERING 9

Prolog standards for structural design – Expert system for conceptual design of bridges – Structural design using Intelligent objects – Expert system for design of offshore structures – Knowledge based system for design of Reinforced concrete halls – Damage assessment based on Fuzzy reasoning – Expert system for base plates - Expert system for structural inspection and maintenance – Case studies

UNIT IV APPLICATION OF AI IN CONSTRUCTION MANAGEMENT 9

Knowledge based regulation processing for Site Development – Key approach to site layout problems – Duration of each activity forecasting techniques – Expert system for construction industry – A Fuzzy expert system for priority ranking in Network Resource Allocation – Expert system in Network resource allocation – Generation and scheduling of construction activities – Case studies

UNIT V APPLICATION OF AI IN TRANSPORTATION ENGINEERING 9

Traffic Control System of Non-autonomous Vehicles at Signalized Road Intersection –Traffic Lights –Traffic Patterns – Improved Safety services – Application in traffic management system – Case studies

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Total: 45 Periods

REFERENCES:

1. Daugherty, Paul R., and H. James Wilson. “Human+ machine: reimagining working the age of AI” Harvard Business Press, 2018
2. Prateek, J. “Artificial Intelligence with Python”, pp. 14–16. Packt Publishing, Birmingham (2017)
3. Husain, Amir “The sentient machine: The coming age of artificial intelligence”. Simon and Schuster, 2017

4. Kaplan, Jerry “Artificial intelligence: What everyone needs to know” Oxford University Press, 2016
5. Wolfgang S. Homburger et.al., “Fundamentals of Traffic Engineering” Institute of Transportation Studies, University of California, Berkely, 2001
6. James L. Pline (Edr) “Traffic Engineering Hand Book”, Institute of Transportation Engineers, Washington DC, USA, 1999
7. B.H.V Topping Artificial Intelligence Techniques and Applications for Civil and Structural Engineers Civil Compress press, 10 Saxe-Coburg places, Edinburgh, 1989

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the concept Artificial Intelligence in Civil Engineering	Understand
CO2	Understand the applications in Geotechnical Engineering	Understand
CO3	Understand the Applications in Structural Engineering	Understand
CO4	Understand the Applications in Construction management techniques	Understand
CO5	Understand the conceptual design and its applications of developing traffic management systems	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2	–	–	–	–	–	–	–	–	–
CO2	3	1	2	1	3	1	–	1	–	1	–	–	3	–
CO3	3	2	2	1	3	1	–	1	–	1	–	–	3	–
CO4	3	1	2	1	3	1	–	1	–	1	–	–	3	–
CO5	3	2	2	1	3	1	–	1	–	1	–	–	3	–
CO	3	2	2	1	3	1	–	1	–	1	–	–	3	–
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP24	GREEN BUILDING DESIGN	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the green composite techniques for buildings
- To explain the importance of recycling materials and techniques involved in green buildings
- To emphasis the significance of sustainable development and construction through solar energy

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

Energy use, carbon emissions, water use, waste disposal – Building materials: sources, methods of production and environmental Implications – Maintenance Energy for Buildings – Reuse of Grey water – Rainwater Harvesting – Indian Green building Council – LEED India rating system

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES 9

Framed Construction – Masonry Construction – Resources for Building Materials – Alternative concepts – Recycling of Industrial and Buildings Wastes – Biomass Resources for buildings

UNIT III COMFORTS IN BUILDING 9

Thermal Comfort in Buildings – Issues – Heat Transfer Characteristic of Building Materials and Building Techniques – Incidence of Solar Heat on Buildings – Implications of Geographical Locations – Ventilation in buildings – Indoor Air Quality – Interior lighting system – Sick building syndrome

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings – Low Energy Cooling – Steps to reduce Energy demand – Case studies of Solar Passive Cooled and Heated Buildings

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites – Water Utilization in Buildings – Low Energy Approaches to Water Management – Management of Solid Wastes – Management of Sullage Water and Sewage – Urban Environment and Green Buildings – Green Cover and Built Environment – Sustainable features for Green building

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

TEXT BOOKS:

1. Jagadish, K. S., Venkataramareddy, B. U. and Nanjundarao, K. S. “Alternative Building Materials and Technologies” New Age International, 2007
2. Ursula Eicker, “Low Energy Cooling For Sustainable Buildings”, John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol. 1 and 2, TERI, New Delhi, 2004

REFERENCES:

1. Osman Attmann, “Green Architecture Advanced Technologies and Materials”, McGraw Hill, 2010
2. Jerry Yudelson, “Green building Through Integrated Design”, McGraw Hill, 2009
3. Marian Keeler and Bill Burke, “Fundamentals of Integrated Design for Sustainable Building”, US Green Building Council, 2009

