



SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

An Autonomous Institution affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade

Kuniamuthur, Coimbatore - 641 008

DEPARTMENT OF CIVIL ENGINEERING

**BE CIVIL ENGINEERING
CURRICULUM AND SYLLABI
REGULATION 2018
CHOICE BASED CREDIT SYSTEM**

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

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VISION AND MISSION OF THE DEPARTMENT

Vision

To be a center of excellence in Civil Engineering Education through full-fledged learning experience along with research.

Mission

To accomplish our vision, we are committed to

- Provide high quality technical education for Undergraduate, Post Graduate and Doctoral Programmes in Civil Engineering.
- Create excellent infrastructural facility and state-of-the-art Laboratories.
- Encourage faculty and students to carry out socially relevant research through collaboration with industry.
- Inculcate ethics and ensure commitment to the society with leadership qualities.

Program Outcomes (POs):-

At the time of their graduation students of Civil Engineering Program should be in possession of the following Program Outcomes

- PO 1. **Engineering knowledge:** Apply the knowledge of mathematics, science and engineering fundamentals for the solution of complex Civil Engineering problems.
- PO 2. **Problem analysis:** Identify, formulate and analyse complex Civil Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.
- PO 3. **Design/development of solutions:** Design solutions for complex Civil Engineering problems and design system components with appropriate consideration for public health & safety, cultural, societal and environmental considerations.
- PO 4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis & interpretation of data and synthesis of the information to provide valid conclusions.
- PO 5. **Modern tool usage:** Create, select & apply appropriate techniques, resources, 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 assess societal, health, safety, legal & 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 as well as norms of the engineering practice.
- PO 9. **Individual and team work:** Function effectively as an individual, 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 the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 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.

Program Educational Objectives (PEOs):-

The following Program Educational Objectives are designed based on the department mission

PEO 1	Employability Skills	Graduates will emerge as competitive professionals in collaboration with renowned builders and set a benchmark in the field of construction.
PEO 2	Technical Competencies	Graduates will adapt to the latest technological development and continue to be a competitive Civil Engineer / Entrepreneur.
PEO 3	Critical Analysis and Design Tools	Graduates will apply logical reasoning and analytical thinking to analyze, interpret, solve multifaceted problems in the field of Civil Engineering and identify advanced tools to satisfy the demands of the society.

Mapping of POs to PEOs

Program Educational Objectives	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
PEO 1	3	2	3	2	2	3	2	2	3	3	3	2
PEO 2	3	3	2	2	3	2	2	2	2	2	2	3
PEO 3	3	3	3	2	3	3	2	2	2	3	2	3

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed
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Program Specific Outcomes (PSOs): -

At the end of the Program, Graduate shall have

PSO 1	Analytical Knowledge and Practical Skills	The ability to analyse, design and interpret by applying the concepts of mathematics and physical sciences in the core areas of Civil Engineering.
PSO 2	Civil Engineer and Sustainability	The propensity to excel in portfolio of waste management, sanitation, housing and construction management for the sustainable environment.
PSO 3	Environment and Social Commitment	The ability to acquire and update knowledge continuously and offer engineering solutions to meet the environmental and societal needs.

Year	Sem	Course Title	Course	Program Outcomes												PSOs				
				1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
I year	Semester I	Linear Algebra and Differential Calculus	T	H	M	-	-	-	-	-	-	-	-	-	-	-	M	-	-	
		Engineering Chemistry	T	H	M	L	-	-	-	M	-	-	-	-	M	L	-	L	-	-
			P	H	M	M	-	-	-	-	-	-	-	-	L	-	-	L	-	-
		Technical Communication skills	T	-	-	-	-	-	-	-	M	M	H	-	M	-	-	M	-	-
			P	-	-	-	-	M	-	-	-	M	H	-	M	-	-	L	-	-
		Problem Solving using C Programming	T	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			P	M	M	-	-	H	-	-	-	-	M	-	M	-	-	H	-	-
	Engineering Graphics	P	L	M	L	L	H	-	-	M	M	M	-	M	M	-	M	-	M	
	Induction Programme	-	-	-	-	-	H	H	H	H	H	H	H	H	-	-	-	-	L	
	Semester II	Integral Calculus and Complex Variable	T	H	H	-	-	-	-	-	-	-	-	-	-	-	L	-	-	
		Engineering Mechanics	T	H	M	M	-	-	-	-	M	M	-	-	-	H	-	-	-	
		Engineering Physics	T	M	L	L	-	-	-	-	-	-	-	-	L	L	-	M	-	-
			P	M	L	L	-	L	-	-	L	L	L	-	L	L	-	M	-	-
		Basics of Electrical and Electronics Engineering	T	M	M	M	-	-	-	-	L	L	-	L	-	L	-	M	-	-
P			H	M	M	M	M	-	-	-	L	-	L	-	L	-	M	-	-	
Engineering Practices		P	H	H	M	M	L	-	-	M	H	H	-	M	H	-	M	-	M	
Environmental Sciences	T	L	L	M	-	L	M	H	M	L	-	-	L	L	-	L	-	L		

Year	Sem	Course Title	Course	Program Outcomes												PSOs		
				1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
II year	Semester III	Fourier Analysis, PDE and Calculus of Variation	T	H	M	L	-	-	-	-	-	-	-	-	-	M	-	-
		Construction Materials and Techniques	T	H	M	M	H	-	-	L	L	-	-	-	L	H	L	L
		Fluid Mechanics	T	H	H	M	M	L	-	-	-	-	-	-	M	M	-	M
		Architecture and Computer Aided Planning	T	H	M	L	-	-	-	H	-	-	L	-	L	M	M	L
			P	H	M	L	-	H	-	M	H	H	M	-	L	M	M	L
		Solid Mechanics	T	H	H	M	M	-	-	-	-	-	-	-	H	H	-	H
			P	H	M	L	H	H	-	-	-	H	H	-	H	H	-	H
		Surveying and Geomatics	T	H	H	H	H	-	-	-	M	-	-	-	H	H	-	M
			P	H	H	M	L	H	-	-	M	M	-	-	H	H	-	M
	Human values and Professional Ethics	T	-	-	-	-	-	-	H	H	H	H	-	-	-	-	L	
	Semester IV	Probability and Computational Methods	T	H	M	L	-	-	-	-	-	-	-	-	M	-	-	
		Design of RC Elements	T	H	H	M	M	-	-	L	M	-	M	-	H	H	L	M
		Mechanics of Materials	T	H	H	M	M	-	-	-	-	-	-	-	H	H	-	H
		Concrete Technology	T	H	M	M	M	M	-	-	-	-	-	-	M	M	-	M
			P	H	H	M	M	H	-	M	M	M	M	-	M	M	-	M
		Hydraulics and Hydraulic Machinery	T	H	H	-	M	-	-	-	-	-	-	-	M	H	-	M
			P	H	H	-	-	H	-	-	-	H	-	-	M	M	-	M
	Soil	T	M	H	H	M	-	L	-	-	-	-	-	L	H	M		

		Mechanics	P	M	M	M	H	M	M	-	M	L	L	-	L	M	L	L		
		Management organizational behavior	T	-	-	-	-	-	H	-	H	H	H	H	-	-	H	-		
III year	Semester V	Foundation Engineering	T	H	H	H	M	M	L	L	L	L	L		L	M	M	L		
		Structural Analysis	T	H	H	M	M	-	-	-	-	-	-	-	H	H	-	M		
		Open Elective I	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Design of Reinforced Concrete Structures	T	H	H	M	M	-	-	-	-	L	L	L	H	H	-	M		
			P	H	H	M	M	H	-	L	M	M	M	L	H	H	-	M		
		Environmental Engineering	T	H	H	M	M	M	M	M	M	M	M	-	-	H	-	-	-	
			P	H	M	M	M	M	M	M	L	L	-	M	M	M	H	M		
		Transportation Engineering	T	H	M	L	L	-	-	-	-	-	-	-	-	L	M		L	
			P	H	M	L	L	H	-	L	L	M	L	-	L	M		M		
		Soft Skills	T	-	-	-	-	-	L	L	M	M	H	M	M	-	-	L		

Year	Sem	Course Title	Course	Program Outcomes												PSOs			
				1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
III year	Semester VI	Design of Steel Structures	T	H	H	H	M	H	-	-	L	L	L	-	H	H	L	L	
		Emerging Elective I	T																
		Professional Elective I	T																
		Professional Elective II	T																
		Construction Engineering and Management	T	H	M	L	M	-	-	-	M	-	M	H	M	M	M	M	-
			P	H	M	L	M	H	-	-	M	M	M	H	L	M	M	M	-
		Estimation	T	H	M	M	-	-	-	-	M	M	H	-	-	M	L	L	

		and Quantity Surveying	P	H	M	M	-	M	-	-	M	M	H	-	-	M	L	L	
		General Aptitude	T	H	H	L	-	-	-	-	-	-	-	-	-	M	-	-	
IV year	Semester VII	Open Elective II	T																
		Emerging Elective II	T																
		Professional Elective III	T																
		Professional Elective IV	T																
		Professional Elective V	T																
		Project Work (Phase I)	PW	M	M	M	H	H	L	M	M	M	H	H	H	H	H	H	M
	Semester VIII	Project Work (Phase II)	PW	M	H	H	H	H	L	M	M	M	H	H	H	H	H	H	M

**B.E. CIVIL ENGINEERING
REGULATION 2018
CHOICE BASED CREDIT SYSTEM
I – VIII SEMESTER CURRICULUM AND SYLLABI**

SEMESTER I								
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	C	O	Ext./Int.	Cat.
THEORY								
1.	18MA101	Linear Algebra and Differential Calculus	3/1/0	4	4	-	50/50	BSC
THEORY CUM PRACTICAL								
2.	18CH101	Engineering Chemistry	3/0/3	6	4.5	-	40/60	BSC
3.	18CS111	Problem Solving using C Programming	3/0/3	6	4.5	-	40/60	ESC
4.	18EN102	Technical Communication skills	2/0/2	4	3	-	40/60	HSMC
PRACTICAL								
5	18ME111	Engineering Graphics	2/0/2	4	3	-	40/60	ESC
MANDATORY COURSE								
6.	18MC101	Mandatory Course I	3 WEEKS		0	-	0/100	MC
Total			13/1/10	24	19	-	600	

SEMESTER II								
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	C	O	Ext./Int.	Cat.
THEORY								
1.	18MA201	Integral Calculus and Complex Variable	3/1/0	4	4	-	50/50	BSC
2.	18ME201	Engineering Mechanics	3/1/0	4	4	2	50/50	ESC
THEORY CUM PRACTICAL								
3.	18EE211	Basics of Electrical and Electronics Engineering	3/0/3	6	4.5	-	40/60	ESC
4.	18PH201	Engineering Physics	3/0/3	6	4.5	-	40/60	BSC
PRACTICAL								
5.	18ME102	Engineering Practices Laboratory	1/0/4	5	3	-	40/60	ESC
MANDATORY COURSE								
6.	18MC201	Mandatory Course II	2/0/0	2	0	-	0/100	MC
Total			15/2/10	27	20	2	600	

SEMESTER III								
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	C	O	Ext./Int.	Cat.
THEORY								
1.	18MA301	Fourier Analysis Partial Differential Equations and Calculus of Variation	3/1/0	4	4	-	50/50	BSC
2.	18CE301	Construction Materials and Techniques	3/0/0	3	3	2	50/50	PCC
3.	18CE302	Fluid Mechanics	3/0/0	3	3	2	50/50	PCC
THEORY CUM PRACTICAL								
4.	18CE303	Architecture and Computer Aided Planning	3/0/3	6	4.5	-	40/60	ESC
5.	18CE304	Solid Mechanics	3/0/3	6	4.5	-	40/60	PCC
6.	18CE305	Surveying and Geomatics	3/0/3	6	4.5	-	40/60	PCC
MANDATORY COURSE								
7.	18MC301	Mandatory Course III	2/0/0	2	0	-	0/100	MC
Total			20/1/9	30	23.5	4	700	

SEMESTER IV								
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	C	O	Ext./Int.	Cat.
THEORY								
1.	18MA401	Probability and Computational Methods	3/0/0	3	3	-	50/50	BSC
2.	18CE401	Design of RC Elements	3/1/0	4	4	2	50/50	PCC
3.	18CE402	Mechanics of Materials	3/0/0	3	3	2	50/50	PCC
THEORY CUM PRACTICAL								
4.	18CE403	Concrete Technology	3/0/3	6	4.5	-	40/60	PCC
5.	18CE404	Hydraulics and Hydraulic Machinery	3/0/3	6	4.5	-	40/60	PCC
6.	18CE405	Soil Mechanics	3/0/3	6	4.5	-	40/60	PCC
MANDATORY COURSE								
7.	18MC401	Mandatory Course IV	2/0/0	2	-	-	0/100	MC
Total			20/1/9	30	23.5	4	700	

SEMESTER V								
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	C	O	Ext./Int.	Cat.
THEORY								
1.	18CE501	Foundation Engineering	3/0/0	3	3	2	50/50	PCC
2.	18CE502	Structural Analysis	3/1/0	4	4	-	50/50	PCC
3.	18xxxxx	Open Elective I	3/0/0	3	3	-	50/50	OEC
THEORY CUM PRACTICAL								
4.	18CE503	Design of Reinforced Concrete Structures	3/0/3	6	4.5	-	40/60	PCC
5.	18CE504	Environmental Engineering	3/0/3	6	4.5	-	40/60	PCC
6.	18CE505	Transportation Engineering	3/0/3	6	4.5	-	40/60	PCC
EMPLOYABILITY ENHANCEMENT SKILLS								
7.	18CE506	Summer Industry Internship and Seminar Presentation	0/1/0	1	1	-	0/100	EES
8	18MC501	Mandatory Course V	2/0/0	2	-	-	0/100	MC
Total			20/2/9	31	24.5	2	800	

SEMESTER VI								
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	C	O	Ext./Int.	Cat.
THEORY								
1.	18CE601	Design of Steel Structures	3/1/0	4	4	2	50/50	PCC
2.	18CE0xx	Emerging Elective I	3/0/0	3	3	2	50/50	EEC
3.	18CE9xx	Professional Elective I	3/0/0	3	3	-	50/50	PEC
4.	18CE9xx	Professional Elective II	3/0/0	3	3	-	50/50	PEC
THEORY CUM PRACTICAL								
5.	18CE602	Construction Engineering and Management	3/0/3	6	4.5	-	40/60	HSMC
6.	18CE603	Estimation and Quantity Surveying	3/0/3	6	4.5	-	40/60	PCC
EMPLOYABILITY ENHANCEMENT SKILLS								
7.	18CE604	Winter Industry Internship and Seminar Presentation	0/0/1	1	0.5	-	0/100	EES
8	18MC601	Mandatory Course VI	2/0/0	2	-	-	0/100	MC
Total			20/1/7	28	22.5	4	800	

SEMESTER VII								
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	C	O	Ext./Int.	Cat.
THEORY								
1.	18xxxxx	Open Elective II	3/0/0	3	3	-	50/50	OEC
2.	18CE0xx	Emerging Elective II	3/0/0	3	3	2	50/50	EEC
3.	18CE9xx	Professional Elective III	3/0/0	3	3	-	50/50	PEC
4.	18CE9xx	Professional Elective IV	3/0/0	3	3	-	50/50	PEC
5.	18CE9xx	Professional Elective V	3/0/0	3	3	-	50/50	PEC
6.	18CE9xx	Professional Elective VI	3/0/0	3	3	-	50/50	PEC
PROJECT WORK								
7.	18CE701	Project Work (Phase I)	0/0/4	4	2	-	40/60	PROJ
Total			18/0/4	22	20	2	700	

SEMESTER VIII								
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	C	O	Ext./Int.	Cat.
PROJECT WORK								
1.	18CE801	Project Work (Phase II)	0/0/24	24	12	-	40/60	PROJ
Total			0/0/24	24	12	-	100	

SCHEME OF CREDIT DISTRIBUTION - SUMMARY

SL. No.	Stream	Credits/Semester								C	%
		I	II	III	IV	V	VI	VII	VIII		
1.	Humanities & Social Sciences Including Management (HSMC)	3	-	-	-	-	4.5	-	-	7.5	5
2.	Basic Sciences (BSC)	8.5	8.5	4	3	-	-	-	-	24.0	15
3.	Engg. Sciences (ESC)	7.5	11.5	4.5	-	-	-	-	-	23.5	14
4.	Professional Core (PCC)	-	-	15	20.5	20.5	8.5	-	-	64.5	39
5.	Professional Electives (PEC)	-	-	-	-	-	6	12	-	18.0	11
6.	Open Electives (OEC) / Emerging Elective Courses (EEC)	-	-	-	-	3	3	6	-	12.0	7
7.	Project Work (PROJ) / Employability Enhancement Skills (EES)	-	-	-	-	1	0.5	2	12	15.5	9
8.	Mandatory Course (MC)	Non-credit								0	0
Total		19	20	23.5	23.5	24.5	22.5	20	12	165	100

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME

SL. No.	Course Work - Subject Area	AICTE Suggested Breakdown of Credits (160)	SKCET Credits (165)
1.	Humanities and Social Sciences including Management courses	12*	7.5
2.	Basic Science courses	25*	24.0
3.	Engineering Science courses including Workshop, Drawing, Basics of Electrical / Mechanical / Computer etc.	24*	23.5
4.	Professional core courses	48*	64.5
5.	Professional Electives courses relevant to the chosen specialization / branch	18*	18.0
6.	Open Subjects- Electives from other technical and / or emerging subjects	18*	12.0
7.	Project Work, Seminar and / or Internship in Industry or elsewhere.	15*	15.5
8.	Mandatory Courses	Non-credit	Non-credit
Total		160*	165

**Minor Variations is allowed as per need of the respective disciplines*

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT (7.5 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18EN102	Technical Communication skills	2/0/2	4	3	HSMC
2.	18CE602	Construction Engineering and Management	3/0/3	6	4.5	HSMC

BASIC SCIENCE COURSES (24 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18CH101	Engineering Chemistry	3/0/3	6	4.5	BSC
2.	18MA101	Linear Algebra and Differential Calculus	3/1/0	4	4	BSC
3.	18PH201	Engineering Physics	3/0/3	6	4.5	BSC
4.	18MA201	Integral Calculus and Complex Variable	3/1/0	4	4	BSC
5.	18MA301	Fourier Analysis, Partial Differential Equations and Calculus of Variation	3/1/0	4	4	BSC
6.	18MA401	Probability and Computational Methods	3/0/0	3	3	BSC

ENGINEERING SCIENCE COURSES (23.5 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18ME111	Engineering Graphics	2/0/2	4	3	ESC
2.	18CS111	Problem Solving using C Programming	3/0/3	6	4.5	ESC
3.	18EE211	Basics of Electrical and Electronics Engineering	3/0/3	6	4.5	ESC
4.	18ME201	Engineering Mechanics	3/1/0	4	4	ESC

5.	18ME102	Engineering Practices Laboratory	1/0/4	5	3	ESC
6.	18CE303	Architecture and Computer Aided Planning	3/0/3	6	4.5	ESC

PROFESSIONAL CORE COURSES (64.5 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18CE301	Construction Materials and Techniques	3/0/0	3	3	PCC
2.	18CE302	Fluid Mechanics	3/0/0	3	3	PCC
3.	18CE304	Solid Mechanics	3/0/3	6	4.5	PCC
4.	18CE305	Surveying and Geomatics	3/0/3	6	4.5	PCC
5.	18CE403	Concrete Technology	3/0/3	6	4.5	PCC
6.	18CE401	Design of RC Elements	3/1/0	4	4	PCC
7.	18CE404	Hydraulics and Hydraulic Machinery	3/0/3	6	4.5	PCC
8.	18CE402	Mechanics of Materials	3/0/0	3	3	PCC
9.	18CE405	Soil Mechanics	3/0/3	6	4.5	PCC
10.	18CE503	Design of Reinforced Concrete Structures	3/0/3	6	4.5	PCC
11.	18CE504	Environmental Engineering	3/0/3	6	4.5	PCC
12.	18CE501	Foundation Engineering	3/0/0	3	3	PCC
13.	18CE502	Structural Analysis	3/1/0	4	4	PCC
14.	18CE505	Transportation Engineering	3/0/3	6	4.5	PCC
15.	18CE601	Design of Steel Structures	3/1/0	4	4	PCC
16.	18CE603	Estimation and Quantity Surveying	3/0/3	6	4.5	PCC

PROFESSIONAL ELECTIVE COURSES (18 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
Elective Stream I : Structural / Geotechnical Engineering						
1.	18CE901	Bridge Engineering	3/0/0	3	3	PEC
2.	18CE902	Disaster Preparedness and Planning	3/0/0	3	3	PEC
3.	18CE903	Earthquake Resistant Structures	3/0/0	3	3	PEC
4.	18CE904	Finite Element Methods	3/0/0	3	3	PEC
5.	18CE905	Green Building Technology	3/0/0	3	3	PEC
6.	18CE906	Ground Improvement and Land Reclamation Methods	3/0/0	3	3	PEC
7.	18CE907	Prefabricated Structures	3/0/0	3	3	PEC
8.	18CE908	Prestressed Concrete Structures	3/0/0	3	3	PEC
9.	18CE909	Tall Buildings	3/0/0	3	3	PEC
Elective Stream II : Environmental / Hydrology and Water Resource Engineering						
1.	18CE910	Air Pollution Management	3/0/0	3	3	PEC
2.	18CE911	Contaminated Site Remediation	3/0/0	3	3	PEC

3.	18CE912	Environmental Impact Assessment and Risk Management	3/0/0	3	3	PEC
4.	18CE913	Hydrology	3/0/0	3	3	PEC
5.	18CE914	Industrial Waste Water Management	3/0/0	3	3	PEC
6.	18CE915	Irrigation Engineering	3/0/0	3	3	PEC
7.	18CE916	Remote Sensing and GIS applications	3/0/0	3	3	PEC
8.	18CE917	Solid and Hazardous Waste Management	3/0/0	3	3	PEC
9.	18CE918	Water Resources Engineering	3/0/0	3	3	PEC
Elective Stream III : Transportation / Construction Engineering						
1.	18CE919	Airport, Docks and Harbors	3/0/0	3	3	PEC
2.	18CE920	Engineering Risk benefit analysis	3/0/0	3	3	PEC
3.	18CE921	Maintenance, Repair and Rehabilitation of Structures	3/0/0	3	3	PEC
4.	18CE922	Pavement Engineering	3/0/0	3	3	PEC
5.	18CE923	Project Management	3/0/0	3	3	PEC
6.	18CE924	Project Safety Management	3/0/0	3	3	PEC
7.	18CE925	Sustainable Construction Materials and Methods	3/0/0	3	3	PEC
8.	18CE926	Traffic Engineering and Management	3/0/0	3	3	PEC
9.	18CE927	Valuation of Civil Engineering Structures	3/0/0	3	3	PEC

EMERGING ELECTIVE COURSES

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18CE007	Building Services Planning and Management	3/0/0	3	3	EEC
2.	18CE008	Condition Assessment of Materials and Structures	3/0/0	3	3	EEC
3.	18CE009	Instrumentation and Sensor Technologies for Engineering Applications	3/0/0	3	3	EEC
4.	18CE010	Intelligent Transportation systems	3/0/0	3	3	EEC
5.	18CE011	Metro Systems and Engineering	3/0/0	3	3	EEC
6.	18CE012	Pre - Engineered Industrial Structures	3/0/0	3	3	EEC
7.	18CE013	Smart City Planning and Development	3/0/0	3	3	EEC

OPEN ELECTIVE COURSES (12 Credits) (Offered by Other Branches)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18CS001	Internet Marketing & E-Commerce	3/0/0	3	3	OEC
2.	18CS002	Software Product Development and Management	3/0/0	3	3	OEC
3.	18CS003	Virtual Reality	3/0/0	3	3	OEC
4.	18CS004	Network Security	3/0/0	3	3	OEC
5.	18CS005	Green Computing	3/0/0	3	3	OEC
6.	18CS006	Data Science	3/0/0	3	3	OEC

7.	18EC001	Sensors and Actuators	3/0/0	3	3	OEC
8.	18EC002	Telemedicine	3/0/0	3	3	OEC
9.	18EC003	Artificial Intelligence and Deep Learning	3/0/0	3	3	OEC
10.	18EC004	Brain computer interface	3/0/0	3	3	OEC
11.	18EC005	Wireless Wearable systems	3/0/0	3	3	OEC
12.	18EC006	Power Management for IOT Devices	3/0/0	3	3	OEC
13.	18EE001	Power plant Engineering	3/0/0	3	3	OEC
14.	18EE002	Energy Auditing, Conservation and Management	3/0/0	3	3	OEC
15.	18EE003	Smart Grid	3/0/0	3	3	OEC
16.	18EE004	Renewable Energy Sources	3/0/0	3	3	OEC
17.	18EE005	Servo and Robot Drives	3/0/0	3	3	OEC
18.	18EE006	Special Purpose Machines	3/0/0	3	3	OEC
19.	18IT001	Mobile Applications Development using Android	3/0/0	3	3	OEC
20.	18IT002	Introduction of Python Programming	3/0/0	3	3	OEC
21.	18IT003	JAVA Programming (Fundamentals)	3/0/0	3	3	OEC
22.	18IT004	Cloud Virtualization	3/0/0	3	3	OEC
23.	18IT005	Database Systems	3/0/0	3	3	OEC
24.	18IT006	Cyber Security	3/0/0	3	3	OEC
25.	18ME001	Industrial Safety	3/0/0	3	3	OEC
26.	18ME002	MEMS/NEMS	3/0/0	3	3	OEC
27.	18ME003	Total Quality Management	3/0/0	3	3	OEC
28.	18ME004	Product Development	3/0/0	3	3	OEC
29.	18ME005	Renewable Energy	3/0/0	3	3	OEC
30.	18ME006	Fuel Cell Technology	3/0/0	3	3	OEC
31.	18MT001	Reliability Engineering	3/0/0	3	3	OEC
32.	18MT002	Vehicle Dynamics	3/0/0	3	3	OEC
33.	18MT003	Micro Machining	3/0/0	3	3	OEC
34.	18MT004	Field and Service Robotics	3/0/0	3	3	OEC
35.	18MT005	Automation System	3/0/0	3	3	OEC
36.	18MT006	Basics of Robotics	3/0/0	3	3	OEC

OPEN ELECTIVE COURSES
(Offered to Other Branches)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18CE001	Disaster Management	3/0/0	3	3	OEC
2.	18CE002	Engineering Risk and Uncertainty	3/0/0	3	3	OEC
3.	18CE003	Environmental and Social Impact Assessment	3/0/0	3	3	OEC
4.	18CE004	Geographical Information System	3/0/0	3	3	OEC
5.	18CE005	Industrial Pollution Prevention	3/0/0	3	3	OEC
6.	18CE006	Smart Materials and Smart Structures	3/0/0	3	3	OEC

PROJECT WORK (14 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18CE701	Project Work (Phase I)	0/0/4	4	2	PROJ
2.	18CE801	Project Work (Phase II)	0/0/24	24	12	PROJ

EMPLOYABILITY ENHANCEMENT SKILLS (1.5 Credits)

SL. No.	Course Code	Course Title	Duration	C	Cat.
1.	18CE506	Summer Industry Internship and Seminar Presentation	2 WEEKS	1	EES
2.	18CE604	Winter Industry Internship and Seminar Presentation	1 WEEK	0.5	EES

MANDATORY COURSES (Non-credit)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	18MC101	Induction Programme	3 WEEKS		0	MC
2.	18MC201	Environmental Sciences	2/0/0	2	0	MC
3.	18MC301	Human values and Professional Ethics	2/0/0	2	0	MC
4.	18MC401	Management Organizational Behaviour	2/0/0	2	0	MC
5.	18MC501	Soft Skills	2/0/0	2	0	MC
6.	18MC601	General Aptitude	2/0/0	2	0	MC

ONE CREDIT COURSES (Additional Credits)

SL. No.	Course Code	Course Title	Credits
1.	18CE01	Autodesk Certified Professional: AutoCAD	1
2.	18CE02	Building Functional Layout Planning, Bye Laws and Approval	1
3.	18CE03	Global Initiative of Academic Networks (GIAN)	1
4.	18CE04	IITB Spoken Tutorial Courses	1
5.	18CE05	Massive Open Online Courses (MOOC)	1
6.	18CE06	NPTEL Online Certification Courses	1
7.	18CE07	Professional Delivery Systems in Construction Industry	1
8.	18CE08	Microsoft Project Design	1
9.	18CE09	Structural Analysis – STADD.Pro and Design	1
10.	18CE10	Valuation of Immovable Properties	1

SEMESTER WISE CREDIT DISTRIBUTION: -

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	20	23.5	23.5	24.5	22.5	20	12	165

Total Credits: 165**L** : Lecture**T** : Tutorial**P** : Practical**C** : Credit**O** : Outside Classroom Learning Experience**Cat.** : Category**HSMC** : Humanities and Social Sciences including Management**OEC** : Open Elective Courses**EEC** : Emerging Elective Courses**BSC** : Basic Science Courses**PROJ** : Project Work**ESC** : Engineering Science Courses**EES** : Employability Enhancement Skills**PCC** : Professional Core Courses**MC** : Mandatory Course**PEC** : Professional Elective Courses

SEMESTER 1

18MA101	LINEAR ALGEBRA AND DIFFERENTIAL CALCULUS (FOR ALL BRANCHES OF B.E / B.TECH PROGRAMMES)	3/1/0/4
Nature of Course	Problem Analytical	
Pre requisites	Higher secondary mathematics	
Course Objectives:		
1.	To develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.	
2.	To gain knowledge in using infinite series of approximations for solutions arising in mathematical modeling	
3.	To familiarize with functions of several variables applicable in many branches of engineering.	
4.	To find the solution of ordinary differential equations as most of the engineering problems are characterized in this form	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C101.1	Recall the concepts of matrices and apply the concept of Cayley Hamilton theorem to find inverse of the matrix.	[R]
C101.2	Express a square matrix in the diagonal form by orthogonal transformation.	[AP]
C101.3	Check the convergence and divergence of various functions which are	[AP]
C101.4	Acquire knowledge about the notion of convergence of numerical sequences and series and learn ways of testing convergence	[AP]
C101.5	Apply the knowledge of differential equation and extreme values of the given function to solve the engineering problems	[AP]
C101.6	Apply the knowledge ODEs and systems of ODEs in the field of	[AP]
Course Contents:		
Module 1: Linear Algebra		20 Hrs
Symmetric, Skew – symmetric and orthogonal matrices - Characteristic equation – Eigen values and eigenvectors of a real matrices and their properties (statement only). Cayley-Hamilton theorem (statement only): Verification and application to find inverse and powers of real matrices. Orthogonal transformation of a real symmetric matrix to diagonal form – Reduction of Quadratic form to canonical form by orthogonal reduction.		
Module 2: Sequences, Series and Functions of several variables		20 Hrs
Convergence of sequences and series – Tests of convergence of positive term series: Comparison test, Alembert’s ratio test- Cauchy root test -Alternating Series- Leibnitz’s test-Series of positive and negative terms-Absolute and conditional convergence.		
Functions of several variables: Total derivatives – Differentiation of implicit functions – Jacobians – Taylor series expansion – Maxima and Minima – Method of Lagrangian multipliers.		
Module 3: Calculus		20 Hrs
Ordinary differential equations-Second and Higher order linear differential equations with constant coefficients –Cauchy’s and Legendre’s linear differential equations- Method of variation of parameters. Application of ODE: Differential equations connected with electric circuits and Simple Harmonic motion (Differential equations and associated conditions need to be given)		
Total Hours:		60 Hrs
Text Books:		
1.	Veerarajan.T, “Engineering Mathematics I”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.	
2.	Ramana, “Higher Engineering Mathematics”m Tata McGraw-Hill Publishing	

	Company Ltd., New Delhi, 2018.														
3.	Grewal.B.S, "Higher Engineering Mathematics", 43 rd edition, Khanna Publications, Delhi, 2014.														
Reference Books:															
1.	Thomas G.B. and Finney R.L., Calculus and Analytic Geometry, 13 th Edition, Pearson, Reprint, 2014														
2.	Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4 th edition, 2012.														
3.	Bali N P and Manish Goyal, "A Text book of Engineering Mathematics" 9 th edition, Laxmi publications ltd, 2014.														
4.	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2014.														
Web References:															
1.	https://www.coursera.org/learn/linearalgebra2														
2.	https://www.coursera.org/learn/differentiation-calculus														
3.	https://www.coursera.org/learn/single-variable-calculus														
4.	https://alison.com/courses/Algebra-Functions-Expressions-and-Equations														
Online Resources:															
1.	http://www.nptel.ac.in/courses/111105035														
2.	http://www.nptel.ac.in/courses/122104017														
3.	http://nptel.ac.in/courses/122102009														
4.	http://nptel.ac.in/courses/111107063														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome		Revised Bloom's Level			Assessment Component				Marks						
C101.1		Remember			Classroom or Online Quiz				4						
C101 .2		Apply			Power point presentation				6						
C101.3, C101.4, C101.5 & C101.6		Apply			Group Assignment & Announced test				10						
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) (50 marks)		
		CIA - I (10 marks)			CIA - II (10 marks)			CIA - III (10 marks)							
Remember		20			20			20					20		
Understand		30			30			30					30		
Apply		50			50			50					50		
Analyse		-			-			-					-		
Evaluate		-			-			-					-		
Create		-			-			-					-		
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
4	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
5	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
Avg	2.7	2	-	-	-	-	-	-	-	-	-	-	2	-	-
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed		

18CH101	ENGINEERING CHEMISTRY (FOR ALL BRANCHES OF B.E / B.TECH PROGRAMMES)		3/0/3/4.5
Nature of Course	Theory skill based		
Pre requisites	-		
Course Objectives (Theory):			
1.	To make the students conversant with boiler feed water, water treatment techniques.		
2.	To understand the principles and applications of electrochemistry and to learn electroanalytical methods.		
3.	To learn the effect of corrosion in materials and the methods for prevention of corrosion.		
4.	To understand the concepts of photophysical and photochemical processes in spectroscopy		
5.	To explore the synthesis and properties of important engineering plastics, energy sources and drug molecules.		
6.	To make the students get practically practiced the basic tests of water treatment		
7.	To understand and analyse the concepts of electrochemistry in real time applications in laboratory		
8.	To understand the working principle of spectroscopic techniques by analyzing with a sample		
9.	To make the students learn the corrosion and its reaction in laboratory condition		
Course Outcomes (Theory):			
Upon completion of the course, students shall have ability to			
C101.1	Recall the need and requirements of boiler feed water, water treatment procedures.		[R]
C101.2	Apply the various corrosion control techniques in real time industrial environments		[AP]
C101.3	Understand the principle and working of reference electrodes and conductivity meters as an analyser.		[U]
C101.4	Apply the knowledge of energy sources and storage devices in engineering field		[AP]
C101.5	Use the knowledge of polymers through its mechanism in the engineering field		[U]
C101.6	Understand the principle and working of certain analytical techniques		[U]
Course Contents:			
Module 1: Water chemistry and Corrosion		15 Hrs	
Water treatment-characteristics of water-hardness-types and estimation by EDTA method. Boiler feed water-requirements-disadvantages of hard water. boiler descaling process. Domestic water treatment-disinfection methods (chlorination, Ozonation, UV treatment)-demineralization process-desalination-reverse osmosis. Corrosion-types-mechanism of dry and wet corrosion-galvanic corrosion-differential aeration corrosion-protective coatings-electroplating of gold-electroless plating of nickel.			
Module 2: Electrochemistry and Energy sources		15 Hrs	
Electrochemical cells-electrolytic cell-reversible and irreversible cells - Free energy and emf, cell potentials, Nernst equation and applications. Oxidation and reduction potentials-standard hydrogen electrode, saturated calomel electrode, glass electrode-pH measurement. Energy Sources-Nuclear energy- reactor-breeder reactor- Photovoltaic cells-Fuel cells. Storage Devices-Batteries- alkaline-Lead acid and nickel cadmium batteries.			
Module 3: Polymer chemistry, Spectroscopic techniques and Synthesis of drug			

molecules		15 Hrs	
Introduction-monomers and polymers-classification of polymers-Polymerization-types. Mechanism of addition polymerization (free radical mechanism). Plastics-classification-preparation, properties and uses of Nylon 6,6, Nylon 6, PVC, Bakelite and PET. Moulding methods-Compression moulding, Injection moulding and Blow moulding. Spectroscopy-Beer Lambert's law, principle, instrumentation and applications of Electronic spectroscopy (UV-visible), Vibrational and rotational spectroscopy (IR) and Flame emission spectroscopy (FES). Synthesis of a commonly used drug molecule-Asprin, p-nitroaniline from acetanilide			
Field work:			
Industrial visit- Water treatment plant / Sewage treatment plant / Reverse osmosis plant			
		Total Hours	45 Hrs.
Course outcomes (Laboratory)			
C101.1	Understand the reaction taking place during water treatment		[U]
C101.2	Apply the knowledge of working of electrodes by conducting simple experiments		[AP]
C101.3	Understand the effect of corrosion by conducting experiment based on it		[AP]
C101.4	Understand the concept of prevention of corrosion by doing electroplating		[U]
C101.5	Understand the working of instruments which is based on photophysical laws		[U]
C101.6	Understand the different mobility rate of biomolecules by conducting the basic separation techniques		[U]
Laboratory Component:			
S.NO	List of Experiment	CO Mapping	RBT
1.	Estimation of hardness of water by EDTA method	C101.7	[E]
2.	Estimation of alkalinity of water sample	C101.7	[E]
3.	Determination of chloride content in given water sample	C101.8	[E]
4.	Estimation of dissolved oxygen in water	C101.8	[E]
5.	Potentiometry- determination of redox potentials and emf's	C101.9	[E]
6.	Conductometric titration-mixture of acids vs NaOH	C101.9	[E]
7.	Determination of strength of strong acid by pH metry	C101.10	[E]
8.	Corrosion rate of mild steel in acid medium	C101.10	[E]
9.	Electroplating of nickel over copper	C101.11	[E]
10.	Spectrophotometry-Estimation of iron in water	C101.11	[E]
11.	Separation of mixture of amino acids by thin layer chromatography	C101.12	[E]
12.	Synthesis of Nylon 66	C101.12	[E]
Text Books:			
1.	Dara S.S and Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2013.		
2.	Krishna Murthy N and Vallinayagam D., "Engineering Chemistry" PHI Learning Pvt Ltd., 2014		
3.	Sunita Rattan, A Text Book of Engineering Chemistry, SK Kataria Publishers, 2013		
Reference Books:			
1.	Shikha Agarwal., "Engineering Chemistry and Applications", Cambridge University press, 2016.		
2.	Liliya.,Bazylak.I., Gennady.E.,Zaikov., Haghvi.A.K., "Polymers and Polymeric Composites" CRC Press, 2014.		
3.	Lefrou.,Christine.,Fabry.,Pierre.,Poignet.,Jean-claude., "Electrochemistry - The Basics,		

	with examples" 2012 ., Springer.
4.	Zaki Ahmad, Digby Macdonald, "Principles of Corrosion Engineering and Corrosion Control", Elsevier Science, 2 nd 2012.

Web References:

1.	http://www.analyticalinstruments.in/home/index.html
2.	https://www.kth.se/.../electrochem/welcome-to-the-division-of-applied-electrochemistry
3.	www.corrosionsource.com/

Online Resources:

1.	nptel.ac.in/courses/105104102/hardness.htm
2.	nptel.ac.in/courses/113108051

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	Rubric based CIA [30 Marks]	
Remember	30	30	30	10	20
Understand	60	50	40	20	50
Apply	10	20	30	40	30
Analyse	-	-	-	30	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Articulation Matrix (Theory)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	1	-	-	-	-	2	-	-	-	-	2	-	-	1
2	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
6	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
Avg	2.8	1.6	1.3	-	-	-	2.0	-	-	-	-	2.0	1.4	-	1.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

Course Articulation Matrix (Lab)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
7	3	3	2	-	1	-	-	-	-	-	-	1	-	-	1
8	3	2	-	-	1	-	-	-	-	-	-	1	-	-	-
9	3	2	2	-	1	-	-	-	-	-	-	1	-	-	-
10	3	2	2	-	1	-	-	-	-	-	-	1	-	-	-
11	3	1	-	-	1	-	-	-	-	-	-	-	-	-	-
12	3	1	-	-	1	-	-	-	-	-	-	-	-	-	-
Avg	3.0	1.8	2.0	-	1	-	-	-	-	-	-	1.0	-	-	1.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CS111	PROBLEM SOLVING USING C PROGRAMMING (COMMON TO CIVIL/ MECH/ ECE/ EEEPROGRAMMES)	3/0/3/4.5
Nature of Course	Problem Programming	
Pre requisites	Nil	
Course Objectives:		
1.	To understand problem solving concepts.	
2.	To gain knowledge about the control structures in C.	
3.	To write C programs using arrays	
4.	To learn functions, structures and unions in C.	
Course Outcomes (Theory)		
Upon completion of the course, students shall have ability to		
C111.1	Apply problem solving techniques to solve real world problems	[AP]
C111.2	Understand C fundamental constructs and control structures	[U]
C111.3	Use the concept of pointers and arrays in designing programs	[AP]
C111.4	Design C programs using the concepts of strings and functions	[AP]
C111.5	Develop programs using structures and Unions in C	[AP]
C111.6	Develop applications using the advance concepts in C Programming	[AP]
Course Contents:		
Module 1: Problem Solving Techniques:		15 Hrs
Algorithm, Pseudo-code and Flowchart Problem Solving with Sequential Logic Structure - Decisions – Loops. Case Study: Raptor and Scratch Tools.		
Module 2: C Fundamental Constructs and Control Structure		15 Hrs
C Character Set – Identifiers and Keywords – Data Types – Constants - Variables and Arrays – Declarations - Operators and Expressions - Data input and output - Preparing and running a Complete C Program-Control Structures: Branching: if-else- Looping – while - do while – for - Nested control structures –switch – break – continue – comma - goto.		
Module 3: Arrays, Strings, Pointers, Functions, Structures and Unions:		15 Hrs
Arrays - Defining an array - Processing an array - Multi dimensional arrays - Strings: Defining a string - Null character -initialization of strings – reading and writing a string - processing the string - Pointers: fundamentals – Pointer Declaration & Usage – Dynamic Memory Allocation. Functions: Defining a Function – Accessing a function – Function Prototype Functions - Pointer to Function - Functions Returning Pointers. - Pointers and Strings - Passing arguments to a function – Recursion. Structures and Unions: The Type Definition (type def) – Enumerated types – Structure - Type Definition – Initialization – Accessing Structures - Structures and Functions – passing Whole Structure – Self-Referential Structure - Unions.		
Total Hours		45 Hrs
Course Outcomes: (Laboratory)		
Upon completion of the course, students shall have ability to		
C111.1	Demonstrate the purpose of office automation software	[AP]
C111.2	Utilize raptor tool for drawing flowcharts	[AP]
C111.3	Prepare animation using scratch tool	[AP]
C111.4	Write programs using decision making and looping statements	[AP]

C111.5	Develop programs using arrays, strings and pointers	[AP]
C111.6	Apply functions and structure concepts to solve problems	[AP]

Laboratory Component:

S. No	List of Experiments	CO Mapping	RBT
1.	Office Automation – Resume preparation , Spreadsheet processing	C111.1	[AP]
2.	Draw Flowchart using Raptor Tool Simple Flow Chart Decision Making Looping [Pretest & Posttest]	C111.2	[AP]
3.	Create Animation / Gaming /Application using Scratch Tool	C111.3	[AP]
4.	Program to process data types, format input and output and to evaluate an expression	C111.4	[AP]
5.	Program using decision making statements	C111.4	[AP]
6.	Program using looping statements	C111.4	[AP]
7.	Program using single- and two-dimensional arrays	C111.5	[AP]
8.	Program with Strings	C111.5	[AP]
9.	Program using Pointers.	C111.5	[AP]
10.	Program using Recursion	C111.6	[AP]
11.	Program using structures	C111.6	[AP]
12.	Branch specific application program	C111.6	[AP]

Text Books:

1.	SprankleM, "Problem Solving and Programming Concepts", 9 th Edition, Pearson Education, New Delhi, 2011
2.	Byron, S. Gottfreid, "Programming with C", McGraw Hill, Schaum's outlines, 3 rd Edition, 2014.
3.	Yashavant Kanetkar, "Understanding Pointer in C", 3 rd Edition, BPB Publication, 2011.

Reference Books:

1.	Herbert Schildt, "The Complete Reference C", 4 th Edition , McGraw Hill , 2015
2.	ThamaraiSelvi S and Murugesan R, "Programming in ANSI C", 6 th Edition, McGraw Hill, 2012.
3.	Venugopal K R and SudeepR.Prasad , "Mastering C", 2 nd Edition, McGraw Hill, 2015
4.	Jeri.RHanly, and Elliot B Koffman, Problem solving and programming Design in C AddisonWesly 2013

Web References:

1.	http://raptor.martincarlisle.com/
2.	https://scratch.mit.edu/

Online Resources:

1.	http://nptel.ac.in/courses/106105085/
2.	http://nptel.ac.in/courses/106106127/

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	Rubric based CIA [30 Marks]	
Remember	30	30	20	20	20

Understand	70	50	30	20	40										
Apply	-	20	50	60	40										
Analyse	-	-	-	-	-										
Evaluate	-	-	-	-	-										
Create	-	-	-	-	-										
Course Articulation Matrix (Theory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	3
2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
5	3	3	-	-	-	-	-	-	-	-	-	-	-	-	3
6	3	3	-	-	-	-	-	-	-	-	-	-	-	-	3
Avg	2.5	2.5	-	-	-	-	-	-	-	-	-	-	-	-	2.5
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				
Course Articulation Matrix (Laboratory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
7	2	2	-	-	3	-	-	-	-	2	-	1	-	-	2
8	2	2	-	-	3	-	-	-	-	2	-	1	-	-	2
9	2	2	-	-	3	-	-	-	-	2	-	1	-	-	2
10	2	2	-	-	2	-	-	-	-	2	-	2	-	-	3
11	2	2	-	-	2	-	-	-	-	2	-	2	-	-	3
12	2	2	-	-	2	-	-	-	-	2	-	2	-	-	3
Avg	2	2	-	-	2.5	-	-	-	-	2	-	2	-	-	2.5
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18EN102	TECHNICAL COMMUNICATION SKILLS (COMMON TO CIVIL/ MCT/ MECH/ IT PROGRAMMES)	2/0/2/3
Nature of Course	Theory Skill Based	
Pre requisites	Basics of English Language	
Course Objectives:		
1.	To enhance learners' LSRW skills.	
2.	To develop communication and soft skills.	
3.	To facilitate learners to acquire effective technical writing skills.	
4.	To prepare learners for placement and competitive exams.	
5.	To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.	
6.	To prepare them to be ready for corporate environments.	
7.	To train the students in the art of conversation, presentation skills and group discussions.	
8.	To develop English language skills in listening, speaking, reading and writing in a range of communicative tasks and activities.	
Course Outcomes: (Theory)		
Upon completion of the course, students shall have ability to		
C102.1	Recall language skills for technical communication.	[U]
C102.2	Understand and communicate effectively in personal and professional situation.	[AP]
C102.3	Apply technical writing skills to write letters, emails and prepare technical documents.	[AP]
C102.4	Apply technical English for competitive exams.	[AP]
C102.5	Apply communicative skills for technical presentations and group discussions.	[AP]
C102.6	Apply soft skills in corporate environment.	[AP]
Course Contents:		
Module 1: Listening and Speaking		15 Hrs
Basics of English Language - Importance of LSRW Skills - Introducing Others - Listening to Short Conversations or Monologues - Listening to Speeches / Talks - Listening and Responding -Identifying the Information Before Listening - Longer Listening Tasks - recognize Functions Speaking - Speaking about Giving Directions / Instruction - Talk about Preferences-Agree and Disagree - Giving Opinions - Speaking Practices by Giving Examples, Reasons and Extra Information-Short Talk on Business Topics.		
Module 2: Reading		15 Hrs
Reading Short Texts - Skimming and Scanning - Comparing Facts and Figures - Reading and Understanding Specific Information in a Text - Reading for Gist - Cloze Reading - Identifying Reasons and Consequences Through Reading Practices- Comprehension - Collocations.		
Module 3: Writing and Grammar		15 Hrs
Writing Formal Letters (Accepting and Declining Invitations) - Writing Business Letters (Placing an Order and Complaint Letter) - Email Writing – Memo - Circular - Agenda and Minutes of the Meeting - Job Application Letter - Resume Writing - Paragraph Writing –		

Essay Writing-Technical Instructions and Recommendations- Jumbled Sentences - Technical Definitions - Report Phrases - Report Writing - Technical Proposal - Transcoding (Bar Chart, Flow Chart) - Note Making. Parts of Speech- Tenses – Subject Verb Agreement - Sentence Structures - Connectives - Modal Verbs - Question Formation - If Conditionals- Active and Passive - Impersonal Passive Voice - Vocabulary Building - Business Vocabulary - Word Formation - Prefixes and Suffixes - Synonyms, Antonyms –, Abbreviations and Acronyms – Homophones and Homonyms- British and American Words - Identifying Common Errors.			
Total Hours			45 Hrs
Course Outcome: Laboratory			
Upon completion of the course, students shall have ability to			
C102.1	Apply LSRW skills to emphasize the practical usage of language.		[AP]
C102.2	Understand and improve pronunciation and English speech sounds.		[U]
C102.3	Understand and acquire the ability to speak and present their views clearly and convincingly, argue logically, use language impressively and gain confidence in public speaking.		[U]
C102.4	Apply to practice and improve their listening comprehension.		[AP]
C102.5	Understand the basic English knowledge to reduce errors in the use of the English language.		[U]
C102.6	Understand the nuances of English language through audio-visual experience and group activities.		[U]
Laboratory Component			
S. No	List of Experiments	CO Mapping	RBT
1.	Listening Comprehension	C 102.1	[E]
2.	Pronunciation, Intonation, Stress and Rhythm	C 102.2	[E]
3.	Common Everyday Situations: Conversations and Dialogues.	C 102.2	[E]
4.	Formal Presentation	C 102.3	[E]
5.	Group Discussion	C 102.4	[E]
6.	Interview Skills	C 102.4	[E]
Text Books:			
1.	Michael Swan, "Practical English Usage", Oxford University Press, 2016		
2.	Martin Hewings, "Advanced Grammar in Use", Cambridge University Press, 2013.		
3.	William Zinsser, "On Writing Well", Harper Resource Book, 2012.		
Reference Books:			
1.	Adrain Wall Work, "English for Academic Research: Writing Exercises", Springer, 2012.		
2.	Sanjay Kumar and PushpLata, "Communication Skills", Oxford University Press. 2011.		
3.	FriederikeKlippel, "Keep Talking, Communicative Fluency Activities for Language Teaching", Cambridge University Press, 2013.		
4.	Sumanth S, "English for Engineers", Vijay Nicole Imprints Private Limited, 2015.		
Web References:			
1.	http://www.academiccourses.com/Courses/English/Business-English		
2.	https://steptest.in		
Online Resources:			
1.	https://www.coursera.org/specializations/business-english		
2.	http://www.academiccourses.com/Courses/English/Business-English		

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [40 marks]		
	Theory						Practical								
	CIA - I [10 Marks]	CIA - II [10 Marks]	CIA - III [10 Marks]	Rubric based CIA [30 Marks]											
Remember	20	20	20	20			20						20		
Understand	40	40	40	40			40						40		
Apply	40	40	40	40			40						40		
Analyse	-	-	-	-			-						-		
Evaluate	-	-	-	-			-						-		
Create	-	-	-	-			-						-		
Course Articulation Matrix (Theory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
1	-	-	-	-	-	-	-	-	-	3	-	2	-	-	1
2	-	-	-	-	-	-	-	1	2	2	-	2	-	-	2
3	-	-	-	-	-	-	-	2	2	2	-	2	-	-	1
4	-	-	-	-	-	-	-	3	3	3	-	1	-	-	2
5	-	-	-	-	-	-	-	2	1	3	-	2	-	-	1
6	-	-	-	-	-	-	-	1	1	2	-	3	-	-	2
Avg	-	-	-	-	-	-	-	1.5	1.5	2.5	-	2	-	-	1.5
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		
Course Articulation Matrix (Lab)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	-	-	2	-	-	-	2	3	-	2	-	-	1
2	-	-	-	-	2	-	-	-	1	3	-	2	-	-	
3	-	-	-	-	2	-	-	-	2	3	-	2	-	-	2
4	-	-	-	-	2	-	-	-	2	3	-	2	-	-	1
5	-	-	-	-	2	-	-	-	2	3	-	2	-	-	1
6	-	-	-	-	2	-	-	-	2	3	-	2	-	-	
Avg	-	-	-	-	2	-	-	-	1.8	3	-	2	-	-	0.8
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		

18ME111	ENGINEERING GRAPHICS (COMMON TO CIVIL/ CSE/ EEE/ ECE/ IT PROGRAMMES)		2/0/2/3
Nature of Course:	Practical Application		
Pre-Requisites:	Basic drawing and Computer Knowledge		
Course Objectives:			
1.	To know the method to construct the conic curves used in Engineering Applications.		
2.	To develop an understanding of Isometric to Orthographic Views and vice versa.		
3.	To learn the basic projection of straight lines and plane surfaces.		
4.	To develop the imagination of solids inclined to one reference plane.		
5.	To know the development of surfaces used in various fields		
Course Outcomes			
Upon completion of the course, students shall have ability to			
C111.1	Sketch the details of conic and special curves in construction industry	[AP]	
C111.2	Draw the isometric to orthographic projections and vice versa	[AP]	
C111.3	Sketch the projection of lines and planes	[AP]	
C111.4	Sketch the projection of solids	[AP]	
C111.5	Develop the lateral surfaces of solids	[AN]	
C111.6	Sketch the perspective projections	[AP]	
Course Contents			
Conic curves and Special Curves-Isometric to Orthographic Projection-Orthographic to Isometric Projection-Projection of Lines and Plane Surfaces-Projection of Solids-Development of Surfaces-Introduction to Perspective projection.			
S.No.	List of Experiments	CO Mapping	RBT
1.	Introduction to Drafting Software.	C111.1	[U]
2.	Construction of Conic Curves (Ellipse, Parabola and Hyperbola)	C111.1	[AP]
3.	Construction of Special Curves (Cycloid and Involutés)	C111.1	[AP]
4.	Isometric to Orthographic projections – Manual sketches	C111.2	[AP]
5.	Isometric to Orthographic projections using software packages.	C111.2	[AN]
6.	Projection of lines – Inclined to HP, VP and Both HP & VP using software packages.	C111.3	[AN]
7.	Projection of Plane surfaces (Hexagon, Pentagon and circle) – inclined to any one of the principle planes using software packages.	C111.3	[AN]
8.	Projection of Solids (Prism and Pyramid) – Inclined to HP using software packages.	C111.4	[AP]
9.	Projection of Solids (Cone and Cylinder) – Inclined to VP using software packages.	C111.4	[AP]
10.	Development of Surfaces (Prism, Pyramid, Cone and Cylinder) using software packages.	C111.5	[AN]
11.	Introduction to Perspective projection.	C111.6	[AP]

													Total Hours	45 Hrs		
Text books :																
1.	Parthasarathy N S And Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.															
2.	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50 th Edition, 2014.															
3.	JeyapooanT,"Engineering Graphics", Vikas Publishing house Pvt Ltd,New Delhi, 2014															
Reference Books:																
1.	Basant Agrawal C M., "Engineering Drawing", McGraw Hill Education, 2013															
2.	Natarajan K.V , "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, 2018															
3.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2011.															
4.	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2013.															
Web References:																
1.	https://ekeeda.com/course/SEM-I/Shivaji-University/Automobile-Engineering/Engineering-Graphics/4386															
2.	https://www.scientechworld.com/education-software-training-and-skill-development/sku-online-learning/engineering-drawing-sku-105															
Online Resources:																
1.	https://swayam.gov.in/course/1370-engineering-graphics															
2.	https://www.class-central.com/course/nptel-engineering-graphics-5305															
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level			Rubric based Continuous Assessment [60 marks]						End Semester Examination [40 marks]							
Remember			30						30							
Understand			30						30							
Apply			20						20							
Analyze			20						20							
Evaluate			-						-							
Create			-						-							
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	3	2	1	1	3	-	-	2	2	2	-	2	2	-	2	
2	3	2	1	1	3	-	-	2	2	2	-	2	2	-	2	
3	3	2	1	1	3	-	-	2	2	2	-	2	2	-	2	
4	3	2	1	1	3	-	-	2	2	2	-	2	2	-	2	
5	3	3	2	2	3	-	-	2	2	2	-	2	2	-	2	
6	3	2	1	1	3	-	-	2	2	2	-	2	2	-	2	
Avg	3.0	2.2	1.2	1.2	3	-	-	2.0	2.0	2.0	-	2.0	2.0	-	2.0	
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed				

18MC101	INDUCTION PROGRAMME (FOR ALL BRANCHES OF B. E / B. TECH PROGRAMMES)		1/0/0/0
Nature of Course	Induction Programme		
Pre requisites	Nil		
Course Objectives:			
1.	To have broad understanding of society and relationships		
2.	To nurture the character and fulfill one's responsibility as an engineer, a citizen and a human being		
3.	To incorporate meta skills and values		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C101.1	Explore academic interest and activities		[AP]
C101.2	Work for excellence		[AP]
C101.3	Promote bonding and give a broader view of life and character		[AP]
Course Contents:			
<p>PHYSICAL ACTIVITY: Research over the past years has shown Yoga to have stress-relieving powers on students, paving the way for improved academic performance with the practice of asanas, meditation and breathing exercises. To prove these words Yoga classes has been planned.</p> <p>CREATIVE ARTS (students can select any one of their choice): Cultural development supports students to understand, feel comfortable with, value and appreciate the potential enrichment of cultural diversity. They should challenge discrimination, whether based on cultural or racial difference. Students should experience cultural traditions embedded in arts, crafts, language, literature, theatre, song, music, dance, sport, Science, technology and travel. Students should develop an appreciation of beauty both in experiencing artistic expression and by exploring their own creative powers. To inculcate those skills they are given a chance to exhibit their talents through painting, sculpture, pottery, music, dance, craft making and so on.</p> <p>UNIVERSAL HUMAN VALUES: Moral development involves supporting students to make considered choices around their behavior and the values that provide a framework for how they choose to live. Moral development is also learning about society's values, understanding the reasons for them, how they are derived and change; and how disagreements are resolved. Students must consider the consequences of personal and societal decisions on the wider community – local and global- and on the environment and future generations. To acquire this the students are exposed to training to enhance their soft skills.</p> <p>LITERARY AND PROFICIENCY MODULES: Social development helps students to work effectively together, developing the inter-personal skills required to relate positively with their peers and people of all ages. Students must also understand how to participate productively in a diverse and plural society and learn about, and how to effectively engage with societal institutions and processes. They should understand that a person may have different roles and responsibilities within society. To reach this the following aspects are given in the form of Reading, writing, speaking – debate, role</p>			

play etc. Communication and computer skills.

