



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 offer world class graduate education for entry level positions in Civil Engineering profession
- To provide high quality technical education and research
- To impart social ethics and 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 Graduates will emerge as competitive professionals in collaboration with renowned builders and set a benchmark in the field of construction.
- PEO 2 Graduates will adapt to the latest technological development and continue to be a competitive Civil Engineer / Entrepreneur.
- PEO 3 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	1	2	3	2	2	3	3	3	2
PEO 2	3	3	2	2	3	2	2	1	2	2	2	3
PEO 3	3	3	3	2	1	3	2	2	2	3	1	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 Sound knowledge in core areas of Civil Engineering such as analysis, design, laboratory investigations and construction aspects by applying concepts of mathematics and physical sciences.
- PSO 2 Ability to demonstrate professional and societal responsibility to recognize the need of the hour like housing, sanitation, waste management and construction management for a sustainable environment.
- PSO 3 Acquired the motivation to acknowledge the desired needs of the personal and professional adaptability through continuous self-learning and understand the impact of engineering solutions in global, economic and societal contexts.

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

Year	Sem	Course Title	Program Outcomes											
			1	2	3	4	5	6	7	8	9	10	11	12
II year	Semester III	Fourier Analysis, Partial Differential Equations and Calculus of Variation	3	3	2	2					2			2
		Construction Materials and Techniques	2	2	3	2	2				2			3
		Fluid Mechanics	3	3	2	2	2				2			3
		Architecture and Computer Aided Planning	3	2	3	2	3	2	2	1	3	2	1	3
		Solid Mechanics	3	3	3	3						2		3
		Surveying and Geomatics	3	3	2	3	1	1	1	2	2	1	1	3
		Human values and Professional Ethics			1		3	2	3	3	3	1	2	2
	Semester IV	Probability and Computational Methods	3	3	2	1	1				1			1
		Design of RC Elements	3	3	3	2	3	3	1		2	2		2
		Mechanics of Materials	3	3	3	3						2		3
		Concrete Technology	3	3	3	2	2		1		1			2
		Hydraulics and Hydraulic Machinery	3	3	2	2	2		2		2	2	2	3
		Soil Mechanics	3	3	2	3					2	2		3
Management organizational behavior		1					2	2	2	3	3	3	3	
III year	Semester V	Foundation Engineering	3	3	3	3	2	3	1	2	2	2		3
		Structural Analysis	3	3	3	3	1		1	1	2	2		3
		Open Elective I												
		Design of Reinforced Concrete Structures	3	3	3	2	3	2	1		1			2
		Environmental Engineering	3	2	3	2	2	3	3		1	2	2	2
		Transportation Engineering	3	3	3	3	1	1	1	2		1	1	2
		Soft Skills							1		2	3	1	2

Year	Sem	Course Title	Program Outcomes											
			1	2	3	4	5	6	7	8	9	10	11	12
III year	Semester VI	Design of Steel Structures	3	3	3	2	3	2	1		2	2		2
		Emerging Elective I												
		Professional Elective I												
		Professional Elective II												
		Construction Engineering and Management	3	3	2	2	3	2		3	2	2	3	3
		Estimation and Quantity Surveying	3	3	2	2	1					2	2	2
		General Aptitude	2	2	3	2	1				1	2	1	2
IV year	Semester VII	Open Elective II												
		Emerging Elective II												
		Professional Elective III												
		Professional Elective IV												
		Professional Elective V												
		Project Work (Phase I)	3	3	3	3	3	1	1		3	3	3	3
	Semester VIII	Project Work (Phase II)	3	3	3	3	3	1	1		3	3	3	3

**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	Architecture Professional Certification Course	1
2.	18CE02	Building Functional Layout Planning, Bye Laws and Approval	1
3.	18CE03	Decentralized Waste Water Treatment System	1
4.	18CE04	Global Initiative of Academic Networks (GIAN)	1
5.	18CE05	IITB Spoken Tutorial Courses	1
6.	18CE06	Massive Open Online Courses (MOOC)	1
7.	18CE07	Non Destructive Testing of Structures	1
8.	18CE08	NPTEL Online Certification Courses	1
9.	18CE09	Professional Delivery Systems in Construction Industry	1
10.	18CE10	Professional Drafting Certification Course	1
11.	18CE11	Project Management Professional Certification Course	1
12.	18CE12	Safety Engineering in Building Construction	1
13.	18CE13	Structural Analysis and Design Package Certification Course	1
14.	18CE14	Sustainable faecal Sludge Management	1
15.	18CE15	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, ordinary and partial derivatives	[R]
C101.2	Express square matrix in the diagonal form and infinite series approximations	[U]
C101.3	Apply the knowledge of differential equation and extreme values of the given functions to solve the engineering problems	[AP]
C101.4	Apply the knowledge of differential equation and extreme values of the given functions to solve the engineering problems	[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 and Series		20 Hrs
Convergence of sequences and series – Tests of convergence of positive term series: Comparison test , D’Alembert’s ratio test- Cauchy root test -Alternating Series- Leibnitz’s test-Series of positive and negative terms-Absolute and conditional convergence.		
Module 3: Calculus		20 Hrs
Functions of several variables: Total derivatives – Differentiation of implicit functions – Jacobians – Taylor series expansion – Maxima and Minima – Method of Lagrangian multipliers. 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.	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 I", 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.			
4.	Howard Anton and Chris Rorres. Elementary Linear Algebra with Supplemental Applications, Wiley, 2010			
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	Understand	Power point presentation	6	
C101.1,2,3	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	-	-	-	-

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			
C111.1	Understand the basic concepts of Engineering Graphics.		[U]
C111.2	Sketch isometric, orthographic projections and projection of lines and planes		[AP]
C111.3	Develop lateral surfaces of solids including prisms and pyramids		[AP]
C111.4	Construct projections of lines, planes, solids and isometric views using modeling software.		[AN]
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	[U]
3.	Construction of Special Curves (Cycloid and Involutés)	C111.1	[U]
4.	Isometric to Orthographic projections – Manual sketches	C111.2	[AP]
5.	Isometric to Orthographic projections – Software sketches	C111.4	[AN]
6.	Projection of lines - Inclined to HP, VP and Both HP & VP	C111.4	[AN]
7.	Projection of Plane surfaces (Hexagon, Pentagon and circle) – inclined to any one of the principle planes	C111.4	[AN]
8.	Projection of Solids (Prism and Pyramid) – Inclined to HP	C111.3	[AP]
9.	Projection of Solids (Cone and Cylinder) – Inclined to VP	C111.3	[AP]
10.	Development of Surfaces (Prism, Pyramid, Cone and Cylinder)	C111.4	[AN]
11.	Introduction to Perspective projection	C111.2	[U]
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.	Jeyapoovan T,"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	-	-

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:			
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.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C101.1	Recall the need and requirements of boiler feed water, water treatment procedures, corrosion and its control.		[R]
C101.2	Understand the principle and working of reference electrodes and conductivity meters as an analyzer.		[U]
C101.3	Apply the knowledge of energy sources and storage devices in engineering field		[AP]
C101.4	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.

Laboratory Component:					
S.NO	List of Experiment	CO Mapping	RBT		
1.	Estimation of hardness of water by EDTA method	C101.1	[E]		
2.	Estimation of alkalinity of water sample	C101.1	[E]		
3.	Determination of chloride content in given water sample	C101.1	[E]		
4.	Estimation of dissolved oxygen in water	C101.1	[E]		
5.	Potentiometry- determination of redox potentials and emf's	C101.2	[E]		
6.	Conductometric titration-mixture of acids vs NaOH	C101.2	[E]		
7.	Determination of strength of strong acid by pH metry	C101.2	[E]		
8.	Corrosion rate of mild steel in acid medium	C101.3	[E]		
9.	Electroplating of nickel over copper	C101.3	[E]		
10.	Spectrophotometry-Estimation of iron in water	C101.4	[E]		
11.	Separation of mixture of amino acids by thin layer chromatography	C101.4	[E]		
12.	Synthesis of Nylon 66	C101.4	[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	-	-	-	-	-

18CS111	PROBLEM SOLVING USING C PROGRAMMING (COMMON TO CIVIL/ MECH/ ECE/ EEE PROGRAMMES)		3/0/3/4.5
Nature of Course	Problem Programming		
Pre requisites	-		
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			
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, arrays and strings in programs	[AP]	
C111.4	Develop applications using functions, structures and unions	[C]	
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
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 a. Simple Flow Chart b. Decision Making c. Looping[Pre test & Post test]	C111.1	[AP]
3.	Create Animation / Gaming /Application using Scratch Tool	C111.1	[AP]

4.	Program to process data types, format input and output and to evaluate an expression	C111.2	[AP]
5.	Program using decision making statements	C111.2	[AP]
6.	Program using looping statements	C111.2	[AP]
7.	Program using single and two dimensional arrays	C111.3	[AP]
8.	Program with Strings	C111.3	[AP]
9.	Program using Pointers.	C111.3	[AP]
10.	Program using Recursion	C111.3	[AP]
11.	Program using structures	C111.4	[AP]
12.	Branch specific application program	C111.4	[AP]

Text Books:

1.	Sprankle M, "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.	Thamarai Selvi S and Murugesan R, "Programming in ANSI C", 6 th Edition, McGraw Hill, 2012.
3.	Venugopal K R and Sudeep R.Prasad, "Mastering C", 2 nd Edition, McGraw Hill, 2015
4.	Jeri.R Hanly, and Elliot B Koffman, Problem solving and programming Design in C Addison Wesley 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	-	-
Understand	70	50	30	-	-
Apply	-	20	50	70	70
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	30	30

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		
Course Outcomes:			
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 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 - Recognise 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
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 Pushp Lata, "Communication Skills", Oxford University Press. 2011.
3.	Friederike Klippel, "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 Rubric based CIA [30 Marks]	
	CIA - I [10 Marks]	CIA - II [10 Marks]	CIA - III [10 Marks]		
Remember	20	20	20	20	20
Understand	40	40	40	40	40
Apply	40	40	40	40	40
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