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Infer the fundamental philosophy of environmental implications	Understand
CO2	Understand the importance of recycling materials	Understand
CO3	Outline the behaviour of thermal comfort in green buildings	Understand
CO4	Explain the utility of solar energy in green buildings	Understand
CO5	Summarize urban environment and sustainable features green buildings	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	1	2	1	-	-	1	1	3	3
CO2	3	-	-	-	-	1	2	1	-	-	1	1	3	3
CO3	3	-	-	-	-	1	2	1	-	-	1	1	3	3
CO4	3	-	-	-	-	1	2	1	-	-	1	1	3	3
CO5	3	-	-	-	-	1	2	1	-	-	1	1	3	3
CO	3	-	-	-	-	1	2	1	-	-	1	1	3	3
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP25	BUILDING INFORMATION MODELLING	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Computer Aided drafting Laboratory

COURSE OBJECTIVES:

- To design the virtual building model with intelligent building elements
- To work with building components
- To design the architectural, structural and MEP components

UNIT I INTRODUCTION TO BIM 9

Introduction – Proprietary and open source software – Basic drawing and editing tools – File import – Setting up units, levels and grids – Working with a project – Drawing and modifying Walls – Wall Shapes and Openings – Plastering, Skirting and Dado – Wall Sweep and Wall reveal – Wall Layers – Stacked Wall – Dimensions and measurements – Adding, loading and Creating Doors and Windows, Wall opening

UNIT II WORKING WITH STRUCTURAL ELEMENTS 9

Drawing and modifying structural element Footing, Column, Beam and Slab – Creating and working with Floor, Roof and Ceiling – Joining/Unjoining of Roof – Roof Soffit – Roof fascia – Creating Stairs, Ramps, lifts, Railings – Curtain wall, curtain grids and Mullions

UNIT III WORKING WITH COMPONENTS, VIEWS AND ELEVATIONS 9

Adding Furniture and fixtures to a project – Working with Components – Creating interior elevations – Adding Lighting fixtures – Creating building sections – Site Design and modifying Topo surfaces – Site Components – Framing plans and elevations – Working with views – Adding Sun Setting – Applying Materials – Rendering and Walkthrough – Working With Rendered File – Schedule – BIM management

UNIT IV ADVANCED STRUCTURAL MODELLING 9

Introduction – Starting a structural project based on a linked architectural model – Adding structural columns and walls – Adding foundations and structural slabs – Structural Reinforcement – Beams, trusses and framing systems – Steel Connections – Detailing

UNIT V INTRODUCTION TO MEP 9

Introduction to MEP – Components and materials – Inserting and connecting MEP components – Creating HVAC networks with ducts and pipes – Creating plumbing networks – Creating electrical circuits – Creating HVAC and Plumbing Systems – Clash Analysis

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

REFERENCES:

1. Eastman, C., Teicholz, P., Sacks, R., & Liston, C. BIM handbook: “A guide to building information modeling for owners, managers, designers, engineers and contractors”, John Wiley & Sons, 2011
2. Hardin, B., & McCool, D., “BIM and construction management: proven tools, methods, and workflows”, John Wiley & Sons, 2015
3. Issa, R. R., & Olbina, S., “Building Information Modeling Applications and Practices”, American Society of Civil Engineers, 2015

4. Pittard, S., & Sell, P. “BIM and Quantity Surveying” Routledge, 2016

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Explore the building information modeling (BIM) interface	Understand
CO2	Design a 3D building model to explain how information is inter-related with structural elements	Apply
CO3	Work with building components and render the model	Apply
CO4	Understand the modeling of structural elements and detailing	Apply
CO5	Understand the concept of mechanical, electrical and plumbing components in BIM	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	–	2	–	3	–	–	–	1	2	2	1	2	–
CO2	2	–	2	–	3	–	–	–	1	2	2	1	2	–
CO3	2	–	2	–	3	–	–	–	1	2	2	1	2	3
CO4	2	–	2	–	3	–	–	–	1	2	2	1	2	3
CO5	2	–	2	–	3	–	–	–	1	2	–	1	2	–
CO	2	–	2	–	3	–	–	–	1	2	2	1	2	3
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP26	PRINCIPLES OF ARCHITECTURE	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the fundamental concepts and theories of urban design and their application
- To understand the concept of residential drafting and designing
- To provide the knowledge on the principles and functional design of buildings familiarize

UNIT I ARCHITECTURAL DESIGN 9

Architectural Design and analysis – Integration of function and aesthetics – Introduction to basic elements and principles of design

UNIT II SITE PLANNING 9

Surveys – Site analysis – Development Control – Layout regulations – Layout design concepts

UNIT III BUILDING TYPES 9

Residential, institutional, commercial and industrial – Application of anthropometry and space standards –Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior design

UNIT IV CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN 9

Man and environment interaction – Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls – Green building concept

UNIT V TOWN PLANNING 9

Planning – Definition, concepts and processes – Urban planning standards and zoning regulations – Urban renewal – Conservation – Principles of Landscape design