LECTURES BY EMINENT PEOPLE: Teaching with Lectures. It is essential to see lectures as a means of helping students learn to think about the key concepts of a particular subject, rather than primarily as a means of transferring knowledge from instructor to student. During the induction period students will attend to Guest lectures by subject experts.

VISIT TO LOCAL AREAS: Traveling is in fact a way of learning to learn. You are out of your comfort zone and so you must learn to be able to adapt to a new learning environment in a very short time. It also helps in your overall learning as well. In the induction period students will be taken to different places near college to learn new things. Eg. Meditation centre /orphanage /Hospital.

FAMILIARIZATION TO DEPARTMENT/BRANCH INNOVATION: Hod's of different branches will present about their department followed by department visit to view various facilities available at their department, new innovations from students and faculties etc.

Course Articulation Matrix (Lab)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	-	-	-	3	3	3	3	3	3	3	-	-	1
2	-	-	-	-	-	3	3	3	3	3	3	3	-	-	1
3	-	-	-	-	-	3	3	3	3	3	3	3	-	-	1
Avg	-	-	-	-	-	3.0	3.0	3.0	3.0	3.0	3.0	3.0	-	-	1.0
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed		

SEMESTER 2

18MA201	INTEGRAL CALCULUS AND COMPLEX VARIABLES (FOR ALL BRANCHES OF B. E / B. TECH PROGRAMMES)	3/1/0/4
Nature of Course	Problem Analytical	
Pre requisites	Higher secondary mathematics	
Course Objectives:		
1.	To gain knowledge in improper integrals, Gamma and Beta functions which are needed in engineering applications	
2.	To develop logical thinking and analytical skills in evaluating multiple integrals	
3.	To acquaint with the concepts of vector calculus needed for problems in all engineering disciplines	
4.	To develop an understanding of the standard techniques of complex variable theory to enable the student to apply them with confidence.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C201.1	Recall basic integration formulae, scalar and vector point function concepts	[R]
C201.2	Identify the concepts of integrals in computing Beta and Gamma functions	[U]
C201.3	Apply the concepts of the integration in evaluating engineering problems related to area, volume and vector point functions.	[AP]
C201.4	Find the derivatives of the complex valued functions and to evaluate complex valued integrals.	[AP]
C201.5	Apply complex integration techniques to solve engineering problems	[AP]
C201.6	Apply complex integration using residues	[AP]
Course Contents:		
Module 1: Integral Calculus		20 Hrs
Definite integrals – Evaluation of definite integrals using Bernoulli’s formula. Beta and Gamma functions: Relation between Beta and Gamma Functions – Evaluation of Integrals using Beta and Gamma Functions. Multiple integrals: Double integration in Cartesian coordinates –Area as double integral – Change the order of integration-Triple integration in Cartesian co-ordinates –Volume as triple integral		
Module 2: Vector Calculus		20 Hrs
Vector differential operator- Gradient of a scalar point function – Directional derivatives – Divergence and Curl of a vector point function – Irrotational and solenoidal vector fields – Simple problems– Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (theorem statements only)– Simple applications involving cubes and rectangular parallelepipeds.		
Module 3: Complex Variable		20 Hrs
Complex differentiation: Analytic Functions – Cauchy-Riemann equations (excluding proof) – Harmonic functions- Conjugate harmonic functions – Construction of analytic functions – Conformal mapping. Transformation: $w = c+z, cz, 1/z$ and Bilinear transformation. Complex integration: Cauchy’s Integral theorem (statement)- Cauchy’s Integral formula – Laurent’s series-Zeros and singularities – Residues – Cauchy’s Residue theorem (statement). Contour integration: Evaluation of real integrals of the form $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$ and $\int_{-\infty}^{\infty} \frac{P(x)}{Q(x)} dx$		
Total Hours:		60 Hrs
Text Books:		
1.	Thomas G.B. and Finney R.L, “Calculus and Analytic Geometry”, 13 th Edition, Pearson, Reprint, 2014.	
2.	Kreyszig. E, “Advanced Engineering Mathematics” Tenth Edition, John Wiley	

	and Sons (Asia) Limited, Singapore 2014.															
3.	Grewal. B.S, "Higher Engineering Mathematics", 43 rd edition, Khanna Publications, Delhi, 2014.															
Reference Books:																
1.	Veerarajan. T, "Engineering Mathematics II", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.															
2.	Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4 th edition, 2012.															
3.	Bali N P and Manish Goyal, "A Text book of Engineering Mathematics" 9 th edition, Laxmi publications ltd, 2014.															
Web References:																
1.	http://nptel.ac.in/video.php?subjectId=122107037															
2.	http://nptel.ac.in/courses/122107036/															
3.	http://nptel.ac.in/video.php?subjectId=117102060															
Online Resources:																
1.	https://www.coursera.org/learn/pre-calculus															
2.	https://www.coursera.org/learn/linearalgebra1															
3.	https://alison.com/courses/Advanced-Mathematics-1															
4.	https://www.edx.org/course/algebra-lineal-mexicox-acf-0903-1x															
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome	Revised Bloom's Level					Assessment Component					Marks					
C201.1	Remember					Classroom/Online Quiz					4					
C201.2	Understand					Technical presentation					6					
C201.1,2,3, 4, 5,6	Apply					Group Assignment					5					
C201.1,2,3, 4, 5,6	Apply					Announced test					5					
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level		Continuous Assessment											End Semester Examination [50 Marks]			
		CIA – I [10 Marks]			CIA – II [10 Marks]			CIA – III [10 Marks]								
Remember		20			20			20					20			
Understand		30			30			30					30			
Apply		50			50			50					50			
Analyse		-			-			-					-			
Evaluate		-			-			-					-			
Create		-			-			-					-			
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	
2	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	
3	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	
4	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	
5	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	
6	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	
Avg	2.5	2.5	-	-	-	-	-	-	-	-	-	-	1	-	-	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18ME201	ENGINEERING MECHANICS (COMMON TO CIVIL/ MECH PROGRAMMES)		3/1/0/4
Nature of Course	Problem analytical		
Pre requisites	Fundamentals of Basic mathematics and physics		
Course Objectives:			
1.	To make the students understand the vector and scalar representation of forces and moments and the static equilibrium of particles and rigid bodies.		
2.	To understand the effect of friction on equilibrium, laws of motion, kinematics of motion and their interrelationship.		
3.	To make the students understand the properties of surfaces and solids, prediction of behavior of particles and rigid bodies under motion		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C201.1	Illustrate the concepts of systems of forces in 2d, space and Particle equilibrium in 2d, 3D		[AP]
C201.2	Illustrate the mechanics involved in Beams and frames – support reactions.		[AP]
C201.3	Calculate the Centroid, Moment of inertia, Mass moment of inertia of composite sections.		[AP]
C201.4	Illustrate the static and dynamic friction involved in ladder, wedge and screw jack by applying the laws of friction		[AP]
C201.5	Demonstrate kinetics of particles and bodies by applying newtons second law applications in rectilinear and curvilinear motions.		[AP]
C201.6	Illustrate kinematics of particles and bodies by applying newtons second law applications.		[AP]
Course Contents:			
Module 1: Equilibrium of Particles and Rigid Bodies		20 Hrs	
Force Systems – Basic concepts, System of Forces, Coplanar Concurrent Forces, Resolution and addition of forces, resultant of several concurrent forces, Forces in space, Particle equilibrium in 2D and 3D. Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems – Equations of equilibrium of rigid bodies in 2D and 3D. Beams and frames – types of supports, loads and reactions.			
Module 2: Centre of Gravity, Moment of Inertia and Friction		20 Hrs	
Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere.			
Friction: Types of friction, Limiting friction, Laws of friction – Static and Dynamic Friction; simple contact friction, ladder friction – wedge friction – screw jack			
Module 3: Dynamics of Particles and rigid bodies		20 Hrs	
Kinematics of Particles: Basic terms, general principles in dynamics; Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates); Relative motion. Kinetics of Particles: Newton's 2 nd law (rectangular, path, and polar coordinates). D'Alembert's principle and its applications; Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique). Kinetics of rigid bodies: rigid body translation, rotation and general plane motion.			
Total Hours:			60 hrs

Text Books:															
1.	Beer F.P, and Johnston E.R, "Vector Mechanics for Engineers Statics and Dynamics", McGraw Hill Education, New Delhi, 2015.														
2.	Dhiman A.K, Dhiman P, and Kulshreshtha D.C, "Engineering Mechanics-Statics and Dynamics", McGraw Hill Education, 2015														
3.	Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", Pearson Education Asia Pvt. Ltd., 2011.														
Reference Books:															
1.	Kottiswaran N, "Engineering Mechanics – Statics and Dynamics", Sri Balaji Publications- 2013.														
2.	Meriam JL and Craige, "Engineering Mechanics statics and dynamics", John Willey and Son's publication 8 th edition.2011														
3.	Kumar DS, "Engineering Mechanics", S.K.Kataria and Sons Publications-2012.														
4.	Vela Murali, "Engineering Mechanics", Oxford University Press (2010)														
Web References:															
1.	https://ocw.mit.edu/courses														
2.	https://drive.google.com/file/d/1DBRwhHeznIhnuOtLafcQbKVkEJkOq-NZ/view														
Online Resources:															
1.	http://nptel.ac.in/courses/112103109/														
2.	http://nptel.ac.in/courses/122104015/														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level			Assessment Component									Marks		
C201.1	Understand			Online Quiz									5		
C201.2& C201.4	Apply			Group assignment									5		
C201.3	Analyze			Group assignment									5		
C201.5 &C201.6	Apply			Announced test									5		
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (50 marks)		
	CIA – I [10 Marks]	CIA – II [10 Marks]	CIA – III [10 Marks]												
Remember	-	-	-									-			
Understand	20	20	30									30			
Apply	50	40	40									40			
Analyse	30	40	30									30			
Evaluate	-	-	-									-			
Create	-	-	-									-			
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
1	3	2	2	-	-	-	-	2	2	-	-	-	3	-	-
2	3	2	2	-	-	-	-	2	2	-	-	-	3	-	-
3	3	2	2	-	-	-	-	2	2	-	-	-	3	-	-
4	3	2	2	-	-	-	-	2	2	-	-	-	3	-	-
5	3	2	2	-	-	-	-	2	2	-	-	-	3	-	-
6	3	2	2	-	-	-	-	2	2	-	-	-	3	-	-
Av g	3	2	2	-	-	-	-	2	2	-	-	-	3	-	-
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		

18EE211	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING (COMMON TO CIVIL/ MECH/ IT PROGRAMMES)	3/0/3/4.5
Nature of Course	Theory Analytical	
Pre requisites	Nil	
Course Objectives:		
1.	To equip students with a basic understanding of Electrical circuits	
2.	To learn the working principle of transformers	
3.	To understand the DC and AC Machine working principles and to have a knowledge on selection of machine for specific types of applications.	
4.	To give a comprehensive exposure to electrical installations.	
5.	To equip students with an ability to understand basics of analog and digital electronics.	
Course Outcomes@Theory) Upon completion of the course, students shall have ability to		
C211.1	Analyse the concepts in ac circuit and dc circuits.	[A]
C211.2	Illustrate the working principle of single-phase transformers.	[U]
C211.3	Explain the working principle of three phase transformers.	[U]
C211.4	Recognize the working principle of DC and AC machines.	[U]
C211.5	Apply the basic components in electrical installations.	[AP]
C211.6	Infer the basic concepts of analog and digital electronics.	[U]
Course Contents:		
Module 1: DC Circuits and AC Circuits		15 Hrs
DC Circuits-Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation, Mesh, Nodal Analysis Superposition, Thevenin and Norton Theorems. AC Circuits- Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel). Three phase balanced circuits, voltage and current relations in star and delta connections (Qualitative approach only).		
Module 2: Electrical Machines and Installations		15 Hrs
Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections (Qualitative only). Construction and working principle of DC motor. Construction and working principle of Synchronous motor and three phase Induction motor. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption.		
Module 3: Basics of Analog and Digital Electronics		15 Hrs
Semiconductor, PN junction diode, Zener diode, rectifier- Half wave, full wave and Bridge rectifier, Introduction to Number system, basic Boolean laws, reduction of Boolean expressions and implementation with logic gates.		

		Total Hours:	45 Hrs
Course outcomes (Laboratory)			
Upon completion of the Laboratory, students shall have ability to			
C211.1	Verify Ohm's law and Kirchhoff's law		[AP]
C211.2	Estimate mesh current and node voltage by Mesh and Nodal Analysis		[E]
C211.3	Apply Network Theorems in electrical circuits		[AP]
C211.4	Measure three phase power		[E]
C211.5	Interpret the load test on dc shunt motor		[U]
C211.6	Demonstrate the components of LT Switch Gears		[U]
Laboratory Component:			
S. No	List of Experiments	CO Mapping	RBT
1.	Familiarization of Electrical Elements, Sources, Measuring Devices and Verification of ohm's law	C211.1	[R]
2.	Estimation of voltage and current by KVL and KCL in Electric Circuits	C211.1	[U]
3.	Determination of mesh current and node voltage by Mesh and Nodal Analysis	C211.1	[U]
4..	Application of Superposition theorems, thevenin's and maximum power transfer theorem in electrical circuits	C211.1	[AP]
5.	Measurement of three phase power	C211.2	[AN]
6.	Demonstration of cut-out sections of machines: dc machine (Commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding – slip ring arrangement) and single-phase induction machine	C211.3	[U]
7.	Load test on dc shunt motor.	C211.3	[AP]
8.	Demonstration of components of LT Switch Gears	C211.4	[U]
9.	Construction of bridge rectifier with and without filters	C211.5	[U]
10.	Verification of logic gates.	C211.5	[R]
Text Books:			
1.	Fitzgerald. A.E., Charles Kingsely Jr, and Stephen D.Umans, "Electric Machinery", Tata McGraw Hill, 6 th edition 2015.		
2.	Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2 nd edition, 2015.		
3.	Hughes, E. "Electrical and Electronics Technology", Pearson, 10 th edition, 2011		
Reference Books:			
1.	Birdie G.S., Water supply Engineering, Dhanpat rai publishing company, 2014		
2.	Venugopal Rao P., "Textbook of Environmental Engineering", Prentice Hall of India Pvt.Ltd, 2013		
3.	SankaraSubramaniam.V, "Environmental Engineering Vol-I and Vol – II", Laxmi Publications, 2015		
4.	Basak N.N, "Environmental Engineering", McGraw Hill Education., 2017		
Web References:			
1.	http://nptel.ac.in/course.php?disciplineId=108		
2.	https://ocw.mit.edu/courses/findbytopic/#cat=engineering&subcat=https://electricalengineering&spec=electricpower		
3.	https://nptel.ac.in/video.php?subjectId=117103063		

Online Resources:															
1.	http://www.electrical-knowhow.com/														
2.	https://www.edx.org/course/electricity-magnetism-part-1-ricex-phys102-1x-1														
3.	https://www.mooc-list.com/course/fundamentals-electrical-engineering-coursera														
Tentative Assessment Method & Level (based on Revised Bloom's Taxonomy)															
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [40 Marks]		
	Theory									Practical					
	CIA – I (10 Marks)	CIA – II (10 Marks)	CIA – III (10 Marks)	Rubric based CIA (30 Marks)											
Remember	50	50	40	40			40			40					
Understand	50	50	40	40			40			40					
Apply	-	-	20	20			20			20					
Analyze	-	-	-	-			-			-					
Evaluate	-	-	-	-			-			-					
Create	-	-	-	-			-			-					
Course Articulation Matrix (Theory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	-	-	-	-	-	1	-	1	-	1	-	3
2	2	1	-	-	-	-	-	-	-	-	1	-	1	-	-
3	2	1	-	-	-	-	-	-	-	-	1	-	1	-	-
4	2	1	-	-	-	-	-	-	-	-	1	-	1	-	-
5	3	2	1	-	-	-	-	1	-	-	1	-	1	-	1
6	2	1	-	-	-	-	-	-	-	-	1	-	1	-	-
Avg	2.3	1.5	1.5	-	-	-	-	1	1	-	1	-	1	-	2
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed		
Course Articulation Matrix (Laboratory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	2	2	-	-	-	1	-	1	-	1	-	2
2	3	3	3	2	2	-	-	-	1	-	1	-	1	-	2
3	3	2	1	2	2	-	-	-	1	-	1	-	1	-	2
4	3	3	3	2	2	-	-	-	1	-	1	-	1	-	2
5	2	1	-	2	2	-	-	-	1	-	1	-	1	-	1
6	2	1	-	2	2	-	-	-	1	-	1	-	1	-	1
Avg.	2.7	2	2	2	2	-	-	-	1	-	1	-	1	-	1.7
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed		

18PH201	ENGINEERING PHYSICS (COMMON TO CIVIL/ MCT/ MECH PROGRAMMES)		3/0/3/4.5
Nature of Course		Theory skill based	
Pre requisites		Nil	
Course Objectives:			
1.	To learn the basic concepts of physics needed for all branches of engineering		
2.	To apply the physics concepts in solving real time engineering problems		
3.	To implement and visualize theoretical aspects in the laboratory		
4.	To familiarize the students to handle various instruments and equipment		
Course Outcomes: (Theory) Upon completion of the course, students shall have ability to			
C201.1	Outline the principle and working of various instruments		[U]
C201.2	Describe the basic concepts of simple harmonic and damped oscillations		[U]
C201.3	Discuss the thermal properties of materials & its applications		[U]
C201.4	Recall the basic concepts of crystal structure of the various materials		[R]
C201.5	Solve complex problems in everyday life using the knowledge gained from the course		[AP]
C201.6	Practice to solve problems using theoretical knowledge as an individual and team		[AP]
Course Contents			
Module 1: Instrumentation		15 Hrs	
Instrumentations: dial gauge, piezo electric strain gauge, load cell (pneumatic and hydraulic load cell), venturi meter, thermocouple, tachometer (AC and DC), stroboscope, cathode ray oscilloscope (CRO – working mechanism), digital storage oscilloscope (DSO), Pirani gauge, scintillation counter, optical microscope, scanning electron microscope (SEM), transmission electron microscope (TEM) – Types of errors: gross error, systematic error and random error.			
Module 2: Harmonic Oscillations and Laser		15 Hrs	
Harmonic Oscillations: Periodic motion-Simple harmonic motion-characteristics of simple harmonic motion-Vibration of simple spring mass system. Resonance-Definition – Damped harmonic oscillator, energy decay in a damped harmonic oscillator. Laser: Einstein's theory of matter radiation interaction and A and B coefficients – Amplification of light by population inversion – Different types of lasers: CO ₂ and Neodymium lasers – Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, applications of lasers in engineering: welding, drilling and cutting.			
Module 3: Thermal properties and Crystallography		15 Hrs	
Thermal properties: Thermal conductivity – Definition – Derivation of 'K' – Co-efficient of thermal expansion, heat capacity, thermal conduction mechanisms and thermal stresses – Applications: Bimetallic strip, thermal insulation, tempered glass, ceramic-to-metal joints, cryogenic materials. Crystallography: crystal system, bravais lattice, atomic packing factor for simple cubic, body centred cubic, face centred cubic and hexagonal close packed structured – Miller indices – Crystal imperfections: point, line burger vector			
		Total Hrs	45 Hrs
Course Outcomes: (Laboratory) Upon completion of the course, students shall have ability to			
C201.1	Construct resonance curve and understand its importance		[AP]
C201.2	Analyze the difference between linear elasticity and rotational elasticity		[AP]
C201.3	Understand the fundamental properties of solids and fluids		[U]
C201.4	Explain the variation of earth magnetic field with respect to distance		[U]
C201.5	Demonstrate between longitudinal and transverse waves with examples		[U]

C201.6	Describe the principles, properties and applications of laser and optical fiber	[U]	
Laboratory Component:			
S.No	List of Experiments	CO Mapping	RBT
1.	Laser and optical fiber parameters	C201.6	[U]
2.	Wavelength measurement of mercury spectrum- Spectrometer Grating	C201.5	[U]
3.	Young's modulus – Non- Uniform bending method	C201.2	[U]
4.	Rigidity modulus – Torsional Pendulum	C201.2	[U]
5.	Coefficient of viscosity for a liquid –Poiseuille's method	C201.3	[U]
6.	Magnetic field along the axis of current carrying coil- Stewart and Gee method.	C201.4	[U]
7.	LCR circuits.	C201.1	[U]
8.	Newton's ring- wavelength of sodium vapour lamp / Air wedge – Thickness of thin sample	C201.5	[U]
9.	Time constant of RC circuits.	C201.1	[U]
10.	Transverse and longitudinal wave modes- Melde's experiment.	C201.1	[U]
Text Books:			
1.	Rajendran, V 'Engineering Physics' McGraw Hill Publications Ltd, New Delhi, 2014.		
2.	David Halliday, Robert Resnick and Jearl Walker "Fundamentals of Physics" Wileyplus.2010.		
3.	Shatendra Sharma and Jyotsna Sharma, "Engineering Physics", Pearson Educations New Delhi,2018.		
Reference Books:			
1.	Avadhanulu M N and Kshirshagar P.G , "A Text Book of Engineering Physics", S.Chand and Co Ltd, 2016.		
2.	Mani P. "Engineering Physics II". Dhanam Publications, 2011		
3.	Richard P. Feynman, "The Feynman Lectures on Physics", Vol. I, The New Millennium Edition.2010.		
4.	Dattu R Joshi, "Engineering Physics" McGraw Hill Publications Ltd, New Delhi 2010.		
Web References:			
1.	http://faculty.sites.uci.edu/chem1l/files/2013/11/RDGerroranal.pdf		
2.	http://nptel.ac.in/downloads/112104158/		
3.	http://nptel.ac.in/courses/113106032/13%20-%20Thermal%20Property.pdf		
4.	http://www.feynmanlectures.caltech.edu/info/		
5.	https://books.google.co.in/books?id=Vbk3BQAAQBAJ&printsec=frontcover&dq=physics-oscillators&hl=ta&sa=X&ved=0ahUKEwj77JSyg8LbAhVJQ48KHc-Rdu8Q6AEIJAA#v=onepage&q=physics-oscillators&f=false		
6.	http://nptel.ac.in/courses/113106032/4%20-%20Crystal%20structure.pdf		
7.	https://www.drdo.gov.in/drdo/data/Laser%20and%20its%20Applications.pdf		
8.	https://physics.info/sho/		

9.	https://web.iit.edu/.../web/.../Academic%20Resource%20Center/.../Miller.
10.	http://www.phys.ufl.edu/courses/phy2054/s09/lectures/2054_ch21A.pdf

Online Resources:

1.	https://www.patana.ac.th/secondary/science/anrophysics/ntopic4/commentary.htm
2.	http://www.indiaeducation.net/
3.	https://learndigital.withgoogle.com/digitalunlocked?gclid=EAlaIqobChMluty_34nC2wlVGQ4rCh0o2AeIEAAYASAAEgKeUvD_BwE&dclid=CKPjlfWJwtsCFQMZigodEPgKBg
4.	https://www.jic.ac.uk/microscopy/links.html
5.	http://esiksha.com/home.asp
6.	www.fiberopticsonline.com/
7.	https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA – I [10 Marks]	CIA – II [10 Marks]	CIA – III [10 Marks]	Rubric based CIA [30 Marks]	
Remember	30	20	30	20	30
Understand	60	60	60	40	60
Apply	10	20	10	40	10
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Articulation Matrix (Theory)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	1	-	-	-	-	-	-	-	-	-	1	1	-	2
2	2	1	-	-	-	-	-	-	-	-	-	1	1	-	2
3	2	1	-	-	-	-	-	-	-	-	-	1	1	-	2
4	1	-	-	-	-	-	-	-	-	-	-	1	1	-	2
5	3	2	1	-	-	-	-	-	-	-	-	2	2	-	2
6	3	2	1	-	-	-	-	-	-	-	-	2	2	-	2
Avg	2.2	1.4	1	-	-	-	-	-	-	-	-	1.3	1.3	-	2
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

Course Articulation Matrix (Laboratory)

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	-	1	-	-	1	1	1	-	2	2	-	2
2	3	2	1	-	1	-	-	1	1	1	-	2	2	-	2
3	2	1	-	-	1	-	-	1	1	1	-	1	1	-	2
4	2	1	-	-	1	-	-	1	1	1	-	1	1	-	2
5	2	1	-	-	1	-	-	1	1	1	-	1	1	-	2
6	2	1	-	-	1	-	-	1	1	1	-	1	1	-	2
Avg	2.3	1.3	1.0	-	1.0	-	-	1.0	1.0	1.0	-	1.3	1.3	-	2
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18ME102	ENGINEERING PRACTICES LABORATORY (COMMON TO CIVIL/ CSE/ EEE/ ECE/ MECH/ IT PROGRAMMES)		1/0/4/3
Nature of Course		M (Practical Application)	
Course Objectives:			
1.	To learn the use of basic hand tools and to know the need for safety in work place and to gain hands on experience in Carpentry, Sheet metal, Plumbing, Welding and Foundry.		
2.	To learn about basic electrical devices, meters and electronics devices and to gain knowledge about the fundamentals of various electrical and electronic gadgets their working and trouble shooting.		
Course Outcomes			
C102.1	Identify and solve the basic engineering problems at home and in workplace		[AP]
C102.2	Develop the surfaces and make simple components like tray, funnel etc.		[C]
C102.3	Make simple metal joints using welding equipment and wooden joints using carpentry tools.		[AP]
C102.4	Prepare pipe connections and sand moulds		[AP]
C102.5	Explain the fundamentals of machining.		[U]
C102.6	Testing Of CRO and Electronic components using Multi-meter.		[AN]
C102.7	Examine and troubleshoot electrical and electronics circuits		[AN]
C102.8	Measure Power and Energy in three phase electrical circuits		[AN]
Course Content:			
GROUP A: (CIVIL & MECHANICAL)			
Manufacturing Methods –Sheet metal operations – Welding – arc welding, gas welding, TIG & MIG welding — basic machining using lathe – metal casting – Carpentry work using power tools – Plumbing components and pipelines			
List of Experiments:			
S.No	List of Experiments	CO Mapping	RBT
1.	Preparation of butt joints and lap joints using arc welding and TIG / MIG welding.	C102.3	[AP]
2.	Sheet metal Forming and Bending, Model making – Trays and funnels.	C102.2	[AP]
3.	Preparation of wooden joints by sawing, planing and cutting.	C102.3	[AP]
4.	Making basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings.	C102.4	[AP]
5.	Basic machining – simple turning operations.	C102.5	[U]
6.	Demonstration of foundry operations like mould preparation for solid and split piece pattern.	C102.4	[AP]
GROUP B : (ELECTRICAL AND ELECTRONICS ENGINEERING)			
List of Experiments:			
Basic Circuit Elements: Resistor, inductor, capacitor. Introduction to measuring equipments: Moving iron meter, moving coil meter, Wattmeter, Energy meter, CRO, Multi-meter. Digital logic circuits, PCB design, fuse, relay, circuit breaker, wire, Earthing, fan, fluorescent lamp, iron box, mixer grinder.			

S.No.	List of Experiments	CO Mapping	RBT
1.	Study and identification of electronic components with specification.	C102.6	[AN]
2.	Testing of CRO and Electronic components using Multimeter.	C102.6	[AN]
3.	Generation and measurement of signals using CRO.	C102.6	[AN]
4.	Familiarisation of digital basic gate IC's.	C102.6	[AN]
5.	Soldering practice-components devices and circuits- using general purpose PCB.	C102.6	[AN]
6.	Demonstration of meters and electrical components.	C102.6	[AN]
7.	Safety precautions with electrical components.	C102.6	[AN]
8.	Residential house wiring.	C102.6	[AN]
9.	Measurement of power and energy.	C102.6	[AN]
10.	Trouble shooting of electrical equipment's.	C102.6	[AN]
Total Hours			45 Hrs
Textbooks:			
1.	Hughes E, "Electrical and Electronics Technology", Pearson, 2010.		
2.	Gowri S and T Jeyapoovan, "Engineering Practices Lab Manual", Vikas Publishing, New Delhi, 2014		
3.	Raghuraman S, "Engineering Practices", Observation cum Laboratory Manual, Cenage Learning, 2012		
Reference Books:			
1.	SeropeKalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology", Pearson Education, Inc. 2009 (Second Indian Reprint)		
2.	HajraChoudhury, "Elements of Workshop Technology", Vol. I & II, Media Promoters Pvt Ltd., 2014.		
3.	Suyambazhagan S, 'Engineering practices' PHI Learning private limited, New Delhi, 2012.		
4.	D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.		
Online References:			
1.	www.nptel.ac.in		
2.	https://www.vidyarthiplus.com/attachment/33926.html		
Web References:			
1.	https://www.bvrit.ac.in/Freshman_Lab_Manuals/Engineering%20Workshop/Engineering%20Workshop.pdf		
2.	www.sme.org		
3.	http://www.allaboutcircuits.com/education/		
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)			
Summative assessment based on Continuous and End Semester Examination			
Revised Bloom's Level	Rubric based Continuous Assessment [60 marks]	End Semester Examination [40 marks]	
Remember	10	10	
Understand	10	10	
Apply	40	40	
Analyze	20	20	
Evaluate	10	10	
Create	10	10	
Course Articulation Matrix			

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	1	-	-	2	3	3	-	2	3	-	2
2	3	3	2	2	2	-	-	2	3	3	-	2	3	-	2
3	3	3	3	2	1	-	-	2	3	3	-	2	3	-	2
4	3	3	3	-	-	-	-	2	3	3	-	2	3	-	2
5	3	3	2	2	-	-	-	2	3	3	-	2	2	-	1
6	3	2	-	-	-	-	-	-	2	3	-	2	1	-	1
Avg	3	2.8	2.4	2.0	1.3	-	-	2	2.8	3	-	2.0	2.5	-	1.7
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18MC201	ENVIRONMENTAL SCIENCES (FOR ALL BRANCHES OF B. E / B.TECH PROGRAMMES)	2/0/0/0
Nature of Course	Theory Concept	
Pre requisites	Basics in Environmental Studies	
Course Objectives:		
1.	To learn the integrated themes on various natural resources.	
2.	To gain knowledge on the type of pollution and its control methods.	
3.	To have an awareness about the current environmental issues and the social problems.	
Course Outcomes: Upon completion of the course, students shall have ability to		
C201.1	Explain the important role in transferring a healthy environment for future generation.	[U]
C201.2	Understand the importance of natural resources and conservation of biodiversity.	[U]
C201.3	Examine the impact of engineering solutions in a global and societal context.	[AP]
C201.4	Apply the knowledge to overcome pollution problems and its mitigation measures	[AP]
C201.5	Develop the knowledge in various environmental issues and sustainable development.	[AP]
C201.6	Demonstrate the impacts and mitigation measures of E-waste management technology	[AP]
Course Contents:		
Module 1: Natural Resources:		10 Hrs
Introduction-Forest resources: Use and abuse, case study-Major activities in forest-Water resources-over utilization of water, dams-benefits and problems. Mineral resources-Use and exploitation, environmental effects of mining- case study-Food resources- World food problems, case study. Energy resources –Renewable and non-renewable energy sources Land resources- Soil erosion and desertification – Role of an individual in conservation of natural resources.		
Module 2: Environmental Pollutions:		10 Hrs
Definition – causes, effects and control measures of: Air Pollution-Acid rain – Greenhouse Effect-Global warming- Ozone layer depletion – case study- Bhopal gas tragedy. Water pollution c. Soil pollution – Solid waste management – Recycling of plastics-Pyrolysis method- causes, effects and control measures of municipal solid wastes d. Noise pollution. E. Nuclear hazards-case study-Chernobyl nuclear disaster-Role of an individual in prevention of pollution.		
Module 3: Social issues and the Environment:		10 Hr
Sustainable development-water conservation, rain water harvesting, E-Waste Management – Environmental ethics: 12 Principles of green chemistry-Scheme of labelling of environmentally friendly products (Eco mark) – Emission standards – ISO 14001 standard.		
Total Hours		30 Hrs
Text Books:		
1.	Anubha Kaushik and C P Kaushik “Perspectives in Environmental Studies”4 th Edition, Newage International (P) Limited, Publisher Reprint 2014. New Delhi.	
2.	Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, Oxford University Press 2015.	
3.	Santra S.C, Environmental Science, New Central Book Agency (P) Limited, New Delhi, 2011	
Reference Books:		

1.	Tyler Miller, Jr., "Environmental Science", Brooks/Cole a part of Cengage Learning, 2014.
2.	William Cunningham and Mary Cunningham, "Environmental Science", 13 th Edition, McGraw Hill, 2015.
3.	Gilbert M. Masters, "Introduction to Environmental Engineering and Science", Third Edition, Pearson Education, 2014.
4.	Khoiyangbam R Sintroductio n to Environmental Sciences, The Energy Resources Institute (TERI) New Delhi, 2012

Web References:

1.	https://www.edx.org/course/subject/environmental-studies
2.	www.environmentalscience.org

Online Resources:

1.	http://nptel.ac.in/courses/104103020/20
2.	http://nptel.ac.in/courses/120108002
3.	http://nptel.ac.in/courses/122106030
4.	http://nptel.ac.in/courses/120108004/
5.	http://nptel.ac.in/courses/122102006/20

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks: 20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C201.1, C201.2	Understand	Online Quiz/ class room quiz	5
C201.3, C201.4	Apply	Technical Presentation	5
C201.5	Apply	Group Assignment	5
C201.6	Apply	Case study report preparation and presentation	5

Summative assessment based on Continuous Assessment

Revised Bloom's Level	Continuous Assessment		
	CIA-I [10 marks]	CIA-II [10 marks]	Term End Assessment [60 marks]
Remember	20	40	20
Understand	60	50	60
Apply	20	10	20
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	-	-	1	3	3	2	1	-	-	2	1	-	1
2	-	-	-	-	-	2	3	2	-	-	-	1	1	-	1
3	1	1	2	-	1	2	3	2	1	-	-	1	1	-	2
4	1	2	-	-	-	2	3	1	-	-	-	1	1	-	-
5	1	1	1	-	-	1	3	1	-	-	-	-	-	-	1
6	-	1	-	-	1	-	3	-	-	-	-	1	-	-	1
Avg	1	1.3	1.5	-	1	2	3	1.6	1	-	-	1.2	1	-	1.2
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

SEMESTER 3

18MA301	FOURIER ANALYSIS, PARTIAL DIFFERENTIAL EQUATIONS AND CALCULUS OF VARIATION	3/1/0/4
Nature of Course	Problem Analytical	
Pre requisites	Basic concepts in integral calculus and differential equations.	
Course Objectives:		
1.	To acquaint the student with Fourier transform techniques which are used in variety of engineering fields	
2.	To study the concept of mathematical formulation of certain practical problems in terms of differential equations and solving for physical interpretation	
3.	To understand the different possible forms of Fourier series and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data	
4.	To solve boundary value problems encountered in engineering practices using Fourier series	
5.	To find numerical solution for partial differential equations	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C301.1	Demonstrate periodic functions arising in the study of engineering problems as Fourier series of Sines and Cosines.	[U]
C301.2	Use Fourier transforms techniques to evaluate integrals	[AP]
C301.3	Solve Partial Differential Equations, linear, nonlinear, homogeneous and non-homogeneous, by various methods.	[AP]
C301.4	Solve Partial Differential Equations arising in engineering problems like Wave equation, Heat flow equation by Fourier series.	[AP]
C301.5	To extend the basic ideas of calculus of one variable to the functions that have two or more variables	[AP]
C301.6	To apply the concepts of calculus of variations in determining stationary paths of a functional to deduce the differential equations for stationary paths	[AP]
Course Contents:		
Module 1: Fourier Analysis		20 Hrs.
Fourier series : Dirichlet's conditions – General Fourier Series – Odd and Even Functions- Half range sine series and cosine series – Parseval's Identity – Fourier transform - Properties (excluding proof) – Transforms of simple functions – Parseval's Identity (Statement) – Evaluation of integrals using Parseval's Identity.		
Module 2: Partial Differential Equations		20 Hrs.
Lagrange's linear equations – Linear homogeneous partial differential equations of second and higher order with constant coefficients – Classification of PDE – One dimensional wave equation – One dimensional equation of heat conduction – Finite difference techniques – Laplace equation – Poisson equation – Liebmann's Iteration Process – Parabolic Equation – Bender-Schmidt's Difference Equation – Crank-Nicholson's Difference Equation.		
Module 3: Calculus of Variation		20 Hrs.
Calculus of Variation – Variation and its properties – Euler's equation – functional dependent on first and higher order derivatives.		
Total Hours:		60 Hrs
Text Books:		
1.	Veerarajan. T, "Transforms and Partial differential equations", 3 rd edition, Tata McGraw-Hill Publishing Company Ltd., reprint, 2016	
2.	Grewal. B.S, "Higher Engineering Mathematics", 43 rd edition, Khanna Publications, Delhi, 2014.	
3.	Ramana, "Higher Engineering Mathematics Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.	

Reference Books:	
1.	Bali N.P ,”A Text book of Engineering Mathematics Sem-III/IV” 13 th edition, Laxmi Publications Ltd, 2017
2.	Kreyszig. E, “Advanced Engineering Mathematics” Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2014
3.	Kandasamy P, and Thilagavathy K,”Numerical Methods “, S.Chand, New Delhi, 2010 edition
4.	Rajasekaran S., Numerical methods in Science and Engineering – A Practical Approach, 3 rd edition, S.Chand, 2017
5.	Gelfand.I.M. and S.V.Fomin, “Calculus of Variations”, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, USA,2012.

Web References:	
1.	https://www.edx.org/course/calculo-diferencial-galileox-cmath001rx
2.	https://www.edx.org/course/pre-university-calculus-delftx-calc001x-1
3.	https://www.edx.org/course/calculus-1a-differentiation-mitx-18-01-1x
4.	https://alison.com/courses/Advanced-Mathematics-1
5.	https://ocw.mit.edu/courses/.../18-335j-introduction-to-numerical-methods-fall-2010 /ocw.usu.edu > Electrical and Computer Engineering > Signals and Systems

Online Resources:	
1.	http://nptel.ac.in/video.php?subjectId=122107037
2.	http://nptel.ac.in/courses/122107036/
3.	http://nptel.ac.in/video.php?subjectId=117102060
4.	https://nptel.ac.in/courses/122106033/

Tentative Assessment Methods & Levels (based on Revised Bloom’s Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom’s Level	Assessment Component	Marks
C301.1	Remember	Classroom or Online Quiz	2
C301.2	Understand	Class Presentation / Power point presentation	4
C301.3.1, 2,3,4,5,6	Apply	Tutorial & Group activities	14

Summative assessment based on Continuous and End Semester Examination

Revised Bloom’s Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Avg	2.7	2	1	-	-	-	-	-	-	-	-	-	2.4	-	-
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE301	CONSTRUCTION MATERIALS AND TECHNIQUES		3/0/0/3
Nature of Course	Theory Application		
Pre requisites	Engineering Chemistry, Engineering Mechanics, Engineering Physics.		
Course Objectives:			
1.	To have a clear knowledge of construction materials and their properties.		
2.	To know the market forms of building materials.		
3.	To learn various tests for assessing the strength and quality of materials.		
4.	To know the various construction techniques and practices		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C301.1	Evaluate the properties of various building materials by using various tests		[AN]
C301.2	Demonstrate the manufacturing process of construction materials and concrete blocks		[AP]
C301.3	Compare the types of cements and various materials used for different construction purposes		[AN]
C301.4	Illustrate the importance of alternate construction materials used in various construction works		[AN]
C301.5	Apply the advanced construction techniques in Substructure constructions		[AP]
C301.6	Apply the advanced construction techniques in Superstructure constructions		[AP]
Course Contents:			
Module 1: Stones, bricks and concrete blocks			10 Hrs
Stone as building material, Criteria for selection, Tests on stones, Deterioration and Preservation of stone work, Bricks, Classification of Bricks, Manufacturing of clay bricks, Tests on bricks, Refractory bricks, Bricks for special use, Concrete blocks, types of concrete blocks.			
Module 2: Cement, aggregate and other material			15 Hrs
Cement, Ingredients of Cement, Manufacturing process, Types and Grades, Properties of cement and Cement mortar, Aggregates, Types of aggregates, Timber, Industrial timber, Plywood, Veneer, Polystyrene, Panels of laminates, Steel, Aluminum, UPVC, Paints, Varnishes, Distempers, Glass, Ceramics, Sealants for joints, Fiber glass reinforced plastic, Composite materials, Types, Applications of laminar composites, Thermal insulation.			
Module 3: Superstructure and substructure			20 Hrs
Earthwork, masonry, stone masonry, Brick masonry, concrete hollow block masonry, flooring, roofing – Flat & Curved roof, centering and shuttering – Slip forms, scaffoldings, Techniques of Box jacking – construction of diaphragm walls, Tunneling techniques, Piling techniques, cable anchoring and grouting, shoring for deep cutting, Launching girders, bridge decks, off shore platforms – Controlled demolition techniques.			
Total Hours:			45 Hrs
Text Books:			
1.	Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2016.		
2.	Sahu G.C, Jayagopal Jena, "Building Materials and Construction", McGraw Hill Education Pvt. Ltd, New Delhi, 2017.		