18MC101	INDUCTION PROGRAMME (FOR ALL BRANCHES OF B.E / B.TECH PROGRAMMES)		1/0/0/0
Nature of Course	Induction Programme		
Pre requisites	-		
Course Objectives:			
1.	To have broad understanding of society and relationships		
2.	To nurture the character and fulfil 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 Yoga</p> <p>CREATIVE ARTS (students can select any one of their choice) Painting, sculpture, pottery, music, dance, craft making and so on</p> <p>UNIVERSAL HUMAN VALUES Enhancing soft skills</p> <p>LITERARY AND PROFICIENCY MODULES Reading, writing, speaking – debate, role play etc. Communication and computer skills</p> <p>LECTURES BY EMINENT PEOPLE Guest lecture by subject experts</p> <p>VISIT TO LOCAL AREAS Meditation centre/orphanage/Hospital</p> <p>FAMILIARIZATION TO DEPARTMENT/BRANCH INNOVATION Lectures by Department's Head and senior faculty members</p>			

SEMESTER 2

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	Define and illustrate the basic concepts of force system	[U]
C201.2	Calculate the resultant force, moment and geometrical properties of 2D, 3D objects	[AP]
C201.3	Analyse the resistance force of particles and objects for Impending Motion	[AN]
C201.4	Determine the displacement, velocity and acceleration of particles and objects.	[AP]
Course Contents:		
<p>Module 1: Equilibrium of Particles and Rigid Bodies 20 Hrs</p> <p>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.</p> <p>Module 2: Centre of Gravity, Moment of Inertia and Friction 20 Hrs</p> <p>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.</p> <p>Friction: Types of friction, Limiting friction, Laws of friction – Static and Dynamic Friction; simple contact friction, ladder friction – wedge friction – screw jack</p> <p>Module 3: Dynamics of Particles and rigid bodies 20 Hrs</p> <p>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 2nd 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.</p>		
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 8th 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	Apply	Group assignment	5	
C201.3	Analyze	Group assignment	5	
C201.4	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	-	-	-	-

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]
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.			
4.				
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 &C201.4	Apply	Group Assignment	5	
C201.1,2,3 &C201.4	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	-	-	-	-

18EE211	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING (COMMON TO CIVIL/ MECH/ IT PROGRAMMES)	3/0/3/4.5
Nature of Course	Theory Analytical	
Pre requisite	-	
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:		
Upon completion of the course, students shall have ability to		
C211.1	Analyse the concepts in ac circuit and dc circuits.	[AN]
C211.2	Understand the working principle of single phase and three phase transformers.	[U]
C211.3	Understand the working principle of DC and AC machines.	[U]
C211.4	Remember the basic components used for electrical installations.	[AP]
C211.5	Understand the basic concepts of analog and digital electronics.	[AP]
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. Time-domain analysis of first-order RL and RC circuits with DC excitation.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.		
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

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.	Charles A.Gross and Thaddeus A.Roppel, "Fundamentals of Electrical Engineering", CRC press, 2012.		
2.	Kulshreshtha D. C., "Basic Electrical Engineering", McGraw Hill, 5 th edition 2011,		
3.	Theodore F. Bogart, Jeffery S. Beasley and Guillermo Rico, "Electronic Devices and Circuits", Pearson Education,6 th edition, 2013.		
4.	Donald .A. Neamen, "Electronic Circuit Analysis and Design", 2nd Edition reprint, Tata McGraw Hill, 2013.		
Web References:			
1.	http://nptel.ac.in/course.php?disciplineId=108		
2.	https://ocw.mit.edu/courses/findbytopic/#cat=engineering&subcat=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 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	50	50	40	40	40
Understand	50	50	40	40	40
Apply		-	20	20	20
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

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:			
Upon completion of the course, students shall have ability to			
C201.1	Familiar with the principle and working of various instruments		[U]
C201.2	Understand the basic concepts of simple harmonic, damped oscillations and lasers		[U]
C201.3	Study the thermal properties of materials & its applications and to Recall the basic concepts of crystal structure of the various materials		[U]
C201.4	Solve complex problems in everyday life using the knowledge gained from the course		[AP]
Course Contents:			
Module 1: Instrumentation			15 Hrs
Instrumentations: dial gauge, piezo electric strain gauge, load cell (pneumatic and hydraulic load cell), venturimeter, 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, laser speckles, 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
Laboratory Component:			
S.No	List of Experiments	CO Mapping	RBT
1.	Laser and optical fiber parameters	C201.2	[U]
2.	Wavelength measurement of mercury spectrum- Spectrometer Grating	C201.1	[U]

3.	Young's modulus – Non- Uniform bending method	C201.1	[U]
4.	Rigidity modulus – Torsional Pendulum	C201.1	[U]
5.	Coefficient of viscosity for a liquid –Poiseuille's method	C201.1	[U]
6.	Magnetic field along the axis of current carrying coil- Stewart and Gee method.	C201.1	[U]
7.	LCR circuits.	C201.2	[U]
8.	Newton's ring- wavelength of sodium vapour lamp / Air wedge – Thickness of thin sample	C201.1	[U]
9.	Time constant of RC circuits.	C201.1	[U]
10.	Transverse and longitudinal wave modes- Melde's experiment.	C201.2	[U]
Text Books:			
1.	Rajendran, V 'Engineering Physics' Mc Graw 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" Mc Graw 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=EAlaIQobChMIuty_34nC2wIVGQ4rCh0o2AeIEAAYASAAEgKeUvD_BwE&dclid=CKPjlfWJwtsCFQMZjgodEPgKBg		

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	-	-	-	-	-

18ME102	ENGINEERING PRACTICES LABORATORY (COMMON TO CIVIL/ CSE/ EEE/ ECE/ MECH/ IT PROGRAMMES)	1/0/4/3
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Nature of Course	Practical Application
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Pre Requisites	Engineering Drawing/Graphics
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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.
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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.
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Course Outcomes

C102.1	Identify and solve the basic engineering problems at home and in workplace.	[AP]
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C102.2	Develop the surfaces and make simple components like tray and funnel.	[C]
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C102.3	Make simple metal joints using welding equipment and wooden joints using carpentry tools.	[AP]
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C102.4	Prepare pipe connections and sand moulds.	[AP]
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C102.5	Understand the fundamentals of machining.	[U]
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C102.6	Examine and troubleshoot electrical and electronic circuits	[AN]
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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	C102.6	[AN]

	specification.		
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 equipments.	C102.6	[AN]

Total Hours | 45 Hrs

Textbooks:

1.	Hughes E, "Electrical and Electronics Technology", Pearson, 2010.
2.	Gowri S and T Jeyapooan, "Engineering Practices Lab Manual", Vikas Publishing, New Delhi, 2014
3.	Raghuraman S, "Engineering Practices", Observation cum Laboratory Manual, Cenage Learning, 2012

Reference Books:

1.	Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology", Pearson Education, Inc. 2014.
2.	Hajra Choudhury, "Elements of Workshop Technology", Vol. I & II, Media Promotors Pvt Ltd., 2014.
3.	Suyambazhagan S, "Engineering practices", PHI Learning private limited, New Delhi, 2012.
4.	Kothari D. P, and Nagrath. J, "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

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	Recall and play an important role in transferring a healthy environment for future generation.		[R]
C201.2	Understand the importance of natural resources and conservation of biodiversity.		[U]
C201.3	Understand and analyze the impact of engineering solutions in a global and societal context.		[U]
C201.4	Apply the gained knowledge to overcome pollution problems.		[AP]
C201.5	Apply the gained knowledge in various environmental issues and sustainable development.		[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: a. Air pollution-Acid rain – Green house effect-Global warming- Ozone layer depletion – case study- Bhopal gas abelin. 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 Hrs
Sustainable development-water conservation, rain water harvesting, E-Waste Management – Environmental ethics: 12 Principles of green chemistry-Scheme of abeling of environmental friendly products (Eco mark) – Emission standards – ISO 14001 standard.			
			Total Hours 30 Hrs
Text Books:			
1.	AnubhaKaushik 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 S Introduction 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	Remember	Online Quiz/ class room quiz	5
C201.2	Understand	Writing Skills	5
C201.3	Understand	Technical Presentation	5
C201.4	Apply	Group Assignment	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	-	-	-

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	Recall basic integration concepts and partial derivatives	[R]
C301.2	Formulate and solve the partial differential equations	[U]
C301.3	Interpret Fourier series solutions to the engineering problems	[AP]
C301.4	Use Fourier transforms techniques to evaluate integrals	[AP]
C301.5	Apply analytical and numerical methods to solve differential equations with boundary conditions	[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.	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2014	
2.	Grewal. B.S, "Higher Engineering Mathematics", 43 rd edition, Khanna Publications, Delhi, 2014.	
3.	Gelfand.I.M. and S.V.Fomin, "Calculus of Variations", Prentice-Hall, Inc., Englewood Cliffs, New Jersey, USA,2012.	
Reference Books:		
1.	Bali N.P , "A Text book of Engineering Mathematics Sem-III/IV" 13 th edition, Laxmi Publications Ltd, 2017	

2.	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 4 th edition, 2016
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.	Veerarajan. T, "Transforms and Partial differential equations", 3 rd edition, Tata McGraw-Hill Publishing Company Ltd., reprint,2016

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, C301.4 & C301.5	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	-	-	-	-

18CE301	CONSTRUCTION MATERIALS AND TECHNIQUES	3/0/0/3
Nature of Course	Theory Application	
Pre requisites	Nil	
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	Remember the basic properties of various construction materials	[R]
C301.2	Understand manufacturing process of construction materials and concrete blocks	[U]
C301.3	Understand the types of cements and various materials used for different construction purposes	[U]
C301.4	Understand the importance of alternate construction materials used in various construction works	[U]
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, Bricks for special use, Refractory bricks, 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.		
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, 2015.	
2.	Sahu G.C, Jayagopal Jena, " Building Materials and Construction", McGraw Hill Education Pvt. Ltd, New Delhi, 2015	
3.	Rangwala.S.C, "Engineering Materials", Charotar Publishing House, New Delhi 2014.	
Reference Books:		
1.	Rajput.R.K, "Engineering Materials", S. Chand & Company Ltd., 2011.	