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Muthu Shoba Mohan.G, “Principles of Architecture”. Oxford University Press, New Delhi, 2018
2. Arvind Krishnan, Nick Baker, Simos Yannas, Szokolay.S.V, “Climate Responsive Architecture”, A Design Hand Book for Energy Efficient Building, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017

REFERENCES:

1. Pramar. V.S. “Design fundamental in Architecture”, Somaiya Publications Pvt. Ltd., New Delhi, 1997
2. Rangwala. S.C. “Town Planning” Charotar Publishing House, Anand, 2005
3. National Building Code of India. SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2005

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K–Level
CO1	Apply knowledge of architectural design principles to critically evaluate building	Apply
CO2	Design the site layout and site analysis	Apply
CO3	Evaluate building rules and regulations, safety standards and integration of building services	Apply
CO4	Analysis characteristics of climate types by passive and active energy controls	Analyze
CO5	Understand the various rules and regulation of town planning and development authorities	Understand

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	–	2	–	2	1	–	1	–	–	2	2	–	–
CO2	2	–	2	–	2	1	–	1	2	–	2	2	–	–
CO3	2	–	3	–	2	1	–	1	2	–	2	2	–	–
CO4	2	–	3	–	2	1	–	1	2	–	2	2	–	–
CO5	2	–	3	–	2	1	–	1	2	–	2	2	–	–
CO	2	–	3	–	2	1	–	1	2	–	2	2	–	–
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

PROFESSIONAL ELECTIVE

U19CEP27	DISASTER MITIGATION AND MANAGEMENT	Category: PE			
		L	T	P	C
		3	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the types of disasters, their significance and management techniques
- To understand the factors causing disaster
- To know about various disaster management schemes

UNIT I INTRODUCTION TO DISASTERS 9

Disasters: Definition of disaster – Natural and Manmade Types of disasters – Natural Disaster such as Earthquake, Landslide, Flood, Drought, Fire, Land subsidence, severe heat aves, Cyclone, volcanoes, tsunami, avalanches, global climate extremes etc – Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism, forest fire etc. Causes, effects and practical examples for all disasters

UNIT II VULNERABILITY AND DISASTER RISK REDUCTION 9

Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural – Non-structural measures, Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders – Institutional Processes and Framework at State and Central Level – State Disaster Management Authority (SDMA)

UNIT III MITIGATION AND DISASTER MANAGEMENT 9

Basic principles of disasters management – Disaster Management cycle – Disaster management policy – National and State Bodies for Disaster Management – Early Warming Systems – Preparedness through (IEC) Information, education & communication – Pre-disaster stage (mitigation), Effect to mitigate natural disaster at national and global levels – International strategy for disaster reduction, Emerging approaches in Disaster Management – Concept of disaster management

UNIT IV REHABILITATION, RECONSTRUCTION AND RECOVERY 9

Reconstruction and Rehabilitation as a Means of Development – Damage Assessment – Post Disaster effects and Remedial Measures – Creation of Long term Job Opportunities and Livelihood Options – Disaster Resistant House Construction – Sanitation and Hygiene – Education and Awareness – Dealing with Victims' Psychology – Long term Counter Disaster Planning

UNIT V TRAINING, AWARENESS PROGRAM AND PROJECT ON DISASTER MANAGEMENT 9

Training and drills for disaster preparedness – Awareness generation program – Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in India

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Total: 45 Periods

TEXT BOOKS:

1. Dave R K, "Disasters: Management in India – Challenges and Strategies", Prowess Publishing, Chennai, 2018
2. Sulthey M, "Disaster Management", PHI Learning PVT Ltd, New Delhi, 2016

3. Chakraborty S C, “Natural Hazards and Disaster Management”, Pargatishil Prokashak, Kolkata, 2007

REFERENCES:

1. Singhal J P, “Disaster Management”, Laxmi Publications, 2010
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012
3. Gupta Anil K, Sreeja S, “Environmental Knowledge for Disaster Risk Management”, NIDM, New Delhi, 2011
4. Kapur Anu, “Vulnerable India: A Geographical Study of Disasters”, IIAS and Sage Publishers, New Delhi, 2010.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

COs	Statements	K-Level
CO1	Understand the different types of disasters	Understand
CO2	Explain on risk assessment and its vulnerability	Understand
CO3	Discuss about the various disaster management techniques	Understand
CO4	Apply the rehabilitation and precaution in disaster management	Apply
CO5	Apply the Knowledge of training and practical oriented program in disaster management	Apply

COURSE ARTICULATION MATRIX:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	2	-	-	-	-	-	1	-	2	-	-
CO2	2	2	2	2	-	-	1	-	-	1	-	2	-	2
CO3	2	-	2	2	-	3	1	-	-	1	-	2	-	2
CO4	2	2	2	2	-	-	1	-	-	1	-	2	-	2
CO5	2	2	2	2	-	3	1	-	-	1	2	2	-	2
CO	2	2	2	2	-	-	-	-	-	1	-	2	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														