3.	Rangwala.S.C, "Engineering Materials", Charotar Publishing House, New Delhi 2015.
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Reference Books:

1.	Rajput.R.K, "Engineering Materials", S. Chand & Company Ltd., 2014.
2.	Duggal.S.K, "Building Materials", New Age International (P) Ltd., Publishers, 2012
3.	Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 9 th Edition, McGraw Hill, Singapore, 2018.
4.	Arora S.P and Bindra S.P "Building Construction, Planning Techniques and Method of Construction", Dhanpat rai and Sons, 2013

Web References:

1.	http://www.constructionmaterials-ct.com
2.	http://nptel.ac.in/downloads/105106053/

Online Resources:

1.	http://www.nptel.ac.in/112103121/
2.	https://www.youtube.com/watch?v=j04CtMzo_0Y

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C301.1 – C301.6	Analyse	Assignment	5
		Quiz	5
		Outside Classroom Learning Experience – Report 1	5
		Outside Classroom Learning Experience – Report 2	5

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA – III [10 marks]	
Remember	-	-	-	-
Understand	20	30	20	10
Apply	40	30	40	40
Analyse	40	40	40	50
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2	PSO 3
1	3	-	-	3	-	-	-	-	-	-	-	1	3	-	-
2	3	-	3	-	-	-	-	-	-	-	-	1	-	1	-
3	3	3	-	2	-	-	-	-	-	-	-	-	1	1	-
4	3	2	2	-	-	-	1	1	-	-	-	-	-	2	1
5	3	1	2	-	-	-	1	-	-	-	-	1	3	-	-
6	3	1	2	-	-	-	1	-	-	-	-	1	3	-	-
Avg	3.0	1.8	2.3	2.5	-	-	1.0	1.0	-	-	-	1.0	2.5	1.3	1.0
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18CE302	FLUID MECHANICS		3/0/0/3
Nature of Course	Theory Analytical		
Pre requisites	Engineering Mechanics		
Course Objectives:			
1.	To study about the properties of fluid, principles of fluid statics, kinematics and dynamics.		
2.	To study about Fluid kinematics and dynamics.		
3.	To study about flow through pipes and pipe networks and boundary layer concepts.		
4.	To understand the application of Dimensional analysis in similitude and model study.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C302.1	Classify the fluid properties and types of flows.		[AN]
C302.2	Estimate the force on immersed surfaces		[AP]
C302.3	Determine the pressure difference in pipe flow		[AP]
C302.4	Evaluate the Velocity and Discharge through pipes using Bernoulli's equation.		[AN]
C302.5	Investigate flow through pipes, pipe network and design simple pipe systems		[AN]
C302.6	Examine the boundary layer thicknesses		[AN]
Course Contents:			
Module 1: Fluid properties and Statics		10 Hrs	
Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Pascal's Law and hydrostatic equation – Fluid pressure – Forces on plane and curved surfaces – Buoyancy – Meta centre– Pressure measurement (Pressure gauges and Manometers) foundations of flow analysis – Finite control volume analysis.			
Module 2: Fluid Kinematics and Dynamics		20 Hrs	
Classification of flows – Continuity equation (one, two- and three-dimensional forms) – Stream and potential functions – Stream, - Streak, Irrotational and rotational flow path lines and Stream tubes– Flow nets. Euler and Bernoulli's equations – Application of Bernoulli's equation – Velocity measurement (Pitot tube, current meter, float technique) – Discharge measurement – Reynolds experiment – Laminar flows through pipes– Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Momentum Equation and application- Energy and other corresponding Equations.			
Module 3: Boundary layer and flow through pipes		15 Hrs	
Definition of boundary layer – Thickness and classification – Displacement and momentum thickness –Development of laminar and turbulent flows in circular pipes – Major and minor losses of flow in pipes– Pipes in series and in parallel, Pipe networks, Water hammer.			
		Total Hours:	45 Hrs
Text Books:			
1.	Modi P N and Seth S.M, "Hydraulics & Fluid Mechanics", Standard book house, New Delhi, 2017.		
2.	Subramanya K "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2018.		
3.	Streeter, Victor L. and Wylie B.E., "Fluid Mechanics", McGraw Hill Ltd., 2017.		
Reference Books:			

1.	Jain A K, "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, 2010.															
2.	Bansal.R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2018.															
3.	Som, S. K., GautamBiswas and Chakraborty, S, "Fluid Mechanics and Fluid Machines", McGraw Hill Education (India) Pvt. Ltd, New Delhi, 2017.															
4.	Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2015.															
Web References:																
1.	https://arxiv.org/ftp/arxiv/papers/1407/1407.3162.pdf															
2.	https://www.youtube.com/playlist?list=PL7FF084F8C414D602															
Online Resources:																
1.	http://nptel.ac.in/courses/105101082															
2.	http://nptel.ac.in/courses/105103095															
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome	Revised Bloom's Level					Assessment Component							Marks			
C302.1	Analyze					Outside Learning Report 1	Classroom Experience –									10
C302.2	Apply															
C302.3	Apply															
C302.4	Analyze					Outside Learning Report 2	Classroom Experience –									10
C302.5	Analyze															
C302.6	Analyze															
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level		Continuous Assessment											End Semester Examination [Theory] [50 marks]			
		CIA-I [10 marks]			CIA-II [10 marks]			CIA – III [10 marks]								
Remember		-			-			-					-			
Understand		30			20			10					10			
Apply		40			30			30					20			
Analyse		30			50			60					70			
Evaluate		-			-			-					-			
Create		-			-			-					-			
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	3	2	-	-	-	-	-	-	-	-	-	2	1	-	2	
2	3	3	2	1	1	-	-	-	-	-	-	2	2	-	2	
3	3	2	1	-	-	-	-	-	-	-	-	2	2	-	1	
4	3	3	3	2	2	-	-	-	-	-	-	2	3	-	2	
5	3	3	2	2	1	-	-	-	-	-	-	2	3	-	-	
6	3	3	2	1	-	-	-	-	-	-	-	1	2	-	-	
Avg	3	2.7	2	1.5	1.3	-	-	-	-	-	-	1.8	2.2	-	1.8	
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed				

18CE303	ARCHITECTURE AND COMPUTER AIDED PLANNING		3/0/3/4.5
Nature of Course	Theory Application		
Pre-requisites	Nil		
Course Objectives:			
1.	To introduce the various facets of architecture and planning for a holistic understanding of the disciplines.		
2.	To understand the elements and principles of architecture.		
3.	To understand the design approach of various building types with specific reference to site and climate.		
4.	To understand the planning aspects of a building.		
Course Outcomes (Theory)			
Upon completion of the course, students shall have ability to			
C303.1	Apply the components and elements of an architectural design.		[AP]
C303.2	Relate spatial relationship and spatial organization principles.		[AP]
C303.3	Incorporate principles of architecture and circulation in the design.		[AP]
C303.4	Perform climate responsive designs and its various components – passive design strategy.		[AP]
C303.5	Design in terms with building Bye laws, NBC, their significance and principles of planning.		[AP]
C303.6	Discuss the Building Information Modelling concepts and its significance.		[U]
Course Contents:			
Module 1: Introduction and Elements of Architecture			15 Hrs
<p>Definitions of Architecture – architecture as a discipline – context for architecture as satisfying human needs: functional, aesthetic and psychological- outline of components and aspects of architectural form. Building typologies: Residential, institutional, commercial and Industrial types – Anthropometry and space standards- Functional relationships -Understanding fundamental elements such as point, line, plane, form and space, shape, pattern, light, color, surface and texture. Understanding perceptual effects of geometric forms such as sphere, cube, pyramid, cylinder and cone. Understanding perceptual effects of configuration of architectural spaces – Spatial relationship and its types, Spatial organization and its types – built form and open space relationships.</p>			
Module 2: Principles of Architecture and Climate responsive design			20 Hrs
<p>Understanding fundamental principles such as proportion, scale, balance, symmetry/asymmetry, rhythm, axis, hierarchy, datum, unity, harmony, dominance, and climax. Movement with reference to the architectural form and space – relationship between architectural form and circulation – Types of circulation. Site analysis and climate responsive design - Site Surveys - Site analysis of natural, cultural and aesthetic factors – topography, hydrology, soils, vegetation, macro/micro climate, surface drainage, accessibility, size and shape, infrastructures available - Site level planning and organization of open, semi-open and built spaces. Man, Climate and Shelter - Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls - Simple passive design considerations.</p>			
Module 3: Principles of Planning & BIM			10 Hrs

Building Rules and Bye-laws-NBC -DCR-Guidelines – Functional utility -people and their requirements – Principles – Space requirement -Roominess -flexibility- Lighting -Ventilation – Grouping – Circulation – amenities -Orientation – Aspect & Prospect –Privacy -Elegance – Economy. Planning of Residential Buildings Planning of Public Buildings – Design considerations- Introduction to BIM – Basic concepts- Case studies.			
Total Hours			45 Hrs
Course Outcomes: (Laboratory)			
Upon completion of the course, students shall have ability to			
C303.1	Design a single storied residential space for given client set and draft its sectional and elevation views.		[AN]
C303.2	Design a Multi- storied residential space for given client set and draft its sectional and elevation views.		[AN]
C303.3	Design a Primary Health centre with all amenities and draft its sectional and elevational views.		[AN]
C303.4	Design a School Building with all amenities and draft its sectional and elevational views.		[AN]
C303.5	Design a factory building with North Light roof truss and draft its sectional and elevational views.		[AN]
C303.6	Draft a 3d view of residential building using Revit software Package.		[AN]
Laboratory Component:			
S. No	List of Exercises	CO Mapping	RBT
1.	Planning and drafting of a single storied residential building.	C303.1	[AN]
2.	Drafting the elevation and sectional views of single storied residential building	C303.1	[AP]
3.	Planning and drafting of a multi storied residential building	C303.2	[AN]
4.	Drafting the elevation and sectional views of multi storied residential building.	C303.2	[AP]
5.	Planning and drafting of a primary hospital building	C303.3	[AN]
6.	Drafting the elevation and sectional views of Primary hospital building.	C303.3	[AP]
7.	Planning and drafting of a school building	C303.4	[AN]
8.	Drafting the elevation and section views of a school building.	C303.4	[AP]
9.	Planning and drafting of a factory building with North Light Roof truss	C303.5	[AN]
10.	Drafting the elevation and section views of a Factory building with North Light Roof Truss	C303.5	[AP]
11.	Drafting the 3D view of a Residential Building using Revit Architecture software package	C303.6	[AP]
12.	Overview to Building Information Modelling	C303.6	[U]
Text Books:			
1.	Simon Unwin, “Analysing Architecture”, Routledge; 4 th edition, 2014		
2.	Koenigsberger O.H. et.al., “Manual of Tropical Housing and Building” – Part I - Climate design, Orient Longman, Madras, India, 2010.		
3.	Kale C.M, Patki S.Y. “Building Drawing with an Integrated to Built Environment” Mc-		

	Graw Hill Education, fifth reprint edition 2013.														
Reference Books															
1.	Julius Panero, Martin Zelnik, "Human Dimension and Interior Space: A Source Book of Design Reference Standards", 2012.														
2.	Arvind Krishnan, Nick Baker, Simos Yannas and Szokolay.S.V., "Climate Responsive Architecture"., A Design Hand Book for Energy Efficient Building, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017														
3.	Ricard Hyde, "Climate Responsive Design: A Study of Buildings in Moderate and Hot Humid Climates" Taylor & Francis; 1 edition, 2015														
4.	National Building Code of India, SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2016.														
Web References:															
1.	http://www.civilengineeringx.com/building-design-and-construction-handbook														
2.	https://www.thebalancesmb.com/designing-climate-responsive-architecture-3157812														
Online Resources:															
1.	http://char.txa.cornell.edu/language/principl/principl.htm														
2.	https://www.open.edu.au/sitecore/content/Alchemy/Home/degrees/master-of-urban-and-regional-planning-curtin-university-cur-urp-mas														
Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)															
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [40 Marks]		
	Theory			Practical											
	CIA-I [10 Marks]	CIA-II [10 Marks]	CIA-III [10 Marks]	Rubric based CIA [30 Marks]											
Remember	20	20	10	-											
Understand	30	20	20	30											
Apply	50	60	70	70											
Analyse	-	-	-	-											
Evaluate	-	-	-	-											
Create	-	-	-	-											
Course Articulation Matrix – Theory															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	-	-	-	-	-	-	1	-	1	2	2	1
2	3	2	1	-	-	-	-	-	-	1	-	1	2	2	1
3	3	2	1	-	-	-	-	-	-	1	-	1	2	2	1
4	3	2	1	-	-	-	3	-	-	1	-	1	2	2	1
5	3	2	1	-	-	-	-	-	-	1	-	1	2	2	1
6	3	2	1	-	-	-	-	-	-	1	-	1	2	2	1
Avg	3	2	1	-	-	-	3	-	-	1	-	1	2	2	1
Course Articulation Matrix – Laboratory															
1	3	2	1	-	3	-	2	3	3	2	-	1	2	2	1
2	3	2	1	-	3	-	2	3	3	2	-	1	2	2	1
3	3	2	1	-	3	-	2	3	3	2	-	1	2	2	1
4	3	2	1	-	3	-	2	3	3	2	-	1	2	2	1
5	3	2	1	-	3	-	2	3	3	2	-	1	2	2	1
6	3	2	1	-	3	-	2	3	3	2	-	1	2	2	1
Avg	3	2	1	-	3	-	2	3	3	2	-	1	2	2	1
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18CE304	SOLID MECHANICS		3/0/3/4.5
Nature of Course	Problem Analytical		
Pre requisites	Engineering Mechanics		
Course Objectives:			
1.	To apply the fundamental concepts of stress, strain and deformation of solids and thin cylinders		
2.	To compute and sketch the bending moment and shear force for different types of beams.		
3.	To analyse plane trusses using various methods.		
4.	To compute the stresses and deformations of beams		
5.	To compute the torsion on shafts and springs.		
Course Outcomes: (Theory)			
Upon completion of the course, students shall have ability to			
C304.1	Apply the fundamental concepts and compute the stress, strain and deformation of solids		[AP]
C304.2	Apply the fundamental concepts and compute the deformation of thin cylinders		[AP]
C304.3	Analyse the behavior of beams subjected to various loading and support conditions and sketch the bending moment and shear force diagrams.		[AN]
C304.4	Analyse the plane trusses using various methods to compute the load carrying capacity of each members.		[AN]
C304.5	Apply the simple bending concept and various methods to compute the stresses, bending, slope and deformations in determinate beams.		[AN]
C304.6	Compute the bending and torsional deformation on shafts and springs.		[AN]
Course Contents:			
Module 1: Stress, Strain and Deformation of Solids		15 Hrs	
Stresses in the Members of a Structure - types of stresses and strain - Hooke's Law - Stress-Strain relationship - Stress-Strain Behavior of Ductile and Brittle Materials - True Stress and True Strain - Strain Energy - Poisson's Ratio - Shear Stress-Strain Diagram - Thermal Stress - Bulk Modulus - Stress Concentrations - Relation between Elastic Constants - Factor of safety- Failure of Materials Due to Creep and Fatigue - Thin cylinders - under internal pressure - deformation of thin cylinders.			
Module 2: Analysis of Beams and Trusses		15 Hrs	
Definition of beam – different types of beams - types of loading - internal forces and moment in beams – resisting moment and shear - relationships between loads, shear forces, and bending moments – shear force and bending moment diagrams - cantilever and simply supported beams - Analysis of plane truss stability and equilibrium of plane frames - analysis of forces in truss members - method of joints - method of sections – method of tension coefficient.			
Module 3: Deflection of beams and Torsion on shafts		15 Hrs	
Theory of simple bending - Deformations in a Symmetric Member in Pure Bending - Stresses and Deformations in the Elastic Range – Neutral axis - Deformation of a Beam			

under Transverse Loading - Slope and deflection of Determinate Beams - Integration Method - Macaulay's Method - Moment-Area Method - Conjugate Beam Method. Torsion - Bending and Torsional Deformation of a Circular Shaft - stepped shafts - - leaf springs - stresses in helical springs - deflection of springs			
Total Hours:			45 Hrs
Course Outcomes: (Laboratory)			
Upon completion of the course, students shall have ability to			
C304.1	Determine the Mechanical properties of metal specimen		[AN]
C304.2	Determine the Hardness Number of metal specimen.		[AN]
C304.3	Determine the Compressive strength of wooden specimen		[AP]
C304.4	Determine the Impact strength of metal specimen		[AP]
C304.5	Determine the Elastic properties of metal beams		[AP]
C304.6	Determine the Elastic properties of Springs		[AP]
Laboratory Component:			
S.No.	List of Experiments	CO Mapping	RBT
1.	Determination of Tensile strength of mild steel rod.	C304.1	[AN]
2.	Determination of Double shear strength of metal specimen.	C304.1	[AN]
3.	Determination of Torsional strength of mild steel rod.	C304.1	[AN]
4.	Determination of Rockwell Hardness Number of metal specimen	C304.2	[AN]
5.	Determination of Brinell Hardness Number of metal specimen.	C304.2	[AN]
6.	Determination of Vickers Hardness Number of metal specimen.	C304.2	[AN]
7.	Determination of Compressive strength of wooden specimen	C304.3	[AP]
8.	Determination of Impact strength of metal specimen by Izod impact tester	C304.4	[AP]
9.	Determination of Impact strength of metal specimen by Charpy impact tester	C304.4	[AP]
10.	Determination of Elastic properties of metal beams	C304.5	[AP]
11.	Determination of Elastic properties of open coiled helical springs	C304.6	[AP]
12.	Determination of Elastic properties of closed coiled helical springs	C304.6	[AP]
Text Books:			
1.	Beer, F.P., Johnston Jr., E.R., Dewolf, J.T. and Mazurek, D.F. "Mechanics of Materials", 7e, McGraw-Hill, 2014.		
2.	Bansal R.K, 'Strength of Materials', Laxmi Publications Ltd, New Delhi, 2018.		
3.	Bansal R K , " Mechanics of Solids ", Laxmi Publication Ltd, New Delhi, 2017		
Reference Books:			
1.	William A. Nash, Strength of Materials, Tata McGraw-Hill Publishing Co. Ltd, New Delhi, 2010		
2.	Gambhir M.L. "Fundamentals of Solid Mechanics", PHI Learning Private Ltd., New		

	Delhi, 2010.														
3.	Srinath L.S “Advance Mechanics of Solids”, McGraw Hill Education, 2017														
4.	Kazimi S.M.A “ Solid Mechanics “, McGraw Hill Education, 2017														
Web References:															
1.	http://www.nesoacademy.org/civil-engineering/mechanics of solids														
2.	http://web.mit.edu/emech/dontindex-build/														
Online Resources:															
1.	http://nptel.ac.in/course.php?disciplineld=105														
2.	http://nptel.iitk.ac.in/courses/Webcourse-contents/IITDelhi/Mechanics%20Of%20Solids/index.htm														
Tentative Assessment Methods and Levels (based on Revised Bloom’s Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:10)															
Course Outcome		Revised Bloom’s Level				Assessment Component				Marks					
C304.1 – 304.6		Analyse				Quiz				5					
C304.1 – 304.6		Analyse				Assignment				5					
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom’s Level	Continuous Assessment												End Semester Examination (Theory) [40 Marks]		
	Theory						Practical								
		CIA-I [10 marks]		CIA-II [10 marks]		CIA III [10 marks]		Rubric Based CIA [20 Marks]							
Remember	-		-		-		-		-		-		-		
Understand	-		-		-		-		-		-		-		
Apply	50		50		40		60		60		50		50		
Analyse	50		50		60		40		40		50		50		
Evaluate	-		-		-		-		-		-		-		
Create	-		-		-		-		-		-		-		
Course Articulation Matrix (Theory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	2	2	-	-	-	-	-	-	-	3	3	-	3
2	3	2	2	2	-	-	-	-	-	-	-	3	3	-	3
3	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
4	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
5	3	2	2	2	-	-	-	-	-	-	-	3	3	-	3
6	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
Avg	3	2.5	2	2	-	-	-	-	-	-	-	3	3	-	3
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		
Course Articulation Matrix (Laboratory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	3	3	-	-	-	3	3	-	3	3	-	3
2	3	2	1	3	3	-	-	-	3	3	-	3	3	-	3
3	3	2	1	3	3	-	-	-	3	3	-	3	3	-	3
4	3	2	1	3	3	-	-	-	3	3	-	3	3	-	3
5	3	2	1	3	3	-	-	-	3	3	-	3	3	-	3
6	3	2	1	3	3	-	-	-	3	3	-	3	3	-	3
Avg	3	2	1	3	3	-	-	-	3	3	-	3	3	-	3
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		

18CE305	SURVEYING AND GEOMATICS		3/0/3/4.5
Nature of Course	Practical Application		
Pre requisites	Nil		
Course Objectives:			
1.	To introduce the principles of various surveying methods and applications to Civil Engineering Projects		
2.	To deals with geodetic measurements and control survey methodology and its Adjustments.		
3.	To introduce the working principles of modern surveying instruments		
4.	The students can be exposed to the modern surveying methods		
Course Outcomes: (Theory)			
Upon completion of the course, students shall have ability to			
C305.1	Measure the area of the plot and volume of earthwork using various techniques		[AP]
C305.2	Choose the surveying equipment to prepare LS & CS, Contour maps and carryout surveying works related to civil engineering projects		[AP]
C305.3	Distinguish the advantages of electronic surveying over conventional surveying methods		[AP]
C305.4	Analyze the working principle of Total station & GPS, its components, signal structure of GPS and error sources		[AN]
C305.5	Elaborate the concepts of setting out of curves		[AN]
C305.6	Classify the concepts of photogrammetry and remote sensing techniques used in modern surveying methods		[AP]
Course Contents:			
Module 1: Chain, Compass and Levelling		12 Hrs	
Definitions, Classifications – basic principles – methods of ranging – Errors in linear measurements and their corrections - Compass – types – bearing systems and conversions – errors and local attraction – Magnetic declination – Coordinate System - levelling and applications – Datum – Bench marks – Levels and staves – Methods – Fly, Check and Reciprocal levelling – curvature and refraction– Longitudinal and cross sectional plotting – Contouring – characteristics & Interpolating methods – Computations of cross sectional areas and volumes			
Module 2: Theodolite, Triangulation and Curve Surveying		18 Hrs	
Theodolite – surveying adjustments (Normal equation, correlates, Principle of least square) – Heights and Distances – Tangential and Stadia tachometry – Triangulation – instrument and accessories – satellite station – reduction to centre – Signals and towers - Trigonometric levelling - Single and reciprocal observations - level nets. Curves – Simple curves – Compound and reverse curves – Setting out methods – Transition curves – Functions and requirements – Setting out by offsets and angles – Vertical curves			
Module 3: Modern Surveying and Geomatics Engineering		15 Hrs	
Total Station Surveying– Electro optical system: Measuring and working principles, sources of errors. Electro optical micro wave system – GPS Surveying - segments of GPS – Satellite configuration and signal structure – Hand held and Geodetic receivers – Photogrammetry and remote sensing techniques – Introduction - aerial photographs - Fundamentals of Geographical Information Systems- Hydrographic surveying – Tides – MSL – Sounding Methods.			
Total Hours:			45 Hrs.

Course outcomes: (Laboratory)			
Upon completion of the course, students shall have ability to			
C305.1	Measure the given area and find out the volume and earthwork calculations		
C305.2	Obtain the difference in elevation between two accessible and inaccessible points		
C305.3	Calculate the height of the target from any point with reference to the bench mark		
C305.4	Plot the LS & CS of road surface and also contour maps		
C305.5	Apply the concepts of setting out of curves and plot the curves based on the presence of area		
C305.6	Measure the latitude and longitude of the given particular point using total station and GPS surveying techniques		
Laboratory Component:			
S. No	List of Experiments	CO Mapping	RBT
1.	Computation of bearings and area by Compass Traversing	C305.1	[AP]
2.	Measurement of Horizontal angles by Repetition, Reiteration and Vertical angles.	C305.2	[AP]
3.	Determination of Tachometric Constants.	C305.3	[AP]
4.	Measurement of height and distance by tangential tachometry.	C305.3	[AP]
5.	Determination of Elevation of an object single plane method. (Base accessible and in- accessible)	C305.2	[AP]
6.	Determination of difference in elevation using Dumpy Level.	C305.2	[AP]
7.	Profile levelling – Longitudinal & Cross-sectional plotting using TERRA MODEL/EXCEL	C305.2	[AP]
8.	Preparation of Contour map by grid contouring method using SURFER 8.0.	C305.4	[AP]
9.	Traversing and area measurement using total station.	C305.4	[AN]
10.	Determination of distances and elevation between two inaccessible points using total station.	C305.6	[AN]
11.	Determination of Latitude and Longitude of the given points using GPS.	C305.6	[AN]
12.	Setting out of simple and Transition curve.	C305.5	[AP]
Text Books:			
1.	Punmia B.C., "Surveying" – "Vols. – I, II & III", Laxmi publications, New Delhi 2016.		
2.	Kanetkar T.P, Kulkarni S.V., "Surveying and Levelling", Vols. I and II, Standard publishers Distributors, New Delhi 2015.		
3.	Anji Reddy M., Remote Sensing and Geographical Information System, B.S. Publications, 2012		
Reference Books:			
1.	Purushothamaraj.P, "Surveying –I & II" Laxmi Publications, 2012.		
2.	James M.Anderson and Edward M. Mikhali, "Surveying, Theory and Practice", 7 th Edition, McGraw Hill, 2017		
3.	Satheesh Gopi, Rasathishkumar, N.Madhu, "Advanced Surveying, Total Station GPS and Remote sensing" Pearson education, 2017.		
4.	Arora K.R., "Surveying Vol I & II", Standard book house, 2015		
Web References:			
1.	http://www.textofvideo.nptel.iitm.ac.in/105107121/lec3.pdf		
2.	https://books.google.co.in/books?id=dF3oDzQ6KZgC&printsec=frontcover&dq=inauthor		

[:22C+Venkatramaiah22&hl=en&sa=X&ved=0ahUKEwi3gfG_5eneAhXRdCsKHQZH
Bh0Q6AEILTAB#v=onepage&q&f=false](https://www.nptel.ac.in/courses/105107122)

Online Resources:

1. <http://www.nptel.ac.in/courses/105107122>
2. <http://www.nptel.ac.in/courses/105104101>

Tentative Assessment Method & Level (based on Revised Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 Marks]
	Theory			Practical Rubric based CIA (30 Marks)	
	CIA – I (10 Marks)	CIA – II (10 Marks)	CIA – III (10 Marks)		
Remember	-	-	-	-	-
Understand	40	30	40	30	20
Apply	60	70	50	50	60
Analyze	-	-	10	20	30
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Articulation Matrix - Theory

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	-	-	-	-	-	1	-	-	-	2	1	-	1
2	3	3	3	3	-	-	-	2	-	-	-	3	3	-	2
3	2	-	-	-	-	-	-	1	-	-	-	1	-	-	1
4	3	3	2	2	-	-	-	2	-	-	-	3	3	-	2
5	3	3	3	3	-	-	-	2	-	-	-	3	3	-	2
6	2	-	2	-	-	-	-	1	-	-	-	3	3	-	2
Avg	2.7	2.8	2.5	2.7	-	-	-	1.5	-	-	-	2.5	2.6	-	1.7
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

Course Articulation Matrix - Laboratory

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	-	2	-	-	2	2	-	-	3	3	-	2
2	3	3	2	-	2	-	-	2	2	-	-	3	3	-	2
3	3	3	2	1	3	-	-	2	2	-	-	3	3	-	2
4	3	3	2	1	3	-	-	2	2	-	-	3	3	-	2
5	3	3	2	1	3	-	-	2	2	-	-	3	3	-	2
6	3	3	3	-	3	-	-	2	2	-	-	3	3	-	2
Avg	3.0	3.0	2.2	1.0	2.7	-	-	2.0	2.0	-	-	3.0	3.0	-	2.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18MC301	HUMAN VALUES AND PROFESSIONAL ETHICS	2/0/0/0
Nature of Course	Theory Concept	
Pre requisites	Nil	
Course Objectives:		
1.	To create an awareness on professional ethics amongst the engineering students.	
2.	To instill Moral values, Social Values and Loyalty amongst the students.	
3.	To impart knowledge about human relations	
4.	To impart the habit of respecting the rights of others.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C301.1	Distinguish the right and wrong by having understanding of basic human values and ethics	[AN]
C301.2	Apply the relevance of values in management.	[AP]
C301.3	Asses the safety and risk associated with project work	[AN]
C301.4	Avoid the occupational crime and understand the Intellectual Property Rights	[AP]
C301.5	Identify the own self by self-awareness, self-acceptance and motivation process.	[AN]
C301.6	Manage the conflicts and resolving in work environment	[AN]
Course Contents:		
Module 1: Human Values and Engineering Ethics		10 Hrs
Introduction to Morals, Values and ethics - Formation of human values – virtues, respect for others, Living peacefully, caring, sharing, Honesty, courage, Valuing time – Cooperation and Organizational commitment - Need for values in global change - Personal Values Influence Ethical Choices - Learn to distinguish right and wrong - Engineering ethics - Senses of Engineering Ethics - variety of moral issues - moral dilemmas - Kohlberg's theory - Gilligan's theory.		
Module 2: Engineering as Social Experimentation		10 Hrs
Engineering as experimentation - Engineers as responsible experimenters - codes of ethics - Assessment of Safety and Risk - Collegiality and Loyalty - respect for authority - Confidentiality - conflicts of interest - occupational crime – Intellectual Property Rights - employee rights- Challenger case study - The three-mile island - Chernobyl case studies.		
Module 3: Human relations and major themes in Human Relations		10 Hrs
The Nature, Purpose of Human Relations - Importance of Human Relations - Major relationship management Challenges – Forces influencing Behavior at work -Personality and behavior development , Integrity and discipline, Free from anger, Mind your Mind – Captain Singh case study - Communication Process - Functions - filters and barriers - self knowing and understanding - self-awareness – self acceptance - motivation – process - self disclosure - Conflict management and resolution - Role of Women.		
		Total Hours: 30 Hrs
Text Books:		
1.	Naagarazan R.S., Professional Ethics and Human Values, New age International Publishers, 2017.	
2.	Barry L. Reece and Rhonda Brandt, Effective Human Relations 9 th Edition, Cengage Publications, 2010.	
3.	Jayakumar V., Professional Ethics and Human Values, Lakshmi Publications, 8 th edition, 2014.	

Reference Books:																
1.	Yogendra Singh and Ankur Garg, “ Human values and Professional Ethics”, AITBS Publishers, India ,2010															
2.	Tripathi A.N, Human Values, 2nd Edition New Age International Publication 2010.															
3.	Chakraborty S.K and Debangshu Chakraborty “Human values and Professional Ethics ” .Himalaya Publishing House , 2014															
4.	Govindarajan M,Natarajan S, and Senthilkumar V.S, “Professional Ethics and Human Values”, PHI Larning Pvt Ltd New Delhi,2013															
Web References:																
1.	http://www.geethanjaliinstitutions.com/engineering/coursefiles/downloads/mech/hvpe.pdf															
2.	https://commulink.files.wordpress.com/2013/02/major-themes-in-hr.pdf															
Online Resources:																
1.	http://nptel.ac.in/courses/109104068/30															
2.	https://nptel.ac.in/courses/109104068/															
Tentative Assessment Methods & Levels (based on Revised Bloom’s Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:40)																
Course Outcome	Revised Bloom’s Level		Assessment Component										Marks			
C301.1 to C301.6	Analyze		Online Course with Minimum 8 Week duration (Assessment marks will be provided based on assignment submission and Pass percentage)										40			
Summative assessment based on End Semester Examination																
Revised Bloom’s Level		End Semester Examination [60 marks]														
Remember		30														
Understand		20														
Apply		20														
Analyse		30														
Evaluate		-														
Create		-														
Course Articulation Matrix																
C O	P O 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	-	-	-	-	-	-	3	3	3	3	-	-	-	-	1	
2	-	-	-	-	-	-	3	3	3	3	-	-	-	-	1	
3	-	-	-	-	-	-	3	3	3	3	-	-	-	-	1	
4	-	-	-	-	-	-	3	3	3	3	-	-	-	-	1	
5	-	-	-	-	-	-	3	3	3	3	-	-	-	-	1	
6	-	-	-	-	-	-	3	3	3	3	-	-	-	-	1	
Avg	-	-	-	-	-	-	3	3	3	3	-	-	-	-	1	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

SEMESTER 4

18MA401	PROBABILITY AND COMPUTATIONAL METHODS	3/0/0/3
Nature of Course	Problem Analytical	
Pre requisites	Basic concepts of probability and statistics.	
Course Objectives:		
1.	To study the concept of solving linear algebraic equations, ordinary differential equations and integration using numerical techniques	
2.	To learn and construct approximate polynomial for the given numerical data and to find the intermediate missing values	
3.	To learn the concept of testing hypothesis using statistical analysis	
4.	To learn basic concepts of probability	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C401.1	Remember the concepts to find the solutions of algebraic and simultaneous equations	[R]
C401.2	Basic probability concepts for discrete and continuous random variables	[U]
C401.3	To approximate given data using polynomial	[AP]
C401.4	Use testing of hypothesis to derive the inference for engineering problems	[AP]
C401.5	Apply numerical methods to solve algebraic, transcendental and simultaneous equations	[AP]
C401.6	Apply numerical methods to obtain approximate solutions to mathematical problems.	[AP]
Course Contents:		
Module 1: Probability and Statistics		15 Hrs
Probability – basic concepts – addition and multiplication rule- Conditional probability- Discrete Random variables: Poisson and Binomial distributions- Continuous random variables: normal and exponential distributions (problems only)- Descriptive statistics - Mean, median, mode and standard deviation for raw, discrete and continuous data- Testing of Hypothesis: Large sample - Z test-Test of significance - Proportions - Small sample test – t test and F test for single mean–difference of means and variance - Chi-square test for goodness of fit and independence of attributes.		
Module 2: Numerical Analysis		15 Hrs
Numerical solutions of systems of linear equations: Gauss Elimination method -Gauss Jordan method –Gauss Jacobi method - Gauss Seidel method – Interpolation: Interpolation with equal intervals: Newton’s Forward and Backward difference formula- error analysis - Interpolation with unequal intervals: Newton’s Divided difference formula – Lagrange’s interpolation formula.		
Module 3: Numerical differentiation and integration		15 Hrs
Numerical solution to first order ordinary differential equations: Single step methods: Taylor series method - Modified Euler’s Method – Runge-Kutta Method of fourth order - Multistep method: Milne’s Predictor- Corrector Method-Adam-Bashforth Predictor- Corrector Method- Numerical integration: Trapezoidal rule – Simpson’s 1/3 and 3/8 rules.		
Total Hours:		45 Hrs

Text Books:															
1.	Grewal B.S., Numerical methods in Engineering and Science. 10 th edition, Khanna Publishers, 2014.														
2.	Kandasamy.P, Thilagavathy ,K and Gunavathy P, "Numerical Methods", S.Chand and company Pvt.Ltd , 2010.														
3.	Gupta, S.C., and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & sons, Reprint 2014.														
Reference Books:															
1.	Jain M.K. Iyengar, K & Jain R.K., "Numerical Methods for Scientific and Engineering Computation", New Age International (P) Ltd, Publishers,6 th edition, 2012														
2.	Kishor S. Trivedi,"Probability & statistics with reliability, queuing and computer science applications" Second Edition, Wiley, PHI Learning Pvt. Ltd.,isbn : 8120305086, 9788120305083,reprint 2016.														
3.	Chapra, "Numerical Methods for Engineers, Sixth Edition", McGraw-Hill publications, 2012														
4.	Veerarajan T , "Probability, Statistics and Random Processes", Second Edition, Tata McGraw Hill Education Private Limited,3 rd reprint,2016														
Web References:															
1.	https://www.mooc-list.com/course/numerical-methods-engineers-saylororg														
2.	https://www.canvas.net/browse/usflorida/courses/numerical-methods														
3.	www.edx.org/ statistics														
4.	www.online.colostate.edu														
5.	http://freevideolectures.com/Course/3028/Econometric-Modelling/22														
Online Resources:															
1.	http://nptel.ac.in/video.php?subjectId=122107037														
2.	http://nptel.ac.in/courses/112106064														
3.	http://nptel.ac.in/courses/111105042														
4.	http://nptel.ac.in/courses/110105039/22														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level					Assessment Component					Marks				
C401.1 & C401.5	Remember					Class Quiz					2				
C401.2	Understand					Group Presentation					4				
C401.3 C401.4 & C401.6	Apply					Announced test and Group Assignment					14				
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [50 marks]		
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]			CIA-III [10 marks]			CIA-III [10 marks]						
Remember	20	15	10			10			10			10			
Understand	30	25	30			30			30			30			
Apply	50	60	60			60			60			60			
Analyse	-	-	-			-			-			-			
Evaluate	-	-	-			-			-			-			
Create	-	-	-			-			-			-			
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-

3	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
Av g	2.5	1.8	1.0	-	-	-	-	-	-	-	-	-	2.0	-	-
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18CE401	DESIGN OF RC ELEMENTS		3/1/0/4
Nature of Course	Analysis and Design		
Pre requisites	Solid Mechanics, Concrete Technology		
Course Objectives:			
1.	To examine the fundamental principles of Reinforced Concrete Design.		
2.	To analyze and design of Slabs and Beams.		
3.	To design for bond, anchorage, shear and torsion of RC elements.		
4.	To analyze and design of Short and Long Columns.		
5.	To analyze and design of Footings.		
Course Outcomes:			
Upon completion of the course, students shall be able to			
C401.1	Demonstrate the design concepts for RC elements.		[AP]
C401.2	Analyse and Design of Slabs.		[AN]
C401.3	Design of Beams for Bond, Anchorage, Shear and Torsion.		[AN]
C401.4	Analyse and Design of Short and Long Columns.		[AN]
C401.5	Analyse and Design of Stairs.		[AN]
C401.6	Analyse and Design of Footings.		[AN]
Course Contents:			
Module 1: Design Philosophy			10 Hrs.
Stress strain curve of concrete and reinforcing steel – working stress method, ultimate load method and limit state method – Limit state philosophy as detailed in IS code - Concept of balanced section, under reinforced and over reinforced section.			
Module 2: Design for Flexure			25 Hrs.
Analysis and Design of one way and two-way rectangular slabs subjected to uniformly distributed load for various boundary conditions and corner effects – Analysis and Design of singly, doubly reinforced rectangular and flanged beams - serviceability requirements for slabs and beams. Behaviour of RC members in bond and anchorage - Behaviour of RC members in shear and torsion - Design requirements as per current code – Design of RC members for combined bending, shear and torsion – Design for development length.			
Module 3: Design of Columns, Stairs and Footings			25 Hrs.
Types of columns – Braced and unbraced columns – Analysis and Design of short axially loaded RC Column - Design of short column and long column for uniaxial and biaxial eccentricities – Design of staircase -waist slab (dog legged) – Design of axially and eccentrically loaded square, rectangular footings – Design of combined rectangular, trapezoidal footings for two columns only.			
Total Hours:			60 Hrs.
Text Books:			
1.	Unnikrishna Pillai and Devdass Menon “Reinforced Concrete Design” Tata McGraw Hill Publishing Company Ltd. New Delhi, 2016.		
2.	Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., New Delhi, 2013.		
3.	Sinha, S.N. Reinforced Concrete Design – Tata McGraw Hill Publishing Company Ltd. New Delhi, 2014.		
Reference Books:			

1.	Subramanian N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
2.	Shah V L and Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publications, Pune, 2013
3.	Punmia B.C. and Jain A.K, "Limit State Design of Reinforced Concrete", Laxmi Publications Pvt.Ltd, New Deldi, 2007.
4.	Krishna Raju.N, "Reinforced Concrete Design:IS:456-2000, Principles and Practice", New Age International Publishers, New Delhi, 2008.

IS Code Books :

1.	IS 456 : 2000 Plain and Reinforced Concrete-Code of Practice, BIS, New Delhi.
2.	IS875:1987Codeofpracticefordesignloads(othertthaneearthquake)forbuildingsand Structures Part1: Dead loads-Unit weights of building material and stored materials, , BIS, New Delhi Part2: Imposed loads, BIS, New Delhi Part3: Wind Loads, BIS, New Delhi Part4: Snow loads, BIS, New Delhi Part5: Special loads and load Combinations, BIS, New Delhi
3.	National Building Code 2016, BIS, New Delhi.
4.	SP16:1980 Design Aids for Reinforced Concrete to IS456 : 1978, BIS, New Delhi.
5.	SP34:1987 Handbook on Concrete Reinforcement and Detailing, BIS, New Delhi

Web References:

1.	https://www.icevirtuallibrary.com/doi/10.1680/beob2e.35218.0007
2.	https://www.accessengineeringlibrary.com/browse/building-design-and-constructionhandbook-sixth-edition

Online Resources:

1.	http://nptel.ac.in/courses/105105104/
2.	http://nptel.ac.in/courses/105105105/

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C401.1	Apply	Outside Classroom Learning Experience - Report I	10
C401.2	Analyse		
C401.3			
C401.4	Analyse	Outside Classroom Learning Experience - Report I	10
C401.5			
C401.6			

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory)
	CIA-I [10 marks]	CIA-II [10 marks]	CIA - III [10 marks]	

				(50 marks)
Remember	10	-	-	-
Understand	30	30	25	25
Apply	30	20	25	25
Analyse	30	50	50	50
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	1	-	-	1	2	-	2	-	3	3	1	2
2	3	3	2	2	-	-	1	2	-	2	-	3	3	1	2
3	3	3	2	2	-	-	1	2	-	2	-	3	3	1	2
4	3	3	2	2	-	-	1	2	-	2	-	3	3	1	2
5	3	3	2	2	-	-	1	2	-	2	-	3	3	1	2
6	3	3	2	2	-	-	1	2	-	2	-	3	3	1	2
Avg	3.0	2.8	1.8	1.8	-	-	1.0	2.0	-	2.0	-	3.0	3.0	1.0	2.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE402	MECHANICS OF MATERIALS		3/0/0/3
Nature of Course	Problem Analytical		
Pre requisites	Solid Mechanics		
Course Objectives:			
1.	To impart the energy principles to analyse the beams, frames and plane trusses		
2.	To perform analysis of indeterminate beams		
3.	To understand the principal planes and compute the principal stresses.		
4.	To compute the load carrying capacity of structural members using various failure theories.		
5	To check the column stability using Euler's theory and various theories		
6	To analyze thick cylinders and compound cylinders.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C402.1	Apply the Energy principles to analyse the trusses, beams and frames.	[AP]	
C402.2	Analyze the indeterminate beams and sketch shear force and bending moments.	[AN]	
C402.3	Analyse the principal planes and compute the principal stresses.	[AN]	
C402.4	Apply the failure theories to compute the load carrying capacity of structural members.	[AP]	
C402.5	Analyse the column stability and compute the critical load using various theories.	[AN]	
C402.6	Analyse thick cylinders and compound cylinders and compute the stresses.	[AN]	
Course Contents:			
Module 1: Energy Principles and Indeterminate beams		20 Hrs	
Strain Energy - Elastic Strain Energy for Various Types of Loading - Conservation of Energy - Impact Loading - Deflection under a Single Load by the Work-Energy Method - Work and Energy under Several Loads - Principle of Virtual work - Method of Virtual forces applied to Trusses, Beams and Frames - Castigliano's Theorem Applied to Trusses, Beams and Frames			
Indeterminate Beams - Propped cantilever and fixed beams - fixed end moments and reactions for concentrated load, uniformly distributed load and combined load - analysis of continuous beams - theorem of three moments - shear force and bending moment diagrams			
Module 2: Principle stresses and Theories of failures		15 Hrs	
Two-dimensional state of stress at a point - Mohr's Circle - Stress paths - Normal and shear stresses on any plane - Principal planes and principal stresses - Maximum shear stress - Theories of failure – Principal stress theory – Principal strain theory – Shear stress theory – strain energy theory and distortion energy theory			
Module 3: Columns and Thick cylinders		10 Hrs	
Columns - Stability of Structures - Euler's Formula for Pin-Ended Columns - Extension of Euler's Formula to Columns with Other End Conditions - eccentrically loaded columns - Rankine – Gordon formula - Secant Formula - Thick cylinders - compound cylinders.			
		Total Hours:	45 Hrs
Text Books:			
1.	Gere, J.M. and Goodno, B.J., "Mechanics of Materials", CENGAGE Learning Custom Publishing; 9th edition edition, 2017.		

2.	Bansal R.K, "Strength of Materials", Lakshmi Publications Ltd, New Delhi, 2012.														
3.	Punmia B.C and Jain A.K., "Mechanics of Materials", Laxmi Publications Ltd, New Delhi, 2012.														
Reference Books:															
1.	William A. Nash, Strength of Materials, Tata McGraw-Hill Publishing Co. Ltd, New Delhi, 2010														
2.	Gambhir.M.L. "Fundamentals of Solid Mechanics", PHI Learning Private Ltd., New Delhi, 2010.														
3.	Kazimi S.M.A., "Solid Mechanics ", Tata McGraw-Hill Publishing Company, New Delhi, 2017														
4.	Hibbeler, R.C. (2011). Mechanics of Materials, 8e, Pearson Prentice Hall.														
Web References:															
1.	http://nptel.iitk.ac.in/courses/Webcourse-contents/IIT-Delhi/Mechanics%20Of%20Solids/index.htm														
2.	http://textofvideo.nptel.iitm.ac.in/1053/lec1.pdf														
3.	http://www.nesoacademy.org/civil-engineering/mechanics_of_solids														
Online Resources:															
1.	http://nptel.ac.in/video.php?subjectId=105106116														
2.	http://nptel.ac.in/video.php?subjectId=112107147														
Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome		Revised Bloom's Level				Assessment Component				Marks					
C402.1, C402.2 & C402.3		Apply				Outside Classroom Learning Experience -Report 1				10					
C402.4, C402.5& C402.6		Apply				Outside Classroom Learning Experience -Report 2				10					
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [50 Marks]		
	CIA-I [10 marks]			CIA-II [10 marks]			CIA III [10 marks]								
Remember	10			10			10						10		
Understand	30			20			20						20		
Apply	30			40			40						40		
Analyse	30			30			30						30		
Evaluate	-			-			-						-		
Create	-			-			-						-		
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
2	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
3	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
4	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
5	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
6	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
Avg	3	3	2	2	-	-	-	-	-	-	-	3	3	-	3
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		

18CE403	CONCRETE TECHNOLOGY		3/0/3/4.5
Nature of Course	Theory Application		
Pre requisites	Construction Materials and Techniques		
Course Objectives:			
1.	To enable the students to understand the concept of mix design.		
2.	To impart knowledge on properties and durability of concrete.		
3.	To impart knowledge on the special concretes.		
4.	To facilitate the students to know concreting under special circumstances.		
Course Outcomes®Theory)			
Upon completion of the course, students shall have ability to			
C403.1	Examine the properties of concrete and admixtures.		[AP]
C403.2	Implement the concepts of mix design for making concrete.		[AP]
C403.3	Determine the properties and manufacturing process of fresh concrete		[AP]
C403.4	Determine the properties of hardened concrete		[AN]
C403.5	Examine the effects of various chemical actions on concrete		[AP]
C403.6	Implement mix design concepts for making various special concretes		[AP]
Course Contents:			
Module 1: Mix Design and Admixtures			15 Hrs
Mix design: Introduction, concept of mix design – mix design methods – IS method of mix proportioning, Mix proportioning of concrete using Admixtures, Properties using virtual labs, Advantages, dosage and application. Admixtures – Plasticizers – Superplasticizer – Retarders – Accelerators – Air entraining admixtures – Water proofing admixtures.			
Module 2: Studies on Fresh and Hardened Concrete			15 Hrs
Workability: Definition, factors affecting workability, measurement of workability using online software : Slump Cone test, Compaction Factor test, Vee-Bee Consistometer test, segregation, bleeding – steps for manufacture of concrete: batching, mixing, transporting, placing, compaction, curing – factors affecting strength of concrete: water/cement ratio, maturity of concrete, micro-shrinkage of concrete – Testing on Hardened Concrete: Compressive strength test, flexural strength of concrete – factors influencing strength results – accelerated strength tests – determination of modulus of elasticity – in-situ strength determination – variation in test results – Non-destructive strength test:- ultrasonic pulse velocity test, rebound hammer test.			
Module 3: Durability of Concrete and Special Concretes			15 Hrs
Durability: Definition, significance, permeability – Chemical Attack and its controlling methods: sulphate attack, alkali aggregate reaction, chloride attack, acid attack, carbonation, concrete in sea water - thermal properties of concrete – resistance to abrasion and cavitation – acoustic properties – corrosion of reinforcement – Special Concretes: Light weight concrete – High strength concrete – High performance concrete – Fibre reinforced concrete – Ferro cement – Polymer concrete – Ready mix concrete – Self compacting concrete – Self curing concrete – Vacuum dewatering concrete – Mass concrete – SIFCON – Concrete with recycled materials.			
			Total Hours: 45 Hrs
Course Outcomes: (laboratory)			
Upon completion of the course, students shall have ability to			
C403.1	Determine the various quantities by applying the IS codes for different ingredients of concrete.		[AP]
C403.2	Investigate the properties of cement and admixtures.		[AP]

C403.3	Determine the fresh properties of concrete.	[AP]
C403.4	Determine the hardened properties of concrete.	[AP]
C403.5	Examine the application of NDT in concrete.	[AN]
C403.6	Investigate the durability properties of concrete.	[AP]

Laboratory Component:

S. No.	List of Experiments	CO Mapping	RBT
1.	Concrete Mix Design Proportioning – IS Method	C403.1	[AN]
2.	Test on Cement – Specific Gravity Test & Fineness Test	C403.2	[AP]
3.	Test on Cement – Consistency and Initial Setting Time Test	C403.2	[AP]
4.	Fresh Concrete Property Test – Slump Cone Test	C403.3	[AP]
5.	Fresh Concrete Property Test – Compaction Factor Test	C403.3	[AP]
6.	Fresh Concrete Property Test – Vee-Bee Consistometer Test	C403.3	[AP]
7.	Hardened Concrete Property Test – Compressive Strength Test	C403.4	[AP]
8.	Hardened Concrete Property Test – Splitting Tensile Strength Test	C403.4	[AP]
9.	Hardened Concrete Property Test – Modulus of Rupture Test	C403.4	[AP]
10.	Concrete Durability Property Test – Acid Attack Test	C403.6	[AP]
11.	Non – Destructive Test – Rebound Hammer Test	C403.5	[AN]
12.	Non – Destructive Test – Ultrasonic Pulse Velocity Test	C403.5	[AN]

Text Books:

1.	Shetty M.S., and Jain A.K., Concrete Technology (Theory and Practice), S. Chand Publishing., New Delhi, 2018.
2.	Santhakumar A. R., Concrete Technology, Oxford University Press, New Delhi, 2018.
3.	Neville A.M., Properties of Concrete, Pearson England Limited, England, 2011.