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", 5th Edition, McGraw Hill, Singapore, 2011.
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
C301.2, C301.3 and C301.4	Understand	Outside Classroom Learning Experience - Report 1	10
C301.5 & C301.6	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	20	10	10	10
Understand	40	40	40	40
Apply	40	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE302	FLUID MECHANICS		3/0/0/3
Nature of Course	Theory and 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	Understand the fluid properties and types of flows.		[U]
C302.2	Compute Hydrostatic and Hydrodynamic forces , Drag and Lift		[AP]
C302.3	Apply Bernoulli's equation to determine the Velocity and Discharge.		[AP]
C302.4	Analyse flow through pipes, pipe network and design simple pipe systems and 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, 2009		
2.	Subramanya K "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.		
3.	Streeter, Victor L. and Wylie B.E., "Fluid Mechanics", McGraw Hill Ltd., 2010.		
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, 2013.		
3.	Som, S. K., Gautam Biswas and Chakraborty, S, "Fluid Mechanics and Fluid Machines", McGraw Hill Education (India) Pvt. Ltd, New Delhi, 2015.		

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	Understand	Outside Classroom Learning Experience - Report 1	10	
C302.2	Apply			
C302.3	Apply	Outside Classroom Learning Experience - Report 2	10	
C302.4	Analysis			
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	-	20	20	30
Evaluate	30	30	40	40
Create	-	-	-	-

18CE303	ARCHITECTURE AND COMPUTER AIDED PLANNING	3/0/3/4.5
Nature of Course	Theory Application	
Pre-requisites		
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:		
Upon completion of the course, students shall have ability to		
C303.1	Understand and appreciate architecture and planning	[U]
C303.2	Plan any civil engineering project by incorporating various aspect of environment and climate of the project area	[AP]
C303.3	Understand and apply the elements and principles of Architecture	[AP]
C303.4	Understand and apply various rules and regulations of planning and development authorities.	[AP]
C303.5	Understand the climate responsive architecture and design.	[U]
C303.5	Understand the concepts of BIM and its broad applications	[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
<p>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 –</p>		

Economy. Planning of Residential Buildings Planning of Public Buildings – Design considerations- Introduction to BIM – Basic concepts- Case studies.			
Total Hours			45 Hrs
Laboratory Component:			
S.No	List of Exercises	CO Mapping	RBT
1.	Planning and drafting of a single storied residential building.	C303.2 C303.4 C303.5	[AP]
2.	Drafting the elevation and sectional views of single storied residential building	C303.3	[AP]
3.	Planning and drafting of a multi storied residential building	C303.2 C303.4 C303.5	[AP]
4.	Drafting the elevation and sectional views of multi storied residential building.	C303.3	[AP]
5.	Planning and drafting of a primary hospital building	C303.2 C303.4 C303.5	[AP]
6.	Drafting the elevation and sectional views of Primary hospital building.	C303.3	[AP]
7.	Planning and drafting of a school building	C303.2 C303.4 C303.5	[AP]
8.	Drafting the elevation and section views of a school building.	C303.3	[AP]
9.	Planning and drafting of a factory building with North Light Roof truss	C303.2, C303.4, C303.5	[AP]
10.	Drafting the elevation and section views of a Factory building with North Light Roof Truss	C303.2 C303.5	[AP]
11.	Drafting the 3D view of a Residential Building	C303.3	[AP]
12.	Introduction to BIM (Building Information Modeling) – Theory	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” McGraw 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/principi/principi.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	-	10
Understand	30	20	20	30	20
Apply	50	60	70	70	70
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

18CE304	SOLID MECHANICS		3/0/3/4.5
Nature of Course	Problem Analytical		
Pre requisites	Engineering Mechanics		
Course Objectives:			
1.	To Understand the fundamental concepts of stress, strain and deformation of solids and thin cylinders		
2.	To analyze plane trusses using various methods.		
3.	To compute and sketch the bending moment and shear force for different types of beams.		
4.	To analyze plane trusses using various methods.		
5.	To compute the stresses and deformations of beams and torsion on shafts.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C304.1	Understand and apply the fundamental concepts of stress, strain and deformation of solids and thin cylinders		[AP]
C304.2	Understand and analyse the behavior of beams subjected to various loading and support conditions and sketch the bending moment and shear force diagrams.		[AN]
C304.3	Understand and analyse the plane trusses with various methods to compute the load carrying capacity of each members.		[AN]
C304.4	Understand and apply the concepts of pure bending of beams to compute the bending and Deformations in the Elastic Range and shear stresses in beams.		[AN]
C304.5	Compute the circular shaft bending and Torsional deformation.		[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.			
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

Laboratory Component:			
S.No.	List of Experiments	CO Mapping	RBT
1.	Determination of tension on mild steel rod.	C304.1	[AN]
2.	Determination of Double shear on metal specimen.	C304.4	[AN]
3.	Finding out Torsional strength value of mild steel rod. .	C304.5	[AN]
4.	Determination of Compression strength on wood / bricks	C304.1	[AN]
5.	Determination of Impact strength of metal specimens - Izod impact test	C304.1	[AN]
6.	Determination of Impact strength of metal specimens - Charpy impact test.	C304.1	[AN]
7.	Finding out the Rockwell Hardness Number on metal Specimen	C304.1	[AN]
8.	Finding out the Brinell Hardness Number on metal Specimen.	C304.1	[AN]
9.	Finding out the Vickers Hardness Number on metal Specimen.	C304.1	[AN]
10.	Finding out the Deflection values on simply supported metal beams.	C304.2	[AN]
11.	Determination of Elastic properties of open coiled helical springs	C304.5	[AN]
12.	Determination of Elastic properties of closed coiled helical springs	C304.5	[AN]
Text Books:			
1.	Beer, F.P., Johnston Jr., E.R., Dewolf, J.T.and Mazurek, D.F. "Mechanics of Materials", 6e, McGraw-Hill, 2012.		
2.	Bansal R.K, 'Strength of Materials', Lakshmi Publications Ltd, New Delhi, 2012.		
3.	Bansal R K , " Mechanics of Solids ",Laxmi Publication,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.	Kszimi 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?disciplineId=105		
2.	http://nptel.iitk.ac.in/courses/Webcourse-contents/IIT Delhi/Mechanics%20of%20Solids/index.htm		

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	10	10	10	20	10
Understand	20	10	10	20	10
Apply	30	30	20	40	20
Analyse	40	50	60	20	60
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

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:			
Upon completion of the course, students shall have ability to			
C305.1	Remember the basic concepts of surveying		[R]
C305.2	Use all surveying equipments, prepare LS & CS, Contour maps and carryout surveying works related to land and civil engineering projects		[AP]
C305.3	Understand the advantages of electronic surveying over conventional surveying methods		[U]
C305.4	Understand the working principle of Total station & GPS, its components, signal structure of GPS and error sources		[U]
C305.5	Apply the concepts of setting out of curves		[AP]
C305.6	Understand the concepts of photogrammetry and remote sensing techniques used in modern surveying methods		[U]
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			
Total Hours:			45 Hrs

Laboratory Component:			
S.No	List of Experiments	CO Mapping	RBT
1.	Compute the bearings and area by Compass Traversing	C305.1	[AP]
2.	Fly & Check levelling using Dumpy Level	C305.5	[AP]
3.	Measurement of Horizontal angles by Repetition, Reiteration and Vertical angles	C305.2	[AN]
4.	Determination of Tachometric Constants	C305.2	[AN]
5.	Profile levelling – Longitudinal & Cross sectional plotting	C305.2	[AN]
6.	Measurement of height and distance by tangential tachometry	C305.2	[AN]
7.	Determination of Elevation of an object single plane method (Base accessible and in- accessible)	C305.2	[AP]
8.	Contouring method by squares	C305.2	[AN]
9.	Setting out of simple curves & Transition curves	C305.2	[AP]
10.	Determination of area by using total station traversing	C305.5	[AP]
11.	Determination of distances and elevation between two inaccessible points using total station	C305.6	[AP]
12.	Determination of Latitude and Longitude of the given points using GPS	C305.6	[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+Venkatramaiah%22&hl=en&sa=X&ved=0ahUKewi3gfG_5eneAhXRdCsKHQZHBh0Q6AEILTAB#v=onepage&q&f=false		
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	
	CIA – I (10 Marks)	CIA – II (10 Marks)	CIA – III (10 Marks)	Rubric based CIA (30 Marks)	
Remember	10	10	10	10	10
Understand	40	40	40	20	40
Apply	50	50	50	40	50
Analyze	-	-	-	30	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

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	Understand the basic Human values and ethics	[U]
C301.2	Understands the significance and relevance of values in management.	[U]
C301.3	Understand his roles, rights and responsibilities as an engineer and the aspect of safety and risk.	[U]
C301.4	Understand the importance and need for proper human relations in the workforce management.	[U]
C301.5	Understand the different themes in human relations.	[U]
Course Contents:		
Module 1: Human Values and Engineering Ethics		10 Hrs
I 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 Behaviour at work – 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.		
		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 Learning Pvt Ltd New Delhi,2013		
Web References:			
1.	http://www.geethanjaliinstitutions.com/engineering/coursefiles/downloads/mech/hvpe.pdf		
2.	Human Relations 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	Understand	Online Quiz/ class room quiz	10
C301.2, C301.3	Understand	Group assignment	10
C301.4	Understand	Online Quiz/ class room quiz	10
C301.5	Understand	Group assignment	10
Summative assessment based on End Semester Examination			
Revised Bloom’s Level	End Semester Examination [60 marks]		
Remember	30		
Understand	50		
Apply	20		
Analyse	-		
Evaluate	-		
Create	-		

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	[R]
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]	
Remember	20	15	10	10
Understand	30	25	30	30
Apply	50	60	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE401	DESIGN OF RC ELEMENTS		3/1/0/4
Nature of Course	Problem Analytical		
Pre requisites	Solid Mechanics		
Course Objectives:			
1.	To introduce the concepts for the analysis and design of reinforced concrete elements as per Limit State Design.		
2.	To impart knowledge on the latest Indian Standard codes of practice for the design of reinforced concrete elements		
3.	To understand the limit state of serviceability requirements, deflection and crack width		
4.	To draw the reinforcement detailing for various reinforced concrete elements.		
Course Outcomes:			
Upon completion of the course, students shall be able to			
C401.1	Understand the philosophy of different methods of design of reinforced concrete elements.		[U]
C401.2	Design the reinforced concrete beam element subjected to SF, BM and Torsion with reinforcement detailing.		[AN]
C401.3	Design slabs with different boundary conditions and RC Staircases including reinforcement detailing.		[AN]
C401.4	Calculate the limit state of serviceability requirements, deflection and crack width		[AN]
C401.5	Design short and long columns for uniaxial and biaxial loading including detailing.		[AN]
C401.6	Design footings for axial load & BM and reinforcement detailing.		[AN]
Course Contents:			
Module 1: Design Philosophy and Limit State Design of Slabs		20 Hrs	
Concept of Elastic method, ultimate load method and limit state method - Design codes and specification - Limit State philosophy as detailed in IS code -Limit state method - Analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects.			
Module 2: Limit State Design of Beams for shear, bond and torsion		20 Hrs	
Limit State design of rectangular, flanged beams – shear, bond, anchorage, and development Analysis and design of singly and doubly reinforced rectangular and flanged beams - Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion.			
Module 3: Limit State Design of Columns and Footings		20 Hrs	
Types of columns - Braced and unbraced columns - Design of short column for axial, uniaxial and biaxial bending - Design of long columns - Design of wall footing - Design of axially and eccentrically loaded rectangular footing - Design of combined rectangular footing for two columns only - Standard method of detailing RC beams, slabs and columns - Special requirements of detailing with reference to erection process.			
		Total Hours:	60 Hrs.
Text Books:			
1.	Varghese P.C., "Limit State Design of Reinforced Concrete", PHI Learning Pvt. Ltd., New Delhi, 2 nd Edition, 2012		
2.	Subramanian N., Design of Reinforced Concrete Structures, Oxford University Press, New Delhi, 2014.		
3.	Punmia B.C., Ashok K. Jain and Arun K. Jain, RCC Designs (Reinforced Concrete		

Structures),, Lakshmi Publications (P) Ltd., New Delhi, Ninth Edition, 2012.

Reference Books:

1.	Neelam Sharma," RCC Design and Drawing ", S.K Kataria and Sons, New Delhi, 2013.
2.	David A. Fanella , "Reinforced Concrete Structures: Analysis and Design " , McGraw Hill Professional, 2015.
3.	Krishna Raju N, "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, 2016.
4.	Unnikrishna Pillai, S., & Devdas Menon, "Reinforced Concrete Design", McGraw Hill Education; 3 rd edition, 2017.
5.	IS 456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
6.	SP 16:1980, Design Aids for Reinforced Concrete to IS 456 : 1978, Bureau of Indian Standards, New Delhi, 1978
7.	SP 34 : 1987, Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi, 1987
8.	IS 875(1-5) : 1987, Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures, Bureau of Indian Standards, New Delhi, 1987

Web References:

1.	https://www.vidyarthiplus.com/vp/Thread-CE2306-Design-of-RC-Elements-REC-Lecture-Notes-1st-Edition#.W_fN0zHhXIU
2.	https://ieeexplore.ieee.org/document/7534790/

Online Resources:

1.	https://nptel.ac.in/courses/106106143/
2.	https://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	Understand	Outside Classroom Hours Technical Report I	10
C401.2 & C401.3	Analyse		
C401.4, C401.5 & C401.6	Analyse	Outside Classroom Hours Technical Report II	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	-	-	-	-

18CE402	MECHANICS OF MATERIALS		3/0/0/3
Nature of Course	Problem Analytical		
Pre requisites	Solid Mechanics		
Course Objectives:			
1.	To know fundamental concepts of Energy Principles		
2.	To analyze the beams, frames and plane trusses to determine the deflection, stress and load carrying capacity.		
3.	To Understand the principle planes and failure theory concepts to compute the load carrying capacity of structural members.		
4.	To analyze thick cylinders and the columns using Euler's theory and compute the load carrying capacity.		
Course Outcomes:			
Upon completion of the course, students shall have ability to			
C402.1	Understand and apply the Energy principles to analyse the trusses, beams and frames.		[AP]
C402.2	Understand and analyze the indeterminate beams		[AN]
C402.3	Understand the principle planes and apply the failure theory concepts to analyse and compute the load carrying capacity of structural members.		[AN]
C402.4	Understand Column stability and apply using Euler's theory concepts to columns for computing the critical load.		[AN]
C402.5	Understand and analyse thick cylinders and compound cylinders.		[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.	Junnarkar S.B. "Mechanics of Structures", Charotar Publishing House Pvt. Ltd.; 24th Edition, 2015		
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	Understand, Apply	Outside Classroom Learning Experience -Report 1	10	
C402.4 & C402.5	Understand, 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	-	-	-	-

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:			
Upon completion of the course, students shall have ability to			
C403.1	Remember the properties of concrete and its admixtures		[R]
C403.2	Apply the concepts of mix design for making concrete		[AP]
C403.3	Understand the properties and manufacturing process of fresh concrete		[U]
C403.4	Understand the properties of hardened concrete		[U]
C403.5	Learn the effects of various chemical actions on concrete		[U]
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, 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: 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
Laboratory Component:			
S. No.	List of Experiments	CO Mapping	RBT
1.	Concrete Mix Design – IS Method	C403.2	[AN]
2.	Test on Cement – Specific Gravity Test	C403.1	[AP]
3.	Test on Cement – Consistency and Initial Setting Time Test	C403.1	[AP]
4.	Fresh Concrete Property Test – Slump Cone Test	C403.3 & C403.6	[AP]

5.	Fresh Concrete Property Test – Compaction Factor Test	C403.3 & C403.6	[AP]
6.	Fresh Concrete Property Test – Vee-Bee Consistometer Test	C403.3 & C403.6	[AP]
7.	Hardened Concrete Property Test – Compressive Strength Test	C403.4 & C403.6	[AP]
8.	Hardened Concrete Property Test – Splitting Tensile Strength Test	C403.4 & C403.6	[AP]
9.	Hardened Concrete Property Test – Modulus of Rupture Test	C403.4 & C403.6	[AP]
10.	Concrete Durability Property Test – Acid Attack Test	C403.5	[AP]
11.	Non – Destructive Test – Rebound Hammer Test	C403.4	[AP]
12.	Non – Destructive Test – Ultrasonic Pulse Velocity Test	C403.4	[AP]

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	50	40	40	20	40
Apply	40	50	30	70	30
Analyse	-	-	20	10	20
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

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:			
Upon completion of the course, students shall have ability to			
C404.1	Analysis and Design of Open channel Flow		[AN]
C404.2	Conduct Investigations on Flow measuring equipments		[AP]
C404.3	Analysis of Hydrodynamic forces on Vanes and Hydraulic models		[AN]
C404.4	Analysis and Design of Pumps and 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
Laboratory Component:			
S.No	List of Experiments	CO Mapping	RB T
1.	Determination of Coefficient of contraction, Coefficient of velocity & Coefficient of discharge for flow through circular / round orifice. (Constant Head)	C404.1	AP
2.	Determination of Coefficient of discharge of a triangular notch.	C404.1	AP
3.	Determination of flow in a pipe using Venturimeter and comparison between experimental value and theoretical values	C404.2	AP

4.	Determination of flow in a pipe using Orifice meter and drawing the calibration curve	C404.2	AP
5.	Verification of Impulse momentum principle for impact of jet on a stationary vane	C404.2	E
6.	Determination of Major losses and Minor losses for a pipe flow	C404.2	AP
7.	Determination of maximum efficiency of displacement pump and drawing the following graphs (i) Discharge Vs Head (ii) Discharge Vs Input Power (iii) Discharge Vs Efficiency	C404.3	AN
8.	Determination of maximum efficiency of roto-dynamic pump and drawing the following graphs (i) Discharge Vs Head(ii) Discharge Vs Input Power (iii) Discharge Vs Efficiency	C404.3	AN
9.	Determination of maximum efficiency of Submersible pump and drawing the following graphs (i) Discharge Vs Head(ii) Discharge Vs Output Power (iii) Discharge Vs Efficiency	C404.3	AN
10.	Determination of the performance of an impulse turbine and drawing the characteristics curves.	C404.4	AN
11.	Determination of performance of a reaction turbine (Francis Turbine) and drawing the characteristics curves. (a) Speed Vs Output Power (b) Speed Vs Efficiency	C404.4	AN
12.	Determination of performance of a reaction turbine (Kaplan Turbine) and drawing the characteristics curves. (a) Speed Vs Output Power (b) Speed Vs Efficiency	C404.4	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.	Yunus Cengel, "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 Leaning 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	20	10	10	-	10
Understand	80	10	10	-	10
Apply	-	30	30	45	30
Analyse	-	50	50	45	50
Evaluate	-	-	-	10	-
Create	-	-	-	-	-

18CE405	SOIL MECHANICS		3/0/3/4.5
Nature of Course	Conceptual, Analytical and Practical Application		
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:			
Upon completion of the course, students shall have ability to			
C405.1	Compute the basic properties of soil and classify the soil according to IS soil classification system		[U]
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	Compute the consolidation settlement of foundations and explain the Significance of soil compaction and slope stability analysis		[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 Hours :			45 Hrs
Laboratory Component:			
S.No.	List of Experiments	CO Mapping	RBT
1.	Determination of Moisture content of Soil	C405.1	[AN]
2.	Determination of Particle size distribution of Cohesion less and cohesive soil	C405.1	[AP]
3.	To Find out the Specific gravity of soil and Relative density of cohesion less soil	C405.1	[AP]

4.	Find out the Atterberg's limits	C405.1	[AP]
5.	Determination of Maximum Dry Density using Standard Proctor's Compaction Test	C405.5	[AN]
6.	Finding out the Field Density of soil using Sand replacement method and core cutter method	C405.5	[AN]
7.	Constant Head Permeability Test	C405.2	[AN]
8.	Falling Head Permeability Test	C405.2	[AN]
9.	Finding out Shear Strength parameters of soil using Direct Shear Method	C405.4	[AN]
10.	Determine the Unconfined Compressive strength and Cohesion from Unconfined Compression Test	C405.4	[AN]
11.	Calculation of California Bearing Ratio of soil.	C405.4	[AN]
12.	Determine the sensitivity of cohesive soil by laboratory Vane shear test	C405.4	[AN]

Text Books:

1.	Arora. K.R, "Soil Mechanics and Foundation Engineering (Geotechnical Engineering)", Standard Publishers Distributors, NaiSarak, Delhi, 2011.
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, 2016.
4.	Gopal Rajan 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, 2008.