Reference Books:

1.	Gambhir M.L., Concrete Technology, Tata McGraw Hill, Publishing Co. Ltd, New Delhi, 2014.
2.	Gupta B.L., and Amit Gupta, Concrete Technology, Standard Publishers Distributors, 4 th Edition, 2010.
3.	IS:10262 Recommended Guidelines for Concrete Mix Design, 2019, BIS, New Delhi.
4.	Rethaliya R P, " Concrete Technology", Charotar Publishing House Pvt Ltd Gujarat 2011

Web References:

1.	https://www.sciencedirect.com/book/9780750656863/advanced-concrete-technology
2.	https://swayam.gov.in/courses/4709-july-2018-concrete-technology

Online Resources:

1.	https://onlinecourses.nptel.ac.in/noc16_ce10
2.	http://nptel.ac.in/courses/105102012

Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Taxonomy	Continuous Assessment				End Semester Examination (Theory) [40 Marks]
	Theory			Practical	
	CIA-I [10 marks]	CIA-II [10 marks]	CIA III [10 marks]	Rubric Based CIA [30 Marks]	
Remember	10	10	10	-	10
Understand	10	10	10	-	10
Apply	30	20	40	30	40

Analyse	50	60	40	70	40										
Evaluate	-	-	-	-	-										
Create	-	-	-	-	-										
Course Articulation Matrix - Theory															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	2	-	-	-	-	-	-	2	2	-	2
2	3	2	1	2	2	-	-	-	-	-	-	2	2	-	2
3	3	2	2	2	1	-	-	-	-	-	-	2	2	-	2
4	3	2	2	2	-	-	-	-	-	-	-	2	2	-	2
5	3	2	2	2	-	-	-	-	-	-	-	2	2	-	2
6	3	2	1	1	-	-	-	-	-	-	-	2	2	-	2
AVG	3	2.2	1.7	1.8	1.7	-	-	-	-	-	-	2	2	-	2
Course Articulation Matrix - Lab															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	3	-	1	1	2	2	-	2	2	-	2
2	3	2	1	1	2	-	2	2	2	2	-	2	2	-	2
3	3	3	2	2	3	-	1	1	2	2	-	2	2	-	2
4	3	3	2	2	3	-	2	2	1	2	-	2	2	-	2
5	3	3	2	2	3	-	1	2	2	2	-	2	2	-	2
6	3	2	1	1	3	-	2	1	2	2	-	2	2	-	2
AVG	3	2.7	1.7	1.7	2.8	-	1.5	1.5	1.8	2	-	2	2	-	2
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18CE404	HYDRAULICS AND HYDRAULIC MACHINERY	3/0/3/4.5
Nature of Course	Theory, Analytical and Practical	
Pre requisites	Fluid Mechanics	
Course Objectives:		
1.	To remember the concept of open channel flow characteristics.	
2.	To understand the concept of hydraulic jumps and surges.	
3.	To study the concepts of hydraulic machines viz. flow through turbines and pumps	
4.	To determine the performance characteristics and design aspects of Pumps and Turbines	
Course Outcomes: (Theory)		
Upon completion of the course, students shall have ability to		
C404.1	Examine the properties of open channel flow	[AP]
C404.2	Investigate the flow measurements involved in open channels	[AP]
C404.3	Determine the hydrodynamic forces on hydraulic similitude's	[AN]
C404.4	Determine the hydrodynamic forces on vanes	[AN]
C404.5	Analyze and design of pumps	[AN]
C404.6	Analyze and design of turbines	[AN]
Course Contents:		
Module 1: Open channel flow		15 Hrs
Classification– Velocity distribution–Types of Flows – Manning's and Chezy's formula – Most economical sections –Gradually varied flow: Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Direct step method – Flow through transitions- Specific energy – Critical flow and its computation. Rapidly varied flow: Hydraulic jump – Types – Energy dissipation – Surges – Types -Flow measurement in open channels.		
Module 2: Hydraulic Similitude and Basics of Turbo machinery		15 Hrs
Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities - dimensionless numbers – model and prototype relations. Distorted and non-distorted models. Scale Effect. Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes -Angular momentum principle, Applications to radial flow turbines.		
Module 3: Hydrodynamic Machines		15 Hrs
Pumps: Classification – Minimum speed to start the pump – Multistage Pumps – Pumps in series and parallel– specific speed – characteristics curves –negative Slip – flow separation conditions – air vessels –indicator diagram - Cavitation. Turbines: – Classification – Pelton wheel -Francis-Kaplan turbines-Working principle, Velocity diagram, Work done and Efficiency – Hydraulic Design -Draft tube.		
Total Hours:		45 Hrs
Course Outcomes: (Laboratory)		
Upon completion of the course, students shall have ability to		
C404.1	Determine the discharge of the flow through orifice & notches	[AN]
C404.2	Find out the co-efficient of discharge through orifice & venturi meters	[AN]
C404.3	Analyze the losses in pipes in various conditions	[AN]
C404.4	Analyze the performance of jet during the impact	[AN]

C404.5	Investigate the performance of pumps and its efficiency	[AP]	
C404.6	Analyze the performance of various turbines and its efficiency	[AP]	
Laboratory Component:			
S.No.	List of Experiments	CO Mapping	RBT
1.	Determination of discharge through an Orifice.	C404.1	[AP]
2.	Determination of discharge through Notches.	C404.1	[AP]
3.	Determination of Coefficient of discharge through Venturi meter	C404.2	[AP]
4.	Determination of Coefficient of discharge through Orifice meter	C404.2	[AP]
5.	Determination of Major losses and Minor losses for a pipe	C404.3	[AP]
6.	Determination of Impact of Jet on Flat plate	C404.4	[AP]
7.	Evaluation of performance characteristics of Centrifugal pump	C404.5	[AP]
8.	Evaluation of performance characteristics of Submersible pump	C404.5	[AN]
9.	Evaluation of performance characteristics of Reciprocating pump	C404.5	[AN]
10.	Determination efficiency of Pelton wheel Turbine	C404.6	[AN]
11.	Determination efficiency of Francis Turbine	C404.6	[AN]
12.	Determination efficiency of Kaplan Turbine	C404.6	[AN]
Text Books:			
1.	Modi P N and Seth S.M, "Hydraulics & Fluid Mechanics", Standard book house, New Delhi, 2017.		
2.	Jain A K, "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, 2010.		
3.	Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 10 th Edition 2018.		
Reference Books:			
1.	Subramanya K, "Flow in open channels", Tata McGraw Hill publishing company 4 th Edition, 2015.		
2.	Som S K, "Introduction to Fluid Mechanics and Fluid Machines", McGraw Hill Education; 3 rd edition, 2017		
3.	YunusCengel, "Fluid Mechanics in SI Units", McGraw Hill Education; 3 rd edition, 2017		
4.	Madan Mohan Das, Mimi Das Saikia, Bhargab Mohan Das, "Hydraulics and hydraulic machines", PHI Learning Pvt Ltd, New Delhi, 2013		
Web References:			
1.	https://lecturenotes.in/subject/560/hydraulics-and-hydraulic-machinery-hhm		
2.	https://personalpages.manchester.ac.uk/staff/david.d.apsley/lectures/hydraulics2/index.htm		
Online Resources:			
1.	http://nptel.ac.in/courses/105103021		
2.	http://nptel.ac.in/courses/105107059		

3.	http://nptel.ac.in/courses/105106114														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [40 marks]		
	Theory									Practical					
	CIA - I [10 marks]	CIA - II [10 marks]	CIA - III [10 marks]			Rubric based CIA [30 Marks]									
Remember	10	10	10			-			10						
Understand	10	10	10			10			10						
Apply	20	30	30			45			30						
Analyse	60	50	50			45			50						
Evaluate	-	-	-			-			-						
Create	-	-	-			-			-						
Course Articulation Matrix - Theory															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	-	-	-	-	-	-	-	-	-	2	3	-	2
2	3	3	-	-	-	-	-	-	-	-	-	2	3	-	2
3	3	3	-	-	-	-	-	-	-	-	-	2	3	-	2
4	3	3	-	2	-	-	-	-	-	-	-	2	3	-	2
5	3	3	-	2	-	-	-	-	-	-	-	3	3	-	2
6	3	3	-	2	-	-	-	-	-	-	-	3	3	-	2
Avg	3	3	-	2	-	-	-	-	-	-	-	2.3	3	-	2
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				
Course Articulation Matrix - Laboratory															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	-	-	2	-	-	-	2	-	-	2	2	-	1
2	3	3	-	-	2	-	-	-	2	-	-	2	2	-	1
3	3	3	-	-	2	-	-	-	2	-	-	2	2	-	2
4	3	3	-	-	3	-	-	-	3	-	-	2	2	-	2
5	3	3	-	-	3	-	-	-	3	-	-	2	2	-	2
6	3	3	-	-	3	-	-	-	3	-	-	2	2	-	2
Avg	3	3	-	-	2.5	-	-	-	2.5	-	-	2	2	-	1.7
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18CE405	SOIL MECHANICS		3/0/3/4.5
Nature of Course	Theory Analytical		
Pre requisites	Engineering Mechanics and Solid Mechanics		
Course Objectives:			
1.	To study the concepts and fundamentals of soil mechanics.		
2.	To identify and describe the principal properties of soil		
3.	To study the engineering behaviour of soil such as permeability, compaction, consolidation and shear strength.		
4.	To study the various techniques for slope stability in soil		
5.	To analyse the stress distribution in the soil media		
Course Outcomes (Theory):			
Upon completion of the course, students shall have ability to			
C405.1	Examine the basic properties of soil and classify the soil according to IS soil classification system		[AN]
C405.2	Determine the Permeability of Cohesive and Cohesionless soils		[AP]
C405.3	Calculate Effective stress within soils and stress due to external loads		[AN]
C405.4	Compute the Shear Strength of soils based on the parameters obtained from shear tests		[AP]
C405.5	Evaluate the consolidation settlement of foundations and explain the Significance of soil compaction		[AN]
C405.6	Classify and analyze the different types of slopes and suggest suitable methods to improve its stability		[AN]
Course Contents:			
Module 1: Introduction to Soil Classification and Permeability Characteristics: 15 Hrs			
Soil formation and soil types - Civil engineering problems related to soils - Nature of soil - Simple definitions - Phase relationships - Determination of properties of soils – Classification - Unified and Indian Soil classification system. Darcy's law – Permeability - Laboratory Methods – Field measurement of permeability - flow nets - uplift pressure.			
Module 2: Stress Distribution, Consolidation and Compaction Characteristics of soils 15 Hrs			
Effective stress concept - Dry and saturated soils - Stress distribution in soil media - Boussinesq's Analysis - Westergard's Analysis - Intensity of vertical stress using influence charts - Consolidation - measurement of compressibility - e-log p curves - Terzaghi's one dimensional consolidation theory – Time rate of consolidation and settlement– Compaction - Factors affecting compaction - Laboratory and field compaction methods.			
Module 3: Shear Strength and Stability of Slopes 15 Hrs			
Mechanism of shear resistance- Effective and total shear strength parameters - Mohr's circle - Mohr– Coulomb failure criterion - Measurement of shear strength - Direct shear test - Triaxial shear test - Unconfined compression strength test - Vane shear test - Shear strength of clay soil and sand. Types of slopes - Stability of infinite slope - Stability of Finite slope - Total stress Analysis - Method of slices and Bishop's method - Use of Taylor's stability number - Slope failure mechanism - Effect of Tension cracks - Improving slope stability by Geo-synthetics.			
Total Hour:			45 Hrs
Course Outcomes (Laboratory):			
Upon completion of the course, students shall have ability to			
C405.1	Illustrate the soil behaviour and suitability of soil for structural purpose and its soil water movement		[AP]
C405.2	Report the compaction state of the soil and classify the index properties of the fine-grained soil		[AP]

C405.3	Calculate the permeability property of soil with different size to estimate the seepage in earthen dams and embankments	[AP]
C405.4	Apply the methods to report the soil strength and its suitability for structural foundation and its cohesive nature	[AP]
C405.5	Relate the water content and density of soil and calculate the settlement of the soil due to pressure exerted by the super structure	[AP]
C405.6	Report the strength parameters of the road and pavement, and also the shear strength of the undrained soil.	[AP]

Laboratory Component:

S.No.	List of Experiments	CO Mapping	RBT
1.	Determination of Moisture content of Soil	C405.1	[AP]
2.	Determination of Particle size distribution of Cohesion less and cohesive soil	C405.1	[AP]
3.	Determination of Specific gravity and Relative density of cohesionless soil	C405.2	[AP]
4.	Determination of the Atterberg's limits of C- ϕ soil	C405.2	[AP]
5.	Determination of permeability characteristics of soil using Constant Head Permeability method	C405.3	[AP]
6.	Determination of permeability characteristics of soil using Falling Head Permeability method	C405.3	[AP]
7.	Determination of Shear Strength parameters of soil using Direct Shear Method	C405.4	[AP]
8.	Determine the Unconfined Compressive strength and Cohesion from Unconfined Compression Test	C405.4	[AP]
9.	Determination of Maximum Dry Density using Standard Proctor's Compaction Test	C405.5	[AP]
10.	Determination of the Field Density of soil using Sand replacement method and core cutter method	C405.5	[AP]
11.	Determination of California Bearing Ratio of soil	C405.6	[AP]
12.	Determination of the sensitivity of cohesive soil by laboratory Vane shear test	C405.6	[AP]

Text Books:

1.	Arora. K.R, "Soil Mechanics and Foundation Engineering (Geotechnical Engineering)", Standard Publishers Distributors, NaiSarak, Delhi, 2015.
2.	Venkataramaiah C, "Geotechnical Engineering", New Age International Ltd., New Delhi Third Edition, 2012.
3.	Punmia , B.C, "Soil Mechanics and Foundation Engineering", Laxmi Publications, New Delhi, Sixteenth Edition, 2017.
4.	GopalRajan and Rao A S R, "Basic and Applied Soil Mechanics", New Age International Ltd., New Delhi Third Edition, 2016.

Reference Books:

1.	Alam Singh, "Modern Geotechnical Engineering", IBS Publications, New Delhi, 2010.
2.	Muni Budhu, "Soil Mechanics and Foundation Engineering", Wiley India publication, New Delhi, Second Edition, 2010.
3.	Purushothama Raj P, "Soil Mechanics and Foundation Engineering", Pearson, 2013.
4.	Palanikumar M, "Soil Mechanics", PHI Learning Pvt. Ltd., 2013
5.	Braja M Das, "Principles of Geotechnical Engineering", PWS-KENT Publishing Company, 2009.

Web References:

1.	https://freevideolectures.com/course/95/soil-mechanics															
2.	https://freevideolectures.com/course/95/soil-mechanics															
Online Resources:																
1.	http://nptel.ac.in/courses/105101084/															
2.	https://nptel.ac.in/courses/105105168/															
Tentative Assessment Method & Levels (based on Revised Bloom's Taxonomy)																
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [40 marks]			
	Theory									Practical						
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	Rubric based CIA [30 marks]												
Remember	-	-	-	10							-					
Understand	10	10	10	20							10					
Apply	50	50	50	40							50					
Analyse	40	40	40	30							40					
Evaluate	-	-	-	-							-					
Create	-	-	-	-							-					
Course Articulation Matrix (Theory)																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	
1	3	2	-	1	-	-	-	-	-	-	-	1	2	-	-	
2	2	3	-	2	-	1	-	-	-	-	-	-	3	-	-	
3	2	2	-	2	-	1	-	-	-	-	-	-	3	2	-	
4	2	3	-	2	-	1	-	-	-	-	-	-	3	1	-	
5	2	3	-	2	-	1	-	-	-	-	-	-	3	2	-	
6	3	3	3	2	-	1	-	-	-	-	-	-	3	2	-	
Av g	2.3	2.7	3.0	1.8	-	1.0	-	-	-	-	-	1.0	2.8	1.8	-	
Course Articulation Matrix (Laboratory)																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	
1	3	2	2	3	3	1	-	2	1	1	-	1	2	1	1	
2	2	2	-	3	2	1	-	2	1	1	-	1	2	1	1	
3	2	2	-	3	2	2	-	2	1	1	-	1	2	-	1	
4	2	2	-	3	2	2	-	2	1	1	-	1	2	1	1	
5	2	2	-	3	2	2	-	2	1	1	-	1	2	1	1	
6	2	2	-	3	2	1	-	2	1	1	-	1	2	-	1	
Av g	2.2	2.0	2.0	3.0	2.2	1.5	-	2.0	1.0	1.0	-	1.0	2.0	1.0	1.0	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18MC401	MANAGEMENT ORGANIZATIONAL BEHAVIOUR	2/0/0/1
Nature of Course	Theory	
Pre requisites	-	
Course Objectives:		
1.	To have a deep knowledge on various organizational systems and behaviour	
2.	To understand the behaviour of an individual and group in an organization	
3.	To be aware on the developing trends in organizational behaviour	
4.	To possess the skill towards the organizational challenges	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C401.1	Understand the Organizational planning and decision making	[U]
C401.2	Recognize the organizational culture and its influence as a whole	[U]
C401.3	Apprehend the individual, interpersonal and groups in an organization	[AP]
C401.4	Identify international theories and approaches in an organizational system	[AP]
C401.5	Understand the workforce controlling of an organization	[U]
C401.6	Understand the productivity and financial issues in control of an organization	[AP]
Course Contents:		
Module 1: Fundamentals of Management, Planning and Decision Making 10 Hrs		
The Management Process, Management Functions, kinds of managers, Managerial roles and skills. Evolution of Management -Theories of Management - Classical, Scientific, Administrative, Behavioral, Management Sciences Theories; Systems and Contingency theory. Organizational planning - Vision, Mission and goals, Types of plans, steps in planning process, approaches to planning, Planning in Dynamic Environment. Decision making process, types of decisions, decision making styles, Vroom's Participative decision-making model.		
Module 2: Individual, interpersonal and group behaviour 10 Hrs		
Importance of Organizational Behaviour, Culture and diversity, personality theories, perception, formation of group behaviour, classification of groups, group properties, group cohesiveness. Leadership traits, Leadership styles, Leadership theories, Power and Politics. Approaches to Motivation, Maslow's needs hierarchy theory, two factor theory of motivation, McGregor's theory, ERG theory, McClelland's needs theory, Valance Theory.		
Module 3: Emerging aspects in organizing and Controlling 10 Hrs		
Organizational Structure, Principles of Organizing, Authority, Power and Influence, designing organizational structure. Mechanistic and organic structures, contemporary organizational design and its challenges. The control process, controlling for organizational performance, types of control, financial controls, Balanced Scorecard, Bench Marking, Contemporary issues in controlling.		
Total Hours:		30 Hrs
Text Books:		
1.	Richard L. Daft, New Era of Management, Cengage Learning, 11 th Edition, 2017.	
2.	Aswathappa, K., "Organizational Behaviour" Text and Problem, Himalaya Publication-12 th Edition,2015	
3.	Pardeshi, P.C., "Organizational Behaviour and Principles and Practice of Management", Nirali publication	
Reference Books:		
1.	Chandrani Singh, Aditi Khatri, "Principles and Practices of Management and Organizational Behaviour" Sage Publications, 2016	

2.	Stephen P. Robbins, V Organizational Behavior, Prentice Hall, 2012															
3.	Charles Burck, "Execution: The Discipline of Getting Things Done", RHUK, 2011.															
4.	John M Ivancevich and Robert Konopaske, Organizational Behavior and Management, McGraw-Hill Education, 2013.															
Web References:																
1.	https://iedunote.com/fundamental-concepts-of-organizational-behavior															
2.	https://nscpolteksby.ac.id/ebook/															
Online Resources:																
1.	https://nptel.ac.in/syllabus/110105034/															
2.	https://freevidelectures.com/course/3502/organizational-behaviour-i															
3.	https://www.edx.org/course/organizational-behaviour-ubcx-busobhr1x															
Tentative Assessment Methods & Levels (based on Revised Blooms' Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:40)																
Course Outcome	Revised Bloom's Level					Assessment Component							Marks			
C401.1	Understand					Quiz							10			
C401.2	Understand					Assignment							10			
C401.3, C401.4, C401.6	Apply					Technical Presentation							10			
C401.5	Understand					Surprise Test							10			
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level					End Semester Examination (Theory) [60 Marks]											
Remember					-											
Understand					70											
Apply					30											
Analyse					-											
Evaluate					-											
Create					-											
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	
1	-	-	-	-	-	3	-	3	3	3	3	-	-	3	-	
2	-	-	-	-	-	3	-	3	3	3	3	-	-	3	-	
3	-	-	-	-	-	3	-	3	3	3	3	-	-	3	-	
4	-	-	-	-	-	3	-	3	3	3	3	-	-	3	-	
5	-	-	-	-	-	3	-	3	3	3	3	-	-	3	-	
6	-	-	-	-	-	3	-	3	3	3	3	-	-	3	-	
Avg	-	-	-	-	-	3	-	3	3	3	3	-	-	3	-	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

SEMESTER 5

18CE501	FOUNDATION ENGINEERING	3/0/0/3
Nature of Course	Theory Analytical	
Pre requisites	Soil Mechanics	
Course Objectives:		
1.	To emphasize the importance of soil investigations	
2.	To estimate the safe bearing capacity for various foundation system including settlement consideration	
3.	To design a suitable foundation (shallow and deep foundations)	
4.	To understand types of earth pressure; pressure distribution behind retaining wall	
5.	To determine the different forces acting on well foundation	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C501.1	Examine the soil and develop soil investigation report for any civil engineering construction	[AN]
C501.2	Estimate proper bearing capacity using IS code methods	[AN]
C501.3	Calculate settlement and to design various types of foundation.	[AN]
C501.4	Determine pile and pile group capacity for any kind of soils including group efficiency and negative friction	[AP]
C501.5	Recommend earth retaining structures for any kind of soil medium	[AP]
C501.6	Examine the forces acting on the well foundation	[AN]
Course Contents:		
Module 1: Soil Exploration and Bearing Capacity		15 Hrs
Necessity- stages- methods of exploration- depth and lateral extent of exploration-types of samples – Different types of Samplers - Field tests- penetration tests (SPT, CPT & DCPT), Geophysical Investigations- in-situ vane shear test- plate load test- sub soil investigation report. Bearing capacity-basic definitions-types of shear failure-Terzaghi's bearing capacity theory- effect of water table- IS Code method- Bearing capacity from SPT and plate load test – Seismic considerations in bearing capacity evaluation.		
Module 2: Shallow and Deep Foundations		18 Hrs
Introduction- types, choice of foundations- Location and depth of foundation - Proportioning of shallow foundation (no structural design) – Raft or Mat Foundation; Settlement-Components of settlement- allowable settlement as per IS Code - differential settlement. Pile Foundations - Classification and selection- Load carrying capacity-static, dynamic formulae (Engineering News and Hileys)- pile load test- design of pile groups- efficiency-Feld's rule, Converse Labarre formula; Settlement of pile group- negative skin friction- Under reamed piles and its design.		
Module 3: Earth Pressure and Well Foundation		12 Hrs
Definitions- Rankine's earth pressure theory for active and passive states for horizontal and inclined surfaces- Rankine's Earth pressure in both Cohesionless and Cohesive soil - Coulomb's earth pressure theory (no derivation)- types of retaining wall – Stability Analysis of Retaining Wall. Well Foundation - Types – Different shapes of wells – Components of wells – forces acting- Terzaghi's Analysis - Sinking of wells – Tilts and shifts (Basic Concepts only) – Seismic force considerations.		
Total Hours:		45 Hrs
Text Books:		

1.	Gopal Ranjan and Rao A S R, "Basic and Applied Soil Mechanics", New Age International Pvt. Ltd., New Delhi, 2020.			
2.	Varghese P. C., "Foundation Engineering", PHI Learning Pvt. Ltd., New Delhi, 2012.			
3.	Arora, K. R. "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors, New Delhi, 7 th Edition Reprint, 2019.			
4.	Punmia B. C., Ashok K Jain and Arun K Jain, "Soil Mechanics and Foundations", Laxmi Publications, New Delhi, Sixteenth Edition, 2019.			
Reference Books:				
1.	Murthy V N S, "Textbook of Soil Mechanics and Foundation Engineering", CBS Publication, New Delhi, 2017.			
2.	Joseph E Bowles, "Foundation Analysis & Design", Tata Mcgraw Hill Publishing Co Ltd, 2014.			
3.	Swami Saran, "Analysis and Design of Substructures Limit State Design", Oxford and IBH Publishing Company Pvt Ltd, 2018.			
4.	IS 8403: 1981 (Reaffirmed 2002), "Code of practice for Determination of Bearing Capacity of Shallow Foundation", Bureau of Indian Standard, New Delhi.			
5.	IS 2911: 2013, "Design and Construction of Pile Foundations", Bureau of Indian Standard, New Delhi.			
Web References:				
1.	https://freevidelectures.com/course/2674/foundation-engineering			
2.	https://www.youtube.com/playlist?list=PLbRMhDVUMngeiZiKPTPEF11CByXmYX3Kv			
3.	https://lecturenotes.in/subject/534/geotechnical-engineering-2			
Online Resources:				
1.	http://nptel.ac.in/courses/105104137/			
2.	http://nptel.ac.in/courses/105107120/			
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)				
Formative assessment based on Capstone Model (Max. Marks:20)				
Course Outcome	Revised Bloom's Level	Assessment Component	Marks	
C501.1	Analyse	Outside Classroom Learning Experience – Report 1	5	
C501.2	Analyse			
C501.3	Analyse	Outside Classroom Learning Experience – Report 2	5	
C501.4	Apply			
C501.5	Apply	Assignment	5	
C501.6	Analyse	Quiz	5	
Summative assessment based on Continuous and End Semester Examination				
Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	
Remember	-	-	-	-
Understand	10	20	20	10
Apply	60	30	40	50
Analyse	30	50	40	40
Evaluate	-	-	-	-
Create	-	-	-	-
Course Articulation Matrix				

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
1	3	2	-	2	2	2	1	2	1	2	-	1	2	2	1
2	3	3	-	2	2	1	-	1	-	-	-	1	2	2	-
3	3	3	3	2	2	1	1	2	-	1	-	1	3	2	-
4	3	2		2	2	1	-	1	-	-	-	-	2	1	-
5	3	-	3	1	2	2	-	1	-	1	-	-	2	-	-
6	3	3	-	3	2	1	-	1	-	-	-	-	3	-	-
AVG	3.0	2.6	3.0	2	2	1.3	1.0	1.3	1.0	1.3	-	1.0	2.3	1.8	1.0
1	Reasonably agreed			2	Moderately agreed						3	Strongly agreed			

18CE502	STRUCTURAL ANALYSIS		3/1/0/4
Nature of Course	Problem analytical		
Pre requisites	Solid Mechanics and Mechanics of Materials.		
Course Objectives:			
1.	To understand use of influence line concept to sketch the shear force, bending moment for determinate structures		
2.	To understand the arch behavior and analyze the arches.		
3.	To perform analysis of indeterminate structures by slope deflection method and moment distribution method.		
4.	To perform analysis of indeterminate structures by matrix methods		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C502.1	Apply the ILD concepts to beams and trusses to analyze and compute the forces and moments.		[AN]
C502.2	Analyze the various types of arches.		[AN]
C502.3	Apply the slope deflection method to analyze the indeterminate beams and frames.		[AN]
C502.4	Apply the moment distribution method to analyze the indeterminate beams and frames.		[AN]
C502.5	Apply the Stiffness matrix concepts to analyze the continuous beams and frames.		[AN]
C502.6	Apply the Flexibility matrix concepts to analyze the continuous beams and frames.		[AN]
Course Contents:			
Module 1: Slope Deflection and Moment Distribution methods		20 Hrs	
Slope Deflection Methods - Analysis of continuous beams - simplification for hinged end - support displacements – Plane rigid frames with and without sway - symmetry and anti-symmetry. Moment Distribution Method - distribution and carryover of moments - stiffness and carry over factors - Analysis of continuous beams - Plane rigid frames with and without sway.			
Module 2: Influence lines and Arches		20 Hrs	
Influence lines for statically determinate beams - support reactions, shear force and bending moment for UDL and series of concentrated loads - Absolute Maximum Bending Moment. Arches - Types of arches - Examples of arch structures - Analysis of three hinged and two hinged arches – parabolic and circular arches – settlement and temperature effects.			
Module 3: Matrix Methods		20 Hrs	
Static Indeterminacy - Degrees of freedom 2D and 3D. Matrix methods - Introduction to matrix methods - need and advantages. Concepts of stiffness and flexibility and their equivalence, Formation of flexibility and stiffness matrix - problems in continuous beams and frames - Limited to two by two matrix.			
			Total Hours: 60 Hrs
Text Books:			
1.	Bhavikatti S S, Structural Analysis Vol-1 and 2, Vikas publishing House, PVT, LTD., 2013		
2.	Vaidyanathan, R and Perumal, P, "Structural Analysis" Vol.1 & 2 Laxmi Publications, New Delhi, 2016.		
3.	Devdas Menon, Structural Analysis, Narosa Publishing House, 2018		
Reference Books:			
1.	Norris, C.H., Wilbur, J.B., and Utku, S., Elementary Structural Analysis, TMH, 2003		
2.	Hibbeler, R.C., Structural Analysis, 8 th Edition, Prentice Hall, 2012		

3.	Ghali,A, Nebille,A.M. and Brown, T.G. "Structural Analysis" A unified classical and Matrix approach" 6 th edition. SponPress, London and New York, 2013.														
4.	Reddy .C.S , "Basic Structural Analysis", Tata McGraw Hill Publishing Company, 2011														
Web References:															
1.	https://freevideolectures.com/course/3015/advanced-structural-analysis														
2.	https://www.studocu.com/en/document/university-of-sheffield/advanced-structural-analysis/lecture-notes/lecture-notes-lectures-11-20/674048/view														
Online Resources:															
1.	https://nptel.ac.in/downloads/105101085/														
2.	https://nptel.ac.in/courses/105105109/														
3.	https://nptel.ac.in/courses/105106050/														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome		Revised Bloom's Level				Assessment Component							Marks		
C502.1&C502.2		Analyse				Assignment							5		
C502.3		Analyse				Assignment							5		
C502.4		Analyse				Assignment							5		
C502.5 & C502.6		Analyse				Online Quiz							5		
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) [50 marks]		
		CIA-I [10 marks]			CIA-II [10 marks]				CIA-III [10 marks]						
Remember		-			-				-				-		
Understand		-			-				-				-		
Apply		50			40				30				30		
Analyse		50			60				70				70		
Evaluate		-			-				-				-		
Create		-			-				-				-		
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	-	-	-	-	-	-	-	3	3	-	2
2	3	3	2	2	-	-	-	-	-	-	-	3	3	-	2
3	3	3	2	2	-	-	-	-	-	-	-	3	3	-	2
4	3	3	2	2	-	-	-	-	-	-	-	3	3	-	2
5	3	3	2	2	-	-	-	-	-	-	-	3	3	-	2
6	3	3	2	2	-	-	-	-	-	-	-	3	3	-	2
Avg	3	3	2	2	-	-	-	-	-	-	-	3	3	-	2
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		

18CE503	DESIGN OF REINFORCED CONCRETE STRUCTURES		3/0/3/4.5
Nature of Course	Problem experimental		
Pre requisites	Design of RC Elements		
Course Objectives:			
1.	To understand the design of retaining walls and yield line theory concepts.		
2.	To acquire knowledge on the design of water tanks, domes and water tanks.		
3.	To understand the concepts of flat slab design.		
4.	To comprehend the design aspects of bridges.		
Course Outcomes:(Theory)			
Upon completion of the course, students shall have ability to			
C503.1	Design and detail the cantilever and counterfort retaining walls	[AN]	
C503.2	Design the various types of slabs based on yield line theory	[AN]	
C503.3	Design and detail the various levels of water tanks	[AN]	
C503.4	Design the plain and reinforced concrete walls	[AN]	
C503.5	Design the flat slab and its components	[AN]	
C503.6	Design and detail the solid slab bridge based on IRC Loadings	[AN]	
Course Contents:			
Module 1: Retaining Walls and Yield Line Theory		15 Hrs	
Retaining walls - Design of cantilever and counterfort retaining walls - Yield Line theory - Application of virtual work method to square, rectangular, circular, hexagonal and triangular slab problems.			
Module 2: Water Tanks and Concrete Walls		15 Hrs	
Water tanks - Underground rectangular tanks - Ground level rectangular water tanks – Hemispherical Domes - Overhead circular water tank - Design of Staging and foundations - Design of plain and reinforced concrete walls.			
Module 3: Flat Slabs and Bridges		15 Hrs	
Flat slabs - Types - Components of flat slab - Design Interior panel of Flat slab - Bridges - Classification of bridges - IRC loadings - Effective width of load dispersion - Design of solid slab bridge.			
		Total Hours:	45 Hrs
Course Outcomes:(Laboratory)			
Upon completion of the Laboratory, students shall have ability to			
C503.1	Examine the two-dimensional frame of structures.	[AN]	
C503.2	Examine the three-dimensional frame of structures.	[AN]	
C503.3	Examine the steel roof truss and workshop shed.	[AN]	
C503.4	Design and detail the retaining wall.	[AN]	
C503.5	Design and detail the reinforced concrete water tanks.	[AN]	
C503.6	Design and detail the flat slab and solid slab bridges.	[AN]	
Lab Component			
S. No	List of Experiments	CO Mapping	RBT
1.	Analysis of a two-dimensional portal frame and draw SFD, BMD using software packages.	C503.1	[AN]
2.	Analysis, Design and Detailing of a two-dimensional RC frame for gravity, wind / seismic load using software	C503.1	[AN]

	packages.		
3.	Analysis, Design and Detailing of a three-dimensional RC frame for gravity, wind / seismic load using software packages.	C503.2	[AN]
4.	Analysis, Design and Detailing of a Steel Roof Truss using software packages.	C503.3	[AN]
5.	Analysis, Design and Detailing of a RC Workshop Shed using software packages.	C503.3	[AN]
6.	Analysis, Design and Detailing of a Steel Workshop Shed using software packages.	C503.3	[AN]
7.	Design and Detailing of Cantilever Retaining Wall using software packages.	C503.4	[AN]
8.	Design and Detailing of Counterfort Retaining Wall using software packages.	C503.4	[AN]
9.	Design and Detailing of Underground Rectangular Water Tank using software packages.	C503.5	[AN]
10.	Design and Detailing of Overhead Circular Water Tank using software packages.	C503.5	[AN]
11.	Design and Detailing of Interior panel of Flat Slab using software packages.	C503.6	[AN]
12.	Design and Detailing of Solid Slab Bridge using software packages.	C503.6	[AN]

Text Books:

1.	Krishna Raju N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2016.
2.	Neelam Sharma., "Reinforced Cement Concrete Design", S.K. Kataria & Sons, New Delhi, 2017.
3.	Punmia P.C., Ashok Kumar Jain and Arun Kumar Jain. "RCC Designs (Reinforced Concrete Structures)", Laxmi Publications, New Delhi, 2015.

Reference Books:

1.	Sinha N. C., and Roy S. K., "Fundamentals of Reinforced Concrete", S. Chand & Co. Ltd., New Delhi, 2015.
2.	Varghese P. C., "Limit State Design of Reinforced Concrete", Prentice Hall of India Ltd., New Delhi, 2015.
3.	Devdas Menon and Unnikrishna Pillai, "Reinforced Concrete Design", Tata McGraw Hill Education Pvt. Ltd, New Delhi, 3 rd Edition, 2017.
4.	Shah H. J. "Reinforced Concrete" (Volume I & II), Charotar Publishing, 2016.

Web References:

1.	https://www.accessengineeringlibrary.com/browse/reinforced-concrete-structures-analysis-and-design-second-edition
2.	https://global.oup.com/academic/product/design-of-reinforced-concrete-structures-9780198086949?cc=us&lang=en&

Online Resources:

1.	https://nptel.ac.in/courses/105105105/
2.	https://nptel.ac.in/downloads/105105104/
3.	https://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Design%20of%20Con%20Struc/New_index1.html

Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's	Continuous Assessment		End Semester Examination
	Theory	Practical	

Taxonomy	CIA-I [10 marks]	CIA-II [10 marks]	CIA III [10 marks]	Rubric Based CIA [30 Marks]	(Theory) [40 Marks]											
Remember	10	10	10	-	10											
Understand	10	10	10	-	10											
Apply	20	20	30	30	30											
Analyse	60	60	60	70	50											
Evaluate	-	-	-	-	-											
Create	-	-	-	-	-											
Course Articulation Matrix - Theory																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	
1	3	3	2	2	-	-	-	-	1	1	1	3	3	-	2	
2	3	3	2	2	-	-	-	-	1	1	1	3	3	-	2	
3	3	3	2	2	-	-	-	-	1	1	1	3	3	-	2	
4	3	3	2	2	-	-	-	-	1	1	1	3	3	-	2	
5	3	3	2	2	-	-	-	-	1	1	1	3	3	-	2	
6	3	3	2	2	-	-	-	-	1	1	1	3	3	-	2	
Av g	3	3	2	2	-	-	-	-	1	1	1	3	3	-	2	
Laboratory Articulation Matrix – Laboratory																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	
1	3	3	2	2	3	-	1	2	2	2	1	3	3	-	2	
2	3	3	2	2	3	-	1	2	2	2	1	3	3	-	2	
3	3	3	2	2	3	-	1	2	2	2	1	3	3	-	2	
4	3	3	2	2	3	-	1	2	2	2	1	3	3	-	2	
5	3	3	2	2	3	-	1	2	2	2	1	3	3	-	2	
6	3	3	2	2	3	-	1	2	2	2	1	3	3	-	2	
Av g	3	3	2	2	3	-	1	2	2	2	1	3	3	-	2	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18CE504	ENVIRONMENTAL ENGINEERING		3/0/3/4.5
Nature of Course	Theory		
Pre requisites	Nil		
Course Objectives:			
1.	To study the principles and concepts of unit operations and processes involved in water and wastewater treatment.		
2.	To evaluate the performance of water and wastewater treatment plants		
3.	To enable the students in designing water and waste water treatment plants for a community.		
4.	To study the various techniques for sludge disposal and disposal into land or water bodies.		
Course Outcomes: Upon completion of the course, students shall have ability to			
C504.1	Identify the various types of treatment techniques adopted for public water supply system		[U]
C504.2	Develop the knowledge in drinking water treatment systems adopted in the world		[AP]
C504.3	Illustrate the concepts of wastewater quality standards and principles for wastewater treatment		[AP]
C504.4	Apply the knowledge in sewage treatment system and recent technologies adopted for wastewater purification		[AP]
C504.5	Establish the concepts of sludge management and disposal systems using various effective methods		[AP]
C504.6	Analyze the amount of Particulate Matters presents in the Air and its control measures		[AN]
Course Contents:			
Module 1: Water quality characteristics and water supply system		15 Hrs	
Physical, Chemical and Biological quality parameters. – Water quality requirements and standards – Planning – objectives – design period – population forecasting – water demand – Water distribution system- Methods of distribution – Analysis of network (Hardy cross method- Theory only). Water Treatment – objectives – unit operations and process – Flash mixers – Flocculators – Sedimentation tanks and sand filters – Disinfection – Aeration – Iron and manganese removal – defluoridation and demineralization – Membrane systems – Desalination – Recent advances			
Module 2 : Primary and Secondary treatment of sewage		15 Hrs	
Sources of waste – Characteristics and composition of sewage – Factors – Primary treatment – Principles, Functions – Screens – Grit chambers – Primary sedimentation tanks – Secondary treatment – Activated sludge process – Attached culture process- UASB – Septic tanks - Trickling filters – oxidation ditches and aerated lagoons – waste stabilization ponds – Reclamation and reuse of sewage – Recent advances in sewage			
Module 3: Sewage Disposal and Air Pollution		15 Hrs	
Sludge Characteristics – Sludge Thickening - Sludge Digestion and Biogas Generation – Sludge Drying beds – Conditioning and dewatering – Incineration – Deep well Injection – Sludge Disposal – Self-purification of natural water bodies – Land disposal and sewage farming – Disposal to lakes and sea – Eutrophication - Oxygen sag curve (Theory only) – Air Pollution – Introduction – Sources – Measurement (For Laboratory Purpose Only).			

			Total Hours:	45 Hrs
Course outcomes: Laboratory				
Upon completion of the Laboratory, students shall have ability to				
C504.1	Experimenting the quality of water based on its physical characteristic using the suitable experimental procedures			[AP]
C504.2	Calculate the type and quantum of chemical required for the removal of dissolved solid substances in water			[AP]
C504.3	Investigate the oxygen content in various forms in water			[AN]
C504.4	Determine the ionic concentration in water using sophisticated analytical methods			[AP]
C504.5	Determine the elemental concentration in water using sophisticated analytical methods			[AP]
C504.6	Investigate the ambient air quality characteristics and calculate the air quality index			[AN]
Laboratory Component:				
S.No	List of Experiments	CO Mapping		RBT
1.	Determination of pH, Turbidity and conductivity of the water and wastewater samples	C504.1		[AP]
2.	Determination of Dissolved Oxygen presents in the water	C504.2		[AP]
3.	Determination of Optimum Coagulant Dosage of the given wastewater sample	C504.2		[AP]
4.	Determination of Bio-chemical Oxygen Demand	C504.3		[AN]
5.	Determination of Chemical Oxygen Demand	C504.3		[AN]
6.	Determination of Iron / Fluorides presents in the given waste water sample	C504.4		[AP]
7.	Determination of Sulphates presents in the given waste water sample	C504.4		[AP]
8.	Determination of Ammonia presents in given wastewater sample	C504.4		[AP]
9.	Determination of Sodium presents in the wastewater sample	C504.5		[AP]
10.	Determination of potassium presents in the wastewater sample	C504.5		[AP]
11.	Determination of Nitrates in the given wastewater sample	C504.5		[AP]
12.	Determination of Air pollutant - Particulate Matter analysis	C504.6		[AN]
Text Books:				
1.	Garg S.K, "Water Supply Engineering", Khanna publishers, 2017			
2.	Garg S.K, "Sewage disposal and Air pollution Engineering", Khanna publishers, 2015			
3.	Punmia B.C, "Water Supply Engineering", Laxmi publications Pvt. Ltd., 2016			
Reference Books:				
1.	Birdie G.S., Water supply Engineering, Dhanpat rai publishing company, 2014			
2.	Venugopal Rao P., "Textbook of Environmental Engineering", Prentice Hall of India Pvt.Ltd, 2013			
3.	SankaraSubramaniam.V, "Environmental Engineering Vol-I and Vol – II", Laxmi Publications, 2015			
4.	Basak N.N, "Environmental Engineering", McGraw Hill Education., 2017			
Web References:				

1.	http://mohua.gov.in/cms/Latest-Manual-part-a-Engineering.php														
2.	http://164.100.161.188/cms/Latest-Manual-Part-B-Operation-and-Maintenance-2013.php														
3.	http://mohua.gov.in/cms/Latest-Manual-Part-C-Management-2013.php														
4.	http://cpheeo.gov.in/cms/manual-on-municipal-solid-waste-management-2016.php														
Online Resources:															
1.	https://www.mooc-list.com/course/water-and-wastewater-treatment-engineering-physicochemical-technology-edx														
2.	http://nptel.ac.in/courses/105106119/														
Tentative Assessment Method & Level (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:10)															
Course Outcome	Revised Bloom's level					Assessment Component					Marks				
C504.1 – C504.6	Apply					Assignment					5				
C504.1 – C504.6	Apply					Quiz					5				
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [40 Marks]		
	Theory									Practical					
	CIA – I (10 Marks)			CIA – II (10 Marks)			CIA – III (10 Marks)			Rubric based CIA (20 Marks)					
Remember	10			10			10			10			20		
Understand	40			40			40			20			20		
Apply	50			50			40			40			40		
Analyze	-			-			10			30			20		
Evaluate	-			-			-			-			-		
Create	-			-			-			-			-		
Course Articulation Matrix (Theory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	2	2	2	2	2	-	-	3	1	3	2
2	3	2	2	2	1	1	2	2	2	-	-	2	2	2	2
3	2	2	2	2	1	1	-	2	1	-	-	2	1	2	2
4	3	3	2	1	-	1	1	-	1	-	-	3	1	3	2
5	2	2	2	1	-	-	1	1	2	-	-	2	1	2	2
6	3	3	3	-	2	2	2	1	1	-	-	3	2	3	2
Avg	2.6	2.5	2.2	1.6	1.5	1.5	1.6	1.6	1.5	-	-	2.5	1.3	2.5	2.0
Course Articulation Matrix (Laboratory)															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	2	2	2	1	2	1	1	-	1	1	2	3	2
2	2	2	2	2	2	2	2	1	1	-	2	2	1	2	2
3	2	2	2	2	2	2	2	1	1	-	1	2	1	2	2
4	3	2	2	2	2	2	2	1	1	-	2	1	2	3	2
5	2	2	2	2	2	1	2	1	1	-	2	2	2	2	2
6	3	3	2	2	2	1	2	1	1	-	2	2	2	3	2
Avg.	2.5	2.2	2.0	2.0	2.0	1.5	2.0	1.0	1.0	-	1.7	1.7	1.7	2.5	2.0

18CE505	TRANSPORTATION ENGINEERING		3/0/3/4.5
Nature of Course	Theory Concept		
Pre requisites	Nil		
Course Objectives:			
1.	To know about highway planning and geometric design of roads.		
2.	To Learn about highway maintenance and public transportation systems.		
3.	To know about the construction and maintenance of railway tracks.		
4.	To Understand the Concept of Working principle of signals		
Course Outcomes: (Theory)			
Upon completion of the course, students shall have ability to			
C505.1	Examine the various cross-sectional elements in railways and highways.		[AP]
C505.2	Plan the various geometric elements of highways and railways.		[AP]
C505.3	Understand the importance of maintenance in highway and railway engineering.		[AP]
C505.4	Assess and evaluate the material properties for highway and railway design.		[AP]
C505.4	Outline the new concepts in highways and railways.		[AP]
C505.6	Investigate the Signaling systems and its working procedures		[AN]
Course Contents:			
Module 1: Railway Planning, Construction and Maintenance			15 Hrs
Role of Indian Railways in National Development - Permanent Way- its Components and their functions - Geometric Design of railway tracks. Points and Crossings – Working Principle - Signaling, Interlocking and Track Circuiting, Track Drainage, Railway Stations and Yards, Level Crossings – LRT & MRTS			
Module 2: Highway Planning and Design			15 Hrs
Significance of highway planning – History of road development in India – factors influencing highway alignment - Engineering surveys for alignment, Classification of highways. Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves – Gradients.			
Module 3: Construction Practice and Maintenance of Pavements			15 Hrs
Pavement components and their functions - Desirable Properties and Testing of Highway Materials: - Soil tests–Tests on Aggregate –Tests on Bitumen. Construction practice- WBM road – Bituminous road – Cement Concrete road- Types of defects in Flexible Pavements – defects in Rigid Pavement, Highway User Benefits, Highway Costs, Vehicle Operation Costs, Economic analysis, Highway projects under Public-Private Sector Participation, Bidding process, Highway finance.			
Total Hours:			45 Hrs
Course Outcomes: (Lab)			
Upon completion of the course, students shall have ability to			
C505.1	Investigate the applicability of aggregates based on shape and size.		[AP]
C505.2	Determine and evaluate the strength parameters of aggregates.		[AN]
C505.3	Design the vertical and horizontal alignment of pavements.		[AN]
C505.4	Plan the geometric design of railway tracks.		[AN]
C505.5	Examine the operating temperature of bitumen in site condition using appropriate equipments.		[AP]
C505.6	Investigate the suitability of bitumen for usage in field.		[AP]
Laboratory Component			

S.No	List of Experiments	CO Mapping	RBT		
1	Determination of the numerical index (density) and water absorption of coarse aggregates	C505.1	[AP]		
2	Determination of resistance offered by aggregate against gradual loading	C505.2	[AN]		
3	Determination of resistance offered by aggregates against sudden loading	C505.2	[AN]		
4	Determination of resistance of aggregate against abrasion	C505.2	[AN]		
5	Determination of particle size distribution of coarse aggregates	C505.1	[AP]		
6	Determination of Elongation and Flakiness Index of aggregates	C505.1	[AP]		
7	Determination of Penetration of bitumen (Penetration Test)	C505.5	[AP]		
8	Determination of Viscosity of bituminous binder	C505.6	[AP]		
9	Determination of Ductility of bituminous binder	C505.6	[AP]		
10	Determination of Softening point of bitumen	C505.5	[AP]		
11	Design of alignment of pavements	C505.3	[AN]		
12	Geometric design of railway tracks	C505.4	[AN]		
Text Books:					
1.	Kadiyali L R, "Principles and Practices of Highway Engineering ", Khanna Technical Publications, Delhi, 2012.				
2.	Veeraragavan. A, Khanna S.K and Justo C E G, "Highway Engineering ", Nem Chand & Bros, 2014.				
3.	Arora .S.P & Saxena .S.C, "A Textbook of Railway Engineering", CBS Publishers, 2017.				
Reference Books:					
1.	Sharma S.K, "Principles Practices& Design of Highway Engineering" S.Chand& Co, 2011.				
2.	Satish Chandra &Agarwal.M.M, "Railway engineering" Prabha&Co ,Delhi, 2012.				
3.	ParthaChraborthy&Animesh Das Principles of Transportation Engineering, Tata McGraw Hill Co Ltd, New Delhi, 2012.				
4.	Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd. 2008				
Web References:					
1.	http://www.youtube.com/watch?v=WUq3uN4MDms				
2.	https://ocw.mit.edu/courses				
Online Resources:					
1.	http://nptel.ac.in/courses/114106025				
2.	http://nptel.ac.in/courses/114106024				
Tentative Assessment Methods & Levels (based on Revised Blooms' Taxonomy)					
Formative assessment based on Capstone Model (Max. Marks. 10)					
Course Outcome	Revised Bloom's Level	Assessment Component	Marks		
C505.1 to C505.6	Analyse	Assignment	5		
		Quiz	5		
Summative assessment based on Continuous and End Semester Examination					
Revised Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 Marks]	Rubric based CIA (20 Marks)	

Remember	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Understand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apply	60	40	50	50	50	50	50	50	50	50	50	50	50	50	50
Analyse	40	60	50	50	50	50	50	50	50	50	50	50	50	50	50
Evaluate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Articulation Matrix - Theory															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
2	3	2	1	1	-	-	-	-	-	-	-	2	2	-	1
3	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
4	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
5	3	2	1	2	-	-	-	-	-	-	-	2	2	-	1
6	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
Avg	3	2	1	1.2	-	-	-	-	-	-	-	1.3	2	-	1
Course Articulation Matrix – Laboratory															
1	3	2	1	1	3	-	1	1	1	1	-	1	1	-	1
2	3	2	1	1	3	-	1	1	1	1	-	1	2	-	1
3	3	2	1	1	3	-	1	2	2	2	-	1	1	-	2
4	3	2	1	1	3	-	1	2	2	2	-	1	1	-	2
5	3	2	1	2	3	-	1	1	2	1	-	1	2	-	2
6	3	2	1	1	3	-	1	1	2	1	-	1	2	-	2
Avg	3	2	1	1.2	3	-	1	1.3	1.7	1.3	-	1	1.5	-	1.7
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18MC501	SOFT SKILLS		2/0/0/0
Nature of Course	Theory Concept		
Pre requisites	Technical Communication Skills		
Course Objectives:			
1.	To develop the student's competency level and their capabilities.		
2.	To teach the students to be effective in workplace and social environments.		
3.	To create self confidence among the students and to resolve stress and conflict within themselves.		
4.	To help the students to enhance their career skills by increasing their productivity and performances.		
5.	To concentrate more on conversation skills, presentation skills, verbal ability, critical and creative thinking.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C501.1	Remember the principles of soft skills required for their profession.		[R]
C501.2	Understand the importance of Interpersonal communication Skills among individuals, groups and cultures.		[U]
C501.3	Apply verbal and nonverbal communication skills in corporate environment.		[AP]
C501.4	Analyse and apply creativity skills, critical thinking skills and problem-solving skills.		[AN]
C501.5	Articulate oral and written messages in an appropriate and persuasive manner to suit specific purposes, audiences and contexts at work place.		[AP]
C501.6	Apply good teamwork skills and Leadership Skills		[AP]
Course Contents:			
Module 1: Professional Communication Skills		10 Hrs	
Introduction to the Soft Skills, Performance Evaluation 1 –Significance of Soft Skills- Understanding the basic Communication Principles –Listening Skills- Listening Exercises- Speaking Skills- How to start and Sustain a Conversation- Speaking in Groups- Understanding self and Personal Branding, attitude, types of attitude, Positive Attitude, Self Confidence and Self-Motivation - Personal Application/Action Taken.			
Advanced Writing Skills-Principles of Business Writing- E mails- Writing Reports- Types of Reports- Strategies for Report Writing- Personal Application/Action Taken.			
Verbal Ability- Analogy- Classification- Odd One Out- Idioms and Phrases- Sentence Correction- Personal Application/Action Taken.			
Module 2: Interpersonal Communication		10 Hrs	
Nonverbal Communication- Individual, Groups and Cultures- Body Language- Attire and Etiquettes- Interpersonal Skills- dealing with diverse People- Networking- Personal Application/Action Taken.			
Developing Creativity- Critical Thinking and Problem-Solving Skills- Making the Right Choice- Never Give Up- Begin to Grow- Personal Application/Action Taken.			
Interviews- Facing Job Interviews - Planning and Preparing- Effective Resume along with Covering Letter- Planning and Preparing- Personal Application/Action Taken.			
Self-Discipline - Self Presentation - Personal Application/Action Taken.			
Module 3: Teamwork and Leadership Skills		10 Hrs	
Industry Expectations- Universal Hiring Rule- Personal Application/Action Taken.			

Importance of Human Values-Importance of Team Work- Developing Key Traits in Motivation, Persuasion, Negotiation and Leadership Skills- Being an Effective Team Player- Personal Application/Action Taken.
 Planning- Prioritization - Delegation- Conflict Management- Group Discussion- Personal Application/Action Taken.
 Essential Skills in working Strategies- Presentation and Interaction Skills- What to Present and How- Being Assertive- Multimedia Presentation-Making Effective Presentations.
 Interview Skills- Do's and Don'ts – Answering the Common Questions of Interview- Performance Evaluation 2- Mock Interview

Total Hours: 30 Hrs

Text Books:

1.	Business Communication for managers: An advanced approach, by Penrose, Cengage learning.
2.	Professional Communication in Engineering. by H.E. Sales. Palgrave Macmillan 2009.
3.	Communication for professional engineers by W. P. Scott, Bertil Billing. Thomas Telford, 1998.

Reference Books:

1.	Reason and professional ethics by Peter Davson-Galle. Ashgate Publishing, Ltd., 2009.
2.	Cross Cultural and Inter Cultural Communication. by William B. Gudykunst. Sage Publications India Pvt Ltd, New Delhi.2003.
3.	Corporate Communications: Theory and Practice. by Joep Cornelissen. Sage Publications India Pvt Ltd, New Delhi.2004.