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 Rubric based CIA [30 marks]	
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]		
Remember	10	10	10	10	10
Understand	40	40	40	30	40
Apply	40	40	40	50	40
Analyse	10	10	10	10	10
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

18MC401	MANAGEMENT ORGANIZATIONAL BEHAVIOUR	2/0/0/1
Nature of Course	Theory Concept	
Pre requisites	Nil	
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 organisation	
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	[AN]
C401.4	Identify international theories and approaches in an organizational system	[AN]
C401.5	Understand the workforce controlling and productivity of the organization	[U]
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, 11e, 2017.	
2.	Aswathappa, K., "Organisational 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		
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
C401.1	Understand	Online Quiz	10
C401.2, C401.3	Understand	Group assignment	10
C401.3	Apply	Group assignment	10
C401.4, C401.5	Understand	Online Quiz	10
Summative assessment based on Continuous and End Semester Examination			
Revised Bloom's Level	End Semester Examination (Theory) [60 Marks]		
Remember	20		
Understand	50		
Apply	-		
Analyse	30		
Evaluate	-		
Create	-		

SEMESTER 5

18CE501	FOUNDATION ENGINEERING	3/0/0/3
Nature of Course	Conceptual and 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	Understand the importance of soil investigation for any civil engineering construction	[U]
C501.2	Do proper bearing capacity estimation including IS code methods	[AN]
C501.3	Calculate settlement and to design various types of foundation.	[AN]
C501.4	To estimate pile and pile group capacity for any kind of soils including group efficiency and negative friction	[AP]
C501.5	Analyse any earth retaining structures for any kind of soil medium	[AP]
C501.6	Analyse 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- I S Code method- Bearing capacity from SPT and plate load test.		
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 I S 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).		
Total Hours:		45 Hrs

Text Books:				
1.	Gopal Ranjan and Rao, ASR, "Basic and Applied Soil Mechanics", New Age International Pvt. Ltd. Publication, New Delhi, 2016.			
2.	Varghese, P.C., "Foundation Engineering", Prentice Hall of India., 2014			
3.	Arora, K. R. "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors New Delhi, 2015.			
4.	Punmia, B.C., "Soil Mechanics and Foundation Engineering", Laxmi Publications, New Delhi, Sixteenth Edition, 2017.			
Reference Books:				
1.	Murthy VN S, "Geotechnical Engineering", Marcel Dekker Inc, 2010			
2.	Joseph E Bowles, "Foundation Analysis & Design W/Cd", 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, 2015.			
4.	IS8403: 1981 (Reaffirmed 2002), "Code of practice for Determination of Bearing Capacity of Shallow Foundation".			
5.	IS 2911: 2013, "Design and Construction of Pile Foundations"			
Web References:				
1.	https://freevideolectures.com/course/2674/foundation-engineering			
2.	https://www.youtube.com/playlist?list=PLbRMhDVUMngeiZjKPTPEF11CByXmYX3Kv			
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	Understand and Apply	Outside Classroom Learning Experience – Report 1	10	
C501.2				
C501.3				
C501.4	Analyse	Outside Classroom Learning Experience – Report 2	10	
C501.5				
C501.6				
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	20	20	10
Apply	60	30	40	50
Analyse	30	50	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

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 analysis of 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	Understand and apply the ILD concepts to beams and trusses to analyse and compute the forces and moments.		[AN]
C502.2	Analyse the various types of arches.		[AN]
C502.3	Understand and apply the various methods to analyse the indeterminate beams and frames to compute the shear forces and bending moments.		[AN]
C502.4	Understand and apply the Stiffness and Flexibility Matrix concepts to analyse the continuous beams and frames.		[AN]
Course Contents:			
Module 1: 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 - Equivalent UDL. Influence lines for forces in members of statically determinate trusses. 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 2: Slope Deflection and Moment Distribution methods			20 Hrs
Slope Deflection Methods - Continuous beams and rigid frames (with and without sway) - Symmetry and antisymmetry - Simplification for hinged end - Support displacements. Moment Distribution Method - Distribution and carryover of moments - Stiffness and carry over factors - Analysis of continuous beams - Plane rigid frames with and without frames.			
Module 3: Indeterminate structures – 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 - simple problems in continuous beams and frames - Limited to three by three matrix.			
Total Hours:			60 Hrs
Text Books:			
1.	Devdas Menon, Structural Analysis, Narosa Publishing House, 2018.		
2.	Vaidyanathan,R and Perumal,P, "Structural Analysis" Vol.1 & 2 Laxmi Publications, New Delhi,2016.		
3.	Bhavikatti S S,Structural Analysis Vol-1and 2, Vikas publishing House, PVT, LTD., 2013		

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. Spon Press, 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	Understand	Technical Presentation / demonstration	5	
C502.2	Analyse	Group assignment	5	
C502.3	Analyse	Group assignment	5	
C502.4	Analyse	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	10	10	10	10
Understand	30	20	10	10
Apply	30	30	30	30
Analyse	30	40	50	50
Evaluate	-	-	-	-
Create	-	-	-	-

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:			
Upon completion of the course, students shall have ability to			
C503.1	Have comprehensive design knowledge of retaining walls.		[AN]
C503.2	Apply the design concepts of yield line theory to slabs.		[AP]
C503.3	Have ample design knowledge of water tanks and domes.		[AN]
C503.4	Design plain and reinforced concrete walls.		[AN]
C503.5	Design the flat slabs in reinforced concrete structures.		[AN]
C503.6	Have generous design knowledge of solid slab bridges.		[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 (only problems no derivations).			
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
Laboratory Component:			
S. No	List of Experiments	CO Mapping	RB T
1.	Design and Detailing of Cantilever Retaining Wall	C503.1	[AN]
2.	Design and Detailing of Counterfort Retaining Wall	C503.1	[AN]
3.	Design and Detailing of Rectangular Slab	C503.2	[AP]
4.	Design and Detailing of Circular Slab	C503.2	[AP]
5.	Design and Detailing of Hexagonal Slab	C503.2	[AP]
6.	Design and Detailing of Triangular Slab	C503.2	[AP]
7.	Design and Detailing of Underground Rectangular Water Tank	C503.3	[AN]
8.	Design and Detailing of Ground level Rectangular Water Tank	C503.3	[AN]
9.	Design and Detailing of Hemispherical Dome.	C503.3	[AN]
10.	Design and Detailing of Reinforced Concrete Walls.	C503.4	[AN]
11.	Design and Detailing of Interior panel of Flat Slab	C503.5	[AN]
12.	Design and Detailing of Solid Slab Bridge.	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 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
Understand	20	20	20	10	10
Apply	30	20	10	30	30
Analyse	40	60	70	50	50
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

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	Understand the various types of treatment techniques adopted for public water supply system		[U]
C504.2	Apply the knowledge in drinking water treatment systems adopted in the world		[AP]
C504.3	Apply 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	Understand the concepts of sludge management and disposal systems using various effective methods		[U]
C504.6	Understand the concepts of Air Pollution and its control measures		[AP]
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

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 Optimum Coagulant Dosage of the given wastewater sample	C504.2	[AP]
3	Determination of Dissolved Oxygen presents in the water	C504.1	[AP]
4	Determination of Bio-chemical Oxygen Demand	C504.2	[AP]
5	Determination of Chemical Oxygen Demand	C504.4	[AP]
6	Determination of 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]
8	Determination of Sodium presents in the wastewater sample	C504.4	[AP]
9	Determination of potassium presents in the wastewater sample	C504.4	[AP]
10	Determination of Nitrates in the given wastewater sample	C504.4	[AP]
11	Determination of Air pollutant - Particulate Matter analysis	C504.6	[AP]
12	Determination of Gaseous Pollutant presents in the air	C504.6	[AP]
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.	Sankara Subramaniam.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 Blooms' Taxonomy)			

Summative assessment based on Continuous and End Semester Examination					
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	20	10	20	10
Understand	40	30	40	40	40
Apply	50	50	50	40	50
Analyze	-	-	-		-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

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:			
Upon completion of the course, students shall have ability to			
C505.1	Understand the cross-sectional elements and methods of alignment in highways.		[U]
C505.2	Design and evaluate the flexible and rigid pavements		[AP]
C505.3	Understand about urban transportation system and design of railway tracks.		[U]
C505.4	To Analyse about Signal and working procedures		[AN]
Course Contents:			
Module 1: 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, Special consideration for hill roads.			
Module 2: Construction Practice and Maintenance of Pavements			15 Hrs
Pavement components and their role - Design principles -Design practice for flexible and rigid Pavements (IRC methods only). 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 –Failures in Rigid Pavement - Pavements Evaluation – Pavements Surface Conditions – Functional and Structural Evaluation - Evaluation of Pavements Failure and Strengthening			
Module 3: Railway Planning, Construction and Maintenance			15 Hrs
Role of Indian Railways in National Development – Railways for Urban Transportation – LRT & MRTS - Engineering Surveys for Track Alignment –Permanent Way- its Components and their Functions. Geometric Design of railway tracks. Points and Crossings - Design of Turnouts, Working Principle - Signalling, Interlocking and Track Circuiting, Track Drainage, Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance, Level Crossings.			
Total Hours:			45 Hrs
Laboratory Component			
S.No	List of Experiments	CO Mapping	RBT
1	Determination of the numerical index (density) of coarse aggregates	C505.2	[AP]
2	Determination of resistance offered by aggregate against gradual loading	C505.2	[AP]
3	Determination of resistance offered by aggregates against sudden loading	C505.2	[AP]
4	Determination of resistance of aggregate against abrasion	C505.2	[AP]
5	Determination of water absorption capacity of aggregates	C505.2	[AP]
6	Determination of Elongation and Flakiness Index of	C505.2	[AP]

	aggregates				
7	Determination of Penetration of bitumen (Penetration Test)	C505.2	[AP]		
8	Determination of Viscosity of bituminous binder	C505.2	[AP]		
9	Determination of Ductility of bituminous binder	C505.2	[AP]		
10	Determination of Softening point of bitumen	C505.2	[AP]		
11	Design of Rigid Pavement	C505.2	[AP]		
12	Design of Flexible Pavement	C505.2	[AP]		
Text Books:					
1.	Kadiyali L R, " Principles and Practices of Highway Engineering ", Khanna Technical Publications, Delhi, 2012.				
2.	Khanna S.K and Justo C E G, "Highway Engineering ", Nem Chand & Bros, Roorkee, 2014.				
3.	Arora .S.P & Saxena .S.C, "A Textbook of Railway Engineering", Dhanpat Rai and Sons, 2009.				
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.	Partha Chhaborthy & 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)					
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	20	10
Understand	30	30	40	40	30
Apply	40	40	30	40	40
Analyse	20	20	20	-	20
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

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 and solving the problems experienced in the field.		[E]
C506.4	Acquire the skills to communicate effectively and to 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	-	-	

18MC501	Soft Skills		2/0/0/0
Nature of Course	Theory Concept		
Pre requisites	Technical Communication Skills		
Course Objectives:			
1.	To develop the students 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 non verbal 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]
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 Survival 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/

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
C501.1	Remember	Group Discussion	10
C501.2 & C501.3	Understand	Listening Skills	10
C501.4	Apply	Interview	10
C501.5	Apply	Formal Presentation	10

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	-

EMESTER 6

18CE601	DESIGN OF STEEL STRUCTURES	3/1/0/4
Nature of Course	Problem analytical	
Pre requisites	Solid Mechanics, Structural Analysis	
Course Objectives:		
1.	To create knowledge on Limit State Design Method for steel Structures	
2.	To impart knowledge on the latest codal provisions for the design of steel structures	
3.	To summarize concepts for the design of connections, tension members, compression members, beams.	
4.	To understand the design concepts for roof trusses including gantry girders.	
Course Outcomes: Upon completion of the course, students shall have ability to		
C601.1	Design bolted and welded connections	[U]
C601.2	Design tension members, splices, lug angles and gusset plates	[AN]
C601.3	Design compression members, lacings, battens and column bases.	[AN]
C601.4	Design laterally supported, unsupported beams and built-up beams.	[AN]
C601.5	Understand the components of industrial structures, design purlins and steel roof trusses	[AN]
C601.6	Design gantry girders	[AN]
Course Contents:		
Module 1: Design Philosophy, Bolted and Welded Connections		20 Hrs.
Limit state method – Types of bolts – Resistance of a bolt in single shear and double shear and bearing – Design for eccentric loading - examples. Principle of welding – methods of welding – weld symbols – edge preparation – welding electrodes – types of welded joints – strength of fillet and butt weld – design of welded connections for lap and butt joint and detailing - Design for eccentric loading - examples.		
Module 2: Design of Tension, Compression Members		20 Hrs.
Design of simple and built up members subjected to tension – effective area of angle and Tee sections connected to Gussets –Tension splice – lug angle, Axially loaded columns – effective length of compression members – slenderness ratio –strength of compression members – design of columns – built up columns – design of lacing and battens – design of column base		
Module 3: Design of Beams, Roof Trusses		20 Hrs.
Introduction to flexural members - Design of laterally supported and unsupported beams - Design of Compound beams, need for lateral support of compression flange and their design – strength of beams in shear - Components of industrial structures - loading specifications - Design of roof trusses and purlins - Introduction to gantry girder - Design of gantry girder.		
Total Hours:		60 Hrs
Text Books:		
1.	Subramanian, N. "Design of Steel Structures", Oxford University Press, New Delhi, 2011	
2.	Duggal, S.K., "Limit State Design of Steel Structures", Tata , Mc Graw Hill Education Pvt Ltd, New Delhi, 2014.	

3.	Negi, L.S., "Design of Steel Structures", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2014
----	--

Reference Books:

1.	Teaching Resource for Structural Steel Design, Vol. 1, 2 and 3, INSDAG - Institute for Steel Development and Growth, Kolkatta, 2000.
2.	Bhavikatti S.S., "Design of Steel Structures (By limit state method as per IS 800:2007)" I K International Publishing house Pvt. Ltd, 2010.
3.	IS 800-2007, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi, 2007
4.	SP 6(1) - 1964 Handbook for Structural Engineers - Structural Steel Sections, Bureau of Indian Standards, New Delhi, 1964
5.	SP 6(3) - 1962 Handbook for Structural Engineers - Steel Columns and Struts, Bureau of Indian Standards, New Delhi, 1962
6.	IS 875 (Part 1~5) : 1987, Indian Standard Code of Practice for Design Loads for buildings and structures, Bureau of Indian Standards, New Delhi, 1987

Web References:

1.	https://lecturenotes.in/subject/161/design-of-steel-structure-dss
2.	https://www.accessengineeringlibrary.com/browse/steel-structures-design-asd-lrfd

Online Resources:

1.	https://nptel.ac.in/courses/105106112/
2.	https://nptel.ac.in/courses/105105162/

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

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C601.1, C601.2 & C601.3	Understand & Apply	Outside Classroom Hours Technical Report I	10
C601.4, C601.5 & C601.6	Analyze & Apply	Outside Classroom Hours Technical Report II	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	10	10
Understand	40	20	20	20
Apply	20	20	30	30
Analyse	20	40	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

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:			
Upon completion of the course, students shall have ability to			
C602.1	Understand the basic concepts in Construction management and project planning in construction Projects		[U]
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	Understand the principles and systems related to Quality and Safety in construction.		[U]
Course Contents:			
Module 1: Introduction to Management & Planning - Need, Importance & Purpose:			
			15 Hrs
Construction Management basics: Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications, Special Characteristics of construction activity, their influence on Construction Management, Scope of Construction Management - Management Planning, Importance of Planning - Types of organizations, Resource planning - Project life cycle, Project feasibility reports based on socio-techno-economic-environmental impact analysis, Qualities, role and responsibilities of project Manager, Role of Project Management Consultants.			
Module 2: Scheduling and Cost control			
			15 Hrs
Relevance of construction schedules - Work Breakdown structure –Bar charts – The critical path method–Calculations for critical path scheduling–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 – Principles of Safety – Safety and Health Management system – Safety Audit – Health and Safety Acts and Regulations.			
Total Hours:			45 Hrs
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	[AP]
3	Determination of Summary Tasks and Milestones	C602.3	[AP]
4	Allocation of Resources to tasks and Levelling Work Resources	C602.3	[AP]

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	[AN]
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.	Seetharaman S, "Construction Engineering and Management, Umesh Publishers, New Delhi, 2008.
3.	Gahlot P S., and B M Dhir,"Construction Planning & management", New Age International Limited Publishers, 2010.

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

Online Resources:

1.	https://nptel.ac.in/courses/105104161/
2.	https://nptel.ac.in/courses/105103093/

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	-	-	-	-	-

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:			
Upon completion of the course, students shall have ability to			
C603.1	Understand and apply the various methods of estimates.		[AP]
C603.2	Estimate the material quantities of load bearing structures		[AP]
C603.3	Estimate the material quantities for special structures such as sanitary structures, wells, roads and retaining walls.		[AP]
C603.4	Perform rate analysis and Tender documents.		[AP]
C603.5	Prepare valuation report and rent fixation for government buildings		[AP]
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
Laboratory Component:			
S. No	List of Experiments	CO Mapping	RBT
1.	Estimation of a Single Room Building: Load bearing structure	C603.2	[AP]
2.	Estimation of 1 BHK Residential Building: Load bearing structure.	C603.2	[AP]
3.	Estimation of Septic Tank with Soak Pit for 2BHK House.	C603.3	[AP]
4.	Estimation of Tube Well	C603.3	[AP]
5.	Estimation of Flexible and Rigid Pavement for State Highway	C603.3	[AP]
6.	Preparation of tender Notice and Document for Proposed School Building Project	C603.4	[AP]

7.	Drafting of contract documents for a Primary Health Center.	C603.4	[AP]
8.	Rate Analysis for Reinforced Cement Concrete Works.	C603.4	[AP]
9.	Valuation of a Masonry Residential Building by depreciation method	C603.5	[AP]
10.	Valuation of a Reinforced Cement Concrete framed building (G+1) by depreciation method	C603.5	[AP]
11.	Fixation and calculation of rent of Government Building.	C603.5	[AP]
12.	Reports on estimates for the construction of Residential Building.	C603.5	[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 Rubric based CIA [30 marks]	End Semester Examination (Theory) [40 marks]
	CIA-I [10 marks]	CIA-II [10 marks]	CIA-III [10 marks]		
Remember	5	-	5	-	10
Understand	35	20	30	30	20
Apply	60	80	65	70	70
Analyse	-	-	-		
Evaluate	-	-	-		
Create	-	-	-		