Web References:

1	https://onlinecourses.nptel.ac.in/noc16_hs15/preview
2	https://www.getinternship.switchidea.com/NTAT/syllabus/Interpersonal-Communication .
3	https://smude.edu.in/smude/programs/bca/soft-skills.html

Online Resources:

1	https://swayam.gov.in/course/4047-developing-soft-skills-and-personality
2	https://www.clearias.com/interpersonal-skills-including-communication-skills-for-csat/
3	https://www.bizlibrary.com/soft-skills-training/

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	-	-	-	-	-	1	1	2	2	3	2	2	-	-	1	
2	-	-	-	-	-	-	1	1	3	3	2	2	-	-	1	
3	-	-	-	-	-	-	-	-	2	3	2	2	-	-	1	
4	-	-	-	-	-	1	1	1	2	3	3	2	-	-	1	
5	-	-	-	-	-	1	1	-	2	3	2	2	-	-	1	
6	-	-	-	-	-	-	1	2	3	3	2	2	-	-	1	
Avg	-	-	-	-	-	1	1	1.5	2.3	3	2.2	2	-	-	1	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18CE506	SUMMER INDUSTRY INTERNSHIP AND SEMINAR PRESENTATION												0/1/0/1		
Nature of Course		Training													
Pre requisites		Nil													
Course Objectives:															
1.	To give a firsthand knowledge of practical problems related to Civil Engineering														
2.	To offer firsthand knowledge on applications of Construction Management in carrying out engineering tasks.														
3.	To train the students on real time learning experiences in site.														
4.	To offer an additional edge to their profession														
Course Outcomes:															
Upon completion of the course, students shall have ability to															
C506.1	Identify critical activities in the Construction Industry												[AN]		
C506.2	Develop the methodology to solve the identified problem												[AN]		
C506.3	Develop skills in facing the problems experienced in the field.												[E]		
C506.4	Develop skills in solving the problems experienced in the field.												[AP]		
C506.5	Acquire the skills to communicate effectively												[AP]		
C506.6	Present the report clearly to specific audience in both the written and oral forms.												[AP]		
Course Contents:															
The students individually undertake training in reputed engineering companies doing construction during the summer vacation for a specified duration of two weeks. At the end of training, a detailed report on the work done should be submitted. The students report will be evaluated through a viva-voce examination by a team of internal faculty.															
Tentative Assessment Method & Levels (based on Revised Bloom's Taxonomy)															
Summative assessment based on Report and Viva Voce Examination															
Revised Bloom's Level		Training Report [40 marks]						Viva Voce Examination [60 marks]							
Remember		-						-							
Understand		10						10							
Apply		20						20							
Analyse		40						40							
Evaluate		30						30							
Create		-						-							
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	-	2	2	-	1	2	-	2	-	3	-	-
2	3	2	2	-	2	2	-	1	2	-	2	-	3	2	1
3	3	3	2	-	3	2	-	2	2	-	2	-	3	1	1
4	3	3	1	-	2	2	-	2	2	-	1	-	3	-	-
5	3	2	1	-	2	2	-	2	2	-	1	-	3	1	1
6	3	2	1	-	2	2	-	2	2	-	1	-	3	1	1
Avg	3	2.5	1.7	-	2.2	2	-	1.5	2	-	1.5	-	3	1.2	1
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

2.	Negi L.S. "Design of steel structures" McGraw Hill Co., New Delhi, 2014
3.	Bhavikatti S.S., "Design of Steel Structures (By limit state method as per IS 800:2007)" I K International Publishing house pvt ltd, 2010.
4.	IS 800-2007, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi.
5.	SP 6(1) - 1964 HAND BOOK FOR STRUCTURAL ENGINEERS – Structural Steel Sections
6.	SP 6(3) - 1962 HAND BOOK FOR STRUCTURAL ENGINEERS – Steel Columns and Struts

Web References:

1.	www.nptel.ac.in
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Online Resources:

1.	http://nptel.ac.in/courses/105103094/
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Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C601.1	Analyze & Apply	Outside Class Hours Technical Report I	10
C601.2			
C601.3			
C601.4	Understand & Apply	Outside Class Hours Technical Report II	10
C601.5			
C601.6			

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	
Remember	-	-	-	-
Understand	-	-	10	10
Apply	25	25	30	30
Analyse	75	75	60	60
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	3	3	3	2	3	-	-	1	1	1	-	2	3	1	1	
2	3	3	3	2	3	-	-	1	1	1	-	3	3	1	1	
3	3	3	3	2	3	-	-	1	1	1	-	3	3	1	1	
4	3	3	3	2	3	-	-	1	1	1	-	3	3	1	1	
5	3	3	3	2	3	-	-	1	1	1	-	3	3	1	1	
6	3	3	3	2	3	-	-	1	1	1	-	3	3	1	1	
Avg	3	3	3	2	3	-	-	1	1	1	-	3	3	1	1	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18CE602	CONSTRUCTION ENGINEERING AND MANAGEMENT	3/0/3/4.5
Nature of Course	Theory analytical	
Pre requisites	Nil	
Course Objectives:		
1.	To study the basic concepts of Construction planning and management.	
2.	To get knowledge on the various project scheduling and Cost control tools.	
3.	To understand the assessment systems of Quality and Quality control.	
4.	To study principles of safety and Health management systems.	
Course Outcomes: (Theory)		
Upon completion of the course, students shall have ability to		
C602.1	Identify the basic concepts in Construction management and project planning	[AP]
C602.2	Apply the analytical skills to solve the construction problems using various Network Scheduling techniques	[AP]
C602.3	Analyze Crashing problems in Construction Management	[AN]
C602.4	Analyze the skill on resource management, quality management and cost management with respect to the project	[AP]
C602.5	Construct the importance of time and cost trade off in projects	[AP]
C602.6	Analyze the concepts of safety and health management system	[AN]
Course Contents:		
Module 1: Introduction to Management & Planning - Need, Importance & Purpose: 15 Hrs		
Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, Process of development of plans and schedules, work break-down structure, concept of productivities, sequence of activities,; Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications, Importance of Planning - Types of organizations, role and responsibilities of project Manager, Resource planning - Project life cycle, Project feasibility reports based on socio-techno-economic-environmental impact analysis, Contract – Types of contracts – Formation of contract, Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination, Changes & variations, Dispute Resolution methods		
Module 2: Scheduling and Cost control 15 Hrs		
Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks - Work Breakdown structure — PERT —Activity float and schedules – Resource oriented scheduling–Scheduling with resource constraints and precedence’s –Scheduling with uncertain durations–Crashing and time/cost trade-offs -Resource smoothing and Levelling		
Module 3: Construction Quality and Safety Management 15 Hrs		
Definition, Quality control, Quality Assurance, Cost of Quality-Quality Assessment system –Continuous process improvement - PDCA cycle, 5S, Kaizen - checklists for quality control, role of inspection, Principles of Safety – Safety and Health Management system – Safety Audit, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.		
Total Hours:		45 Hrs
Course Outcomes: (Lab)		
Upon completion of the course, students shall have ability to		
C505.1	Identify the activities of the tasks required for the project	[AP]
C505.2	Assign the working time with calendars	[AN]

C505.3	Determine the critical path for the projects		[AN]
C505.4	Plan and allocate resource for the activities involved in a project		[AN]
C505.5	Analyze the optimum resource required by smoothing and levelling		[AN]
C505.6	Examine and track the project status in the report		[AN]
S.No.	Laboratory Component	CO Mapping	RBT
1	Navigate and Customize the Project 2013 Interface, Adding Tasks and Resources to a Project.	C602.2	[AP]
2	Creating Calendars and Changing Working Time with Calendars	C602.3	[AN]
3	Determination of Summary Tasks and Milestones	C602.3	[AN]
4	Allocation of Resources to tasks and Levelling Work Resources	C602.3	[AN]
5	Use of MS Project to assign and Review the Over allocated Resources	C602.3	[AN]
6	Determination of Critical path and activities using MS Project	C602.3	[AN]
7	Identification of Critical path for simple and complex projects	C602.3	[AN]
8	Resource allocation for activities involved in 2BHK Residential building	C602.2	[AP]
9	Resource smoothing and Resource leveling for Commercial projects	C602.3	[AN]
10	Use of MS Project for Scheduling of activities in a 2BHK Residential building	C602.3	[AN]
11	Scheduling of activities in a G+3 Multistoried building using MS Project	C602.3	[AN]
12	Tracking and Report generation for a project by updating the activities with the use of MS Project	C602.3	[AN]
Text Books:			
1.	Neeraj Kumar Jha, "Construction Project Management-Theory and Practice" Pearson publications, 2011.		
2.	Joy P K, Total Project Management: The Indian Context, Macmillan India Ltd, 2010.		
3.	Gahlot P S., and B M Dhir,"Construction Planning & management", New Age International Limited Publishers, 2010.		
4.	Seetharaman S, "Construction Engineering and Management, Umesh Publishers, New Delhi, 2008.		
Reference Books:			
1.	Halpin,D.W., "Financial and cost concepts for construction Management", John Wiley and Sons, New York, 2005.		
2.	Lock, Gower, Project Management Handbook, 2013.		
3.	Jimmie W.Hinze, "Construction Planning and Scheduling", Prentice Hall Publication, 4 th edition,2011		
4.	Charles Patrick ,"Construction Project planning & Scheduling", Pearson, 2012 .		
Web References:			
1.	https://lecturenotes.in/subject/547/construction-management-cm		
2.	https://www.transit.dot.gov/sites/fta.dot.gov/files/FTA_Report_No._0015.pdf		
3.	https://www.pmi.org/		
4.	https://www.projectmanager.com/		
Online Resources:			

1.	https://nptel.ac.in/courses/105104161/
2.	https://nptel.ac.in/courses/105103093/
3.	https://www.edx.org/course/project-management-of-engineering-projects-prepari
4.	https://www.coursera.org/programs/sri-krishna-college-of-engineering-and-technologyotq60/browse?productId=qzhn9PT2EeSKSCIAC7TI2A&productType=s12n&query=+project&showMiniModal=true

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [50 marks]
	Theory			Practical	
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	Rubric Based CIA [30 marks]	
Remember	10	-	-	10	10
Understand	20	20	20	10	10
Apply	30	20	10	30	30
Analyse	40	60	70	50	50
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

Course Articulation Matrix– Theory

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2	PSO 3
1	3	2	1	2	-	-	-	2	-	2	3	2	2	2	-
2	3	2	1	2	-	-	-	2	-	2	3	2	2	2	-
3	3	3	2	2	-	-	-	2	-	2	3	1	2	2	-
4	3	2	1	2	-	-	-	2	-	2	3	2	2	2	-
5	3	2	1	2	-	-	-	2	-	2	3	1	2	2	-
6	3	3	2	2	-	-	-	2	-	2	3	2	2	2	-
Avg	3.0	2.3	1.3	2.0	-	-	-	2.0	-	2.0	3.0	1.6	2.0	2.0	-
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

Course Articulation Matrix - Lab

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2	PSO 3
1	3	2	1	2	3	-	-	2	2	2	3	1	2	2	-
2	3	2	1	2	3	-	-	2	2	2	3	1	2	2	-
3	3	3	2	2	3	-	-	2	2	2	3	1	2	2	-
4	3	2	1	2	3	-	-	2	2	2	3	1	2	2	-
5	3	2	1	2	3	-	-	2	2	2	3	1	2	2	-
6	3	3	2	2	3	-	-	2	2	2	3	1	2	2	-
Avg	3.0	2.3	1.3	2.0	3.0	-	-	2.0	2.0	2.0	3.0	1.0	2.0	2.0	-
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE603	ESTIMATION AND QUANTITY SURVEYING		3/0/3/4.5
Nature of Course	Theory analytical		
Pre requisites	Nil		
Course Objectives:			
1.	To obtain knowledge in various methods of estimates		
2.	To apply the various estimation methods for buildings.		
3.	To prepare estimate for the special structures such as sanitary structures, wells, roads and retaining walls.		
4.	To acquire knowledge in tender notice preparation, valuation and report preparation.		
Course Outcomes:(Theory)			
Upon completion of the course, students shall have ability to			
C603.1	Describe the various types and methods of estimation with their advantages and disadvantages.		[U]
C603.2	Prepare the estimation of load bearing, framed RCC structures, septic tank, tube well and roads.		[AP]
C603.3	Prepare tender notice and contract works for various works in construction.		[AP]
C603.4	Perform the rate analysis for different items of works in a RCC building.		[AP]
C603.5	Perform valuation of a RCC building by various methods and describe the concepts involved in it.		[AN]
C603.6	Prepare report for various building typologies and to fix the rent for buildings.		[AN]
Course Contents:			
Module 1: Estimation of Buildings and Special structures		15 Hrs	
General - Units of measurements - Types of estimation - Methods of estimates - Advantages. Simple problems - Estimation of different foundations, steps and boundary walls. Load bearing structures - Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for rooms, residential building with flat roof. Estimating of septic tank, soak pit- sanitary and water supply installations - tube well. Estimate of bituminous and cement concrete roads. Estimate of retaining walls.			
Module 2: Specification, Tenders and Rate analysis		15 Hrs	
Specifications - General and Detailed specifications for various items of work – Tenders - TTT Act - e-tender - preparation of tender Notice and Document – Contracts - Types of Contracts - Drafting of contract documents - Arbitration and legal requirements - Schedule of rates and Data book - procedure of rate analysis - Requirement of labour and materials for different works - Obtaining rate for different works namely cement mortar - cement concrete - RCC - RR masonry - Brick masonry - Damp Proof Course - Plastering - flooring - painting.			
Module 3: Valuation and Report Preparation		15 Hrs	
Valuation - definition of various terms such as free and lease hold property - Market value - Book value - Assessed value - Mortgage Value - Replacement Value - Gross and Net Income - Capital cost - Cost Escalation - Depreciation - sinking fund method - Fixation of Rent - calculation of standard rent of Government Building - Principles of Report preparation.			
Total Hours:			45 Hrs
Course Outcomes:(Lab)			
Upon completion of the course, students shall have ability to			
C603.1	Prepare the detailed estimate of residential building (load bearing)		AP
C603.2	Prepare the detailed estimate of tube well and septic tank with soak pit		AP
C603.3	Prepare the detailed estimate of flexible and rigid pavement for Highways.		AP

C603.4	Prepare a tender notice and contract documents for given infrastructure	AN	
C603.5	Perform rate analysis for items of work and to prepare a report of estimate for any given infrastructure.	AP	
C603.6	Valuate the R.C.C Framed building and masonry buildings.	AN	
Laboratory Component:			
S. No	List of Experiments	CO Mapping	RB T
1.	Estimation of a Single Room Building: Load bearing structure using spread sheets.	C603.1	[AP]
2.	Estimation of 1 BHK Residential Building: Load bearing structure using spread sheets.	C603.1	[AP]
3.	Estimation of septic Tank with Soak Pit for 2-BHK House using spread sheets.	C603.2	[AP]
4.	Estimation of Tube Well using spread sheets.	C603.2	[AP]
5.	Estimation of Flexible and Rigid Pavement for State Highway using spread sheets.	C603.2	[AP]
6.	Preparation of tender Notice and document for proposed School Building Project	C603.3	[AP]
7.	Drafting of contract documents for a proposed primary health Center.	C603.3	[AP]
8.	Rate Analysis for different items of work in a R.C.C building construction.	C603.4	[AP]
9.	Valuation of a proposed masonry residential building by depreciation method.	C603.5	[AP]
10.	Valuation of a proposed reinforced Cement Concrete framed building (G+1) by depreciation method.	C603.5	[AP]
11	Fixation and calculation of rent of proposed Government Building.	C603.5	[AP]
12	Reports on estimates for the construction of Infrastructures like roads, buildings and culverts.	C603.6	[AP]
Text Books:			
1.	Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers and Distributors Pvt. Ltd., 2016.		
2.	Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand and Company Ltd., 2012.		
3.	Vazirani, V.N and Chandola, S.P., "Civil Engineering Estimation, costing and Valuation)", Khanna Publications., 2015.		
4.	Upadhyay A.K, "Civil Estimation and Costing" S.K. Kataria and Sons, New Delhi, 2015.		
Reference Books:			
1.	Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD		
2.	Tamil Nadu Transparencies in Tenders Act, 1998.		
3.	Patil B.S, 'Civil Engineering Contracts and Estimates', University Press, 2013.		
4.	Banerjee D.N, 'Principles and Practices of Valuation', V Edition, Estern Law House, 2015.		
5.	Seetharaman S, 'Estimation and Quantity Surveying', Anuradha Publications, 2015.		
Web References			
1.	https://www.youtube.com/watch?v=D04uxZpgp6M		
2.	https://www.youtube.com/watch?v=vurarO8Fcg4		
Online Resources			
1.	https://nptel.ac.in/courses/105103093/14		
2.	https://www.coursera.org/learn/construction-cost-estimating		

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment											Practical	End Semester Examination (Theory) [40 marks]		
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]									Rubric based CIA [30 marks]			
Remember	5	-	5									-	10		
Understand	35	20	30									30	20		
Apply	60	80	65									70	70		
Analyse	-	-	-												
Evaluate	-	-	-												
Create	-	-	-												
Course Articulation Matrix – Theory															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
2	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
3	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
4	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
5	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
6	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
Avg	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
Course Articulation Matrix - Lab															
1	3	2	2	-	2	-	-	2	2	3	-	-	2	1	1
2	3	2	2	-	2	-	-	2	2	3	-	-	2	1	1
3	3	2	2	-	2	-	-	2	2	3	-	-	2	1	1
4	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
5	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
6	3	2	2	-	-	-	-	2	2	3	-	-	2	1	1
Avg	3	2	2	-	2	-	-	2	2	3	-	-	2	1	1
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed		

18MC601	GENERAL APTITUDE		2/0/0/0
Nature of Course	Problem analytical		
Pre requisites	Basic Mathematical calculations		
Course Objectives:			
1	To ensure that students learn to think critically about mathematical models for relationships between different quantities and use those models effectively to solve problems and reach conclusions about them.		
2	To impart skills that enable students to effectively use and interpret data, formulas, and graphs in the workplace.		
3	To instills confidence in facing technical aptitude questions interviewed by recruiters.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C601.1	To teach the basics of Quantitative Techniques in a graded manner.	[R]	
C601.2	Understand the verbal and non-verbal nature of problems in reality and know the shortcut methods of solving it.	[U]	
C601.3	Solve problems using their general mental ability.	[AP]	
C601.4	To give intense focus on improving and increasing the ability of solving real problems.	[AP]	
C601.5	Think critically about mathematical models for relating different quantities to reach conclusion.	[AP]	
C601.6	Enable effective use of data interpretation, formulas, graphs and assumptions.	[AP]	
Course Contents:			
Module 1: Number Theory and Statistics		14 Hrs	
Number Systems– HCF and LCM of Numbers – Decimal Fractions – Simplification – Square Root and Cube Root of a number – Surds and Indices – Problems on numbers – Percentage – Ratio and Proportion – Divisibility – Mixtures – Averages- Polynomials – Solving Equations and Inequalities – Discard’s rule of signs – Problems on ages – Chain rule – Time and Work – Time and Distance – Problems on Trains – Problems on Boats and Streams- Measures of central tendency – Mean, Median and Mode – Variance and Standard deviation Logarithms – Profit and Loss – Simple Interest – Compound Interest.			
Module 2: Logic and Decision Making		8 Hrs	
Analogy – Classification – Series completion – Coding and Decoding – Blood Relations – Puzzle Test – Direction Sense test – Logical Venn Diagrams - Number Ranking and Time Sequence Test – Decision Making – Assertion and Reason– Inserting the missing one – Logical Sequence of words – Syllogisms.			
Module 3: Reasoning		8 Hrs	
Logic – Statement and Arguments – Statements and Assumptions – Statements and Course of Action – Statements and Conclusions – Deriving conclusions from passages – Functions – Different kinds of functions – Miscellaneous sets- Series – Analogy – Classifications – Analytical Reasoning – Problems on Cubes and Dice – Mirror Images – Water Images – Rule Detection.			
Total Hours:			30 Hrs
Text Books:			
1	Aggarwal R. S. “Quantitative Aptitude” Revised Edition, S. Chand Publication.		
2	Abhijit Guha “Quantitative Aptitude” 5 th Edition, McGraw Hill Education.		
Reference Books:			
1	Edgar Thorpe “Mental Ability & Quantitative Aptitude” 3 rd Edition, McGraw Hill Education.		

Web References:															
1	https://www.wiziq.com/tutorial/815468-quantitative-aptitude-reasoning-data-interpretation-video-lectures														
2	https://learningpundits.com/contest?referrer=harsh.cse15@nituk.ac.in														
3	https://nptel.ac.in/courses/114106041/8														
4	https://nptel.ac.in/courses/111103020/2														
Online Resources:															
1	http://aptitudetraining.in/home/index.php														
2	https://www.udemy.com/vedicmaths/														
3	https://www.youtube.com/channel/UCtmn-DsF4BhPug-ff9LiDAA?disable_polymer=true														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:40)															
Course Outcome	Revised Bloom's Level					Assessment Component							Marks		
C601.1	Remember					Classroom or Online Quiz							10		
C601.2 & C601.3	Understand					Formal presentation							10		
C601.4, C601.5 & C601.6	Apply					Formal interview tests							20		
Summative assessment based on Continuous and End Semester Examination															
Bloom's Level		End Semester Examination [60 marks]													
Remember		20													
Understand		40													
Apply		40													
Analyse		-													
Evaluate		-													
Create		-													
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
5	3	3	1	-	-	-	-	-	-	-	-	-	2	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
Avg	3	2.5	1	-	-	-	-	-	-	-	-	-	2	-	-
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		

18CE604	WINTER INDUSTRY INTERNSHIP AND SEMINAR PRESENTATION												0/0/1/0.5		
Nature of Course		Training													
Pre requisites		Nil													
Course Objectives:															
1.	To give a firsthand knowledge of practical problems related to Civil Engineering														
2.	To offer firsthand knowledge on applications of Construction Management in carrying out engineering tasks.														
3.	To train the students on real time learning experiences in site.														
4.	To offer an additional edge to their profession														
Course Outcomes:															
Upon completion of the course, students shall have ability to															
C604.1	Identify critical activities in the Construction Industry													[AN]	
C604.2	Develop the methodology to solve the identified problem													[AN]	
C604.3	Develop skills in facing the problems experienced in the field.													[AP]	
C604.4	Develop skills in solving the problems experienced in the field.													[AP]	
C604.5	Acquire the skills to communicate effectively													[AP]	
C604.6	Present the report clearly to specific audience in both the written and oral forms.													[AP]	
Course Contents:															
The students individually undertake training in reputed engineering companies doing construction during the winter vacation for a specified duration of one week. At the end of training, a detailed report on the work done should be submitted. The students will be evaluated through a viva-voce examination by a team of internal faculty.															
Tentative Assessment Method & Levels (based on Revised Bloom's Taxonomy)															
Summative assessment based on Report and Viva Voce Examination															
Revised Bloom's Level		Training Report [40 marks]					Viva Voce Examination [60 marks]								
Remember		10					10								
Understand		20					20								
Apply		40					40								
Analyse		30					30								
Evaluate		-					-								
Create		-					-								
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	2	2	2	3	3	3	2	3	2	2	3
2	3	3	2	2	1	2	2	3	3	3	2	3	2	2	3
3	3	2	1	1	1	2	2	3	3	3	2	3	2	2	3
4	3	2	1	1	1	2	2	3	3	3	2	3	2	2	3
5	3	2	1	1	1	2	2	3	3	3	2	3	2	2	3
6	3	2	1	1	1	-	-	3	3	3	-	3	2	2	3
Avg	3.0	2.3	1.3	1.3	1.2	2.0	2.0	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

SEMESTER 7

18CE701	PROJECT WORK (PHASE I)			0/0/4/2	
Nature of Course	Project				
Pre requisites	Nil				
Course Objectives:					
1.	To provide students an opportunity to exercise their creative and innovative qualities in a group project environment.				
2.	To improve the skill of addressing various problems related to Civil Engineering				
3.	To estimate the ability of the student in transforming the theoretical knowledge studied so far into an application.				
4.	To train the students to analyse the problems and its solutions, report preparation and to present and defend the report.				
Course Outcomes:					
Upon completion of the course, students shall have ability to					
C701.1	Practice the way of investigation and exploration of scientific documents and case studies to Identify the existing problems in civil engineering domain.			[AP]	
C701.2	Articulate the relevant and competent topic for the proposed project.			[AP]	
C701.3	Investigate the suitable components and computational models to identify the best solution.			[AN]	
C701.4	Operate himself as an individual or build teams for a given task to achieve common goals.			[AP]	
C701.5	Draft and compile the outputs of a project as a report.			[C]	
C701.6	Present and Justify the outcomes of their project in an open platform			[E]	
Course Contents:					
<p>This course is aimed to provide more weightage for identify and develop practical solutions to real life problems related to Civil Engineering industry. The theoretical knowledge, principles and practices gained from various subjects and software should be applied to develop effective solutions to various computing problems. Students could join (maximum 3) together, form a team and execute a project. The project work could be done in the form of a design project or analytical project or even a minor practical project in the college. Participation in any technical event / competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course. Modeling Techniques, Design and Testing strategies should be documented properly.</p> <p>A committee consisting of Head of the department, the Supervisor of the design comprehension project and two senior faculty members of the department will perform the internal assessment of the Project (Phase I). A report on Project (Phase I) should be submitted for evaluation and project work should be presented and demonstrated before the panel of examiners.</p>					
Total Hours:				15 Hrs	
Tentative Assessment Method & Levels (based on Revised Bloom's Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Revised Bloom's Level	Continuous Assessment [40 marks]			Project Book [20 marks]	End Semester Examination (Viva-Voce) [40 marks]
	Review – I [10 marks]	Review – II [10 marks]	Review – III [20 marks]		
Remember	-	-	-	-	-

Understand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apply	50	40	30	30	30	30	30	30	30	30	30	30	30	30	30
Analyse	50	40	50	50	50	50	50	50	50	50	50	50	50	50	50
Evaluate	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Create	-	-	20	20	20	20	20	20	20	20	20	20	20	20	20
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
1	3	2	-	3	2	-	2	2	-	-	-	3	3	2	1
2	2	2	1	-	-	2	-	1	-	2	-	-	2	3	-
3	2	3	3	3	3	1	-	2	1	-	2	3	3	3	2
4	-	-	-	-	-	-	-	2	3	-	3	3	-	-	2
5	2	-	-	-	3	-	-	3	-	3	-	1	2	-	-
6	-	-	-	-	2	1	-	-	-	3	-	3	-	-	2
Avg	2.3	2.3	2.0	3.0	2.5	1.3	2.0	2.0	2.0	2.7	2.5	2.6	2.5	2.7	1.8
1	Reasonably agreed			2	Moderately agreed					3	Strongly agreed				

SEMESTER 8

18CE801	PROJECT WORK (PHASE II)			0/0/24/12	
Nature of Course		Practical			
Course Objectives:					
1.	To provide students an opportunity to exercise their creative and innovative qualities in a group project environment.				
2.	To develop the ability to addressing a specific problem right from its identification.				
3.	To estimate the ability of the student in transforming the theoretical knowledge studied so far into an application.				
4.	To train the students to analyze the problems and its solutions, report preparation and to present and defend the report.				
Course Outcomes:					
Upon completion of the course, students shall have ability to					
C801.1	Practice the way of investigation and exploration of scientific documents and case studies to Identify the existing problems in civil engineering domain.			[AP]	
C801.2	Investigate the suitable components and interpretation using computational models to validate and justify his solutions			[AN]	
C801.3	Choose peer groups to collaborate and bring out the sustainable products for commercialization.			[AP]	
C801.4	Operate himself as an individual or build teams for a given task to achieve common goals.			[AP]	
C801.5	Draft and compile the outputs of a project as a report.			[C]	
C801.6	Present and Justify the outcomes of their project in an open platform			[E]	
Course Contents					
<p>This course is aimed to provide more weightage for identify and develop practical solutions to real life problems related to Civil Engineering industry. The theoretical knowledge, principles and practices gained from various subjects and software should be applied to develop effective solutions to various computing problems. Students could join (maximum 3) together, form a small team and execute a project. The project work could be done in the form of a project or internship in the industry, design project or analytical project or even a minor practical project in the college. Participation in any technical event / competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course. Modeling Techniques, Design and Testing strategies should be documented properly.</p> <p>A committee consisting of Head of the department, the Supervisor of the design comprehension project and two senior faculty members of the department will perform the internal assessment of the Project (Phase II). A report on Project (Phase II) should be submitted for evaluation and project work should be presented and demonstrated before the panel of examiners.</p>					
Total Hours:				15 Hrs	
Tentative Assessment Method & Levels (based on Revised Bloom's Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Revised Bloom's Level	Continuous Assessment			Project Book [20 marks]	End Semester Examination (Viva-Voce) [40 marks]
	Review – I [10 marks]	Review – II [10 marks]	Review – III [20 marks]		
Remember	-	-	-	-	-

Understand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apply	50	40	30	30	30	30	30	30	30	30	30	30	30	30	30
Analyse	50	40	50	50	50	50	50	50	50	50	50	50	50	50	50
Evaluate	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Create	-	-	20	20	20	20	20	20	20	20	20	20	20	20	20
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	-	3	2	-	2	2	-	-	-	3	3	2	1
2	2	3	3	3	3	1	-	2	1	-	2	3	3	3	2
3	-	-	3	-	3	-	2		3	-		2	-	3	3
4	-	-	-	-	-	-	-	2	3	-	3	3	-	-	2
5	2	-	-	-	3	-	-	3	-	3	-	1	2	-	-
6	-	-	-	-	2	1	-	-	-	3	-	3	-	-	2
AVG	2.3	2.5	3.0	3.0	2.6	1.0	2.0	2.3	2.3	3.0	2.5	2.5	2.7	2.7	2.0
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

PROFESSIONAL ELECTIVE COURSES
Elective Stream I: Structural / Geotechnical Engineering

18CE901	BRIDGE ENGINEERING	3/0/0/3
Nature of Course	Concepts and Analytical	
Pre requisites	-	
Course Objectives:		
1.	Able to determine the design parameters needed for the bridge design.	
2.	To acquire knowledge in the design of reinforced concrete bridges.	
3.	Able to analyze and design the slab bridge components and also know about the design principles of modern bridges.	
4.	To know about the various substructure components and its requirements.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C901.1	Classify bridges, IRC loads acting on bridges.	[U]
C901.2	Generalize the general design considerations for various bridges.	[AP]
C901.3	Design of short span bridges – culverts, solid slab bridges, tee beam bridges	[AN]
C901.4	Outline the design concepts of long span bridges – continuous bridges, box girder bridges and balanced cantilever bridges.	[AN]
C901.5	Design of steel bridges – riveted / welded plate girder bridges.	[AN]
C901.6	Choose the bearings, substructure for various bridges.	[AP]
Course Contents:		
Module 1: Introduction		10 Hrs
Classification – Investigation and planning, choice of type – IRC Specifications for road bridges – standard live loads – other forces acting on bridges – general design considerations.		
Module 2: Short/ Long Span Bridges		15 Hrs
Load distribution theories – analysis and design of slab culverts – tee beam and slab bridges – Design of post-tensioned pre-stressed concrete Tee beam and slab bridges – Design principles of continuous bridges – box girders – balanced cantilever bridges – marine bridges.		
Module 3: Design of Plate Girder Bridges, Bearings and Substructures		20 Hrs
Design of riveted and welded plate girder bridges for highway and railway loading – wind effects – main section, splicing, curtailment, stiffeners – Different types of bearings – Design of bearings – Design of masonry and concrete piers and abutments – Types of bridge foundations – Design of foundations.		
Total Hours:		45 Hrs
Text Books:		
1.	Jagadeesh T.R. and Jayaram M.A., “Design of Bridge Structures”, 2 nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2014.	
2.	Ponnuswamy S., “Bridge Engineering”, 2 nd Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi. 2011.	
3.	Krishnaraju N., “Prestressed Concrete Bridges”, CBS Publishers, New Delhi, 2010.	
Reference Books:		
1.	Johnson Victor D., “Essentials of Bridge Engineering”, 6 th Edition, Oxford and IBH Publishing Co., New Delhi, 2010.	
2.	Raina V.K., “Concrete Bridge Practice Analysis, Design and Economics”, 3 rd Edition,	

	Shroff Publishers and Distributors Pvt. Ltd., New Delhi, 2013.															
3.	Bakht B. and Jaegar L.G., "Bridge Analysis Simplified", McGraw Hill, 2010.															
4.	Troitsky M.S., "Planning and Design of Bridges", John Wiley & Sons, Inc., Singapore, 2012.															
Web References:																
1.	http://www.accessengineeringlibrary.com/browse/handbook-of-civil-engineering-calculations-second-edition/p200128239975_59001															
2.	http://science.howstuffworks.com/engineering/civil/bridge1.htm															
Online Resources:																
1.	http://nptel.ac.in/courses/105105165/															
2.	http://www.youtube.com/playlist?list=PLZzO5hTp04ec6uudZ_lem0kO_8ob1MtVt															
Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks: 20)																
Course Outcome	Revised Bloom's Level						Assessment Component						Marks			
C901.1	Understand						Classroom Test						5			
C901.2	Apply															
C901.3	Analyze						Group Assignment						5			
C901.4	Analyze						Classroom Quiz						5			
C901.5	Analyze															
C901.6	Apply						Technical Presentation						5			
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Taxonomy	Continuous Assessment												End Semester Examination (Theory) [50 Marks]			
	CIA-I [10 marks]			CIA-II [10 marks]			CIA III [10 marks]									
Remember	20			15			10						10			
Understand	20			20			20						20			
Apply	25			25			30						30			
Analyse	35			40			40						40			
Evaluate	-			-			-						-			
Create	-			-			-						-			
Course Articulation Matrix																
C O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3	
1	3	3	3	3	-	1	1	-	-	1	-	2	3	-	2	
2	3	2	1	1	-	1	1	-	-	1	-	2	3	-	2	
3	3	3	2	2	-	1	1	-	-	1	-	2	3	-	2	
4	3	3	2	2	-	1	1	-	-	1	-	2	3	-	2	
5	3	3	2	2	-	1	1	-	-	1	-	2	3	-	2	
6	3	2	1	1	-	1	1	-	-	1	-	2	3	-	2	
Avg	3.0	2.7	1.8	1.8	-	1.0	1.0	-	-	1.0	-	2.0	3.0	-	2.0	
1	Reasonable Agreed						2	Moderately Agreed				3	Strongly Agreed			

18CE902	DISASTER PREPAREDNESS AND PLANNING	3/0/0/3
Nature of Course	Theory	
Pre requisites	-	
Course Objectives:		
1.	To understand the knowledge of the disaster management and its influence	
2.	To study and analyze vulnerability	
3.	To study and assess the building behavior during various disasters	
4.	To understand the policy and procedure involved during disaster	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C902.1	Analyze the various types of disasters	[AN]
C902.2	Identify the potential deficiency of existing building during disaster with remedial measures	[AP]
C902.3	Distinguish the protection measures against all disasters	[AN]
C902.4	Examine the hazard assessment procedure for all disaster	[AN]
C902.5	Plan the capacity building and programmes for all the disasters	[AP]
C902.6	Discuss the policy and schemes for disaster management in India	[AN]
Course Contents:		
Module 1: Disaster Risk management in India		20 Hrs
Disaster management in India –Disaster Management Act, 2005 – Policies for Disaster preparedness and programs, Early Warning System - Organizational structure for disaster management –Disaster management schemes-schemes and grants on DM-planning commission-Tsunami - Role of NDRF in disaster management- Role of news media in Disaster management. Dimensions of natural & anthropogenic disasters - Difference between hazard and disaster-Types of disaster-Phases of disaster management-Principles /components of disaster management, Natural disasters and mitigation efforts – Flood control – Drought management – Cyclones – Land use planning - NBC threat and safety measures – Forest fires – Oil fires – Accidents in coal mines- Hazard affecting buildings-Building safety against hazards– Floods-Flood relief and rescue management- Cyclones-Landslides – Fire - Earthquake hazard map-Causes of earthquakes-Classification of earthquakes- Nuclear disaster - chemical and industrial accidents - Mitigation strategies.		
Module 2: Hazard Assessment		15 Hrs
Vulnerability assessment and seismic strengthening of buildings-Non-structural components – Repair restoring strengthening of existing buildings-retrofitting of load bearing walls- RC and masonry structures-seismic hazard assessment- - Seismic response of damped vibration - Earthquake resistant measures in RC and masonry buildings - Tropical cyclone and its effects on building - Protection measures from damage to buildings - Effects of tsunami on built structures.		
Module 3: Inter-Relationship Between Disasters and Development		10 Hrs
Community planning and community contingency plan-report building and initial awareness-Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.– Forecasting and warning of disasters – Psychological and social dimensions in disasters –Trauma and stress – Medical first responder -Education and Training – Establishment of capacity building among various stake holders – Government - Educational institutions		
		Total Hours: 45 Hrs
Text Books:		

1.	Singh.R.B,” Disaster Management “, Rawat publications, 2012
2.	Ghosh G.K, ”Disaster Management”, A.P.H Publishing Corporation, 2015
3.	Geol S.L “Encyclopedia of Disaster Management”, Deep and deep publication Pvt. Ltd, 2015.
4.	Sharma S.C.,”Disaster Management”, Khanna Publishing House, 2019.
5.	Singh B.K.,” Handbook Of Disaster Management: Techniques and Guidelines”, Rajat Publications, 2008.

Reference Books:

1.	Brian Tomaszewski, Geographic Information Systems (GIS) for Disaster Management, CRC Press, Taylor and Francis Group of publication, 2015.
2.	Sundar.I., Disaster Management ,Sarup and Sons, 3rd edition, New Delhi 2007
3.	SathishModh, Introduction to Disaster Management, Macmillan publishers, 2nd edition, New Delhi, 2009
4.	Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
5.	IS:1893 (Part I) - 2009 “ code of practice for Earthquake Resistant Design of Structures

Web References:

1.	https://ndma.gov.in/en/
2.	http://www.indiandefencereview.com/spotlights/nbc-disasters-prevention-management/
3.	https://nidm.gov.in/
4.	http://www.ndrf.gov.in/

Online Resources:

1.	https://nptel.ac.in/courses/105101004/
2.	https://lecturenotes.in/notes/14515-note-for-disaster-management-dm-by-jntu-heroes
3.	https://www.coursera.org/learn/disaster-preparedness/home/welcome
4.	https://www.edx.org/course/a-resilient-future-science-and-technology-for-disa

Assessment Methods & Levels (based on Revised Bloom’s Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom’s Level	Assessment Component	Marks
C902.1- C902.6	Apply	Surprise Test	5
	Analyze	Group Assignment 1	5
		Online Course with Minimum 8 Week duration (Assessment marks will be provided based on assignment submission and Pass percentage)	10

Summative assessment based on Continuous and End Semester Examination

Revised Bloom’s Level	Continuous Assessment			End Semester Examination (Theory) [50 Marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA III [10 marks]	
Remember	40	30	20	20
Understand	20	20	20	30

Apply	30	30	30	30											
Analyse	10	20	30	20											
Evaluate	-	-	-	-											
Create	-	-	-	-											
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	1	2	-	2	-	2	-	-	-	-	3	-	3
2	3	3	2	3	-	1	-	2	-	2	-	2	3	2	3
3	3	2	1	2	-	2	-	2	-	-	-	1	3	2	2
4	3	2	1	2	-	2	-	2	-	-	-	2	3	3	3
5	3	3	2	3	-	1	-	2	-	2	-	3	3	3	3
6	3	2	1	2	-	2	-	2	-	-	-	1	3	-	2
Avg	2.8	2.3	1.3	2.3	-	1.7	-	2.0	-	2.0	-	1.8	3	2.5	2.7
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18CE903	EARTHQUAKE RESISTANT STRUCTURES		3/0/0/3
Nature of Course	Problem Analytical		
Pre requisites	-		
Course Objectives:			
1.	To understand the concept of vibration and damping forces.		
2.	To understand the degree of freedom systems.		
3.	To study the causes of earthquake and responses of structures to various types of earthquakes.		
4.	To understand the earthquake resistant design concepts.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C903.1	Implement the concept of static, dynamic and damping forces on system		[AP]
C903.2	Examine the concepts of degree of freedom system		[AN]
C903.3	Point out the concepts involved in seismology		[AN]
C903.4	Utilize the concepts for analyzing the disastrous earthquakes.		[AN]
C903.5	Analyse the earthquake resistant structures as per codal provisions		[AN]
C903.6	Compare the structures with various vibration control technologies		[AN]
Course Contents:			
Module 1: Theory of Vibrations and Multiple Degree of freedom system		15 Hrs	
Concept of inertia and damping ,Types of Damping , Difference between static forces and dynamic excitation, Degrees of freedom, SDOF idealization, Equations of motion of SDOF system for mass as well as base excitation - D'Alemberts Principle, Free vibration of SDOF system, Response to harmonic excitation, Impulse and response to unit impulse, Duhamel integral, Two degree of freedom system, Normal modes of vibration, Natural frequencies, Mode shapes, Introduction to MDOF systems Decoupling of equations of motion, Mode superposition Method (Concepts only)			
Module 2: Physical Geology and Elements of Seismology		15 Hrs.	
Geology in Civil Engineering – Structure of earth and its composition – Weathering of rocks – Scale of weathering – soils – Land forms and process associated with river, wind, ground water and sea – Earth quakes - Causes of Earthquake, Geological faults, Tectonic plate theory, Elastic rebound, Epicenter, Hypocenter, Primary, shear and Raleigh waves Seismogram, Magnitude and intensity of earthquakes, Magnitude and Intensity scales, Spectral Acceleration, – Seismic zones in India - Information on some disastrous earthquakes			
Module 3: Response of Structures to Earthquakes and Design Methodology		15 Hrs	
Response and design spectra, concept of peak acceleration, Effect of soil properties and damping, Liquefaction of soils, Importance of ductility and Methods of introducing ductility into RC structures. Behaviour of reinforced cement concrete, steel structures under earthquake loading - IS 1893, IS 13920 and IS 4326 Codal provisions, Design as per the codes, Base isolation techniques, Vibration control measures, Important points in mitigating effects of earthquake on structures.			
			Total Hours: 45 Hrs
Text Books:			
1.	Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", PHI Learning Pvt. Ltd., New Delhi, 12 th Edition, 2014.		
2.	Anil K. Chopra, "Dynamics of Structures", Pearson Publishers, 5 th Edition, 2016.		
3.	Duggal S.K., "Earthquake Resistant Design of Structures", Oxford University Press,		

	2013.															
Reference Books:																
1.	Madhujit Mukhopadhyay, "Structural Dynamics", Ane Books Pvt. Ltd., New Delhi, 2015.															
2.	Mehmet E. Uz and Muhammad N. S. Hadi, "Earthquake Resistant Design of Buildings" CRC Press, 2017.															
3.	Mohiuddin Khan, "Earthquake Resistant Structures", Butterworth-Heinemann Publishers, 2013.															
Web References:																
1.	https://app.knovel.com/web/toc.v/cid:kpERDS0001/viewerType:toc/															
2.	http://www.iitk.ac.in/nicee/IITK-GSDMA/EBB_001_30May2013.pdf															
Online Resources:																
1.	https://nptel.ac.in/courses/105102016/															
2.	https://nptel.ac.in/courses/105101004/															
Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks: 20)																
Course Outcome	Revised Bloom's Level	Assessment Component	Marks													
C903.1 & C903.2	Analyse	Project Based Learning (Project Demonstration, Presentation and Report Writing)	20													
C903.3	Analyse															
C903.4	Analyse															
C903.5 & C903.6	Analyse															
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 Marks]												
	CIA-I [10 marks]	CIA-II [10 marks]	CIA III [10 marks]													
Remember	10	10	10	10												
Understand	10	10	10	10												
Apply	30	20	20	20												
Analyse	50	60	60	60												
Evaluate	-	-	-	-												
Create	-	-	-	-												
Course Articulation Matrix																
C O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3	
1	3	2	1	1	-	-	-	-	-	-	-	2	3	-	2	
2	3	3	2	2	-	-	-	-	-	-	-	2	3	-	2	
3	3	3	2	2	-	2	2	1	1	2	1	2	3	1	2	
4	3	3	2	2	-	2	2	1	1	2	1	2	3	1	2	
5	3	3	2	2	-	2	2	1	1	2	1	2	3	1	2	
6	3	3	2	2	-	2	2	1	1	2	1	2	3	1	2	
Av g	3.0	2.8	1.8	1.8	-	2.0	2.0	1.0	1.0	2.0	1.0	2.0	3.0	1.0	2.0	
1	Reasonable Agreed					2	Moderately Agreed					3	Strongly Agreed			

18CE904	FINITE ELEMENT METHODS		3/0/0/3
Nature of Course	Concepts and Analytical		
Pre requisites	-		
Course Objectives			
1.	To understand the basic concept of finite element for one, two, and three-dimensional finite elements		
2.	To understand the basic principles of structural mechanics and to apply the concepts on simple structural elements.		
3.	To solve simple structural mechanics problems using finite elements and Isoperimetric elements		
4.	To learn various numerical solution techniques to solve finite element problems.		
Course Outcomes			
Upon completion of the course, students shall have ability to			
C904.1	Describe the concepts of finite element analysis		[U]
C904.2	Illustrate Triangular Elements, Rectangular Elements, Lagrange and Serendipity Elements		[AP]
C904.3	Formulate the stiffness matrix for truss and beam elements		[AP]
C904.4	Analyse pin jointed trusses, plane frames by FEM		[AN]
C904.5	Apply FEM for three-dimensional stress analysis		[AN]
C904.6	Examine Axisymmetric Element and its Finite Element Formulation		[AN]
Course Contents:			
Module 1: Finite Elements			15 Hrs
Concept of an element – Applications in various disciplines of engineering - Basic element shapes - Element properties – Node numbering procedure - Displacement models – Approximation displacements by Polynomials - Convergence requirements – Generalised co-ordinates – Natural co-ordinates – Local and Global coordinates - Shape functions for linear & quadratic models – Stiffness matrix – Nodal load vector – Static condensation – Simple problems.			
Module 2: Introduction to Isoparametric elements			15 Hrs
Concept of sub, iso, super parametric elements – Shape functions – Gauss quadrature – Examples in one- and two-dimensional elements – Stress analysis of three-Dimensional elements.			
Module 3: Solution techniques			15 Hrs
Different solvers – Variational approach – Weighted mean residual methods like Collocation method, Sub domain method, Galerkin method and Least square method – Simple problems only.			
			Total Hours 45 Hrs
Text Books:			
1.	Krishnamoorthy C.S., "Finite Element Analysis- Theory and Programming", Second Edition, Tata McGrawHill Publishing Co.,2014.		
2.	P.Seshu, "Textbook of Finite Element Analysis", Prentice Hall India Pvt Ltd, 2016.		
3.	Tirupathi, R.Chandrupatla and Ashok, D. Belegundu., "Introduction to Finite Elements in Engineering", Prentice Hall of India Private Limited., New Delhi, 2014.		

Reference Books:															
1.	Rajasekaran, S., "Finite Element Methods in Engineering Design", S.Chand & Co Ltd., New Delhi, 2012.														
2.	Mukhopadhyay, M., "Matrix, Finite Element Computer and Structural Analysis", Oxford & IBH publishing Co., Pvt. Ltd. New Delhi, 2013														
3.	Singiresu S Rao, "The Finite Element Method in Engineering", Butterworth - Heinemann, UK, 2016														
4.	Bathe. K.J., "Finite Element Procedure", Prentice Hall of India, New Delhi, 2014														
Web References:															
1.	https://ocw.mit.edu/courses/mechanical-engineering/2-092-finite-element-analysis-of-solids-and-fluids-i-fall-2009/lecture-notes/														
2.	http://www.adina.com/MITRES2_002S10_linear.pdf														
Online Resources:															
1.	https://nptel.ac.in/courses/112104116/														
2.	https://nptel.ac.in/courses/105105041/														
Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level											Assessment Component	Marks		
C904.1	Understand											Announced Test	5		
C904.2	Apply														
C904.3	Apply											Tutorial	5		
C904.4	Analyse											Assignment	5		
C904.5	Analyse														
C904.6	Analyse											Technical Presentation	5		
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [50 marks]		
	CIA-I [10 marks]	CIA-II [10 marks]					Term End Examination [10 marks]								
Remember	10	10					10		10						
Understand	20	20					20		20						
Apply	35	30					30		30						
Analyse	35	40					40		40						
Evaluate	-	-					-		-						
Create	-	-					-		-						
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
1	2	1	-	2	-	-	-	-	-	-	-	2	3	-	-
2	3	2	2	2	-	-	-	-	-	-	-	3	3	-	-
3	3	2	2	2	-	-	-	-	-	-	-	3	3	-	-
4	3	2	2	2	-	-	-	-	-	-	-	3	3	-	-
5	3	2	1	2	-	-	-	-	-	-	-	3	3	-	-
6	3	2	2	2	-	-	-	-	-	-	-	3	3	-	-
Av g	2.8	1.8	1.8	2	-	-	-	-	-	-	-	2.8	3	-	-
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE905	GREEN BUILDING TECHNOLOGY		3/ 0/ 0/ 3
Nature of Course	Theory Concept		
Pre- requisites	-		
Course Objectives:			
1.	To understand the concepts of sustainability, energy and environment.		
2.	To select materials to decrease environmental impacts.		
3.	To understand the green buildings system implementation and its efficiency.		
4.	To study and identify green building rating system and their economic Aspects.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C905.1	Apply the ideology of green building concepts and demonstrate the Conventional Vs Green buildings.		[AP]
C905.2	Apply the philosophies of Integrated design, Ecological design and Regenerative design.		[AP]
C905.3	Analyse the different systems involved in green building design – water, energy, materials, land and air.		[AN]
C905.4	Implement design and aspects involved in building commissioning-benefits.		[AP]
C905.5	Use rating systems -LEED, Green globes and GRIHA to self -evaluate the proposed design.		[AN]
C905.6	Implement the economic aspects of green building – quantifying short term and long-term benefits.		[AP]
Course Contents:			
Module 1: Introduction:		15 Hrs	
Historical Perspective Buildings. Conventional versus Green Buildings - Comparison. Minor and major aspects of Green Buildings - The Integrated Design Process. Green Building Documentation Requirements. Conventional, Contemporary and Future Ecological Design - Green Design to Regenerative Design - Eco Charette process - SWOT analysis			
Module 2: Green building systems and its Implementation:		15 Hrs	
Sustainable sites and landscaping - Enhancing ecosystems. Building envelope - selection of green materials, products and applications. Passive design strategies. Internal load reduction - Indoor environment quality - Building water and waste water management - Use of LEED / IGBC standards - Site Planning, Health and Safety Planning, Construction and Demolition -Waste Management - Reducing the Footprint of Construction Operations - Maximizing the Value of Building Commissioning - HVAC Systems, Lighting and cleaning systems for green buildings - Costs and Benefits of Building Commissioning - use of LEED/ IGBC standards			
Module 3: Assessment and Economics of Green building:		15 Hrs	
International Building Assessment Systems - The USGBC/ LEED Building Assessment Standard - The LEED Certification Process - The Green Globes Building Assessment Protocol - Example of a Platinum / Gold / Silver Building. Comparison of present Building Rating Systems - Code compilation requirements - LEED, GRIHA - Economic aspects of Green Buildings - Quantifying Green Building Benefits - Managing Costs and Barriers.			