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 and solving the problems experienced in the field.		[E]
C604.4	Acquire the skills to communicate effectively and to 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	-	-	
Understand	10	10	
Apply	20	20	
Analyse	40	40	
Evaluate	30	30	
Create	-	-	

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	The students understand the verbal and non-verbal nature of problems in reality and know the shortcut methods of solving it.		[U]
C601.3	The students able to 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]
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: General Ability		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	R. S. Aggarwal “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	Understand	Formal presentation	10
C601.3& C601.4	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	-		

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	Define a compelling and viable problem as project topic.			[AN]	
C701.2	Develop skill to create practical solutions to identified problem.			[C]	
C701.3	Ability to use software model and other artifacts appropriate for problem			[C]	
C701.4	Effectively explain and defend their work in front of an evaluation panel			[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. 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
Analyse	50	40	50	50	50
Evaluate	-	20	20	20	20
Create	-		20	20	20

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	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task				[AN]
C801.2	Acquire collaborative skills through working in a team to achieve common goals				[AP]
C801.3	Formulate proper methodology for solving problems concerned with Civil Engineering				[C]
C801.4	Acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.				[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>					
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
Analyse	50	40	50	50	50
Evaluate	-	20	20	20	20
Create	-		20	20	20

PROFESSIONAL ELECTIVE COURSES
Elective Stream I: Structural / Geotechnical Engineering

18CE901	BRIDGE ENGINEERING		3/0/0/3
Nature of Course	Problem Analytical		
Pre requisites	Design of RC Elements, Design of Reinforced Concrete Structures		
Course Objectives			
1.	The student will be able to determine the design parameters needed for bridge design		
2.	To acquire knowledge on the design of reinforced concrete bridges.		
2.	The student will be able to analyze and design the slab bridge and also know about the design principles of modern bridges		
3.	The student will be able to know about various substructure components and its requirements		
Course Outcomes			
Upon completion of the course, students shall have ability to			
C901.1	Describe the classification of bridges, IRC loads acting on bridges.		[U]
C901.2	Demonstrate the general design consideration for various bridges		[AP]
C901.3	Design short span bridges - culverts, solid slab bridges, Tee Beam Bridges		[AN]
C901.4	Explain the design concepts of long span bridges - continuous bridges, box girder bridges and balanced cantilever bridges		[AN]
C901.5	Design steel bridges – riveted / welded plate girder bridges		[AN]
C901.6	Classify the bearings, substructure for bridges		[AN]
Course Contents:			
Module 1 : Introduction			10 Hrs
Classification, investigations and planning, choice of type, I.R.C. Specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.			
Module 2 : Short / Long Span Bridges			20 Hrs
Load distribution theories, analysis and design of slab culverts, Tee beam and slab bridges. Design of post-tensioned prestressed concrete Tee beam and Slab bridge, Design principles of continuous bridges, box girder bridges, balanced cantilever bridges and 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 “, 2nd 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 “, 6th Edition, Oxford and IBH Publishing Co. New Delhi, 2010.		
2.	Raina V.K.,” Concrete Bridge Practice Analysis, Design and Economics “, 3rd Edition, Shroff Pub & Dist. 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.	https://www.accessengineeringlibrary.com/browse/handbook-of-civil-engineering-calculations-second-edition/p200128239975_59001			
2.	https://science.howstuffworks.com/engineering/civil/bridge1.htm			
Online Resources :				
1.	https://nptel.ac.in/courses/105105165/			
2.	https://www.youtube.com/playlist?list=PLZzO5hTp04ec6uwdZ_lem0kO_8ob1MtVt			
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	
C901.1	Understand	Announced Test	5	
C901.2	Apply			
C901.3	Analyse	Group assignment	5	
C901.4	Analyse	Class room quiz	5	
C901.5	Analyse			
C901.6	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	20	15	10	10
Understand	20	20	20	20
Apply	25	25	30	30
Analyse	35	40	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

18CE902	DISASTER PREPAREDNESS AND PLANNING	3/ 0/ 0/ 3
Nature of Course	Theory	
Pre requisites	Nil	
Course Objectives:		
1.	To understand the knowledge of the disaster management and its influence	
2.	To study and assess the building behavior during various disasters	
3.	To study and analyze vulnerability	
4.	To understand the policy and procedure involved during disaster	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
CE902.1	Understand the various types of disasters	[U]
CE902.2	Identify the potential deficiency of existing building during disaster with remedial measures	[AP]
CE902.3	Derive the protection measures against all disasters	[AP]
CE902.4	Understand hazard assessment procedure	[U]
CE902.5	Illustrate the disaster management schemes in India	[U]
Course Contents:		
Module 1: Introduction to Disaster management		15 Hrs
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 – Crisis in power Sector – Accidents in coal mines- Hazard affecting buildings-Building safety against hazards– Floods-Cyclones-Landslides – Fire - Earthquake hazard map-Causes of earthquakes-Classification of earthquakes		
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-retrofitting of existing buildings-RVS method of screening- RC and masonry structures-seismic hazard assessment-Community planning and community contingency plan-report building and initial awareness - Seismic response of damped vibration - Performance of ground and building in past earthquakes - Earthquake resistant measures in RC and masonry buildings -Landslides zoning map - causes and potential measures - Flood zone map - Effects on building -Protection measures - Tropical cyclone and its effects on building - Protection measures from damage to buildings - Tsunami magnitude and intensity - Effects of tsunami on built structures -Nuclear disaster - chemical and industrial accidents - Mitigation strategies.		
Module 3: Disaster Management policy and Procedure in India		15 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-Medical first responder – Flood relief and rescue management- National Disaster Rescue Force -Disaster preparedness– Disaster mitigation – Forecasting and warning of disasters – Psychological and - social dimensions in disasters – Trauma and stress – Emotional intelligence – Role of news media in Disaster management.		

		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.			
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.	Sathish Modh, Introduction to Disaster Management, Macmillan publishers, 2nd edition, New Delhi, 2009			
4.	Annual report , Ministry of Home Affairs, Government of India, 2009-2016.			
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/			
Online Resources:				
1.	https://nptel.ac.in/courses/105101004/			
2.	https://lecturenotes.in/notes/14515-note-for-disaster-management-dm-by-jntu-heroes			
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	
CE902.1	Understand	Surprise Test	5	
CE902.2	Apply	Group Assignment 1	5	
CE902.3	Apply	Group Assignment 2	5	
CE902.4 CE902.5	Understand	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	40	20	20	20
Understand	60	60	40	40
Apply	-	20	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE903	EARTHQUAKE RESISTANT STRUCTURES		3/0/0/3
Nature of Course	Problem Analytical		
Pre requisites	Engineering Mechanics		
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	Remember the concept of static, dynamic and damping forces on system		[R]
C903.2	Understand the concepts of degree of freedom system		[U]
C903.3	Understand the concepts of seismology		[U]
C903.4	Apply the concepts for analysing the disastrous earthquakes.		[AP]
C903.5	Analyse and Design of earthquake resistant structures		[AN]
C903.6	Analyse the structures provided with vibration control		[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 idealisation, 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 – solis – Land forms and process associated with river, wind, ground water and sea – Earth quakes - Causes of Earthquake, Geological faults, Tectonic plate theory, Elastic rebound, Epicentre, Hypocentre, 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.	Damodarasamy S. R. And Kavitha S., “Basics of Structural Dynamics and Aseismic Design”, PHI Learning Pvt. Ltd., New Delhi, 5 th Edition, 2018 (Under Printing).			
3.	Duggal S.K., “Earthquake Resistant Design of Structures”, Oxford University Press, 2013.			
Reference Books:				
1.	Anil K. Chopra, “Dynamics of Structures”, Pearson Publishers, 5 th Edition, 2016.			
2.	Madhujit Mukhopadhyay, “Structural Dynamics”, Ane Books Pvt. Ltd., New Delhi, 2015.			
3.	Mehmet E. Uz and Muhammad N. S. Hadi, “Earthquake Resistant Design of Buildings” CRC Press, 2017.			
4.	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	Understand	Surprise test	5	
C903.3	Understand	Group Assignment	5	
C903.4	Apply	Case Study	5	
C903.5 & C903.6	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]	CIA III [10 marks]	
Remember	30	10	-	10
Understand	70	40	20	20
Apply	-	50	40	30
Analyse	-	-	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

18CE904	FINITE ELEMENT METHODS		3/0/0/3
Nature of Course	Problem Analytical		
Pre requisites	Structural Analysis		
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 Isoparametric 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 - Basic element shapes - Element properties – Node numbering procedure - Displacement models – Approximation displacements by Polynomials - Convergence requirements – Generalised co-ordinates – Natural co-ordinates – Shape functions for linear & quadratic models – Stiffness matrix – Nodal load vector – Static condensation – Simple problems.			
Module 2 : INTRODUCTION TO ISOPARAMETIRC ELEMENTS			15 Hrs
Concept of sub, iso, super parametric elements – 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	Surprise Test	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	20	15	10	10
Understand	20	20	20	20
Apply	25	25	30	30
Analyse	35	40	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

18CE905	GREEN BUILDING TECHNOLOGY		3/ 0/ 0/ 3
Nature of Course	Theory Concept		
Pre- requisites	Nil		
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	Understand various components which make the building energy Efficient such as lighting, space conditioning, heat control and energy efficient.		[U]
C905.2	Understand various Green building systems, criteria for selection materials and their applications		[U]
C905.3	Understand green building implementation measures and various green building rating systems along with its implementation for conventional buildings		[A]
C905.4	Understand the economic aspects and environment benefits of Green Buildings		[U]
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.	Charles J. Kibert, “Sustainable Construction: Green Building Design and Delivery”, 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	Understand	Class Room Quiz	5
C905.2	Understand	Group Assignment	5
C905.3	Understand, Analyze	Group Mini Project	5
C905.4	Remember, Understand	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 [10marks]	Term End Examination [10 marks]	
Remember	40	40	30	20
Understand	60	60	40	60
Apply	-	-	-	-
Analyze	-	-	30	20
Evaluate	-	-	-	-
Create	-	-	-	-

18CE906	GROUND IMPROVEMENT TECHNIQUES AND LAND RECLAMATION		3/0/0/3
Nature of Course	Theory and Application		
Pre-requisites	Soil Mechanics and Foundation Engineering		
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	Identify the geotechnical problems in different type of soils		[R]
C906.2	Apply the drainage and dewatering techniques to improve soil stability		[AP]
C906.3	Apply the In situ treatment of Cohesion less and cohesive soil		[AP]
C906.4	Understand the concept of earth reinforcement and different methods in Land reclamation		[U]
C906.5	Apply different grouting techniques for soil stability		[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.	Bikas Chandra Chattopadhyay, "Ground Improvement Techniques", PHI Learning, 2017.		
2.	Purushothama Raj, P. "Ground Improvement Techniques", Laxmi Publications, 2016.		
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.		