Short - & long -term environment benefits. Some typical case studies of Green Buildings																	
														Total Hours:		45 Hrs	
Text Books:																	
1.		Jerry Edelson, "Green Buildings A to Z", Understanding the buildings, www.newsociety.com,2008.															
2.		"Green building guidelines: Meeting the demand for low-energy, resource-efficient homes", Sustainable Buildings Industry Council, 2004.															
3.		Guttila Yugantha Jayasinghe," A text book on Green Buildings "Lambert Academic Publishing,2018.															
Reference Books:																	
1.		CharlesJ.Kibert,"SustainableConstruction:GreenBuildingDesignandDelivery",2nd Edition, Wiley, 2007.															
2.		Jerry Yudelson, "Green Buildings through Integrated Design", Tata McGraw Hill, 2008.															
3.		Jeannie Leggett Sikora,"Green Building Strategies: From Plan to Profit" Builder Books 2012.															
Web References:																	
1.		http://www.grihaindia.org/events/inno/pdf/25nov/sudarshan.pdf															
2.		https://archive.epa.gov/greenbuilding/web/html/about.htm															
Online Resources:																	
1.		https://www.coursera.org/learn/renewable-energy-entrepreneurship															
2.		https://www.edx.org/course/sustainability-in-architecture-an-interdisciplinary-introduction-0															
Assessment Methods & Levels (based on Bloom's Taxonomy)																	
Formative assessment based on Capstone Model (Max. Marks:20)																	
Course Outcome				Revised Bloom's Level				Assessment Component				Marks					
C905.1-C905.6				Create				Project Based Learning				20					
Summative assessment based on Continuous and End Semester Examination																	
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) [50 marks]				
		CIA-I [10 marks]			CIA-II [10marks]			Term End Examination [10 marks]									
Remember		-			-			-					-				
Understand		40			40			30					20				
Apply		60			60			40					60				
Analyze		-			-			30					20				
Evaluate		-			-			-					-				
Create		-			-			-					-				
Course Articulation Matrix																	
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3		
1	3	2	1	-	-	-	2	2	2	-	-	-	1	2	1		
2	3	2	1	-	-	-	2	2	2	-	-	-	1	2	1		
3	3	2	1	-	-	-	2	2	2	-	-	-	1	2	1		
4	3	2	1	-	-	-	2	2	2	-	-	-	1	2	1		
5	3	2	1	-	-	-	2	2	2	-	-	-	1	2	1		
6	3	2	1	-	-	-	2	2	2	-	-	-	1	2	1		

Av g	3	2	1	-	-	-	2	2	2	-	-	-	1	2	1
1	Reasonably agreed			2	Moderately agreed			3	Strongly agreed						

18CE906	GROUND IMPROVEMENT TECHNIQUES AND LAND RECLAMATION		3/0/0/3
Nature of Course	Theory and Application		
Pre-requisites	-		
Course Objectives:			
1.	To identify basic deficiencies of various soil deposits.		
2.	To study the various ways and means of improving the soil characteristics		
3.	To study the Insitu treatment methods in cohesion and cohesion less soils		
4.	To study the different methods in Land Reclamation		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C906.1	Decide the appropriate improvement in different soils.		[AN]
C906.2	Use drainage and dewatering techniques to improve soil stability.		[AP]
C906.3	Apply the In-situ treatment for cohesionless and cohesive soil.		[AP]
C906.4	Analyse earth nature and apply the concept of earth reinforcement.		[AN]
C906.5	Apply grouting techniques for soil stability.		[AP]
C906.6	Use suitable techniques for land reclamation.		[AP]
Course Contents:			
Module 1: Introduction and Drainage Techniques			15 Hrs
Role of ground improvement in foundation engineering – Basic micro structure of clays – Soil Map of India (Basic knowledge) - Geotechnical problems in alluvial, laterite and black cotton soils - Drainage techniques - Well points - Vacuum and electro osmotic method - Eductors.			
Module 2: In- Situ Treatment of Soil and Earth Reinforcement			15 Hrs
In-situ densification of cohesionless and consolidation of cohesive soils – Preloading with vertical drains - Vibro Compaction Methods – Vibro Displacement Methods – Dynamic Compaction - Concept of reinforcement – Types of reinforcement material- applications of reinforced earth – Tests done on geosynthetics - use of Geotextile for filtration, drainage and separation in road and other works.			
Module 3: Grouting Techniques and Land Reclamation			15 Hrs
Types of grouts – Pre Grouting Site investigation - Grouting equipment and machinery- Injection methods- grout monitoring- Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils - Selection of suitable ground improvement techniques based on soil condition - Land Reclamation: Introduction - Methods – Reclamation of arid land – eroded, infertile land – Reclamation of swampy and coastal areas - Case studies.			
Total Hours:			45 Hrs
Text Books:			
1.	Purushothama Raj, P. "Ground Improvement Techniques", Laxmi Publications, 2016.		
2.	Bikas Chandra Chattopadhyay, "Ground Improvement Techniques", PHI Learning, 2017.		
3.	Chu J, Leung C F, "Ground Improvement Technologies", Research Publishing, 2010.		
Reference Books			
1.	Jie Han, "Principles and Practice of Ground Improvement", John Wiley Publications, 2015.		
2.	Klaus Kirsch, "Ground Improvement", CRC Press, 2012.		
3.	Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2012.		

4.	Peter G. Nicholson, "Soil Improvement and Ground Modification Methods", 2014.															
Web References:																
1.	https://civildigital.com/ground-improvement-techniques-complete-list-of-methods-classifications/															
2.	http://www.geosyn.co.uk/															
Online Resources:																
1.	https://nptel.ac.in/courses/105108075/															
2.	https://nptel.ac.in/courses/105106052/															
Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome	Revised Bloom's Level					Assessment Component					Marks					
C906.1	Apply					Group Assignment					5					
C906.2 - 5	Analyse					Online Quiz					5					
C906.1 – 6	Analyze					Power Point Presentation					10					
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [50 Marks]			
	CIA-I [10 Marks]			CIA-II [10 Marks]			CIA-III [10 Marks]									
Remember	10			-			-						-			
Understand	30			30			40						30			
Apply	60			50			60						50			
Analyse	-			20			-						20			
Evaluate	-			-			-						-			
Create	-			-			-						-			
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3	
1	3	2	1	-	-	1	-	2	2	2	-	2	2	-	1	
2	3	2	1	-	-	1	-	1	2	2	-	1	2	-	1	
3	3	2	1	-	-	1	-	1	2	2	-	1	2	-	1	
4	3	2	1	-	-	1	1	1	2	2	-	1	2	-	1	
5	3	2	1	-	-	1	1	1	2	2	-	1	2	-	1	
6	3	2	1	-	-	1		2	2	2	-	1	2	-	1	
Av g	3	2	1	-	-	1	1	1.3	2	2	-	1	2	-	1	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18CE907	PREFABRICATED STRUCTURES		3/0/0/3
Nature of Course	Practical application		
Pre requisites	-		
Course Objectives:			
1.	To understand the different types of prefabricated elements and the concepts of modular construction.		
2.	To understand the technologies used for fabrication and erection of prefabricated elements.		
3.	To study the different types of joints used for structural connection in prefabricated structures		
4.	To understand the applications of codal provisions for abnormal loadings and progressive collapse.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C907.1	Apply prefabrication techniques on various components based on the requirements		[AP]
C907.2	Apply the standardization techniques on prefabricated elements		[AP]
C907.3	Apply suitable structural connections for prefabricated members		[AP]
C907.4	Handle the problems during connections on prefabricated members		[AP]
C907.5	Apply the suitable methods to avoid progressive collapse of the structure		[AP]
C907.6	Apply the various Codal provisions for abnormal loads to avoid structural collapse		[AP]
Course Contents:			
Module 1: Introduction to Prefabricated Structures and components		15 Hrs	
Need for prefabrication – Principles – Materials – Comparison with conventional and Precast Prestressed construction under time and cost aspects - Types of prefabrication – Site and plant prefabrication - Economy of prefabrication – Plant layout - Modular coordination –Standardization – Systems – Production – Transportation – Erection. Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs-Ribbed floor panels – Wall panels – Columns – Shear walls- Footings- Storage of precast elements –Dimensional tolerances.			
Module 2: Design Principles and Joint in Structural Members		15 Hrs	
Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility –Ductile detailing - Allowance for joint deformation. Joints for different structural connections – Dimensions and detailing- Effective sealing of joints for waterproofing – Provisions for non-structural fastenings – Expansion joints			
Module 3: Design for Abnormal Loads and its Applications		15 Hrs	
Progressive collapse - Importance of avoidance of progressive collapse - Methods to prevent progressive collapse - Code provisions - Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc.- Benefits of Pre-fabricated structures - Case studies related to application of prefabricated component in building construction.			
Total Hours:			45 Hrs
Text Books:			
1.	Hubert Bachmann and Alfred Steinle, "Precast Concrete Structures", Ernst & Sohn Verlag für Architektur und technische Wissenschaften GmbH & Co. KG, Berlin, Germany, 2012.		
2.	Ulrich Knaack, "Prefabricated Systems: Principles of Construction", Birkhauser Architecture; 1st Edition, 2010.		
3.	"Handbook on Precast concrete for buildings", ICI Bulletin 02, Indian Concrete		

	Institute, 2016														
Reference Books:															
1.	Alejandro Bahamon, "PreFab-Prefabricated and Movable Architecture", HarperCollins Design International, November 2002.														
2.	Mokk L, "Prefabricated Concrete for Industrial and Public Structures", Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.														
3.	IS 3414-1968 Reaffirmed 2000, Code of Practice for Design and Installation for Joints in Buildings, BIS, New Delhi.														
4.	IS 10297-1982 Reaffirmed 2008, Code of Practice for Design and Construction of Floors and Roofs using Precast Reinforced/Prestressed Concrete Ribbed or Cored Slab Units, BIS, New Delhi.														
5.	IS 11447-1985 Reaffirmed 2003, Code of Practice for construction with Large Panel Prefabricates, BIS, New Delhi.														
6.	IS 15916 – 2010, Building design and erection using prefabricated concrete — code of practice, BIS, New Delhi.														
7.	IS 4326-1993 Reaffirmed 2003, Earth Quake resistant design & construction of building - Code of practice, BIS, New Delhi.														
8.	IS 13920-1993 Reaffirmed 2003, Ductile Detailing of Reinforced Concrete Structures subjected to seismic force - Code of practice, BIS, New Delhi.														
9.	National Building Code of India 2005- Section 7, SP 7 (Group 1), Bureau of Indian Standards, New Delhi.														
Web References:															
1.	https://civildigital.com/prefabricated-structures-prefabrication-concept-components-advantages-ppt/														
2.	www.metcolleges.ac.in/Notes/CIVIL/FinalYear/CE2045/CE2045.docx														
Online Resources:															
1.	https://www.concrete.org/topicsinconcrete/topicdetail/precast														
2.	https://precast.org/education/classes/														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level	Assessment Component	Marks												
C907.1&C907.2	Apply	Outside Classroom Learning Experience - Report 1	5												
C907.3 &C907.4	Apply	Outside Classroom Learning Experience - Report 2	5												
C907.5	Analyse	Assignment	5												
C907.6	Analyse	Quiz	5												
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]											
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]												
Remember	20	10	10	10											
Understand	30	30	20	20											
Apply	20	30	40	40											
Analyse	30	30	30	30											
Evaluate	-	-	-	-											
Create	-	-	-	-											
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
1	3	2	2	-	-	-	-	-	-	-	-	3	3	2	-
2	3	2	2	-	-	-	2	-	-	-	-	3	3	2	-

3	3	2	2	-	-	-	-	-	-	-	-	3	3	-	-
4	3	2	2	-	-	-	-	-	-	-	-	3	3	-	-
5	3	2	2	-	-	-	2	-	-	-	-	3	3	2	-
6	3	2	2	-	-	-	2	-	-	-	-	3	3	2	-
Av g	3	2	2	-	-	-	2	-	-	-	-	3	3	2	-
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE908	PRESTRESSED CONCRETE STRUCTURES		3/0/0/3
Nature of Course	Theory Analytical		
Pre requisites	-		
Course Objectives:			
1.	To understand the principle of pre stressing.		
2.	To Gain the knowledge on Analysis and design of pre stressed elements		
3.	To Understand the concept of Concordant cables		
4.	To gain the knowledge on analysis of Composite elements		
5.	To be able to analyze and design the Circular pre stressed concrete structures		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C908.1	Classify the different methods of pre stressing.		[U]
C908.2	Determine the effective pre stress including the short- and long-term losses.		[AP]
C908.3	Analyze and design pre stressed concrete beams under flexure and shear.		[AN]
C908.4	Classify the methods of achieving continuity in pre stressed concrete		[U]
C908.5	Analyze circular pre stressed concrete structures		[AN]
C908.6	Design circular pre-stressed concrete structures		[AN]
Course Contents:			
Module 1: Methods and Materials of Pre stressing			15 Hrs.
Principles of prestressing -methods of prestressing – materials required - Anchorage systems –Analysis of Sections, effect of loading on tensile stresses in tendons- Losses of prestress, Definition of Type I, Type II and type III structures- Design and choice of sections of Post-tensioned beams based on working stress approach - Layout of cables in post-tensioned beams			
Module 2: Deflection, Flexure, Shear and Anchorage zone design			15 Hrs.
Effect of tendon profile on deflection - Factors influencing Deflections - Short term and long term deflections -codal requirements, Shear and principal stresses - Limit state shearing resistance of cracked and uncracked sections - Design of shear reinforcement - Transmission of prestressing force by bond in pretensioned members -check for transmission length - Design of anchorage zone of post-tensioned beams by I.S. Code method and Guyon's method.			
Module 3: Composite Construction and Circular Pre stressing			15 Hrs.
Types of composite construction involving precast prestressed units and cast in-situ concrete -Analysis - Analysis for stresses - Design for flexure and shear - Effect of differential shrinkage Concordant Cable -Methods of achieving continuity in prestressed concrete continuous beams - Assumptions in elastic analysis - primary and secondary moments - Pressure line- concordant cable and linear transformations - Design Principle Circular prestressing in liquid retaining tanks - Analysis for stresses - Design of tank wall incorporating the recommendations of I.S: 3370 part III and IV codes - Types of prestressed concrete tension and compression members, pipes and poles.			
Total Hours:			45 Hrs.
Text Books:			
1.	Krishna Raju N., "Prestressed Concrete", Tata McGraw Hill Education, Sixth Edition, 2018.		
2.	Rajagopalan N., "Prestressed Concrete", Narosa Publishing House, New Delhi, 2010.		
3	Praveen Nagarajan, "Prestressed Concrete Design" Pearson Education India, First edition, 2013		

Reference Books:																
1.	Sinha N. C. and Roy S. K., "Fundamentals of Pre stressed Concrete", S Chand & Co,2011															
2.	Lin T.Y. and Ned H. Burns, "Design of Prestressed Concrete Structures", John Wiley Sons, New York, 2015.															
3.	Praveen Nagarajan, "Prestressed Concrete Design" Pearson Education India, First edition, 2013.															
Web References:																
1.	https://lecturenotes.in/subject/245/prestressed-concrete-structures-pcs															
2.	https://learnengineering.in/ce6702-prestressed-concrete-stfructures/															
Online Resources:																
1.	http://www.nptel.ac.in/courses/105106118/															
2.	http://www.nptel.ac.in/courses/105106018/															
Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome	Revised Bloom's Level				Assessment Component								Marks			
C908.1 & C908.2	Remember				Quiz								5			
C908.3 & C908.4	Understand				Assignment								5			
C908.5	Analyse				Group Assignment								5			
C908.6	Analyse				Seminar								5			
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level	Continuous Assessment									End Semester Examination (Theory) [50 marks]						
	CIA-I [10 marks]			CIA-II (10 marks]			CIA-III [10 marks]									
Remember	20			20			20			20						
Understand	80			30			20			20						
Apply	-			-			-			-						
Analyse	-			50			60			60						
Evaluate	-			-			-			-						
Create	-			-			-			-						
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3	
1	3	2	1	1	-	-	-	-	-	-	-	2	3	-	2	
2	3	3	2	2	-	-	-	-	-	-	-	2	3	-	2	
3	3	3	2	2	-	2	2	1	1	2	1	2	3	1	2	
4	3	3	2	2	-	2	2	1	1	2	1	2	3	1	2	
5	3	3	2	2	-	2	2	1	1	2	1	2	3	1	2	
6	3	3	2	2	-	2	2	1	1	2	1	2	3	1	2	
Av g	3.0	2.8	1.8	1.8	-	2.0	2.0	1.0	1.0	2.0	1.0	2.0	3.0	1.0	2.0	
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed				

18CE909	TALL BUILDINGS	3/0/0/3
Nature of Course	Theory Analytical	
Pre requisites	-	
Course Objectives:		
1.	To know the materials used in Tall building construction	
2.	To study the analysis and design aspects of Tall Buildings	
3.	To understand the behavior of structural systems	
4.	To know the stability calculations of Tall buildings	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C909.1	Analyse the design criteria used in tall building construction	[AN]
C909.2	Evaluate the loads acting in the tall building design	[AN]
C909.3	Analyse the behavior of structural systems	[AN]
C909.4	Apply the concepts for design and analysis of structural systems	[AP]
C909.5	Analyse the effects of gravity of loading using approximate methods	[AP]
C909.6	Evaluate the stability of Tall Buildings	[AN]
Course Contents:		
Module 1: Design Criteria and Materials		10 Hrs
Development of High Rise Structures - General Planning Considerations - Design philosophies - Materials used for Construction. Loading: Gravity Loading - Dead Load - Live Load - Live load reduction technique - Impact Load - Construction Load - Sequential Loading, Lateral Loading - Wind load - Earthquake Load. Combination of Loads.		
Module 2: Analysis and Design of Structural Systems		20 Hrs
Behavior of Various Structural Systems - Factors affecting growth, Height and Structural form. High rise behavior of Various structural systems - Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall-frames, tubular structures, cores, outrigger - braced and hybrid mega systems. Analysis and Design: Modelling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerized general three-dimensional analysis.		
Module 3: Overall buckling analysis of frame systems		15 Hrs
wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.		
Total Hours:		45 Hrs
Text Books:		
1.	Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 2011.	
2.	Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 2011.	
3.	CBRI, "Building materials and components", India, 1990.	
Reference Books:		

1.	Lin.T.Y, StotesBurry.D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 2011.
2.	Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 2012
3.	Wolfgang Schueller "High Rise Building Structures", John Wiley and Sons, New York 2015.

Web References:

1.	https://www.csiamerica.com/news/tall-buildings-modeling-analysis-design-london
2.	http://www.ctbuh.org/TallBuildings/FeaturedTallBuildings/tabid/1736/language/en-US/Default.aspx

Online Resources:

1.	https://www.udemy.com/modeling-analysis-of-high-rise-building-using-etabs-2016/
2.	https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-012-introduction-to-civil-engineering-design-spring-2002/readings/the-tall-office-building-artistically-considered/

Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C909.1&C909.2	Analyse	Group Assignment	5
C909.3	Analyse	Group Assignment	5
C909.4	Apply	Group Assignment	5
C909.5	Apply	Technical Presentation	5
C909.6	Analyse		

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination [Theory] [50 marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	
Remember		10	10	10
Understand	20	20	20	20
Apply	20	20	20	20
Analyse	60	50	50	50
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	1	-	-	-	-	-	-	-	3	3	-	-
2	3	2	2	1	-	-	-	-	-	-	-	3	3	-	-
3	3	3	2	2	-	-	-	-	-	-	-	3	3	-	-
4	3	3	3	2	-	-	-	-	-	-	-	3	3	-	-
5	3	3	2	2	-	-	-	-	-	-	-	3	3	-	-
6	3	3	2	2	-	-	-	-	-	-	-	3	3	-	-
Avg	3	2.8	2.3	1.7	-	-	-	-	-	-	-	3	3	-	-
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

Elective Stream II: Environmental / Hydrology and Water Resource Engineering

18CE910	AIR AND NOISE POLLUTION MANAGEMENT	3/0/0/3
Nature of Course	Theory application	
Pre requisites	-	
Course Objectives:		
1	To Understand about air Quality Criteria and air pollutants	
2	To identify appropriate modelling solutions for air quality problems.	
3	To find the solution for source inventory of air pollution and use proper Control measures.	
4	To aware about the noise pollution causes and its abatement technologies	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C910.1	Identify the sources, characteristics and effects of ambient and indoor air pollution.	[U]
C910.2	Outline the ambient air quality and noise pollution standards.	[U]
C910.3	Apply Sampling methods to monitor air quality parameters and their influencing meteorological parameters.	[AP]
C910.4	Identify the suitable modeling software to predict the source of emission and dispersion characteristics.	[U]
C910.5	Illustrate the relevant source based noise monitoring parameters and evaluate the causes incurred on the society.	[AP]
C910.6	Select the suitable noise level estimating equipment, and describe its techniques and significance.	[AN]
Course Contents:		
MODULE 1: Air Pollution Sources, Classification and Effects		15 Hrs.
Air Pollution and Global Climate - Air quality criteria - emission standards - Ambient air quality standards - Air pollution indices - Air quality management in India. Sources and classification - Analysis of air pollutants - Air pollution and its effects on human beings, plants and animals - Economic effects of air pollution - Effect of air pollution on meteorological conditions. Indoor Air Quality- Standards- Types of Ventilation		
MODULE 2: Sampling, Meteorology and Air Quality Modelling		15 Hrs.
Sampling and measurement of particulate and gaseous pollutants - Ambient air sampling - Stack sampling. Environmental factors - Meteorology - temperature lapse rate and stability – Adiabatic lapse rate - Wind Rose - Inversion - Wind velocity and turbulence - Plume behaviour - Dispersion of air pollutants - Maximum mixing depth - Dispersion model - Estimation of plume rise - Stack design - Modelling softwares.		
MODULE 3: Noise Pollution Monitoring		15 Hrs.
Basics of acoustics and specification of sound - Sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources - Outdoor and indoor noise propagation - Psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes - Special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.		
Total Hours:		45 Hrs.
Text Books:		
1	Rao.C.S. “Environmental Pollution Control Engineering”, New Age International	

	Publishers, 2018.
2	Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 2017
3	Thad Godish, Wayne T. Davis "Air Quality", CRC Press, Newyork,2014
4	Handbook of Noise Measurement – APG Peterson & EE Gross PH, Englewood cliffs New Jersey, latest edition.

Reference Books:

1	Lawrence K.Wang, Norman C Pererla, Yung – Tse Hung, "Air Pollution Control Engineering", Tokyo, 2010
2	Noel De Nevers, " Air Pollution Control Engineering", Waveland Press, 2016.
3	Wark, C.F. Warner & W.T. Davis "Air Pollution Control: its Origin and Control, Addison-Wesley, 1998
4	Wayne R. Davis (Editor) Air & Waste Management Association, "Air Pollution Engineering Manual", 2nd Edition, Wiley Publications, 2000

Web References:

1	https://www.epa.gov/criteria-air-pollutants/naaqs-table
2	http://cpcb.nic.in/

Online Resources:

1	https://nptel.ac.in/courses/105102089
2	http://www.envirocomp.org/

Tentative Assessment Methods & Levels (based on Revised Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C910.1 – C910.6	Analyse	Massive Open Online Courses recommended by the course instructor	20

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	CIA I (10 Marks)	CIA II (10 Marks)	CIA III (10 Marks)	
Remember	30	30	30	30
Understand	30	30	30	30
Apply	40	40	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	3	-	1	-	-	-	-	-	-	-	1	1	1	2
2	2	-	-	2	-	-	1	2	-	-	-	1	-	-	1
3	3	2	-	-	-	1	-	-	1	-	-	1	3	-	2
4	1	2	-	1	-	-	1	-	1	-	-	-	2	-	1
5	3	3	-	1	-	3	-	1	-	-	-	1	1	-	1
6	1	3	-	1	-	-	-	1	-	-	-	1	2	1	1
Av g	2.0	2.6	-	1.2	-	2.0	1.0	1.3	1.0	-	-	1.0	1.8	1.0	1.3

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed
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18CE911	CONTAMINATED SITE REMEDIATION		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	-		
Course Objectives:			
1.	To obtain an overview on pollutants, pollutants monitoring and remediation methods in the environment.		
2.	To provide an overview of the required processes for managing contaminated sites.		
3.	To learn the conditions and procedure for the design of remediation methods.		
4.	To explore the engineering aspects of emerging site remediation technologies.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C911.1	Familiarize with concepts, terminology, and technologies used to address contaminated soil, sediment, and groundwater.		[AP]
C911.2	Outline about contaminant transport mechanisms		[AN]
C911.3	Examine physical, chemical and biological processes governing contaminant fate and transport in the subsurface		[AN]
C911.4	Manipulate the use of appropriate tools and techniques for the planning and design of site investigations		[AP]
C911.5	Propose technically and economically feasible and sustainable remedies for contaminated sites		[AP]
C911.6	Assess the various ground water remediation methods		[AP]
Course Contents:			
Module 1: Contaminant transport and Characterization			15 Hrs
Contaminated site Sources – Hydro geological considerations in Saturated and Unsaturated Zone-Factors governing soil-pollutant interaction - Contaminant Characteristics - Contaminant transport mechanisms – Contaminant transport through landfill barriers - Methods of Site Characterization - Geophysical Methods - Boring and Groundwater Sampling - Monitoring Wells			
Module 2 : Treatment and Disposal Methods			15 Hrs
Monitored natural attenuation - Solidification and stabilization – Bioremediation – Incineration - Soil washing - Electro kinetics - Pump and treat - Air sparging - Soil Vapor Extraction - Permeable reactive Treatment Walls - Advanced remediation technologies			
Module 3: Ground Water Remediation			15 Hrs
Pump and treat - Air sparging - Soil Vapour Extraction methods - Permeable reactive Treatment Walls - Advanced remediation technologies for ground water remediation - Contaminated Sites – Case Study Reports			
			Total Hours: 45 Hrs
Text Books:			
1.	Lawrence K. Wang “Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill Book Company, New York, 2017.		
2.	William J. Deutsch. Ground Water Geochemistry. Fundamentals and Applications to Contamination. Lewis Publishers, New York, 2010		
3.	Walter Z. Tang Physicochemical Treatment of Hazardous Wastes, Lewis Publishers, 2009		
Reference Books:			
1.	Martin N. Sara., Site Assessment and Remediation Handbook, Second Edition, Lewis Publishers, 2008		
2.	LaGrega M.D., Buckingham P.L. and Evans J.C., “Hazardous Waste Management”- McGraw Hill, New York, 2010		
3.	Edward J. Calabrese, Paul T. Kosteki, James Dragun., Contaminated Soils,		

	Sediments and Water: Successes and Challenges, Birkhäuser publications, 2012														
4.	Wentz, C.A., Hazardous Waste Management, McGraw Hill, Singapore, 2008														
Web References:															
1.	Clu-In Contaminated Site Clean-up Information EPA www.clu-in.org														
2.	ITRC Guidance Documents and other Information ITRC www.itrcweb.org														
3.	Superfund Site and Program Information EPA www.epa.gov/superfund														
Online Resources:															
1.	https://www.epa.gov/remedytech/remediation-technologies-cleaning-contaminated-sites														
2.	http://www.mfe.govt.nz/more/funding/contaminated-sites-remediation-fund														
3.	http://www.crccare.com/														
4.	http://www.clu-in.org/														
Tentative assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level					Assessment Component					Marks				
C911.1 & C911.2	Analyze					Online Quiz					5				
C911.3	Analyze					Group Assignment					5				
C911.4	Create					Technical Presentation					5				
C911.5 & C911.6	Apply					Group Assignment					5				
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [50 marks]		
	CIA I [10 Marks]				CIA II [10 Marks]				CIA III [10 Marks]						
Remember	40				20				20				20		
Understand	40				30				20				20		
Apply	-				20				40				40		
Analyse	20				-				20				20		
Evaluate	-				20				-				-		
Create	-				-				-				-		
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2	PSO 3
1	3	3	2	2	-	2	-	-	-	2	-	-	3	2	-
2	3	3	2	2	-	2	-	-	-	2	-	-	3	2	-
3	3	3	2	2	-	2	-	-	-	2	-	-	3	2	-
4	3	3	2	2	-	2	-	-	-	2	-	-	3	2	-
5	3	3	2	2	-	2	-	-	-	2	-	-	3	2	-
6	3	3	2	2	-	2	-	-	-	2	-	-	3	2	-
Av g	3	3	2	2	-	2	-	-	-	2	-	-	3	2	-
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE912	ENVIRONMENTAL IMPACT ASSESSMENT AND RISK MANAGEMENT		3/0/0/3
Nature of Course		Theory application	
Pre requisites		-	
Course Objectives:			
1	To deal with the various impacts of infrastructure projects on the components of environment		
2	To acquire knowledge regarding the methods of assessing the impact		
3	To know about the various impacts of development projects on environment and the mitigating measures		
4	To understand the risk assessment related to the environment		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C912.1	Interpret the importance of EIA in Civil Engineering projects	[U]	
C912.2	Choose the appropriate method of assessment for EIA	[U]	
C912.3	Apply the environmental management plan including the preparation, implementation and mitigation aspects	[AP]	
C912.4	Assess the environmental impact assessment of major projects	[AP]	
C912.5	Evaluate the risk assessment based on response analysis	[AP]	
C912.6	Decide on emergency preparedness plans for risk condition	[AP]	
Course Contents:			
Module-1: Introduction and Methodologies of EIA		15 Hrs.	
Impact of development projects under Civil Engineering on environment – Evolution of Environmental Impact Assessment (EIA)-Baseline Study- Framework of EIA-Stages of EIA-Environmental Impact Statement (EIS) –Terms of Reference- EIA capability and limitations – Legal provisions on EIA. Methods of EIA -Check lists - Matrices - Networks – Overlay - Cost-benefit analysis.			
Module-2: Prediction, Assessment and Environmental Management Plan		15 Hrs.	
Assessment of Impact and mitigation measures of impact on land, water and air, noise, social, cultural flora and fauna; Assessment of Socio-economic impact of the project-Mathematical models; public participation – Documentation of EIA Findings & Report Preparation -Rapid EIA. ISO 14000. Environmental legislation in India and Environmental Audit. Case Studies: EIA for infrastructure projects –Large scale Industries-Mining-Hydropower projects- Bridges - Highways - Dams - Water Supply and Drainage Projects.			
Module- 3: Environmental Risk Management		15 Hrs.	
Environmental risk assessment framework-Hazard identification – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment– HAZOP and FEMA methods - Risk Characterization -Risk communication - Emergency Preparedness Plans- Case Studies			
Total Hours:			45 Hrs.
Text Books:			
1	Anjaneyulu,Y,"Environmental Impact Assessment methodologies", B.S. Publications,2011		
2	Anji Reddy Mareddy, "Environmental Impact Assessment – Theory and Practice" , B S Publications, 2017		
3	RikiTherivel, "Methods of Environmental and Social Impact Assessment", Routledge Publisher, 2018		
Reference Books:			

1	Barthwal R R., "Environmental Impact Assessment" New age International Pvt.Ltd., 2012
2	Angus Morrison, " Advanced Introduction to Environmental Impact Assessment", Edward Elgar Publishing Ltd., 2018.
3	SalimMomtaz, ZobaidulKabir S M., "Evaluating Environmental and Social Impact Assessment in Developing Contries", Elsevier Publications,2013
4	Peter Wathern, " Environmental Impact Assessment – Theory and Practice" Routledge Publisher, 2013

Online Courses:

1	https://nptel.ac.in/courses/120108004/
2	https://nptel.ac.in/courses/123105001

Web References:

1	https://nptel.ac.in/courses/120108004/
2	https://nptel.ac.in/courses/123105001

Tentative Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C912.1 & C912.2	Understand	Project Based Learning system (Project demonstration, Presentation and Report writing)	20
C912.3	Understand		
C912.4	Apply		
C912.5 & C912.6	Apply		

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	
Remember	10	20	20	20
Understand	50	60	40	20
Apply	40	20	40	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	-	-	-	-	-	3	2	-	-	-	2	-	1	1
2	2	-	-	-	-	-	2	2	-	-	-	2	-	-	2
3	3	3	3	3	2	2	2	2	2	1	-	3	2	2	2
4	2	-	-	-	-	-	2	2	-	-	-	2	-	1	1
5	3	3	2	2	2	2	3	2	2	1	-	3	2	-	2
6	2	1		1			2	2	-	-	-	2	-	-	2
Avg	2.3	2.3	2.5	2	2	2	2.3	2	2	1	-	2.3	2	1.3	1.6
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE913	HYDROLOGY		3/0/0/3
Nature of Course	Theory Analytical		
Pre requisites	-		
Course Objectives:			
1.	To understand all the components of the hydrological cycle.		
2.	To study the concept of mechanics of rainfall, it's spatial and temporal measurement and their applications.		
3.	To understand the different types of simple statistical analysis and application of probability distribution of rainfall and runoff.		
4.	To learn the concepts of simple methods of flood routing and ground water hydrology.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C913.1	Understand and the basics of precipitation, abstraction, hydrologic cycle		[U]
C913.2	Estimate the losses of precipitation and evaporation by various methods		[AN]
C913.3	Classify the hydrograph, types and their application		[AN]
C913.4	Analyse the flood routing and its methods		[AN]
C913.5	Apply the concepts of Groundwater hydrology and methods		[AP]
C913.6	Calculate the reservoir capacity using various methods		[AN]
Course Contents:			
Module 1: Precipitation		15 Hrs	
Hydrologic cycle–Types of precipitation–Forms of precipitation–Measurement of rainfall–Spatial measurement methods–Temporal measurement methods –Frequency analysis of point rainfall –Intensity, duration, frequency relationship–Probable maximum precipitation. Abstraction from Precipitation: Losses from precipitation – Evaporation losses – Reservoir evaporation – Infiltration losses – Infiltration capacity–Measurement of infiltration–Infiltration indices–Effective rainfall.			
Module 2: Runoff		15 Hrs	
Watershed, Catchment and basin – Catchment characteristics – Factors affecting runoff – estimation using empirical formula - Hydrographs: Factors affecting hydrograph–Base flow separation– Derivation of unit hydrograph –S-curve hydrograph–Unit hydrograph of different deviations - Synthetic unit hydrograph. Flood Routing:Flood frequency studies– Recurrence interval– Gumbel's method– Flood routing – Reservoir flood routing – Muskingum's channel routing– Flood control.			
Module 3: Groundwater Hydrology		15 Hrs	
Types of aquifer–Darcy's law–Dupuit's assumptions–Confined aquifer–Unconfined aquifer– Recuperation test–Transmissibility–Specific capacity–Pumping test–Steady flow analysis only – Reservoirs –Classification of reservoirs – principles and design – site selection – spillways – area – capacity – storage estimation – sedimentation – life of reservoirs – rule curve.			
Total Hours:			45 Hrs
Text Books:			
1.	Subramanya,K,“EngineeringHydrology”,TataMcGraw-HillPublishingCo.,Ltd.,2013		
2.	Raghunath, H. M., “Hydrology”, New Age International Publishers, 2ndedition, 2015		
3.	Van Te Chow., “Applied Hydrology”, McGraw Hill Education, 2017		

Reference Books:															
1.	Daniel Webster, "Hydrology", Wentworth Press, 2016														
2.	Manish Kumar Goyal, "Engineering Hydrology", PHI Learning., 2012														
3.	MysooruR.Yadupathi Putty, "Principles of Hydrology", I K International Publishing House Pvt.Ltd, 2011														
4.	Jayarami Reddi. P., "A Text book of Hydrology", Laxmi Publications, New Delhi, 2016														
Web References:															
1.	http://www.univpgri-palembang.ac.id/perpus/fkip/Perpustakaan/Geography/Hidrologi/Hidrologi%20Dasar.pdf														
2.	https://hydrologie.org/BIB/Publ_UNESCO/TP_006_E.pdf														
3.	https://www.researchgate.net/publication/264895381_Engineering_hydrology														
4.	https://www.pdfdrive.com/hydrology-books.html														
Online Resources:															
1.	https://easyengineering.net/engineering-hydrology-book-pdf-by-k/														
2.	http://www.geo.uu.nl/~wwwhydro/folder.pdf														
3.	http://www.uotechnology.edu.iq/dep-building/LECTURE/dams%20and%20water/third_class/engineering%20hydrology/Engineering%20Hydrology.pdf														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level					Assessment Component						Marks			
C913.2 & C913.3	Analyze					Online Courses						20			
C913.4	Analyze														
C913.5	Apply														
C913.6	Evaluate														
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment											End Semester Examination (Theory) [50 marks]			
	CIA-I [10 marks]	CIA-II [10 marks]	CIA - III [10 marks]												
Remember	-	-	-								-				
Understand	60	50	40								50				
Apply	30	30	30								30				
Analyse	10	20	30								20				
Evaluate	-	-	-								-				
Create	-	-	-								-				
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	1
2	3	2	-	-	-	-	2	1	-	-	-	3	2	-	1
3	2	1	-	-	-	-	2	-	-	-	-	2	-	-	1
4	3	2	-	1	-	-	1	1	-	-	-	2	2	-	2
5	3	2	-	2	-	-	2	-	-	-	-	3	-	-	2
6	3	2	-	-	-	-	2	1	-	-	-	3	2	-	2
Av g	2.7	1.8	-	1.5	-	-	1.8	1.0	-	-	-	2.5	2.0	-	1.5
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE914	INDUSTRIAL WASTEWATER MANAGEMENT		3/0/0/3
Nature of Course	Theory Application		
Pre requisites	-		
Course Objectives:			
1	To acquire a detailed knowledge on the current practices in industrial wastewater treatment.		
2	To learn the principles, objectives and basic criteria for the selection of processes for wastewater treatment and/or recycling with attention to environmental sustainability		
3	To impart knowledge on sources and characteristics of various industrial wastes and strategies for its prevention and control		
4	To plan the minimization of industrial wastes generated by the various industries		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C914.1	Identify the sources, characteristics and composition of industrial wastewater		[U]
C914.2	Carry out qualitative and quantitative assessment of industrial wastewater		[AP]
C914.3	Suggest for suitable waste minimization techniques for industries		[U]
C914.4	Identify and select appropriate treatment method for effluent		[AP]
C914.5	Manage the effluent treatment from major industries		[U]
C914.6	Understand the concept of industrial clusters		[U]
Course Contents:			
Module 1: Introduction to Industrial Wastewater		15 Hrs.	
Sources and types of industrial wastewater – Environmental impacts – Regulatory requirements – Effluent standard -Industrial wastewater monitoring and sampling – generation rates – characterization and variables– Source reduction techniques- effect of Industrial Effluents on Streams, Sewer and Human health – Waste Audit. Industrial scenario in India – Industrial activity and environment – Uses of water by Industry			
Module 2: Treatment Technologies & Disposal		15 Hrs.	
Waste minimization - Equalization - Neutralization – Oil separation – Flotation – Precipitation – Heavy metal Removal – adsorption – Aerobic and anaerobic biological treatment – Sequencing batch reactors – High Rate reactors - Chemical oxidation – Ozonation – Photo catalysis – Wet Air Oxidation – Evaporation – Ion Exchange – Membrane Technologies – management of RO reject - Nutrient removal – Individual and Common Effluent Treatment Plants – Advantages – Joint treatment of Industrial and domestic wastewater- Quantification and characteristics of sludge – thickening, Digestion, Wet combustion – Conditioning, Dewatering and Disposal of Sludge.			
Module 3: Hazardous waste management and Case Studies		15 Hrs.	
Hazardous waste – types – sources – collection – Physico chemical treatment – Solidification – Incineration – Secured landfills - Industrial manufacturing process description – wastewater characteristics and effluent treatment flow sheet for Textiles– Sugar mill– distilleries–Dairy- Tanneries – Pulp and Paper mill – Chemical industries – Metal finishing industries – Iron and Steel industries – Meat packing industries and Poultry plant – Industrial estates and Industrial Clusters.			

		Total Hours:	45 Hrs.	
Text Books:				
1	NarayanaRao M and Amal K. Dutta, "Wastewater Treatment", Oxford & IBH PublishingCo., Pvt. Ltd., New Delhi, 2012			
2	Barnes D, Buss PJ and Gould BW, "Water and Wastewater Systems", Pitman Publishing Inc., Marshfield, 2000.			
3	Metcalf; Eddy, "Waste Water Engineering", Tata McGraw Hill Publishing Co Ltd., NewDelhi., 4 th Edition 2008			
Reference Books:				
1	Patwardhan, A.D., "Industrial Wastewater Treatment", PHI publications, 2017			
2	Wesley Eckenfelder Jr. W, "Industrial water pollution control", McGraw Hill book Co,New Delhi, 2001.			
3	Basak. N.N. "Environmental Engineering", McGraw Hill Education., 2017			
Web References:				
1	http://research.iaun.ac.ir/pd/aminsharei/pdfs/UploadFile_1633.pdf			
2	http://164.100.161.188/cms/Latest-Manual-Part-B-Operation-and-Maintenance-2013.php			
Online Resources:				
1	https://www.mooc-list.com/course/water-and-wastewater-treatment-engineering-physicochemical-technology-edx			
2	https://www.researchgate.net/publication/270647618_Industrial_Wastewater_Treatment_by_Activated_Sludge			
Tentative Assessment Methods & Levels (based on Revised Blooms' Taxonomy)				
Formative assessment based on Capstone Model (Max. Marks:20)				
Course Outcome	Revised Bloom's Level	Assessment Component		Marks
C914.1,2	Understand	Project Based Learning system (Project demonstration, Presentation and Report writing)		20
C914.3 & 4	Apply			
C914.5	Apply			
C914.6	Apply			
Summative assessment based on Continuous and End Semester Examination				
Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks] CIA-II [10 marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-I [10 marks]	
Remember	-	-	-	-
Understand	50	30	50	30
Apply	50	70	50	70
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Course Articulation Matrix				

C O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	-	-	-	-	-	2	-	-	-	-	2	-	1	2
2	2	2	-	-	-	-	3	2	-	-	-	3	-	-	3
3	1	-	-	-	-	-	1	1	-	-	-	1	-	-	1
4	3	3	3	2	2	-	2	2	2	-	-	3	-	2	2
5	3	2	2	-	-	-	2	1	-	-	-	3	-	2	3
6	1	-	-	-	-	-	2	1	-	-	-	1	-	-	1
Av g	2.0	2.3	2.5	2	2	-	2	1.4	2	-	-	2.2	-	1.7	2
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed		

18CE915	IRRIGATION ENGINEERING		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	-		
Course Objectives:			
1.	To understand the need and mode of irrigation.		
2.	To study about minimizing water losses and on farm development works.		
3.	To learn the concepts involved in elementary hydraulic design of different structures and its maintenance.		
4.	To learn about Irrigation water management.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C915.1	Teach the various types of Irrigation		[AP]
C915.2	Outline the methods of irrigation		[AN]
C915.3	Analyze the various hydraulic structures		[AN]
C915.4	Apply the concepts of irrigation water management		[AP]
C915.5	Assess the hydraulic design of cross drainage works		[AP]
C915.6	Contrast about Irrigation water management		[AN]
Course Contents:			
Module 1: Irrigation Methods:			15 Hrs
Need and mode of irrigation – Advantages - types of irrigation – consumptive use of water – Duty and delta – Relationship – Factors affecting duty – Irrigation efficiencies – estimation of Evapotranspiration using experimental method. Methods- Well irrigation - Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation			
Module 2: Diversion and Impounding structures:			15 Hrs
Diversion head works – Weir and Barrage– Layout of Weir - Causes of failure of weirs and their remedies – Weirs on pervious foundations – Types of impounding structures – Tanks, sluices and weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of Gravity dams.			
Module 3: Canal Irrigation and water Management:			15 Hrs
Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal head works – Canal regulators – River training works - Need for optimization of water use – Minimizing irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations			
			Total Hours: 45 Hrs
Text Books:			
1.	Santhosh Kumar Garg, "Irrigation and Hydraulic Structures", Khanna Publishers, New Delhi, 2011.		
2.	Punmia BC and Pande B BLal, "Irrigation and Water Power Engineering", Laxmi Publications Pvt Ltd., New Delhi, 2009.		
3.	SahasraBudhe S R, "Irrigation and Hydraulic Structures", Katson Publishing House, Ludhiana, 2013.		
Reference Books:			
1.	Asawa G L,"Irrigation Engineering", New Age International Publishers, New Delhi, 2009.		
2.	Sharma S K, "Irrigation Engineering and Hydraulics Structures", S.Chand Publishing, 2016.		
3.	Sahasrabudhe S R, "Textbook of Irrigation Engineering" Katson Books,2012.		
4.	GurcharanSingh., "Irrigation Engineering" Standard Book house, New Delhi,2009.		
Web References:			

1.	https://ieeexplore.ieee.org/document/7534790/														
2.	https://www.aboutcivil.org/irrigation-engineering-water-resources-lectures.html														
Online Resources:															
1.	https://nptel.ac.in/courses/105104140/														
2.	http://nptel.ac.in/courses/105104103/														
3.	https://www.ieee.org/sitemap.html														
Tentative assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome		Revised Bloom's Level				Assessment Component				Marks					
C915.1		Evaluate				Online Quiz				5					
C915.2		Analyze				Group Assignment				5					
C915.3, C915.4		Apply				Group Assignment				5					
C915.5 & C915.6		Create				Technical Presentation				5					
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) [50 marks]		
		CIA-I [10 marks]			CIA-II [10 marks]			CIA - III [10 marks]							
Remember		-			-			-					-		
Understand		70			60			50					40		
Apply		30			40			50					60		
Analyse		-			-			-					-		
Evaluate		-			-			-					-		
Create		-			-			-					-		
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	-	-	-	-	2	2	-	-	-	-	1	-	-	1
2	2	-	-	-	-	2	2	-	-	-	-	2	1	-	1
3	3	2	2	-	-	2	3	2	-	-	-	3	2	-	2
4	2	-	-	-	-	2	2	1	-	-	-	2	2	-	2
5	2	1	-	-	-	1	2		-	-	-	1	1	-	1
6	2	-	-	-	-	2	1	1	-	-	-	1	-	-	1
Avg	2.2	1.5	2.0	-	-	1.8	2.0	1.3	-	-	-	1.7	1.5	-	1.3
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE916	REMOTE SENSING AND GIS APPLICATIONS	3/0/0/3
Nature of Course	Theory Concepts	
Pre requisites	-	
Course Objectives:		
1.	To study the basic concepts of remote sensing	
2.	To study the aerial photography and photogrammetry	
3.	To study satellite remote sensing principles and GIS techniques	
4.	To understand various types of satellite remote sensing and interpretation Techniques	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C916.1	Understand the basic components of remote sensing techniques	[U]
C916.2	Develop the concepts of remote sensing techniques for atmospheric characteristics analysis	[AP]
C916.3	Analyse the positions of satellites and its uses in remote sensing technology	[AN]
C916.4	Illustrate the basics of Geographical Information systems and its uses in remote sensing technologies	[AP]
C916.5	Prepare spatial and non-spatial maps using modern software tools	[AP]
C916.6	Apply the concepts of Remote sensing and GIS in various technologies	[AP]
Course Contents:		
Module 1: Remote Sensing		20 Hrs
Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra-Red (IR), Near IR, Middle IR , Thermal IR and Microwave – Black Body Radiation - Planck’s law – Stefan-Boltzmann law. EMR interaction with atmosphere and earth: Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface.		
Module 2: Optical and Microwave Remote Sensing		15 Hrs
Satellites - Classification – Based on Orbits – Sun Synchronous and Geo Synchronous – Based on Purpose – Earth Resources Satellites, Communication Satellites, Weather Satellites, Spy Satellites – Satellite Sensors - Resolution – Spectral, Spatial, Radiometric and Temporal Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics.		
Module 3: Geo graphic Information System		10 Hrs
GIS – Components of GIS – Hardware, Software and Organisational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters.		

													Total Hours:	45 Hrs		
Text Books:																
1	AnjiReddy.M, "Text book of Remote sensing and GIS", B.S.Publications., 2012															
2	Kumar.S, "Basics of Remote sensing and GIS", Laxmi Publications., 2016															
3	Sinha.S.K "Fundamentals of Remote sensing and GIS", Ayushman Publication house., 2014															
Reference Books:																
1	Basudeb Bhatta, "Remote sensing and GIS", Oxford publishers., 2012															
2	Lillesand, Kiefer and Chipman, "Remote sensing and Image interpretation", Wiley., 2011															
3	Manugula.S.S and VeerannaBommakanti, "Photogrammetry, GIS and Remote sensing", Educreation Publishing., 2018															
4	Jauhari.K.S, "Remote Sensing and GIS", A pragati's Edition., 2012															
Web References:																
1	http://www.gdmc.nl/oosterom/PoRSHyperlinked.pdf															
2	https://www.researchgate.net/publication/233793637_Principles_of_remote_sensing_an_introduutory_textbook															
3	http://giswin.geo.tsukuba.ac.jp/sis/tutorial/koko/remotesensing/FundamentalRemoteSensing.pdf															
Online Resources:																
1	http://ags.geography.du.ac.in/Study%20Materials_files/Punyatoya%20Patra_AM.pdf															
2	http://bforest.portal.gov.bd/sites/default/files/files/bforest.portal.gov.bd/page/bb40dcf3_5140_49c8_9b54_9b43993607ac/Advanced%20Remote%20Sensing%20And%20GIS.compressed.pdf															
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome		Revised Bloom's Level				Assessment Component						Marks				
C916.1 - 6		Apply				Project Based Learning System						20				
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) [50 marks]			
		CIA-I [10 marks]			CIA-II [10 marks]			CIA - III [10 marks]								
Remember		-			-			-					-			
Understand		60			50			40					50			
Apply		40			50			60					50			
Analyse		-			-			-					-			
Evaluate		-			-			-					-			
Create		-			-			-					-			
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	2	-	-	-	-	2	-	-	-	-	-	-	2	-	2	
2	3	3	-	-	3	2	-	2	-	2	-	-	2	-	2	
3	3	2	-	-	2	2	-	1	-	-	-	-	2	-	2	
4	3	2	1	-	2		-	-	-	2	-	-	3	-	-	
5	3	2	1	-		1	-	-	-	-	-	-		-	1	
6	-	2	1	-	2	-	-	-	-	1	-	-	1	-	1	
Av	2.8	2.2	1	-	2.3	1.8	-	1.5	-	1.7	-	-	2	-	1.7	

g														
1	Reasonably agreed			2	Moderately agreed			3	Strongly agreed					

18CE917	SOLID AND HAZARDOUS WASTE MANAGEMENT	3/0/0/3
Nature of Course	Theory Analytical	
Pre requisites	-	
Course Objectives:		
1.	To understand the necessity and importance of professional solid waste management	
2.	To learn the methods and means of waste collection and transfer of solid and hazardous wastes	
3.	To study the different treatment approaches for MSW hazardous wastes	
4.	To study the design and operation of Municipal and Hazardous landfills	
Course Outcomes: Upon completion of the course, students shall have ability to		
C917.1	Explain the functional elements of municipal solid waste management system	[U]
C917.2	Analyze the role of PPP in waste management	[AN]
C917.3	Evaluate the various processing technologies for MSW	[AP]
C917.4	Analyze the various options for disposal of Municipal Solid Waste	[AN]
C917.5	Identify and classify the hazardous wastes	[U]
C917.6	Choose the treatment, storage, and disposal options for hazardous waste	[AP]
Course Contents:		
Module 1: Fundamentals of Solid Waste Management		10 Hrs
Types and sources of solid waste, non-hazardous and hazardous waste-Pre sent scenario and need for solid and hazard waste management- Legislations on management and handling of solid wastes and hazardous waste - Elements of integrated waste management and roles of stakeholders - Financing and Public Private Participation for waste management. Effects of improper solid waste management		
Module 2: Municipal Solid Waste Management		20 Hrs
Source-types-composition-Estimation of physical, chemical Characteristics. Collection services-Types of collection system-Analysis of collection routes- Types of transfer stations-Transport means and methods-Location of transfer stations. Processing of MSW-Onsite storage and Processing methods. Offsite Processing- combustion, pyrolysis, gasification, incineration-Principles of aerobic and anaerobic composting- Co-digestion of solid waste-Waste to Energy Concept. Disposal of MSW-Sanitary Landfill-siting Considerations-design and Operation of sanitary landfill-Leachate and Gas Collection –monitoring system. Reuse of disposal sites		
Module 3: Hazardous Waste Management		15 Hrs
Types of Hazardous Wastes –Source of generation- Characterization-TCLP tests-Storage, labelling and handling of hazardous wastes- Effects of improper management – Treatment and disposal of Hazardous wastes -Hazardous waste management in India. Environmental Risk assessment-case studies-Remediation of Hazardous Landfill sites		
		Total Hours: 45 Hrs
Text Books:		
1.	M N Rao and Razia Sultana “Solid and Hazardous Waste Management”, Bs Publication,2012.	

2.	Bhide A.D and Sundaresan, B.B. "Solid Waste Management Collection, Processing and Disposal", 2011.														
3	George Tchobanoglous, Hilary Theisen and Samuel Vigil. "Integrated Solid Waste Management", McGraw-Hill Publishers, 2014														
4.	John Pichtel. Waste management Practices Municipal, hazardous and Industrial Taylor and Francis 2009.														
Reference Books:															
1.	Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.														
2.	A Design Approach Sincero, A.P., and Sincero, G.A., " Environmental Engineering" PHI Learning 2009.														
3.	Vesilind, P. A and WorrelW.A " Solid Waste Engineering" –, Cengage Learning 2011.														
4.	Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. "Environmental Engineering" McGraw-Hill Publishers, 2016.														
Online Resources:															
1.	https://www.nptel.ac.in/courses/105106056/														
2.	http://nptel.ac.in/courses/120108005/														
Web References:															
1.	http://mohua.gov.in/publication/manual-on-solid-waste-management-systems-cpheeo-2000.php														
2.	https://www.epa.gov/hw														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level	Assessment Component	Marks												
C917.1 - 6	Analyse	Online courses	20												
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]											
	CIA-I [10 marks]	CIA-II [10 marks]	CIA - III [10 marks]												
Remember	-	-	-	-											
Understand	60	40	30	20											
Apply	40	40	50	40											
Analyse	-	20	20	40											
Evaluate	-	-	-	-											
Create	-	-	-	-											
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	-	-	-	-	-	2	-	-	-	-	1	-	-	1
2	2	-	-	-	-	-	2	-	-	-	-	2	-	-	2
3	3	-	2	-	-	2	2	-	-	-	-	3	-	2	2
4	3	2	-	-	-	2	2	-	-	-	-	3	-	2	2
5	2	2	-	-	-	2	-	-	-	-	-	2	-	1	2
6	3	2	1	-	-	3	-	-	-	-	-	2	-	2	2
AVG	2.5	2.0	1.5	-	-	2.2	2.0	-	-	-	-	2.2	-	1.8	1.8
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE918	WATER RESOURCES ENGINEERING		3/0/0/3
Nature of Course	Theory Concepts		
Pre requisites	-		
Course Objectives:			
1.	To understand the concepts of water resource engineering.		
2.	To understand importance of reservoir planning.		
3.	To design of well in different aquifers.		
4.	To understand the design of canals, distribution of water and river control.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C918.1	Identify the basics concepts of Water resource		[AP]
C918.2	Analyze the reservoir capacity, their yield predictions, types and their application		[AN]
C918.3	Apply the concepts of design of wells and canals.		[AP]
C918.4	Apply the remedial measures for water logging and river control works.		[AP]
C918.5	Determine the types of reservoir and its capacity		[E]
C918.6	Design the unlined irrigation channel and well		[C]
Course Contents:			
Module 1: Introduction to Water Resources		15 Hrs	
Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Estimation of water requirements for irrigation and drinking- Single and multipurpose reservoir – Multi objective – Fixation of Storage capacity -Strategies for reservoir operation – Design flood-levees and flood walls - flood estimation by empirical formulae – rational formula – recurrence interval – Importance of rainwater harvesting – water resource system modelling-optimization and simulation			
Module 2: Water Resource Management and Planning		15 Hrs	
Economics of water resources planning; – National Water Policy – Consumptive and non-consumptive water use – Water quality – Scope and aims of master plan – Concept of basin as a unit for development – Water budget- Conjunctive use of surface and ground water-Purpose of storage work – types of reservoirs – Investigation for reservoir planning – Selection of site for a reservoir – yield of a reservoir – Safe, secondary and average yield – mass curve and demand curve – Calculation of safe yield from a reservoir of a given capacity – Determination of reservoir capacity for a specified yield – Zones of storage in reservoirs – Reservoir sedimentation and their control – trap efficiency – Basics of flood routing			
Module 3: Distribution System and control of Water logging		15 Hrs	
Classification of Canals and wells – canal alignment – Design Procedure for an unlined irrigation channel and design of well– Kennedy’s theory – Wood table – Lacey’s theory – Comparisons of the two theories – Uses of Garret’s diagram in channel design – Balancing depth of cutting – component parts of a canal cross section – design of lined canals – Problems – well flow near aquifer boundaries, partial penetrating wells, characteristics of well losses - Water logging – Causes and effects of water logging – remedial measures – Land drainage – advantages – types of drainage system – Layout of tile drainage. Rivers – classifications – Meandering and cut-off – River training works – Objectives – Classification and types of river training works.			
		Total Hours:	45 Hrs
Text Books:			
1.	Punmia B.C. and Pande B.B. Lal, “Irrigation and Water Power Engineering”, Laxmi Publications Pvt. Ltd., New Delhi, 2012.		

2.	Garg S K, "Hydrology and Water Resource Engineering", Khanna Publication, India, 2011														
3.	Larry W. Mays, "Water Resources Engineering", Wiley Publications, 2010.														
Reference Books:															
1.	Duggal K.N. and Soni J.P. "Elements of Water Resources Engineering", New Age International Pvt. Ltd., New Delhi, 2010.														
2.	Gupta B.L. and Amit Gupta, "Water Resources System and Management", Standard Publishers Distributors, New Delhi, 2013.														
3.	Santhosh Kumar Garg, "Irrigation Engineering and Hydraulic Structures", Khanna Publications Pvt. Ltd., New Delhi, 2011.														
4.	Agarwal, V.C, "Groundwater Hydrology", PHI Learning Private Ltd., 2012.														
Web References:															
1.	https://drive.google.com/file/d/0Bzs0e0JeDGmQdHdZSm1SQ2FSdms/view														
2.	https://gietcivil.in/2017/01/02/water-resources-engineering-1/														
3.	https://books.google.co.in/books?id=TuU1apOIRilC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false														
Online Resources:															
1.	https://nptel.ac.in/syllabus/105104103/														
2.	https://nptel.ac.in/courses/105108081/														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level	Assessment Component	Marks												
C918.1 C918.3 C918.4	Apply	Online Quiz	5												
C918.2	Analyse	Self-Support Assignment	5												
C918.5	Evaluate	Self-Support Assignment	5												
C918.6	Create	Self-Support Assignment	5												
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]											
	CIA-I [10 marks]	CIA-II [10 marks]	CIA - III [10 marks]												
Remember	20	20	20	10											
Understand	20	20	20	20											
Apply	30	20	10	30											
Analyse	10	20	20	10											
Evaluate	10	10	20	10											
Create	10	10	10	20											
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	2	3	2	3	2	-	2	-	2	-	3	2
2	3	3	2	3	3	2	3	2	-	2	-	2	-	3	2
3	3	2	1	2	3	2	3	2	-	2	-	2	-	3	2
4	3	2	1	2	3	2	3	2	-	2	-	2	-	3	2
5	3	3	2	3	3	2	3	2	-	2	-	2	-	3	2
6	3	3	3	3	3	2	3	2	-	2	-	2	-	3	2
Avg	3.0	2.5	1.7	2.5	3.0	2.0	3.0	2.0	-	2.0	-	2.0	-	3.0	2.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

Elective Stream III: Transportation / Construction Engineering

18CE919	AIRPORTS, DOCKS AND HARBOURS	3/0/0/3
Nature of Course	Theory Analytical	
Pre-requisites	-	
Course Objectives:		
1.	To understand the components of aircraft characteristics, planning and components of airport.	
2.	To design the components of airports.	
3.	To study the types and components of docks and harbours.	
4.	To know the planning principles involved in designing docks and harbours.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C919.1	Differentiate aircraft characteristics, components of an airport.	[AN]
C919.2	Demonstrate the working of runways and taxiways & generate the final layout.	[AP]
C919.3	Prepare the layout of harbour	[AN]
C919.4	Categorize the components of docks and harbours.	[AN]
C919.5	Apply navigational aids in airports and harbours	[AP]
C919.6	Outline the new concepts involved in airports, docks and harbours	[AN]
Course Contents:		
Module 1: Airport planning		15 Hrs
Airport site selection – Components of airports- Forecasting in aviation- Airport obstructions – Airport drainage-Zoning laws-Clearance over highways and railways - Regional planning - Airport architecture – Apron - Terminal Building-Hangars- Motor vehicle parking area and circulation pattern-Airport Building-Wind direction indicators-Airport lighting - Air traffic control-Runway and taxiway markings-Visual aids-Air traffic control network - Passenger facilities and services, Airport Economics.		
Module 2: Airport Design		15 Hrs
Runway orientation – Cross wind component - Wind rose diagram(Problems)- Basic runway length – Corrections to basic runway length – geometric design of runways – Layout of taxiway and terminal area- airport pavement design (flexible pavement only) - Systems of aircraft parking – Circular Runways.		
Module 3: Docks and Harbours		15 Hrs
Types - Layout and planning principles-site selection-Terminal facilities-Port building- Transit shed- Warehouse-Mooring accessories-breakwaters –wharves-quays – piers-fenders-Jetties-navigation aids– dry and wet docks- dredging – Inland water Transport, Durability issues		
Total Hours:		45 Hrs
Text Books:		
1.	Khanna S. K., Arora M. G. And Jain S. S., “Airport Planning and Design ”, Nemchand and Brothers, Roorkee, 2015.	
2.	Bindra S. P., “A Course in Docks and Harbour Engineering”, Dhanapat Rai and Sons, New Delhi, 2013.	
3	SaxenaSubhash C and Satyapal Arora,” A Course in Harbour Engineering”, Dhanpat Rai and Sons, Delhi, 2010.	
Reference Books:		

1.	Venkatramaiah. C., "Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad, 2015.
2.	Oza and Oza, "Elements of Dock and Harbour Engineering", Charotar Publishing House, 2016.
3.	Rangwala, " Airport Engineering ", Charotar Publishing House, 2015
4.	Mundrey J.S., "Textbook in Harbour Engineering", 2010.

Web References:

1.	http://www.youtube.com/watch?v=WUq3uN4MDms
2.	https://www.faa.gov/airports/engineering/

Online Resources:

1.	https://pdhonline.com/courses/c359/c359_new.htm
2.	https://www.iata.org/training/subject-areas/Pages/airport-courses.aspx

Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C919.1, C919.2	Apply	Online Quiz	5
C919.3	Apply	Group Assignment	5
C919.4	Analyse	Group Assignment	5
C919.5, C919.6	Analyse	Online Quiz	5

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 Marks]
	Theory			
	CIA-I [10 Marks]	CIA-II [10 Marks]	CIA -III [10 Marks]	
Remember	-	10	-	10
Understand	20	20	30	20
Apply	40	40	40	40
Analyse	40	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	1	-	-	-	-	-	-	2	2	-	1	1	-	2
2	3	2	-	-	-	-	-	2	2	2	-	2	2	-	2
3	3	2	1	-	-	-	-	2	2	2	-	2	1	-	2
4	2	1	-	-	-	-	-	-	2	2	-	2	2	-	2
5	3	2	1	-	-	-	-	1	2	2	-	2	2	-	2
6	3	2	1	-	-	-	-	-	2	2	-	3	2	-	2
Avg	2.7	1.7	1	-	-	-	-	1.7	2	2	-	2	1.7	-	2
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE920	ENGINEERING RISK BENEFIT ANALYSIS	3/0/0/3
Nature of course	Theory Concept	
Pre requisites	-	
Course Objectives:		
1.	Identification, analysis, and prioritization of risks.	
2.	Treatment of risk to prevent, minimize, monitor, and control the probability of risk.	
3.	Principles and applications of risk assessment and management in the context of engineering management and systems engineering.	
4.	Idea to be created for discovery of risk assessment and management concepts and tools	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C920.1	Differentiate the elements and types of Risk analysis	[AP]
C920.2	Illustrate the methods of risk assessment and apply them in real case studies.	[AN]
C920.3	Outline the methods of Decision making	[AP]
C920.4	Use modelling in analyzing risks and provide contingencies.	[AN]
C920.5	Outline the concepts of Cost Benefit Analysis in cases of uncertainty	[AP]
C920.6	Apply CBA to analyse and evaluate real life problems.	[AN]
Course Contents:		
Module 1: Risk Analysis		15 Hrs
Introduction – Risk-Related terminology and definitions – fundamental of risk, risk planning, risk identification- importance of risk Analysis – elements and types of risk Analysis – Risk Assessments – types of risk assessments - Probabilistic risk assessment (PRA) – strength of PRA - Steps in conducting a PRA.		
Module 2: Decision Analysis		15 Hrs
Decision making techniques using risk information -Economic methods - Non economic techniques - scenario and logical modelling, development and quantification – Risk Events and factors - representation of risk values and risk acceptance criteria.		
Module 3: Cost – benefit Analysis (CBA)		15 Hrs
Concept, limitations, Background and fundamental premises, Time value of money, Basis for comparison of alternatives, CBA Including uncertainty, Evaluating public activities - Case studies.		
		Total Hours: 45 Hrs
Text Books:		
1.	Kunreuther, H. "Risk Analysis and Risk Management in an Uncertain World." Risk Analysis, August 2013.	
2.	Richard Wilson and Edmund A.C. Crouch, "Risk Benefit Analysis", Harvard centre for risk analysis, 2014.	
3.	Modarres M,. Kaminskiy, V. Krivtsov , "Reliability Engineering and Risk Analysis: A Practical Guide", 2nd Edition, CRC Press, Taylor & Francis Group, 2010	
Reference Books:		
1.	Harry campbell and Richard Brown, "Benefit cost analysis", Cambridge University Press,UK, 2015.	
2.	B. M. Ayyub,"Risk Analysis in Engineering and Economics", Chapman-Hall/CRC Press, 2010.	
3.	Vose, David , "Risk Analysis: A Quantitative Guide " 3 rd Edition, John Wiley & Sons Ltd, 2018	

4.	Boardman, T. et al. "Cost-Benefit Analysis: Concepts and Practice" (Upper Saddle River, NJ: Prentice-Hall) 2018.														
Online Resources:															
1.	https://nptel.ac.in/courses/105103023/21														
2.	https://nptel.ac.in/courses/110107081/22														
Web Resources															
1.	https://ocw.mit.edu/courses/engineering-systems-division/esd-72-engineering-risk-benefit-analysis-spring-2007/lecture-notes/														
2.	https://www.pmi.org/learning/library/risk-analysis-project-management-7070														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level					Assessment Component					Marks				
C920.1 - 6	Analyse					Project Based Learning (Applications of risk management software's and providing a project demonstration)					20				
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) [50 marks]		
		CIA-I [10 marks]			CIA-II [10 marks]			CIA - III [10 marks]							
Remember		10			-			-					10		
Understand		20			30			20					20		
Apply		40			30			30					40		
Analyse		30			40			50					30		
Evaluate		-			-			-					-		
Create		-			-			-					-		
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
1	-	-	-	-	-	-	-	1	2	2	2	1	-	1	1
2	-	-	-	-	2	-	-	2	2	2	2	2	-	1	2
3	-	-	-	-	-	-	-	2	2	2	2	1	-	1	2
4	-	-	-	-	2	-	-	2	2	2	2	2	-	2	2
5	-	-	-	-	-	-	-	2	2	2	3	1	-	2	2
6	-	-	-	-	2	-	-	1	2	2	3	2	-	1	2
Avg	-	-	-	-	2	-	-	1.7	2	2	2.3	1.5	-	1.3	1.8

18CE921	MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES	3/0/0/3
Nature of Course	Theory Concept	
Pre requisites	-	
Course Objectives:		
1.	To recognize the importance of Maintenance and Repair Strategies for damaged structures.	
2.	To understand the different types of special concretes and techniques for repair.	
3.	To appreciate the quality assurance and durability of concrete.	
4.	To understand the Retrofitting and Rehabilitation techniques for structural members	
5.	To learn the concept used in various demolition techniques and case studies.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C921.1	Inspect and evaluate the damaged structure.	[AP]
C921.2	Suggest the suitable repair material.	[AP]
C921.3	Analyse the serviceability and durability of concrete	[AP]
C921.4	Assess the concrete strength using NDT, PDT methods	[AP]
C921.5	Apply suitable retrofitting method for the affected structure.	[AP]
C921.6	Apply the different techniques for rehabilitation and demolition	[AP]
Course Contents:		
Module 1: Maintenance and Repair Strategies		15 Hrs
Maintenance, repair and rehabilitation, Facets of maintenance, importance of maintenance various aspects of Inspection, assessment procedure for evaluating a damaged structure, causes of deterioration. Repair materials - Special concretes and mortar, Geopolymer concrete, concrete chemicals, special cements for accelerated strength gain, expansive cement.		
Module 2: Serviceability and Durability of Concrete		15 Hrs
Quality assurance for concrete construction, concrete properties, strength, permeability, thermal properties and cracking, Effects due to climate, temperature, chemicals, corrosion, Design and construction errors, Effects of cover thickness and cracking – Assessment of concrete strength – Non-destructive methods – destructive methods – partially destructive methods.		
Module 3: Repairs, Rehabilitation and Retrofitting of Structures		15 Hrs
Repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering, corrosion, wear, fire, leakage and marine exposure - recent development of seismic retrofit methods - rust eliminators and polymers coating for rebars during repair - foamed concrete, mortar and dry pack, vacuum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning - methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coating sand cathodic protection - engineered demolition techniques for dilapidated structures. Methods adopted in lifting of buildings / structures and its benefits.		
Case Study – Failure study on existing building (only for Internal Assessment)		
Total Hours:		45 Hrs
Text Books:		
1.	Vidivelli B., “Rehabilitation of Concrete Structures”, Standard Publishers Distributors, 2015.	
2.	Bhattacharjee J., “Concrete Structures Repair Rehabilitation and Retrofitting”, CBS Publishers, 2017.	
3.	Poonam I. Modi, Chirag N. Patel, “Repair and Rehabilitation of Concrete Structures”, PHI Learning Pvt. Ltd, 2016.	

Reference Books:															
1.	Gupta B. L. and Amit Gupta, "Maintenance & Repair of Civil structures", Standard Publishers Distributors, New Delhi, 2015.														
2.	Varghese P.C., "Maintenance, Repair & Rehabilitation and Minor Works of Buildings", Prentice Hall India Learning Private Limited, 2014.														
3.	Guha P. K., "Maintenance and Repairs of Buildings", New Central Book Agency (P) Ltd., 2011.														
4.	Gahlot P S, and Sanjay Sharma, "Building Repair and Maintenance Management", CBS Publishers, 2010.														
Web References:															
1.	https://cpwd.gov.in/units/handbook.pdf														
2.	https://icjonline.com/journals/201202feb/files/2012_02_icj%20e%20journal.pdf														
Online Resources:															
1.	https://nptel.ac.in/courses/114106035/38														
2.	https://nptel.ac.in/courses/105104030/38														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level			Assessment Component									Marks		
C921.1	Apply			Assignment									5		
C921.2&C921.3	Apply			Technical Presentation									5		
C921.4	Apply			Online Technical Quiz									5		
C921.5 & C921.6	Apply			Case Study Report									5		
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment											End Semester Examination (Theory) [50 marks]			
	CIA-I [10 marks]			CIA-II [10 marks]			CIA-III [10 marks]								
Remember	20			10			10					10			
Understand	30			30			30					30			
Apply	50			60			60					60			
Analyse	-			-			-					-			
Evaluate	-			-			-					-			
Create	-			-			-					-			
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
1	3	2	1	1	-	-	1	1	1	1	-	2	3	1	1
2	3	2	1	1	-	-	1	1	1	1	-	2	3	1	1
3	3	2	1	1	-	-	1	1	1	1	-	2	3	1	1
4	3	2	1	1	-	-	1	1	1	1	-	2	3	1	1
5	3	2	1	1	-	-	1	1	1	1	-	2	3	1	1
6	3	2	1	1	-	-	1	1	1	1	-	2	3	1	1
Avg	3.0	2.0	1.0	1.0	-	-	1.0	1.0	1.0	1.0	-	2.0	3.0	1.0	1.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE922	PAVEMENT ENGINEERING		3/0/0/3
Nature of Course	Theory Analytical		
Pre requisites	-		
Course Objectives:			
1.	To understand the types and components of Pavements.		
2.	To understand various analysis and design procedures of pavements.		
3.	To know the different methods of rehabilitation of highway pavements.		
4.	To identify different methods of maintenance and evaluation of pavements.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C922.1	Classify the factors governing the design		[AP]
C922.2	Analyse and design flexible pavements.		[AN]
C922.3	Analyse and design rigid pavements.		[AN]
C922.4	Implement maintenance and evaluation procedure of the pavement		[AN]
C922.5	Examine the warping, friction, wheel load stress and calculate the critical combination of stresses.		[AP]
C922.6	Implement different methods of strengthening the pavement.		[AP]
Course Contents:			
Module 1: Pavement Types and Factors affecting Design			15 Hrs
Introduction – Pavement as layered structure - Types and component parts of pavements, factors affecting design and performance of pavements, comparison between highway and airport pavements.			
Module 2: Stress Analysis and Design of Flexible and Rigid Pavements			15 Hrs
Stress and deflections in pavements under repeated loading, Boussinesq's Theory, Burmister theory, wheel load stresses, ESWL, methods of flexible pavement design group index, CBR, triaxial, Mcleod and IRC method, Westergaard's analysis, wheel load stress, warping stress, frictional stress and combination of stresses, types of joints, Design of slab and joints, IRC method.			
Module 3: Pavement Evaluation and Stabilization			15 Hrs
Structural evaluation of flexible and rigid pavements - Causes of distress in rigid and flexible pavements - Evaluation by deflection measurements, PSI, strengthening of pavements, overlays, choice of stabilizers, Geo synthetics, Types, Use of Geo synthetics in roads – life cycle analysis of pavements – pavement maintenance. Case Study – Pavement Evaluation and Stabilization (For Internal Assessment only)			
			Total Hours: 45 Hrs
Text Books:			
1.	Khanna S K & C E G Justo and Justo, Highway Engineering, Nemchand & Sons publisher, 2017.		
2.	PratabChraborthy and Animesh Das., "Principles of Transportation Engineering", PHI Learning Pvt. Ltd, 2017.		
3.	Nishantha Bandara, "Geotechnical aspects of Pavement Engineering", Momentum Press, 2018		
4.	Rajib B. Mallick, "Pavement Engineering", CRC Press, Third Edition, 2017		
Reference Books:			
1.	Sharma S K, Principles, Practice and design of highway Engineering, S.Chand & Co Ltd, New Delhi, 2014.		
2.	Srinivasa Kumar R, Pavement Design, Orient Blackswan Private Limited - New Delhi, 2013.		
3.	Nick Thom, "Principles of Pavement Engineering", ICE Publishing, 2014.		
4.	Guidelines for the Design of flexible Pavements, Indian Road Congress, IRC 37-2012		
Web References:			

1.	https://drive.google.com/file/d/1C2jGmbCF58JuwS4I-4Dibl9hHIP3-64h/view														
2.	https://drive.google.com/file/d/1afPJycv9m2Pz3erMLJvXZm--pE0BWNax/view														
Online Resources:															
1.	http://nptel.ac.in/courses/105105107/														
2.	http://nptel.ac.in/courses/105101087/														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level		Assessment Component										Marks		
C922.1	Apply		Assignment										5		
C922.2	Analyse														
C922.3	Analyse														
C922.4	Analyse		Online Quiz										5		
C922.5	Apply		Group Assignment										5		
C922.6	Apply		Technical Presentation										5		
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment											End Semester Examination (Theory) [50 Marks]			
	CIA-I [10 Marks]	CIA-II [10 Marks]	CIA-III [10 Marks]												
Remember	-	-	-												
Understand	20	20	20									20			
Apply	30	30	30									30			
Analyse	50	50	50									50			
Evaluate	-	-	-												
Create	-	-	-												
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	3	2	1	1	-	-	-	2	-	-	2	3	1	2
2	2	3	3	1	1	-	-	-	2	-	-	2	3	2	2
3	3	3	2	2	1	-	3	-	2	-	-	2	3	1	1
4	3	2	2	2	2	-	3	-	2	-	-	1	3	2	3
5	3	2	2	2	1	-	-	-	2	-	-	1	3	1	3
6	3	2	2	2	1	-	-	-	2	-	-	2	3	2	2
Avg	2.7	2.5	2.2	1.7	1.2	-	2.5	-	2	-	-	1.7	3	1.5	2.2
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE923	PROJECT MANAGEMENT		3/0/0/3
Nature of Course	Theory & analytical		
Pre requisites	-		
Course Objectives:			
1.	To study the basic concepts of Project management and Organization.		
2.	To get knowledge on the various project cost estimating methods.		
3.	To understand the process of project monitoring and control.		
4.	To study the risks associated with projects and quantify risks under certainty and uncertainty		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C923.1	Identify the basic concepts of Project Management techniques and tools		[AP]
C923.2	Distinguish the types of estimates and estimation methods		[AN]
C923.3	Apply various techniques to estimate project budget and control project cash flows		[AP]
C923.4	Examine the importance of safety management		[AN]
C923.5	Select the suitable equipment by depreciation method		[AN]
C923.6	Analyze the risks in construction projects under certainty and uncertainty		[AN]
Course Contents:			
Module 1: Overview of Project Management, Concepts and Techniques			20 Hrs
Definition and objectives of Project Management, Characteristics of projects, Stages of Project Management, Project Life cycle- Establishing Project organization - Types of Organizations and Organizational structures. Tendering - Arbitration - International projects - Detailed Project Reports (DPR) / Build Own Operate (BOO) / Build Own Operate Transfer (BOOT) Projects / Build Operate and Transfer (BOT) – case studies. Development of construction techniques – High rise Building Technology – Seismic effect – Environmental impact of materials – responsible sourcing – Eco Building (Green Building) – Material used – Construction methods – Natural Buildings – Passive buildings – Intelligent (Smart) buildings – Meaning – Building automation – Energy efficient buildings for various zones			
Module 2: Project Cost Estimating, Monitoring and control			15 Hrs
Types of Estimates-Methods of Estimation -Equipment Management-Classification-Factors for selection-Methods of calculating Depreciation-Cost & Cost Control –Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, RR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows).			
Module 3: Project Risk Analysis			10 Hrs
Risk definition- Identification of Risk-Risk Analysis- Decision making- Decision making under certainty and uncertainty-Risk treatment strategies-Risk Avoidance-Loss reduction and Risk Prevention-Risk retention and Assumption.			
Total Hours:			45 Hrs
Text Books:			
1.	Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw–Hill Publishing Co., New Delhi, 2012.		
2.	Neeraj Kumar Jha,"Construction Project Management-Theory and Practice" Pearson publications, 2011.		
3.	Joy P K, Total Project Management: The Indian Context, Macmillan India Ltd, 2010.		

4.	Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
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Reference Books:

1.	Lock, Gower, Project Management Handbook, 2013.
2.	Halpin, D.W., "Financial and cost concepts for construction Management", John Wiley and Sons, New York, 2005.
3.	Seetharaman S, "Construction Engineering and Management, Umesh Publishers, New Delhi, 2000.
4.	Jimmie W. Hinze, "Construction Planning and Scheduling", Prentice Hall Publication, 4th edition, 2011.

Web References:

1.	http://org.elon.edu/cmdept/procedures.htm
2.	http://www.manage.gov.in/studymaterial/PM.pdf
3.	https://www.pmi.org/
4.	https://www.projectmanager.com/

Online Resources:

1.	https://nptel.ac.in/syllabus/110101009/
2.	https://nptel.ac.in/courses/110104073/
3.	https://www.edx.org/course/project-management-of-engineering-projects-prepari
4.	https://www.coursera.org/programs/sri-krishna-college-of-engineering-and-technologyotq60/browse?productId=qzhn9PT2EeSKSCIAC7TI2A&productType=s12n&query=+project&showMiniModal=true

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C923.1 - C923.6	Apply	Quiz	5
		Assignment	5
C923.1 - C923.6	Analyze	Online Course with Minimum 8 Week duration (Assessment marks will be provided based on assignment submission and Pass percentage)	10

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 Marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA - III [10 marks]	
Remember	20	30	20	30
Understand	30	30	20	10
Apply	20	20	20	30
Analyse	20	10	20	20
Evaluate	10	10	20	10
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	2	1	-	-	2	-	2	3	2	3	3	-
2	3	3	2	3	1	-	-	2	-	2	3	2	3	3	-
3	3	2	1	2	1	-	-	2	-	2	3	2	3	3	-
4	3	3	2	3	1	3	-	2	-	2	3	2	3	3	-
5	3	3	3	3	1	-	-	2	-	2	3	2	3	3	-
6	3	3	2	3	1	-	-	2		2	3	2	3	3	-
Av g	3.0	2.7	1.8	2.7	1.0	3.0	-	2.0	-	2.0	3.0	2.0	3.0	3.0	-
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE924	PROJECT SAFETY MANAGEMENT	3/0/0/3
Nature of Course	Theory and Concept	
Pre requisites	-	
Course Objectives:		
1.	To understand the concept of Construction Safety Management	
2.	To understand the safety practices and systems in construction industry.	
3.	To study the various construction accidents and the preventive measures	
4.	To study the Safety Considerations in Equipment Handling:	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C924.1	Identify the concepts of construction safety management	[AP]
C924.2	Analyze the various construction accidents its causes and preventive measures	[AN]
C924.3	Construct the risk assessment method followed in construction projects	[AN]
C924.4	Classify the Safety systems in construction contracts and different Contractual Obligations	[AN]
C924.5	Apply the safety measures for various construction works	[AP]
C924.6	Apply the safety consideration in handling various equipment's	[AP]
Course Contents:		
Module 1: Principles of Safety Management		15 Hrs
Evaluation of safety management - Accident causation theories - Construction accidents-causes and prevention of accidents - Role of various parties -top management, site managers, supervisors, safety officers, general employees, - Construction related laws - occupational and safety hazard assessment - Incident Recall Technique (IRT) – OSHA, OSHAS act and standard -compliance- roles and Responsibilities- violations- EHS-ISO standards- Safety audit - Risk management –risk identification, analysis, planning of risk responses and communication of risks, secondary risks, residual risks		
Module 2: Safety Systems and Practices in Construction Operations		15 Hrs
Hazard: Biological, Chemical, Physical and ergonomics - Identification of Unsafe act and unsafe condition - Project coordination and safety procedures -Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. safety at various stages of construction – Calculation of severity and frequency of accident - Elements of an Effective -safety motivational programme - Job-site assessment - Safety Meetings - Contractual Obligations - Safety in construction contracts- Substance Abuse - safety Record Keeping - Safety sampling- safety audit - Safety Culture - Elements of an Effective Safety Programmes – Site specific safety management plans (SSMP).		
Module 3: Safety Consideration in Equipment Handling		15 Hrs
Study of safety policies - training provided on any ISO approved construction Company-Certification for Safety training – Role of Government agencies and Private agencies in promoting safety training - Incentive for safety practices - safety in office, safe use of ladders - safety in welding - Safety in hand tools - Safety in grinding- Hoisting apparatus and conveyors- Safety in the use of mobile cranes - safety system of storing construction materials - Excavation - blasting- timbering - scaffolding -First aid on site - Safety awareness program- Fire hazards and preventing methods		
Total Hours:		45 Hrs
Text Books:		
1.	Patrick X.W. Zou and RizaYosiaSunindijo, "Strategic Safety Management in	

	Construction and Engineering”, John Wiley and Sons, USA, 2015.
2.	Charles D. Reese, “Occupational Health and Safety Management: A Practical Approach “, CRC Press, Taylor and Francis Group of publication, 2015.
3.	Richard J. Coble, Jimmie Hinze and Theo C. Haupt, “Construction Safety and Health Management “, Prentice Hall Inc., India, 2011.

Reference Books:

1.	Richard J. Coble, Jimmie Hinze and Theo C. Haupt, “Construction Safety and Health Management “, Prentice Hall Inc., 2011.
2.	Hand Book on Construction Safety Practices, SP:70, BIS, 2001.
3.	Safety Management in Construction Industry – A manual for project managers. NICMAR Mumbai.
4.	Construction Safety Handbook – Davies V.S. Thomasin K, Thomas Telford, London.

Web References:

1.	https://www.osha.gov/shpguidelines/hazard-identification.html
2.	https://www.pmi.org/learning/library/project-managers-role-safety-champion-8879
3.	http://www.nsc.org.in/index.php?option=com_content&view=article&id=56&Itemid=84
4.	https://www.iseindia.in/

Online Resources:

1.	https://onlinecourses.nptel.ac.in/noc18_ce15/unit?unit=41&lesson=44
2.	https://www.google.com/search?q=1.%09Risk+assessment+A+Practical+Guide%2C+Institution+of+Occupational+Safety+and+Health%2C+United+Kingdom%2C1993.&ie=utf-8&oe=utf-8&client=firefox-b-ab
3.	https://onlinecourses.nptel.ac.in/noc17_ce18/unit?unit=41&lesson=46
4.	https://albertabcsafety.com/

Assessment Methods & Levels (based on Revised Bloom’s Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom’s Level	Assessment Component	Marks
C924.1 - C924.6	Apply	Quiz	5
		Assignment	5
C924.1 - C924.6	Analyze	Online Course with Minimum 8 Week duration (Assessment marks will be provided based on assignment submission and Pass percentage)	10

Summative assessment based on Continuous and End Semester Examination

Revised Bloom’s Level	Continuous Assessment			End Semester Examination (Theory) [50 Marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA – III [10 marks]	
Remember	40	20	20	30
Understand	30	30	30	20
Apply	20	30	30	30
Analyse	10	20	20	20

Evaluate	-	-	-	-											
Create	-	-	-	-											
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	1	2	-	2	-	2	-	2	1	3	2	1	3
2	3	3	2	3	-	3	-	2	-	2	3	2	3	3	2
3	3	3	3	3	-	2	-	3	-	2	3	2	3	2	2
4	3	3	2	3	-	3	-	2	-	2	3	2	3	2	3
5	3	2	1	2	-	2	-	3	-	2	3	2	3	3	2
6	2	2	1	2	-	2	-	2	-	2	3	2	3	2	2
Avg	2.70	2.5	1.7	2.5	-	2.3	-	2.3	-	2	2.7	2.2	2.8	2.2	2.3
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE925	SUSTAINABLE CONSTRUCTION MATERIALS AND METHODS	3/0/0/3
Nature of Course	Theory application	
Pre requisites	-	
Course Objectives:		
1.	To know the sustainability principles and green building concepts.	
2.	To learn about the sustainable materials and green building certification process.	
3.	To gain knowledge of cost analysis in sustainable construction.	
4.	To learn about the application of latest technologies in sustainable construction.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C925.1	Demonstrate the viable sustainability principles.	[AP]
C925.2	Report green building concepts and technologies involved in buildings.	[AP]
C925.3	Assess the green building certification process.	[AN]
C925.4	Sort the specifications of sustainable construction materials.	[AN]
C925.5	Investigate the cost analysis of sustainable construction process.	[AN]
C925.6	Implement the latest technologies in sustainable construction.	[AP]
Course Contents:		
Module 1: Principles of Sustainability		15 Hrs
Sustainability – Environmental challenges – Global warming – Green Building concept – Greenhouse gas emissions – Green energy technology – Energy conservation in buildings.		
Module 2: Sustainable Materials		15 Hrs
Green building components – Impact of energy and atmosphere in a building – Sustainable urban development – Building deconstruction – LEED – LEED certification process – Role of sustainable materials in design – Sustainable material specifications - Design of structural component by integrating sustainability concepts.		
Module 3: Sustainable Methods		15 Hrs
Green building and BIM – Sustainable materials cost analysis – Life cycle Assessment – Sustainable technologies for construction industry – Types of sustainable construction methods – Lean manufacturing – IOT applications in Sustainable construction - Future energy systems – Challenges in adopting sustainable methods.		
		Total Hours: 45 Hrs
Text Books:		
1.	Charles J. Kibert, “Sustainable Construction: Green Building Design and Delivery” Wiley India Pvt. Ltd., India, 4 th Edition, 2016.	
2.	Allen, David T. Shonnard and David R., “Sustainable Engineering: Concepts, Design and Case Studies”, Prentice Hall Publishers, 2012.	
3.	Robert Brinkmann, “Introduction to Sustainability”, Wiley India Pvt. Ltd., 2016.	
Reference Books:		
1.	Jamal Khatib, “Sustainability of Construction Materials” 2 nd Edition, Woodhead Publishers, 2016.	
2.	Ravindra K. Dhir OBE, GURmel S., Ghataora and Ciaran J. Lynn, “Sustainable Construction Materials”, 1 st Edition, Woodhead Publishers, 2016.	
3.	Spiro N. Pollalis, Andreas Georgoulis Stephen J.Ramos and Daniel Schodek, “Infrastructure Sustainability and Design”, Routledge Publishers, 2012.	
4.	William Spence and Eva Kultermann, “Construction Materials, Methods and Techniques: Building for a Sustainable Future”, Cengage Learning Publishers, 2011.	
Web References:		
1.	https://www.designingbuildings.co.uk/wiki/Sustainable_materials	

2.	http://www.sustainablebuild.co.uk/ecofriendlyconstructionmethodsmaterials.html															
Online Resources:																
1.	https://nptel.ac.in/courses/105105157/29															
2.	https://onlinecourses.nptel.ac.in/noc18_ce08/															
Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks: 20)																
Course Outcome	Revised Bloom's Level					Assessment Component					Marks					
C925.1 & C925.2	Apply					Online Quiz					5					
C925.3	Analyze					Technical Presentation					5					
C925.4 & C925.5	Analyze					Group Assignment					5					
C925.6	Apply					Case Study					5					
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Taxonomy	Continuous Assessment												End Semester Examination (Theory) [50 Marks]			
	CIA-I [10 marks]				CIA-II [10 marks]				CIA III [10 marks]							
Remember	10				10				10				10			
Understand	10				10				10				10			
Apply	80				30				80				40			
Analyse	-				50				-				40			
Evaluate	-				-				-				-			
Create	-				-				-				-			
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	3	2	1	1	-	1	3	2	1	1	-	2	1	-	2	
2	3	2	1	1	-	1	3	2	1	1	-	2	1	-	2	
3	3	3	2	2	-	1	3	2	1	1	-	2	1	-	2	
4	3	3	2	2	-	1	3	2	1	1	-	2	1	-	2	
5	3	3	2	2	-	1	3	2	1	1	-	2	1	-	2	
6	3	2	1	1	-	1	3	2	1	1	-	2	1	-	2	
Avg	3.0	2.5	1.5	1.5	-	1.0	3.0	2.0	1.0	1.0	-	2.0	1.0	-	2.0	
1	Reasonable Agreed					2	Moderately Agreed					3	Strongly Agreed			

18CE926	TRAFFIC ENGINEERING AND MANAGEMENT		3/0/0/3
Nature of Course		Theory analytical	
Pre requisites		-	
Course Objectives:			
1.	To know about the basic elements and facilities of traffic engineering.		
2.	To understand the traffic control and regulations.		
3.	To understand the fundamental traffic flow		
4.	To study traffic management systems and traffic safety.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C926.1	Identify the basic components and elements in traffic engineering		[AP]
C926.2	Distinguish the relationship between speed, density and flow		[AN]
C926.3	Explain the concepts of traffic Survey to estimate travel demand analysis		[AN]
C926.4	Design the links and capacity of traffic flow at rotary in at -grade intersection		[AP]
C926.5	Design of signal setting		[AN]
C926.6	Analyze the various urban transportation system and effective use of transportation management system		[AN]
Course Contents:			
Module 1: Traffic Planning and Surveys		15 Hrs	
Traffic Characteristics – Traffic flow, Road user, Vehicle– PIEV Theory - Skid Resistance and Braking Efficiency (Problems) - Accident Studies and Safety Level of Services-Problems–capacity of urban and rural roads –Highway capacity and levels of service-PCU concept – Capacity of the rural and urban roads – Fundamentals of Traffic Flow – Traffic Surveys – Speed, journey time and delay surveys – Origin Destination Survey-Vehicles Volume Survey including non- motorized transports			
Module 2: Design and Traffic Control		15 Hrs	
Principles and elements of intersection design- Conflict points at intersections, rotary design, interchanges. Traffic signs, road markings and signal coordination - Traffic Control aids - Road furniture, street lighting- Traffic volume studies, origin destination studies, speed studies, travel time and delay studies–Pre-timed and traffic actuated - Design of signal setting - phase diagrams, timing diagram –Networking pedestrian facilities & cycle ways Parking Survey –Accident analyses.			
Module 3: Traffic Management and system		15 Hrs	
Design of at grade intersections- Principles of design – Channelization - Grade separated intersections-Urban Traffic problems in India – Integrated planning of town, country, regional and all urban infrastructure –AADT-Area Traffic Management System - Traffic System Management (TSM) with IRC standards -- Traffic Regulatory Measures-Travel Demand Management (TDM)– Coordination among different agencies – Intelligent Transport System application in traffic management - Promotion and integration of public transportation .			
Total Hours:			45 Hrs
Text Books:			
1.	Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2011.		
2.	Khanna .K and Justo C.E.G. and Veeraragavan, A Highway Engineering, Nem		

	Chand Bros., Roorkee, Revised 10th Edition, 2014
3.	Nicholas J.Garber Lestern A.Hoel, Traffic and Highway Engineering, Fifth Edition, Cengage Learning India Pvt.Ltd, New Delhi, 2015.
4.	Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHI Learning Pvt. Ltd., 2011.

Reference Books:

1.	JotinKhisty C and B. Kent Lall, "Transportation Engineering", Prentice Hall of India Private Limited, New Delhi, 2011
2.	Sankara Subramanian.V, "Traffic Engineering and Management", Lakshmi Publications, India, 2013.
3.	Srinivasa Kumar, "Introduction to Traffic Engineering", Universities Press, 2018
4.	Hobbs.F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005

Web References:

1.	https://www.slideshare.net/NayanaD123/ce2026-traffic-engineering-and-management-notes
2.	https://www.monash.edu/engineering/its/publications/tem2017
3.	https://www.irte.com/
4.	http://nhidcl.com/#

Online Resources:

1.	https://nptel.ac.in/courses/105101008/32
2.	https://nptel.ac.in/courses/105101008/28
3.	https://nptel.ac.in/courses/105101008/2
4.	https://nptel.ac.in/courses/105/101/105101008/

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C926.1 - C926.6	Apply	Quiz	5
		Assignment	5
C926.1 - C926.6	Analyze	Online Course with Minimum 8 Week duration (Assessment marks will be provided based on assignment submission and Pass percentage)	10

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 Marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]	
Remember	20	20	20	30
Understand	30	30	20	20
Apply	30	20	30	20
Analyse	20	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3

1	3	2	1	2	-	-	-	2	-	2	2	2	3	2	2
2	3	3	2	3	-	-	-	2	-	2	2	2	3	2	2
3	3	3	3	3	-	-	-	2	-	2	2	2	3	2	2
4	3	2	1	2	-	-	-	2	-	2	2	2	3	2	2
5	3	3	2	3	-	-	-	2	-	2	2	2	3	2	2
6	3	3	3	3	-	-	-	2	-	2	2	2	3	2	2
Avg	3.0	2.7	2.0	2.7	-	-	-	2.0	-	2.0	2.0	2.0	3.0	2.0	2.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE927	VALUATION OF CIVIL ENGINEERING STRUCTURES	3/ 0/ 0/ 3
Nature of Course	Theory Concept	
Pre- requisites	-	
Course Objectives:		
1.	To understand fundamental concepts on valuation of civil engineering structures	
2.	Ability to analyze different technicalities involved in valuation of properties	
3.	To understand all legal practices to be adopted in practices of valuation	
4.	To apply different methods of valuation of properties	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C927.1	Perform valuation of a property with appropriate methods.	[AP]
C927.2	Appraise different legal norms and constraints involved in valuation of properties	[AN]
C927.3	Describe Indian accounting standards as applicable to real estate valuation	[U]
C927.4	Appraise the different approaches to value – income, market and cost approach.	[AN]
C927.5	Describe Factors influencing Demand and Supply Schedule in Real Estate	[U]
C927.6	Compute Various methods of Computation of Depreciation, Functional, Technological and Economic Obsolescence	[AP]
Course Contents:		
Module 1: Cost, Price and Value		15 Hrs
Types of Value-Basic elements of Value Marketability, Utility, Scarcity, and Transferability Factors affecting Valuation Physical, Economic, Legal and Social - Highest and Best Use, Value in Use, Value in Exchange - Real Property: Rights and Interests in Real Estate, Types of ownerships and Types of occupancy in Real Estate - Annuities, Capitalization, Rate of Capitalization, Years Purchase, Sinking Fund, Redemption of Capital, Reversionary Value - Construction and use of Valuation Tables - Urban Infrastructure and its influence on Value of Real Estate - Real Estate Market and its characteristics, Investment in Real Estate, Factors influencing Demand and Supply Schedule in Real Estate - Different valuation methods and problems on it.		
Module 2: Income Approach to Value		15 Hrs
Relation between Income and Value - Valuation of Property affected by the Rent Control Act, Licensed property under the Easement Act, 1882 and Leasehold properties under the Transfer of Property Act, 1882. - Derivation of Yield Rate from Market Derived Data. - Remunerative Rate of Interest and Accumulative Rate of Interest -Types of rent: Outgoings, income, Yield, Years Purchase-Determination of Market Rent and Standard Rent-Lease: lessor and lessee: Types of Lease, Lease provisions and Covenants. Valuation of Lessor's Interest, Lessee's Interest including Sub-Lease in Leased Property. Premature Termination of Lease or Surrender of Lease. - Real Estate as an Investment, Yield from Real Estate vis à - vis other forms of Investments-sound Investment Comparison. - Investment Decisions: Discounted Cash Flow Techniques - Internal Rate of Return (IRR) and Net Present Value (NPV) Profit Method.		

Module 3: Cost Approach to Value & documentation			15 Hrs	
Methods of Cost - Estimates for Buildings - Life of Building: Economic/Physical/Legal. - Factors affecting life of the building. - Total Life, Age, Estimating Future Life - Various methods of Computation of Depreciation, Functional, Technological and Economic Obsolescence - Reproduction Cost / Replacement cost, Depreciated Replacement Cost (DRC) working, adopting DRC as Value subject to Demand and Supply aspect - Land Value by Market Approach and Building Value by Cost Estimation Method for Owner Occupied Bungalows, Factories, Public B buildings. Study of Indian Accounting Standards (Ind AS) as applicable to Valuation of Real Estate. - Study of International Valuation Standards (IVS) as applicable to Valuation of Real Estate Report Writing				
Total Hours:			45 Hrs	
Text Books:				
1.	Rangwala "Valuation of Real estate Properties"- Charotar publishing house			
2.	Douglas Scarrett," Property Valuation: Five methods" Routledge ,2014			
3.	Joshua kahr," Real estate market valuation and analysis", John Wiley and sons 2005			
Reference Books:				
1.	Valuation of immovable properties under direct taxes			
2.	Mooya "Real estate valuation theory – a critical appraisal "-Springer Publishing house,2016			
3.	John Armatys," Principles of Valuation"- Routledge 2016			
Web References:				
1.	http://www.institutionofvaluers.net/forums/forum/immovable-property/			
2.	https://cpwd.gov.in/Publication/GuidelinesProperties2009.pdf			
Online Resources:				
1.	https://www.iped.com.br/en/architecture-and-engineering/course/property-valuation-course			
2.	https://nptel.ac.in/courses/105103023/25			
Assessment Methods & Levels (based on Revised Bloom's Taxonomy)				
Formative assessment based on Capstone Model (Max. Marks:20)				
Course Outcome	Revised Bloom's Level	Assessment Component	Marks	
C927.1- C927.6	Analyse	Project based learning.	20	
Summative assessment based on Continuous and End Semester Examination				
Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	CIA-I [10 marks]	CIA-II (10 marks)	CIA-III [10 marks]	
Remember	20	20	20	20
Understand	80	30	20	20
Apply	-	-	-	-
Analyse	-	50	60	60
Evaluate	-	-	-	-
Create	-	-	-	-
Course Articulation Matrix				

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	-	-	-	-	2	2	-	-	-	1	1	1
2	3	2	1	-	-	-	-	2	2	-	-	-	1	1	1
3	3	2	1	-	-	-	-	2	2	-	-	-	1	1	1
4	3	2	1	-	-	-	-	2	2	-	-	-	1	1	1
5	3	2	1	-	-	-	-	2	2	-	-	-	1	1	1
6	3	2	1	-	-	-	-	2	2	-	-	-	1	1	1
Avg	3	2	1	-	-	-	-	2	2	-	-	-	1	1	1
1	Reasonably agreed					2		Moderately agreed				3	Strongly agreed		

OPEN ELECTIVES

18CE001	DISASTER MANAGEMENT	3/ 0/ 0/ 3
Nature of Course	Theory Concept	
Pre-Requisites	-	
Course Objectives:		
1.	To understand the knowledge of the disaster phenomenon, its different contextual aspects, Impacts and public health consequences.	
2.	To remember different disaster management schemes.	
3.	To understand recent trends in disaster management	
4.	To apply disaster management in Forecasting and warning of disasters	
5.	To analyse the risk and vulnerability in disaster management	
Course Outcomes		
Upon completion of the course, students shall have ability to		
C001.1	Identify the disaster management schemes and components	[AP]
C001.2	Analyze the potential effects of disasters and methods to deliver public health response to avert these effects and as well risk and vulnerability in disaster management	[AN]
C001.3	Apply disaster management in Forecasting and warning of disasters and disaster management technique	[AP]
C001.4	Construct the risk assessment to resolve the uncertainty and risk occurs due to disaster	[AP]
C001.5	Examine the recent trends in disaster management	[AN]
C001.6	Classify the Emergency Management System for all the disasters	[AN]
Course Contents		
Module 1: Introduction to Disaster Management		15 Hrs
Dimensions of natural & anthropogenic disasters – Principles/ components of disaster management – Classification of Disasters - Organizational structure for disaster management –Disaster management schemes– Natural disasters and mitigation efforts – Flood control – Drought management – Cyclones – Land use planning, NBC threat and safety measures – Forest fires – Oil fires – Crisis in power Sector – Accidents in coal mines		
Module 2: Disaster Management in India		15 Hrs
Disaster management in India- Coastal Hazards - Assessing risk and vulnerability- Disaster preparedness – Disaster mitigation – Forecasting and warning of disasters - Role of news media in Disaster management –Rehabilitation of victims - Operations Management (OM) – Risk assessment and disaster response – NGO management – SWOT analysis based on design & formulation strategies – Insurance & risk management, Institution awareness and safety programs- Funding's for disaster management.		
Module 3: Recent Trends in Disaster Management and its Applications		15 Hrs
Recent trends in disaster information provider – Electronic warning systems -Geo Informatics - Psychological and social dimensions in disasters– Trauma and stress – Emotional intelligence -Applications in disaster management – Management of epidemics – Bio-Terrorism – Forecasting and Management of casualties - Emergency Management Systems (EMS).		

													Total Hours	45 Hrs		
Text Books:																
1.	Palanivel K., "Disaster Management", Allied Publishers, 2015.															
2.	Sulphrey M.M., "Disaster Management" PHI Learning Publications, 2016.															
3.	Amita Singh, " Development and Disaster Management", Springer, 2018.															
Reference Books:																
1.	Handbook of Disaster Management and Emergency Management", Kompendiet, Gothenburg Sweden, 2017.															
2.	SathishModh, Introduction to Disaster Management, Macmillan publishers, New Delhi, 2010.															
3.	Arulsamy S., "Disaster Management" , Neelkamal Publications, 2016															
4.	Nicolas A. Valcik, "Case Study in Disaster Response and Emergency Management", Taylor and Francis group, 2017.															
Web References:																
1.	www.nidm.gov.in/online															
2.	https://swayam.gov.in/courses/4983-disaster-management															
Online Resources:																
1.	nptel.ac.in/ courses/ 105107123															
2.	nptel.ac.in/ courses/ 114106025															
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome		Revised Bloom's Level				Assessment Component				Marks						
C001.1 to C001.6		Apply				Quiz				5						
C001.1 to C001.6						Surprise Test				5						
C001.1 to C001.6		Analyze				Technical Presentation				5						
C001.1 to C001.6						Assignment				5						
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [50 marks]			
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]													
Remember	30	30										30				
Understand	30	30										20				
Apply	20	20										30				
Analyze	20	20										20				
Evaluate	-	-										-				
Create	-	-										-				
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	2	2	1	2	-	2	-	2	-	-	-	-	3	-	3	

2	3	3	2	3	-	1	-	2	-	2	-	2	3	2	3
3	3	2	1	2	-	2	-	2	-	-	-	1	3	2	2
4	3	2	1	2	-	2	-	2	-		-	2	3	3	3
5	3	3	2	3	-	1	-	2	-	2	-	3	3	3	3
6	3	2	1	2	-	2	-	2	-	-	-	1	3	-	2
Avg	2.8	2.3	1.3	2.3	-	1.7	-	2.0	-	2.0	-	1.8	3	2.5	2.7
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE002	ENGINEERING RISK AND UNCERTAINTY	3/0/0/3
Nature of Course	Theory and Application	
Pre requisites	-	
Course Objectives:		
1.	To understand the methods of Risk analysis and assessment.	
2.	To understand the measures of risk mitigation.	
3.	To obtain knowledge on the contributors to risk and precursor analysis.	
4.	To understand the types of Uncertainty and methods of propagation.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C002.1	Identify the elements of Risk and methods of risk assessment	[AP]
C002.2	Perform the Qualitative and Quantitative assessments of risk	[AP]
C002.3	Use rank and predict the contributors to risk	[AP]
C002.4	Illustrate the measures of uncertainty and the methods for assessing propagation	[AN]
C002.5	Outline quantitative uncertainty analysis and risk assessment.	[AN]
C002.6	Apply models in assessing the risk involved.	[AP]
Course Contents:		
Module 1: Introduction of Risk and Decision Analysis		20 Hrs
Introduction – Importance of risk analysis - Elements and types of risk analysis,-Risk Assessment, management and communication - Elements and types of risk assessment – Risk and hazard – Engineering risk assessment – performance and elements of a risk assessment – Risk mitigation- approaches to risk management, monitoring for compliance, risk perception and design implications – Decision analysis - the multi stage decision model – the value of perfect information – the axioms of rational behaviour – introduction to utility – risk aversion – multi attribute utility theory – decision analysis and risk management		
Module 2: Cost benefit analysis		10 Hrs
explanation – objectives; types of evaluation; programme evaluation and CBA; CBA in practice – need for undertaking CBA – when to use CBA - Importance ranking in probabilistic risk assessment- importance measures in success risk assessment- Precursor analysis		
Module 3: Process and Uncertainty		15 Hrs
Determining scope and objective – assessing constrains – considering alternatives – identification, quantification and valuation – evaluation of net present value – sensitivity analysis – equity and distributional implications – results – recommendation and report generation; case study. Uncertainty – Types of uncertainty – Measure of uncertainty – Uncertainty propagation methods – Comparison of uncertainty propagation methods – Graphic representation		
Total Hours:		45 Hrs
Text Book		
1.	Ayyub B. M., “Risk Analysis in Engineering and Economics “, , Chapman-Hall/CRC Press, 2014.	
2.	Mohammad Modarres, “Risk Analysis in Engineering- Techniques, Tools and Trends”, CRC- Taylor & Francis Group CRC Press, Florida,2019	
3.	Mohammad Modarres, Mark P.Kaminskiy and Vasiliy Krivitsov, “Reliability Engineering and Risk Analysis”, CRC- Taylor & Francis Group CRC Press, Florida. (Edition 2017)	
Reference Books:		
1.	Vose, David , “Risk Analysis: A Quantitative Guide”, 3rd Edition, John Wiley & Sons Ltd, 2008	

2.	Mankiw, G. Principles of Economics (Mason, OH: South-Western Cengage Learning) 2008.														
3.	Sergio E.Serrano, "Engineering uncertainty and risk analysis", Hydro science Inc., 2011														
4.	Ehsan Goodarzi, Mina Ziaei and Lee Teang Shui, "Introduction to risk and uncertainty in hydrosystem engineering", Springer, 2013														
Online Resources:															
1.	https://nptel.ac.in/courses/105103133/30														
2.	https://www.etikkom.no/globalassets/documents/publikasjoner-som-pdf/risk-and-uncertainty-2009.pdf														
3.	https://www.researchgate.net/publication/290883771_Risk_Assessment_Handbook														
Web Resources:															
1.	https://www.pmi.org/learning/library/risk-analysis-project-management-7070														
2.	https://www.guru99.com/risk-analysis-project-management.html														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level	Assessment Component	Marks												
C002.1 - 6	Analyse	Project Based Learning (Risk Assessment tools and presentation)	20												
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]											
	CIA- I [10 marks]	CIA-II [10 marks]	CIA - III [10 marks]												
Remember	10	-	-	10											
Understand	20	30	20	20											
Apply	40	30	30	40											
Analyse	30	40	50	30											
Evaluate	-	-	-	-											
Create	-	-	-	-											
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	-	-	3	-	-	2	2	2	1	-	-	1	1
2	-	-	-	-	3	-	-	1	2	2	1	2	-	1	2
3	-	-	-	-	3	-	-	2	2	2	1	-	-	1	1
4	-	-	-	-	3	-	-	2	2	2	1	-	-	1	1
5	-	-	-	-	3	-	-	1	2	2	1	2	-	2	2
6	-	-	-	-	3	-	-	1	2	2	1	2	-	2	2
Avg	-	-	-	-	3	-	-	1.5	2	2	1	2	-	1.3	1.5
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE003	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	3/0/0/3
Nature of Course	Theory Concept	
Pre requisites	-	
Course Objectives:		
1.	To be introduced to environmental and social impact assessment and the current legislation covering it	
2.	To acquire knowledge regarding the methods of assessing the impact	
3.	To learn and understand Prediction, Assessment of Impact and mitigation measures for the impact	
4.	To know about the various impacts of development projects on environment and the mitigating measures	
5.	To deal with the various impacts of infrastructure projects on the components of environment	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C003.1	Develop the key concepts of environmental and social impact assessment and the current legislation covering it	[AP]
C003.2	Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna and Socio Economics	[AN]
C003.3	Plan options for mitigation of adverse impact on environment and society	[AP]
C003.4	Examine issues that affect the quality of the EIA Report	[AN]
C003.5	Present and explain the components and decision-making processes involved in environmental and social assessment through various case studies	[AP]
C003.6	Carry out scoping and screening of developmental projects for environmental and social assessments	[AP]
Course Contents:		
Module 1: Introduction to EIA and Methodologies		20 Hrs
Impact of Development projects on Environment – Evolution of Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) – Objectives – EIA Types –EIA in project cycle – capacity and limitations – Legal provisions on EIA – Environmental Impact Assessment Notifications – Environmental Impact Assessment Consultants –Legal provisions on EIA. Methods of Categorization of industries for EIA - Elements of EIA – Process screening, baseline studies, mitigation, matrices, checklist -Methods of EIA –Strengths, weaknesses and applicability – appropriate methodology solution.		
Module 2: Prediction, Assessment and mitigation measures for impact		15 Hrs
Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna, Socio Economic Impact, Mathematical models for Impact prediction, Rapid EIA, Public participation – Post Environmental Audit. Social Impact Assessment (SIA)- Objectives and purpose. Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, water, energy, flora and fauna; Addressing the issues related to the Project Affected People – Environment management Plan – ISO 14000		
Module 3: Case Studies		10 Hrs
EIA and SIA case studies for new and expansion projects - wastewater treatment plants, water supply and drainage, Highways and bridges- Railways - Dams, Irrigation projects, Power plants.		
		Total Hours: 45 Hrs
Text Books:		

1.	Anjaneyulu,Y,"Environmental Impact Assessment methodologies", B.S. Publications,2011
2.	Anji Reddy Mareddy, " Environmental Impact Assessment – Theory and Practice" , B S Publications, 2017
3.	RikiTherivel, "Methods of Environmental and Social Impact Assessment", Routledge Publisher, 2018
4.	N S Raman, A R Gajbhiye and S R Khandeshwar, "Methods of Environmental Impact Assessment", Dreamtech Publisher, 2019

Reference Books:

1.	Barthwal R R., "Environmental Impact Assessment" New age International Pvt.Ltd., 2012
2.	Angus Morrison, " Advanced Introduction to Environmental Impact Assessment", Edward Elgar Publising Ltd., 2018.
3.	SalimMomtaz, ZobaidulKabir S M., "Evaluating Environmental and Social Impact Assessment in Developing Contries", Elsevier Publications,2013
4.	Peter Wathern, " Environmental Impact Assessment – Theory and Practice" Routledge Publisher, 2013
5.	Shukla S. K. and Srivastava P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 2009.

Web References:

1.	http://www.moef.gov.in/citizen/specinfo/eia.html
2.	http://www.moef.gov.in/citizen/specinfo/emp.html
3.	http://environmentclearance.nic.in/

Online Resources:

1.	https://nptel.ac.in/courses/120108004/5
2.	https://www.gov.je/Planning Building/LawsRegs/SPG/PracticeNotes/Pages/EIA.aspx

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C003.1 - 6	Analyze	Project Based Learning system (Project demonstration, Presentation and Report writing)	20

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 marks]
	CIA-I [10 Marks]	CIA-II [10 Marks]	CIA-III [10 Marks]	
Remember	-	-	-	-
Understand	20	60	20	30
Apply	70	20	40	40
Analyse	10	20	40	30
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	-	-	-	-	-	3	2	-	-	-	2	-	1	1
2	2	-	-	-	-	-	2	2	-	-	-	2	-	-	2
3	3	3	3	3	2	2	2	2	2	1	-	3	2	2	2
4	2	-	-	-	-	-	2	2	-	-	-	2	-	1	1

5	3	3	2	2	2	2	3	2	2	1	-	3	2	-	2
6	2	1	-	1	-	-	2	2	-	-	-	2	-	-	2
Avg	2.3	2.3	2.5	2	2	2	2.3	2	2	1	-	2.3	2	1.3	1.7
1	Reasonably agreed			2	Moderately agreed				3	Strongly agreed					

18CE004	GEOGRAPHICAL INFORMATION SYSTEMS	3/0/0/3
Nature of Course	Theory application	
Pre requisites	-	
Course Objectives:		
1.	To possess knowledge about GIS techniques and its application in the field of Civil Engineering.	
2.	To possess knowledge on GIS application	
3.	To provide an understanding of the basic concepts and uses of GIS technology and spatial analysis	
4.	To provide an understanding and use of social and environmental systems information in the design and planning process	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C004.1	Apply the basic concepts, types of data available and development of maps using GIS	[AP]
C004.2	Demonstrate the input data analysis using GIS software	[AP]
C004.3	Prepare the maps and models by using various software tools	[AP]
C004.4	Analyse the complete error analysis using various methods	[AN]
C004.5	Manipulate the basic concepts involved in GIS by using modern methods	[AP]
C004.6	Apply the GIS concepts in various resource management techniques	[AP]
Course Contents:		
Module 1: GIS Technique and Data Input		15 Hrs
MAP – Types of Maps – Development of GIS – Components of GIS – Hardware, software, organisation – Types of data – Spatial and non-spatial data – Print, Line and Polygon – Vector and Raster data – Database structures – Files – Vector and Raster data structures.		
Module 2: Data analysis and Modelling		15 Hrs
Data Retrieval – Query – Simple Analysis – Spatial Analysis – Overlay – Vector Data Analysis – Raster Data Analysis – Modelling using GIS – Digital Elevation Model - Raster vs Vector Models- TIN and GRID data models – Cost and path analysis – Expert Systems – Artificial Intelligence – connectivity and containment – Topological Consistency – Non topological file formats – Attribute Data linking –Linking External Databases – Integration with GIS. Data output and error analysis: Data Output – Types – Devices used – Raster and Vector Display Devices – Printers – Plotters – Photo write Devices – Sources of Errors – Types of Errors – Elimination – Accuracies.		
Module 3: Advanced GIS Applications		15 Hrs
AM/FM – Utility Network Management – Integration with Remote Sensing – Knowledge based techniques – Multi-criteria Techniques – Introduction to Object Oriented Data base Models. GIS applications in resource management: Fields of Applications – Natural Resources – Agriculture – Soil – Water Resources – Wasteland Management - Social Resources - Cadastral Records – LIS - Water resources – Urban Analysis – Watershed Management – Resources Information Systems.		
		Total Hours: 45 Hrs
Text Books:		
1.	Michael N.Demers, "Fundamentals of GIS", Wiley.,2012	
2.	Tor Bernhardsen, "GIS an Introduction", Wiley.,2011	
3.	Jayceon Garcia, "Introduction to GIS", Larsen and Keller Education.,2017	

4.	WilpenL.Gorr and Kristen S.Kurland, "GIS Tutorial", ESRI press.,2016															
Reference Books:																
1.	Sinha S.K, "Fundamentals of Remote sensing and GIS", Ayushman Publication house., 2014															
2.	Kumar.S, "Basics of Remote sensing and GIS", Laxmi publications.,2016															
3.	Paul Bolstad, "GIS Fundamentals", XanEdu Publishing Inc.,2016															
Web References:																
1.	http://www.gdmc.nl/oosterom/PoGISHyperlinked.pdf															
2.	https://www.researchgate.net/publication/323945547_Fundamentals_of_GIS															
3.	http://giswin.geo.tsukuba.ac.jp/sis/tutorial/Fundamentals_of_GIS_Estoque.pdf															
4.	https://webapps.itc.utwente.nl/librarywww/papers_2009/general/principlesgis.pdf															
Online Resources:																
1.	https://nptel.ac.in/courses/105102015/															
2.	https://nptel.ac.in/courses/105108073/															
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome	Revised Bloom's Level					Assessment Component						Marks				
C004.1 - 6	Apply					Online Course (MOOC)						20				
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [50 marks]			
	CIA-I [10 marks]				CIA-II [10 marks]				CIA - III [10 marks]							
Remember	-				-				-				-			
Understand	60				50				40				50			
Apply	40				50				60				50			
Analyse	-				-				-				-			
Evaluate	-				-				-				-			
Create	-				-				-				-			
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	2	-	-	-	-	2	-	-	-	-	-	-	2	-	2	
2	3	3	-	-	3	2	-	2	-	2	-	-	2	-	2	
3	3	2	-	-	2	2	-	1	-	-	-	-	2	-	2	
4	3	2	1	-	2		-	-	-	2	-	-	3	-	-	
5	3	2	1	-		1	-	-	-	-	-	-		-	1	
6	-	2	1	-	2	-	-	-	-	1	-	-	1	-	1	
Av g	2.8	2.2	1	-	2.3	1.8	-	1.5	-	1.7	-	-	2	-	1.7	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18CE005	INDUSTRIAL POLLUTION PREVENTION		3/0/0/3
Nature of Course	Theory application		
Pre requisites	-		
Course Objectives:			
1.	Identify pollution prevention policies, concepts, and terminology		
2.	Understand the cause for the pollution in industries		
3.	Evaluate technologies and approaches to cost-effectively eliminate waste and pollution and reduce energy consumption		
4.	Recommend appropriate technologies based on the process in industries		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C005.1	Illustrate the implications of industrial revolution on the environmental pollution and classified pollutants based on industries.		[AP]
C005.2	Articulate the conservation model for process management and relate the regulatory guidelines laid for the industrial emissions.		[AP]
C005.3	Illustrate the various waste minimization, control and treatment technologies related to industrial effluents.		[AP]
C005.4	Model the suitable pollution control strategies on air and noise pollution from industrial sectors.		[AN]
C005.5	Report the process and emission of various industries		[AP]
C005.6	Analyse and develop a sustainable industrial process model to prevent the emissions.		[AN]
Course Contents:			
Module 1: Introduction			15 Hrs
Man and the environment - Consequences of industrial pollution growth - Impact on environment by industrial growth. Sources - Types of Industrial pollutants. Mass & Energy balance system - Industrial Management Concept - Zoning Atlas - Government Guidelines and legislations for industries			
Module 2: Pollution Prevention Technologies			15 Hrs
Cleaner Production - Life Cycle Assessment – Waste minimization methods - Zero Effluent Discharge – ETP & CETP - Air pollution source, emissions, cause and control – Noise Pollution cause - control measures			
Module 3: Case Studies			15 Hrs
Industrial Process and pollution prevention in Petroleum Industry - Chemical Industry - Pulp & Paper Industry - Tannery Industry - Cement Industry - Pharmaceuticals Industry - Iron and Steel Industry - Distillery Industry			
			Total Hours: 45 Hrs
Text Books:			
1.	Rao. C.S., “Environmental Pollution and Control Engineering”, 2 nd Edition, Revised, Wiley Eastern Limited, India, 2018		
2.	Metcalf & Eddy, “Wastewater Engineering”, Tata McGraw-Hill Education Private Limited, 2009		
3.	Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. “Environmental Engineering”, McGraw Hill International, 2017		
Reference Books:			
1.	Mahajan. S.P., “ Pollution Control in Process Industries ”, Tata-McGraw Hill, New Delhi, 1985		

2.	Henry C. Perkins, Air Pollution McGraw Hill W.L. Faith, Air Pollution control, John Wiley Charles E. Baukal, Jr :Industrial Combustion Pollution and control, Marcel Dekker, Inc, N.Y. 2004
3.	Mahajan. S.P., " Pollution Control in Process Industries ", Tata-McGraw Hill, New Delhi, 1985

Web References:

1.	http://www.cpcb.nic.in
2.	http://www.moef.nic.in/report/0203/chap-05.pdf
3.	http://www.moef.gov.in/citizen/specinfo/enguin.html

Online Resources:

1.	https://nptel.ac.in/courses/105102089/8
2.	https://nptel.ac.in/courses/105104099/39

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C005.1 – C005.6	Analyse	Massive Open Online Courses recommended by the course instructor	20

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 Marks]
	CIA I [10 Marks]	CIA II [10 Marks]	CIA III [10 Marks]	
Remember	20	-		20
Understand	70	60	50	20
Apply	10	40	50	60
Analyse	-	-	-	
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	3	-	2	-	2	-	-	-	-	-	1	2	2	2
2	-	2	3	2	-	2	2	2	-	2	-	1	3	1	2
3	3	2	3	2	-	1	2	2	-	-	-	2	2	3	2
4	2	2	3	2	-	1	-	-	-	-	1	2	3	2	3
5	2	2	-	1	-	2	-	-	-	1	-	1	-	2	1
6	3	2	3	2	-	1	2	2	-	1	-	1	3	2	2
Avg	2.4	2.2	3.0	1.8	-	1.5	2.0	2.0	-	1.3	1.0	1.3	2.6	2.0	2.0
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE006	SMART MATERIALS & SMART STRUCTURES	3/0/0/3
Nature of Course	Theory application	
Pre requisites	-	
Course Objectives:		
1.	To enable the students understand importance and structure of smart materials	
2.	To make the students understand the applications of smart materials	
3.	To familiarize students with different types of smart materials used in engineering field	
4.	To develop the knowledge in actuators and sensors and their integration into a smart structure.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C006.1	Understand and apply the concept of smart materials and their structural applications.	[U]
C006.2	Apply the vibration absorbers appropriately.	[AP]
C006.3	Measure the strain using strain gauges.	[AP]
C006.4	Use control techniques in Civil Engineering.	[AN]
C006.5	Implement the Shape Memory techniques - Alloys in Bridges.	[AP]
C006.6	Perform the Structural Health Monitoring using modern tools.	[AP]
Course Contents:		
Module 1: Properties of Materials and Vibration Absorbers		15 Hrs
Introduction to smart materials and structures - Piezoelectric Materials and properties - Actuation of structural components - Shape Memory Alloys - Constitutive modelling of the shape memory effect, vibration control - Embedded actuators - Electro rheological and magneto rheological fluids - Mechanisms and Properties - Fiber Optics - Fiber characteristics - Fiber optic strain sensors. Parallel damped vibration absorber - Gyroscopic vibration absorber - Active vibration, absorber - Applications - Vibration Characteristics of mistuned systems - Analytical approach.		
Module 2: Measuring Techniques and Control Of Structures		15 Hrs
Strain Measuring Techniques using Electrical strain gauges - Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes – Chemical and bio chemical sensing in structural assessment -Control modelling of structures - Control strategies and limitations - Classification of control systems: Classical control, Modern control, Optimal control and Digital control - Active structures in practice.		
Module 3: Applications In Civil Engineering		15 Hrs
Application of Shape Memory - Alloys in Bridges – Concept of Smart Bridges – Application of ER Fluids - Application of MR Dampers in Different Structures – Application of MR Dampers in Bridges and High Rise Structures – Structural Health Monitoring - Application of Optical Fibres - Concept of Smart Concrete.		
		Total Hours: 45 Hrs
Text Books:		
1.	Michelle Addington and Daniel Schodek, “Smart materials and new technologies”, Elsevier, 2015	
2.	You-lin Xu and Jia He Smart, “ Smart Civil structures”, CRC Press, First edition 2017	
3.	Anca Filimon, “ Smart materials”, Apple Academic Press, 2018	

Reference Books:																
1.	Srinivasan A.V and Michael McFarland, “ Smart structures”, Cambridge University press, 2009															
2.	Rajan Vepa, “Dynamics of smart structures”, Wiley, 2008															
3.	Gandhi, M.V and Thompson, B.S., “Smart Materials and Structures”, Chapman and Hall, 1992															
Web References:																
1.	https://www.youtube.com/watch?v=yXHllowQntk															
2.	https://www.scribd.com/document/87509211/Smart-Structures-and-Materials															
Online Resources:																
1.	https://www.youtube.com/watch?v=ync30eHVD8s															
2.	https://www.youtube.com/watch?v=b5IPJeCDEPw															
Tentative Assessment Methods & Levels (based on Revised Bloom’s Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome	Revised Bloom’s Level					Assessment Component							Marks			
C006.1	Understand					Online Quiz							5			
C006.2 & C006.3	Understand					Group assignment							5			
C006.4 & C006.5	Apply					Case study							5			
C006.6	Analyse					Technical Presentation							5			
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom’s Level	Continuous Assessment												End Semester Examination (Theory) [50Marks]			
	CIA-I [10 marks]	CIA-II [10 marks]	CIA - III [10 marks]													
Remember	20			-			-			20						
Understand	80			50			70			50						
Apply	-			50			30			30						
Analyse	-			-			-			-						
Evaluate	-			-			-			-						
Create	-			-			-			-						
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	
1	3	2	1	-	3	-	-	2	2	2	-	1	1	1	1	
2	3	2	1	-	3	-	-	2	2	2	-	1	1	1	1	
3	3	2	1	-	3	-	-	2	2	2	-	1	1	1	1	
4	3	2	2	-	3	-	-	2	2	2	-	1	1	1	1	
5	3	2	1	-	3	-	-	2	2	2	-	1	1	1	1	
6	3	2	1	-	3	-	-	2	2	2	-	1	1	1	1	
Av g	3	2	1	-	3	-	-	2	2	2	-	1	1	1	1	
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed				

EMERGING ELECTIVE COURSES

18CE007	BUILDING SERVICES PLANNING AND MANAGEMENT	3/0/0/3
Nature of Course	Theory Concept	
Pre requisites	-	
Course Objectives:		
1.	To understand how a building can be made comfortable and safe with the services designed and installed.	
2.	To impart knowledge on basics of electrical wiring system.	
3.	To impart knowledge on basics of air conditioning and lighting.	
4.	To recognize the importance of fire detection and protection.	
5.	To impart knowledge on basics of water supply fixture.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C007.1	Distinguish various machinery used in different types of buildings.	[AP]
C007.2	Examine the electrical layout and the safety installation in buildings.	[AN]
C007.3	Plan a building for physically handicapped and elderly people friendly.	[AN]
C007.4	Design illumination and artificial lighting suitable for various buildings	[AP]
C007.5	Summarize the water supply network and the sanitary fixtures.	[AP]
C007.6	Plan fire safety installation for any building.	[AN]
Course Contents:		
Module 1: Machinerics and Electrical Systems in Buildings		15 Hrs
Lifts and Escalators - Special features required for physically handicapped and elderly people, Conveyors, Vibrators, Concrete mixers, AC/DC motors, Generators, Air conditioning system, Basic amenities of Gas, Water, Air and Electricity. Basics of electricity, Single/Three phase supply, Solar panels their installation and applications, Protective devices in electrical installations, Transformers and switch gears, Earthing for safety, Types of earthing, ISI Specifications, Types of wires, wiring systems and their choice, Planning electrical wiring for buildings, Main and distribution boards, layout of substations.		
Module 2: Principles of Illumination and Design		15 Hrs
Design of modern lighting, lighting for stores, offices, schools, hospitals and house lighting, Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.		
Module 3: Water Supply, Sanitary fixtures, Fire and Safety Installation		15 Hrs
Principles of design of water supply in buildings - House service connection - Fixtures and fittings - Systems of plumbing and drawings of types of plumbing. Causes of fire in buildings - Safety regulations - NBC Guidelines, Planning considerations in building for Fire protection - fire detection and firefighting installations in buildings, Necessity of integrated planning and designing of different services in buildings.		
Total Hours:		45 Hrs
Text Books:		
1.	Udhayakumar, R., "A text book of Building services", Eswar Press, Chennai, 2013.	
2.	Roger Greeno and Fred Hall, "Building Services Handbook", (8th edition), Routledge Publishers, New Delhi, 2015.	

3.	Steffy, G., "Architectural Lighting Design: A Practical Guide", Crowood Press, 2019.															
Reference Books:																
1.	Killinger J. and Killinger L., "Heating and Cooling Essentials", Goodheart – Wilcox Publishers, 2013.															
2.	National Building Code of India, BIS 2016.															
3.	Handbook of Building Engineers in Metric Systems, NBC, New Delhi, 2012.															
4.	Handbook of Housing Statistics, NBO, 2013.															
Web References:																
1.	www.understandconstruction.com/building-services															
2.	https://ipf.msu.edu/about/departments/building-services															
Online Resources:																
1.	https://www.academiccourses.com															
2.	http://web.mit.edu/facilities/maps/MIT_bldg_design_handbook.pdf															
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome	Revised Bloom's Level					Assessment Component						Marks				
C007.1 - 6	Analyse					Project Based learning (Software usage and project presentation)						20				
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) [50 Marks]			
		CIA-I [10 marks]			CIA-II [10 marks]			CIA III [10 marks]								
Remember		20			20			20					20			
Understand		60			20			20					20			
Apply		20			40			40					40			
Analyse		-			20			20					20			
Evaluate		-			-			-					-			
Create		-			-			-					-			
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	2	1	-	1	-	-	-	-	2	2	-	2	2	-	2	
2	3	2	1	1	2	-	-	3	2	2	-	2	2	1	2	
3	2	1	-	1	-	1	-	3	2	2	-	2	2	-	2	
4	3	2	1	1	2	2	-	-	2	2	-	3	2	1	2	
5	2	1	-	1	-	1	2	2	2	2	-	2	2	-	2	
6	3	2	1	1	2	2	2	3	2	2	-	2	2	1	2	
Av g	2.5	1.5	1	1	2	1.5	2	2.8	2	2	-	2.2	2	1	2	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18CE008	CONDITION ASSESSMENT OF MATERIALS AND STRUCTURES		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	-		
Course Objectives:			
1.	To understand the diverse quality assessing methods for concrete.		
2.	To learn about the non-destructive testing methods for concrete, masonry, steel and timber structures.		
3.	To know the quality assessing methods for structural steel.		
4.	To understand the latest structural health monitoring techniques.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C008.1	Examine the quality assessment methods of concrete		[AN]
C008.2	Execute the non-destructive testing methods for concrete, masonry and timber structures.		[AP]
C008.3	Examine the quality assessment methods of structural steel		[AN]
C008.4	Execute the non-destructive testing methods for structural steel		[AP]
C008.5	Analyze structural health monitoring by various methods		[AN]
C008.6	Implement the latest techniques in structural health monitoring		[AP]
Course Contents:			
Module 1: Assessment of Concrete			15 Hrs
Cause of deterioration: Service and exposure conditions, visual investigation, Assessment of corrosion – corrosion control methods – chemical attack – causes and control of cracking, active and inactive cracks – Different non-destructive and partial destructive methods of investigation for concrete, masonry and timber structures – Schmidt hammer test, concrete core drilling, Ultrasonic pulse velocity, rebar locator, half-cell potentiometer, concrete resistivity, impact echo test, pull off test, petrography – Condition assessment of flexible and rigid pavements.			
Module 2: Assessment of Structural Steel			15 Hrs
Testing of Structural Steel, lamination – Dynamic loading and fatigue – Welding technology, weldability – Inspection of riveted, welded and bolted connections – Quality control of aspect of welded joints – Different non-destructive methods of testing for steel structures – DP test, ultrasonic and radiography test – fire damaged structures.			
Module 3: Structural Health Monitoring			15 Hrs
Active and passive health monitoring techniques – load testing of structures, dynamic testing of structures – Introduction to system identification techniques: Sensors, Exciters, Data acquisition and data processing, filtering technique, sampling rate – Application of digital signal processing in structural health monitoring – Introduction to probabilistic structural health monitoring.			
			Total Hours: 45 Hrs
Text Books:			
1.	Shetty M.S., “Concrete Technology – Theory and Practice”, S. Chand Publishing, New Delhi, 2014.		
2.	Mohammed A. El-Reddy, “Concrete and Steel Construction – Quality control and assurance”, CRC Press, US, 2013.		
3.	Fu-Kuo Chang and Fotis Kopsaftopoulos, “Structural Health Monitoring”, DES tech Publications. Inc, US, 2017.		
Reference Books:			
1.	Mohamed Abdullah El-Reddy, “Assessment, Evaluation and Repair of Concrete, Steel and Offshore Structures”, CRC Press, US, 2018.		

2.	Wong B Stephen, "Non-Destructive Testing – Theory, practice and industrial applications", Lambert Academic Publishing, US, 2014.
3.	Ruqiang Yan and Subhas Chandra Mukhopadhyay, "Structural Health Monitoring", Springer International Publishing AG, Switzerland, 2017.
4.	Athanasios Nikolaidis, "Highway Engineering: Pavements, Materials and Control of quality", CRC Press, US, 2014.

Web References:

1.	https://www.masterbuilder.co.in/non-destructive-testing-ndt-concrete-repair-projects/
2.	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470061626

Online Resources:

1.	https://onlinecourses.nptel.ac.in/noc18_oe05/preview
2.	http://decibelnde.com/course/certified-civil-quality-controller/

Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks: 20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C008.1	Analyze	Project Based Learning (Project Demonstration, Presentation and Report Writing)	20
C008.2	Apply		
C008.3 & C008.4	Analyze & Apply		
C008.5 & C008.6	Analyze & Apply		

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Taxonomy	Continuous Assessment			End Semester Examination (Theory) [50 Marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA III [10 marks]	
Remember	10	10	10	10
Understand	10	10	10	10
Apply	30	20	20	20
Analyse	50	60	60	60
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	2	-	-	1	1	1	-	2	2	-	1
2	3	2	1	1	2	-	-	1	1	1	-	2	2	-	1
3	3	3	2	2	2	-	-	1	1	1	-	2	2	-	1
4	3	2	1	1	2	-	-	1	1	1	-	2	2	-	1
5	3	3	2	2	2	-	-	1	1	1	-	2	2	-	1
6	3	2	1	1	2	-	-	1	1	1	-	2	2	-	1
Avg	3	3	2	2	2	-	-	1	1	1	-	2	2	-	1
1	Reasonably agreed				2	Moderately agreed				3	Strongly agreed				

18CE009	INSTRUMENTATION AND SENSOR TECHNOLOGIES FOR ENGINEERING APPLICATIONS		3/0/0/3
Nature of Course	Theory Concept		
Pre-Requisites	-		
Course Objectives:			
1.	To understand the principles of operation and characteristics of instrumentation and Integrated sensor systems.		
2.	Recognize and apply measurement best practice and identify ways to improve measurement and evaluation		
3.	Troubleshoot and solve problems in instrumentation and measurement systems		
4.	Able to calculate the statistical information		
5.	Interpretation of signals to get deeper insight into physical phenomena		
Course Outcomes			
Upon completion of the course, students shall have ability to			
C009.1	Choose right use of sensors and instruments for different applications along with limitations		[AP]
C009.2	Differentiate the sensors and their modes of operation measurements		[AN]
C009.3	Suggest proper sensor technologies for specific applications		[AN]
C009.4	Apply his knowledge to set up measurement systems and do the studies		[AP]
C009.5	Analyse Frequency Domain Signal Processing		[AN]
C009.6	Describe the requirements during the transmission of measured signals		[U]
Course Contents :			
Module 1: Fundamentals of Measurement, Sensing and Instrumentation		10 Hrs	
Definition of measurement and instrumentation - physical variables - common types of sensors and their functions - Sensor applications – interpretation of signals from a known sensor type - types of instrumentation - Sensor Specifics.			
Module 2: Sensor Installation, Operation, Analysis and Interpretation		20 Hrs	
Predict the response of sensors to various inputs - Construct a conceptual instrumentation and monitoring program - sensor installation - Differentiate between types of sensors and their modes of operation and measurement - Piezometer, Inclinator, Strain gauge - Time domain signal processing - Discrete signals, Signals and noise - a few examples of statistical information to calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range).			
Module 3: Frequency Domain Signal Processing and Analysis		15 Hrs	
Need for frequency domain analysis and its principles - Draw conclusions about physical processes based on analysis of sensor data - Combine signals in a meaningful way to gain deeper insight into physical phenomena - Basic concepts in frequency domain signal processing and analysis - Fourier Transform - FFT (Fast Fourier Transform) - Example problems: Noise reduction with filters, Leakage, Frequency resolution.			
Total Hours:			45 Hrs
Text Books:			
1.	David A. Bell, "Electronic Instrumentation and Measurements", Oxford University Press, India, 2013.		
2.	IlyaGertsbakh, "Measurement Theory for Engineers", Springer, 2010.		
3.	Aruthur Whitemore Smith, "Principles of Electrical Measurements", Nabu Press, 2010.		
Reference Books:			
1.	Albert D. Helfrick, "Modern Electronic instrumentation and measurement techniques", Pearson Education, India, 2015.		

2.	Rajput R. K., "Electrical and Electronic Measurements and Instrumentation", S Chand and Company, 2016.
3.	Navani J. P., "Electronic Measurement and Instrumentation", S Chand and Co. Ltd, 2015.
4.	Johnson, "Process Control Instrumentation Technology", Pearson Education India, 2015

Web References:

1.	https://lecturenotes.in/subject
2.	www.worldsensing.com

Online Resources:

1.	https://youtu.be/qbKnW42ZM5c
2.	www.ivt.ntnu.no/imt/courses

Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C009.2 – C009.5	Analyse	Project Based Learning	20

Summative assessment based on Continuous and End Semester Examination

Revised Bloom's Level	Continuous Assessment			End Semester Examination (Theory) [50 Marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA III [10 marks]	
Remember	-	-	-	-
Understand	60	40	30	30
Apply	40	40	30	30
Analyse	-	20	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
1	3	-	-	1	-	-	-	1	-	-	-	1	1	1	1	
2	3	3	-	1	2	-	-	-	2	-	1	1	2	-	-	
3	3	2	-	2	2	-	-	-	2	-	1	1	1	1	1	
4	3	2	-	-	2	-	-	-	2	-	1	1	3	1	1	
5	2	3	-	2	2	-	-	-	2	-	1	1	3	-	-	
6	1	3	-	-	-	-	-	-	-	-	-	1	1	-	-	
Avg	2.5	2.6	-	1.5	2.0	-	-	1.0	2.0	-	1.0	1.0	1.8	1.0	1.0	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18CE010	INTELLIGENT TRANSPORTATION SYSTEMS	3/0/0/3
Nature of Course	Theory Concept	
Pre requisites	-	
Course Objectives:		
1.	To learn the objectives, benefits and the telecommunications in ITS.	
2.	To understand about Architecture and Hardware in ITS.	
3.	To Know about the functional areas, user needs and services in ITS.	
4.	To learn the concepts of Advanced ITS operations and applications.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C010.1	Outline the basics of intelligent transport system and its features.	[U]
C010.2	Illustrate the suitable smart technologies to adopt in various transportation functionalities for ITS.	[AP]
C010.3	Apply the various smart monitoring systems to manage and regulate the traffic systems.	[AP]
C010.4	Describe the ITS implementation in various countries.	[U]
C010.5	Explain the advanced models of ITS and its significance.	[U]
C010.6	Apply the advanced techniques of ITS in various functional areas.	[AP]
Course Contents:		
Module 1: Intelligent Transport System Architecture and Hardware		15 Hrs
Introduction to intelligent transport system – Definition – Role and Responsibilities – Advanced Traveller Information System – Fleet Oriented ITS Services – Electronic Toll Collection – Critical issues – Security – Safety – Architecture – ITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques – Dynamic Message Sign – GPRS – GPS – Toll Collection – Case studies on deployment planning, system design and operation of ITS		
Module 2: Intersection Management		15 Hrs
Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management – Control Centre – Junction Management Strategies – automated highway systems - Vehicles in Platoons – Integration of Automated Highway Systems. intelligent transport system programs in the World – Overview of ITS implementations in developed countries.		
Module 3: Advanced Transport System		15 Hrs
Concepts of Advanced Traffic Management Systems (ATMS) – Commercial Vehicle Operations (CVO) – Advanced Vehicle Control Systems (AVCS) – Advanced Public Transportation Systems (APTS) – Smart Route System – Data Collection – Process – Dissemination to Travellers – Evaluation of Information – Value of Information – Business Opportunities.		
		Total Hours: 45 Hrs
Text Books:		
1.	Ramachandran M., “Metro Rail Projects in India: A study in Project Planning”, Oxford University Press, 2011.	
2.	Sussman, J. M., “Perspective on ITS”, Artech House Publishers, 2005.	
3.	Gianluigi Ferrari. ,”Advanced Technologies for Intelligent Transportation System” Global Publishers, 2014.	
4.	Mashrur A Chowdhury and Adel Wadid Sadek., “Fundamentals of intelligent transportation systems planning”, Artech house Publisher, 2003.	
Reference Books:		
1.	Muhammad Alam., “Intelligent Transportation System” Springer International Publishing AG, 2016.	

2.	US Department of Transportation, "National ITS Architecture Documentation", 2007 (CDROM).															
3.	ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.															
4.	Choudury M A and Sadek A, "Fundamentals of Intelligent Transportation Systems Planning" Artech House, 2003.															
Web References:																
1.	http://www.its.dot.gov/															
2.	http://ops.fhwa.dot.gov/															
3.	http://www.fhwa.dot.gov/research/															
Online Resources:																
1.	https://nptel.ac.in/courses/105101008/48															
2.	https://courses.moodle.wisc.edu/prod/course/view.php?id=148															
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)																
Formative assessment based on Capstone Model (Max. Marks:20)																
Course Outcome	Revised Bloom's Level					Assessment Component					Marks					
C010.1 – C010.6	Apply					Massive Open Online Courses recommended by the course instructor					20					
Summative assessment based on Continuous and End Semester Examination																
Revised Bloom's Level	Continuous Assessment												End Semester Examination (Theory) [50 Marks]			
	CIA-I [10 marks]				CIA-II [10 marks]				CIA III [10 marks]							
Remember	40				20				20				20			
Understand	40				40				30				20			
Apply	20				20				30				30			
Analyse	-				20				20				30			
Evaluate	-				-				-				-			
Create	-				-				-				-			
Course Articulation Matrix																
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2	PSO 3	
1	2	-	-	-	-	-	1	1	-	-	-	1	-	-	1	
2	3	-	1	2	-	-	-	-	-	-	-	1	2	-	-	
3	3	2	-	1	-	-	2	1	-	-	-	-	2	-	-	
4	2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	
5	2	-	-	-	-	-	1	-	-	-	-	1	-	-	1	
6	3	2	1	2	-	-	1	1	-	-	-	-	2	-	-	
Av g	2.5	2.0	1.0	1.7	-	-	1.3	1.0	-	-	-	1.0	2.0	-	1.0	
1	Reasonably agreed					2	Moderately agreed					3	Strongly agreed			

18CE011	METRO SYSTEMS AND ENGINEERING		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	-		
Course Objectives:			
1.	To learn the Metro planning and financials		
2.	To understand the working of mechanical components in metro systems		
3.	To learn the civil engineering structures in metro engineering		
4.	To know the electrical and electronics components in metro systems		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C011.1	Discuss the Metro planning and financials in Various systems		[AP]
C011.2	Examine the working and methods for stations and bridges.		[AN]
C011.3	Apply the civil engineering structures in metro engineering		[AP]
C011.4	Assess the electrical and electronics components in metro systems		[E]
C011.5	Apply the Power systems in metro engineering		[AP]
C011.6	Outline about signaling systems and control systems.		[AN]
Course Contents:			
Module 1: General and Mechanical		15 Hrs	
Overview of Metro Systems – Need for Metro – Routine Studies – Basic Planning and Financials – Rolling stock – Vehicle dynamics and structure – Tunnel ventilation systems – Air conditioning for stations and buildings – fire control systems – lifts and escalators.			
Module 2: Civil Engineering		15 Hrs	
Overview and construction methods for Elevated and Underground stations – Viaducts spans and bridges – Underground tunnels – Depots – Commercial and Service buildings – Initial surveys & Investigation – Basics of Construction planning & Management – Construction Quality & Safety systems – Traffics integration – Multimodal transfers and pedestrian facilities – Environmental and social safeguards – Track systems – permanent way: facilities management			
Module 3: Electrical and Electronics		15 Hrs	
OHE – Traction power – substations – TSS and ASS – Power SCADA – Standby and backup systems – green buildings – carbon credits and clear air mechanics - Signalling systems – Automatic fare collections – Operation Control Centre (OCC and BCC) – SCADA and other control systems – Platform screen doors			
			Total Hours: 45 Hrs
Text Books:			
1.	Umesh Rai B., “Handbook of Research on Emerging Innovations in Rail Transportation Engineering”, IGI Global Publishers, 2016.		
2.	Paul E. Garbutt, “World Metro Systems”, Capital Transport Publishing, 2010.		
3.	Ramachandran M., “Metro Rail Projects in India: A study in Project Planning”, Oxford University Press; 2011.		
4.	Daniel Martins, “Electrical Power systems and control centers”, CRC Press, 2016		
Reference Books:			
1.	Catherine Zerdoun, “ Underground: Subways and Metros of the world”, Firefly Books, 2009		
2.	Mark Ovenden “Metro Maps of the World” Capital Transport Publishing, 2003.		
3.	Mary Meghan Ryan “Annual metro Data Book” Global Publishers, 2011.		
4.	Ethan N. Elkind “Metro Rail and Future of the city” University of California, 2005.		
Web References:			
1.	http://www.indianrailways.gov.in/railwayboard/uploads/directorate/infra/downloads/MS_S_Book_010715.pdf		

2.	http://planningcommission.gov.in/sectors/ppp_report/5.Old%20Bid%20Document/VI.%20Manual%20of%20Specifications%20and%20Standards/23.Hyderabad-Metro-MSS.pdf														
Online Resources:															
1.	https://ieeexplore.ieee.org/document/7534790/														
2.	https://www.ieee.org/sitemap.html														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome	Revised Bloom's Level					Assessment Component					Marks				
C011.1	Evaluate					Online Quiz					5				
C011.2	Apply					Assignment					5				
C011.3 & C011.5	Apply					Group Assignment					5				
C011.4 & C011.6	Analyze					Presentation					5				
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level	Continuous Assessment											End Semester Examination (Theory) [50 Marks]			
	CIA-I [10 marks]			CIA-II [10 marks]			CIA III [10 marks]								
Remember	40			20			20					10			
Understand	30			20			10					10			
Apply	30			40			30					30			
Analyse	-			20			30					30			
Evaluate	-			-			10					20			
Create	-			-			-					-			
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
2	3	2	1	1	-	-	-	-	-	-	-	2	2	-	1
3	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
4	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
5	3	2	1	2	-	-	-	-	-	-	-	2	2	-	1
6	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
Av g	3	2	1	1.2	-	-	-	-	-	-	-	1.3	2	-	1
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			

18CE012	PRE - ENGINEERED INDUSTRIAL STRUCTURES	3/0/0/3
Nature of Course	Theory and Analytical	
Pre-requisites	-	
Course Objectives:		
1.	To understand the functional planning of industrial structures	
2.	To know the functional aspects and the codal provisions for the design of various industrial structures.	
3.	To analyse and design the transmission line towers.	
4.	To design the cold formed sections.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C012.1	Demonstrate the classification industrial structures.	[AN]
C012.2	Analyze and design Industrial structures	[AN]
C012.3	Use appropriate principles to design industrial buildings	[AP]
C012.4	Illustrate the planning process of transmission line towers	[AP]
C012.5	Develop appropriate sections for cold formed gauges	[AP]
C012.6	Prepare the layout of industrial building	[AP]
Course Contents:		
Module 1: Introduction, functional requirements and Design Aspects		15 Hrs
Definition and uses-Classification of Industries and Industrial structures - General requirements for industries like cement, chemical and steel plants - Site layout - Design Aspects: Modular co-ordination and prefabrication including partial prefabrication		
Module 2: Design of Pre Engineered Buildings		15 Hrs
Analysis of industrial building for Gravity and Wind load - Analysis and design of gable frames - Analysis and design of gantry column (stepped column / column with bracket) - girts – bracings – Layout of a PEB		
Module 3: Design of Transmission line towers and Cold formed sections		15 Hrs
Analysis of transmission line towers for wind load and design of towers including all connections - Forms of light gauge sections - Effective width computation of unstiffened, stiffened, multiple stiffened compression elements of cold formed light gauge sections.		
		Total Hours: 45 Hrs
Text Books :		
1.	Alexander Newman, "Metal Building Systems: Design and Specifications", McGraw-Hill Professional; Third edition, 2014.	
2.	Subramanian N - "Design of Steel Structure" Oxford University Press, 2011	
3.	Bungale S. Taranath, "Structural Analysis and Design of Tall Buildings: Steel and Composite Construction", CRC Press; 1 edition, 2011	
Reference Books		
1.	Vitor Abrantes, "The Pre-Fabrication of Building Facades (Building Research: Design, Construction and Technologies)", Springer International Publishing AG, 2018.	
2.	IS:8640- 1977, "Recommendations for dimensional parameters for industrial building", BIS, 1977 (Reaffirmed 2007).	
3.	Drew Plunkett, "Detail in Contemporary Bar and Restaurant Design (Detailing for Interior Design)", Laurence King Publishing, 2013.	

4.	Vivek K S and P. Vyshnavi P, "Pre - Engineered Steel Building", Lap Lambert Academic Publishing, 2017.														
Web References:															
1.	https://www.zamilsteel.co.in/products/pre-engineered-buildings/														
2.	https://www.ediscompany.com/what-is-a-pre-engineered-building/														
Online Resources:															
1.	https://pdhonline.com/courses/s120a/s120a_new.htm														
2.	http://www.mbma.com/														
Tentative Assessment Methods and Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome		Revised Bloom's Level				Assessment Component				Marks					
C012.1 - 6		Analyse				Project Based Learning (STAAD Pro model and presentation)				20					
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) [50 Marks]		
		Theory													
		CIA-I [10 Marks]			CIA-II [10 Marks]			CIA-III [10 Marks]							
Remember		10			-			-					10		
Understand		20			30			20					20		
Apply		40			30			30					40		
Analyse		30			40			50					30		
Evaluate		-			-			-					-		
Create		-			-			-					-		
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	-	3	-	-	1	2	2	-	1	2	-	1
2	3	2	1	-	3	1	-	1	2	2	-	1	2	-	1
3	3	2	1	-	3	1	-	1	2	2	-	2	2	-	1
4	3	2	1	-	3	1	-	1	2	2	-	2	2	-	1
5	3	2	1	-	3		-	1	2	2	-	1	2	-	1
6	3	2	1	-	3	1	-	1	2	2	-	1	2	-	1
Av g	3	2	1	-	3	1	-	1	2	2	-	1.3	2	-	1
1	Reasonably agreed				2	Moderately agreed						3	Strongly agreed		

18CE013	SMART CITY PLANNING AND DEVELOPMENT		3/0/0/3
Nature of Course	Theory		
Pre-requisites	-		
Course Objectives			
1.	To understand characteristics of a smart city like smart economy, smart people, smart governance, smart mobility and smart environment		
2.	To gain exposure on global context of smart cities and smart cities mission of Indian Government.		
3.	To critically evaluate the smart cities mission -its feasibility and constraints		
4.	To analyse and achieve a balance between smart and sustainable development of cities		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C013.1	Describe characteristics of a smart city like smart economy, smart people, smart governance, smart mobility and smart environment		[U]
C013.2	Involve in Public private partnership model of urban governance.		[AP]
C013.3	Discuss global context of smart cities and smart cities mission of Indian Government.		[U]
C013.4	Critically evaluate the smart cities.		[AN]
C013.5	Describe the global context of smart cities and smart cities mission of Indian Government.		[U]
C013.6	Achieve a balance between smart and sustainable development of cities		[AP]
Course Contents:			
Module 1: Introduction & Global Experiences		15 Hrs	
Smart cities –concept -origin – ideology-Typologies and different meanings - Wired city – Virtual city – Intelligent city –Information city – Digital city –Smart community –Knowledge city –Learning city –Sustainable city - Green City - Characteristics of smart cities - smart economy –smart people – smart governance – smart mobility– smart environment –smart living-Strategies and policies - Approaches towards smart cities in various countries-Smart city planning in advanced economies – economic, financial viability – social implications Smart city planning in Global South economic, financial viability – social implications - Case Study.			
Module 2: Smart cities Mission in India		15 Hrs	
Smart city mission - Objectives – features – coverage and duration Preconditions and criteria for the selection of smart city - actions and tools for smart cities Strategies – retrofitting, redevelopment, Greenfield, Brownfield, pan-city Governance and management –special purpose vehicles - smart solutions – arranging finance and funds – PPP model of urban governance			
Module 3: Critical Evaluation of Smart Cities		15 Hrs	
What is so ‘smart’ about the smart city - Critical evaluation of the smart city Concept - The contradiction of being ‘smart’ – smart vs. dull – fast vs. slow – the urban and digital divide social divide - Financial and economic viability of smart city in the Global South Critical evaluation of smart city development projects in India. Achieving balance between smart and sustainability development of cities.			
			Total Hours: 45 Hrs
Text Books:			
1.	Mani N., “Smart Cities & Urban Development in India”, New Century Publications, 1st edition, 2016.		

2.	Amitabh Satyam, "The Smart City Transformations: The Revolution of the 21st Century", Bloomsbury, India, 2017.														
3.	Arun Firodia, "Smart City", Vishwakarma Publications, 2015.														
Reference Books:															
1.	Beth Simone Noveck, "Smart Citizens, Smarter State: The Technologies of Expertise and the Future of Governing", Harvard University Press, First Printing edition, 2015.														
2.	Poonam Sharma, "Sustainable Smart Cities in India" Springer International Publishing, 2017.														
3.	Stan McClellan, "Smart Cities Applications, Technologies, Standards, and Driving Factors", Springer International Publishing, 2018.														
4.	Stephen Goldsmith, "The Responsive City: Engaging Communities Through Data-Smart Governance", Wiley and sons, 2014.														
Web References:															
1.	http://smartcities.gov.in/content/														
2.	http://www.smart-cities.eu/														
Online Resources:															
1.	https://www.coursera.org/learn/smart-cities														
2.	https://www.edx.org/course/smart-cities-ethx-ethx-fc-03x-1														
Tentative Assessment Methods & Levels (based on Revised Bloom's Taxonomy)															
Formative assessment based on Capstone Model (Max. Marks:20)															
Course Outcome		Revised Bloom's Level				Assessment Component						Marks			
C013.1 & C013.2		Remember				Online Quiz						4			
C013.3 & C013.4		Understand				Class Presentation						6			
C013.5 & C013.6		Apply				Group Assignment Classroom Quiz						10			
Summative assessment based on Continuous and End Semester Examination															
Revised Bloom's Level		Continuous Assessment											End Semester Examination (Theory) [50 Marks]		
		CIA-I [10 marks]			CIA-II [10 marks]			CIA III [10 marks]							
Remember		20			20			20					20		
Understand		30			30			30					30		
Apply		50			50			50					50		
Analyse		-			-			-					-		
Evaluate		-			-			-					-		
Create		-			-			-					-		
Course Articulation Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	-	-	-	-	2	2	-	-	-	-	2	1
2	3	3	2	-	-	-	-	2	2	-	-	-	-	2	1
3	3	3	2	-	-	-	-	2	2	-	-	-	-	2	1
4	3	3	2	-	-	-	-	2	2	-	-	-	-	2	1
5	3	3	2	-	-	-	-	2	2	-	-	-	-	2	1
6	3	3	2	-	-	-	-	2	2	-	-	-	-	2	1
Avg	3	3	2	-	-	-	-	2	2	-	-	-	-	2	1
1	Reasonably agreed				2	Moderately agreed					3	Strongly agreed			