5.	Manfred R. Hausmann, "Engineering principles of ground modification", McGraw-Hill Ryerson, Limited, 2008.			
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	
C906.4	Understand	Group Assignment	5	
C906.2	Apply	Online Quiz	5	
C906.3				
C906.5				
C906.5	Apply	Group Assignment	5	
C906.1 – 5	Understand	Power Point 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	30	30	20	20
Understand	30	40	20	20
Apply	40	30	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE907	PREFABRICATED STRUCTURES		3/0/0/3
Nature of Course	Practical application		
Pre requisites	Design of Reinforced concrete Structures.		
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			
C908.1	Understand the need for prefabrication and its types.		[U]
C908.2	Understand the standardization techniques and behaviour of Prefabricated Components		[U]
C908.3	Understand the design Principles and apply various structural connections for Prefabricated Members		[AP]
C908.4	Understand Progressive collapse of the structure and apply the Codal provisions for abnormal loads		[AP]
Course Contents:			
Module 1: Introduction to Prefabricated Structures and components		15 Hrs	
Need for prefabrication – Principles – Materials – Comparison with monolithic construction Types of prefabrication – Site and plant prefabrication - Economy of prefabrication- 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 – 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.

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
C908.1	Understand	Power point presentation	5
C908.2	Apply	Group Assignment	5
C908.3	Apply	Group Assignment	5
C908.4	Apply	Class room 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	60	60	50	50
Apply	20	30	40	40
Analyse				
Evaluate	-	-	-	-
Create	-	-	-	-

18CE908	PRESTRESSED CONCRETE STRUCTURES	3/0/0/3
Nature of Course	Theory Analytical	
Pre requisites	Design and detailing of R C Structures	
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 analyse and design the Circular pre stressed concrete structures	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C909.1	Understand the different methods of pre stressing.	[R]
C909.2	Estimate the effective pre stress including the short and long term losses.	[U]
C909.3	Analyze and design pre stressed concrete beams under flexure and shear.	[AN]
C909.4	Understand the methods of achieving continuity in pre stressed concrete	[AN]
C909.5	Analyze and 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-structures/			
Online Resources:				
1.	http://www.nptel.ac.in/courses/105106118/			
2.	http://www.nptel.ac.in/courses/105106118/			
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	Remember	Class Room Quiz	5	
C909.2	Understand	Group Assignment	5	
C909.3	Analyse	Group Assignment	5	
C909.4	Analyse	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	20	20	20	20
Understand	80	30	20	20
Apply	-	-	-	-
Analyse	-	50	60	60
Evaluate	-	-	-	-
Create	-	-	-	-

18CE909	TALL BUILDINGS	3/0/0/3
Nature of Course	Theory Analytical	
Pre requisites	Design of Reinforced Concrete Structures	
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	Understand the materials used in Tall Building construction	[U]
C909.2	Evaluate the loading acting in the buildings	[AN]
C909.3	Understand the behavior of structural systems	[U]
C909.4	Apply the concepts for design and analysis of Tall Buildings	[A]
C909.5	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 frames 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	Understand & Remember	Group Assignment	5
C909.2	Analyse	Online Quiz	5
C909.3	Understand	Self – Support Assignment	5
C909.4	Apply	Technical Presentation / Case Study	5
C909.5	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	20	20	20	20
Understand	20	30	20	20
Apply	-	-	10	10
Analyse	60	50	50	50
Evaluate	-	-	-	-
Create	-	-	-	-

Elective Stream II: Environmental / Hydrology and Water Resource Engineering

18CE910	AIR POLLUTION MANAGEMENT	3/0/0/3
Nature of Course	Theory application	
Pre requisites	Nil	
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 air pollution and Legislations.	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C910.1	Understand the sources, characteristics and effects of air pollution.	[U]
C910.2	Remember the ambient and indoor air quality standards	[R]
C910.3	Apply Sampling and modeling techniques in validating air quality parameters.	[AP]
C910.4	Suggest suitable air pollution prevention equipment and techniques for various gaseous and particulate pollutants to Industries.	[AP]
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 – Introduction.		
Module 3: Air Pollution Control Measures, Legislations And Case Studies		15 Hrs
Control - Source correction methods - Control equipment - Particulate control methods - Settling chamber - cyclone separators - inertial devices - Electrostatic precipitator - scrubbers - Control of gaseous emissions - Absorption - Adsorption equipment - adsorption and combustion devices. Air pollution survey - Air pollution legislation and regulations – Environmental criteria for siting industries and green belts - Air pollution in Indian cities. Case studies - some specific industries - cement industry - refineries - fertilizer - paper industry - Sources of pollutants and its controls.		
Total Hours:		45 Hrs
Text Books:		
1.	Rao.C.S. "Environmental Pollution Control Engineering", Wiley Eastern Limited, 2008.	
2.	Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 2004	
3.	Thad Godish, Wayne T. Davis "Air Quality", CRC Press, Newyork,2014	
Reference Books:		

1.	Lawrence K.Wang, Norman C Pererla, Yung - Tse Hung, "Air Pollution Control Engineering", Tokyo, 2004
2.	Noel De Nevers, " Air Pollution Control Engineering" (2 nd Edn.) McGraw Hill ,New York 2000
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 Bloom's Taxonomy)

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

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C910.1	Remember	Online Quiz	5
C910.2	Understand	Technical Presentation	5
C910.3	Apply	Group Assignment	5
C910.4	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	30	30	30	30
Understand	30	30	30	30
Apply	40	40	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE911	CONTAMINATED SITE REMEDIATION		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	Nil		
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.		[R]
C911.2	Understand physical, chemical and biological processes governing contaminant fate and transport in the subsurface		[U]
C911.3	Understand the Use of appropriate tools and techniques for the planning and design of site investigations		[U]
C911.4	Propose technically and economically feasible and sustainable remedies for contaminated sites		[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 - Permeable reactive Treatment Walls - Advanced remediation technologies - 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	Remember	Online Quiz	5	
C911.2	Understand	Group Assignment	5	
C911.3	Understand	Technical Presentation	5	
C911.4	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	20	-	-	20
Understand	80	50	70	50
Apply	-	50	30	30
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE912	ENVIRONMENTAL IMPACT ASSESSMENT AND RISK MANAGEMENT		3/0/0/3
Nature of Course	Theory application		
Pre requisites	Nil		
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	Understand the necessity to study the impacts and risks that will be caused by projects or industries and the methods to overcome these impacts		[U]
C912.2	Describe the legal requirements of environmental and risk assessment for projects		[U]
C912.3	Prepare terms of reference for environmental impact and socio-economic impact for any developmental project		[AP]
C912.4	Prepare environmental management plan and risk mitigation plan by considering environmental aspects, impacts and potential hazards respectively for any project		[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 and Sastry.C.A “Environmental Impact Assessment Methodologies”, BS Publications, Hyderabad, 2007.
2.	Shukla S. K. and Srivastava P.R., “Concepts in Environmental Impact Analysis”, Common Wealth Publishers, New Delhi, 2009.
3.	Canter, L.W., “ Environmental Impact Assessment “, McGraw Hill, New York, 1996

Reference Books:

1	Lawrence, D.P., “ Environmental Impact Assessment – Practical Solutions to recurrent problems “ , Wiley-Inter science, New Jersey, 2003
2.	Judith Petts, Handbook of Environmental Impact Assessment Vol. I and II, Blackwell Science, New York, 1998
3.	Hosetti.B “Environmental Impact Assessment and Management”, Daya Publishing House,2014.
4.	Petts, J., Handbook of Environmental Impact Assessment, Vol. I and II, Blackwell science, London, 1999.

Web Courses:

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

Online References:

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

Tentative 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
C912.1	Understand	Online Quiz	5
C912.2	Understand	Group Discussion	5
C912.3	Apply	Group Assignment	5
C912.4	Apply	Surprise Test	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	10	20	20	20
Understand	50	60	40	20
Apply	40	20	40	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE913	HYDROLOGY		3/0/0/3
Nature of Course	Theory Analytical		
Pre requisites	Nil		
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	Understand the hydrograph, types and their application		[U]
C913.3	Analyze the flood routing and its methods		[AN]
C913.4	Apply the concepts of Groundwater hydrology and methods		[AP]
C913.5	Analyze 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.,“Engineering Hydrology”,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.	Mysooru R.Yadupathi Putty, "Principles of Hydrology", I K International Publishing House Pvt.Ltd, 2011
4.	Jayarami Reddi.P., "A Text book of Hydrology", LaxmiPublications, NewDelhi, 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
C913.1	Understand	Online Quiz	5
C913.2	Understand	Technical presentation	5
C913.4	Apply	Group Assignment	5
C913.3, C319.5	Analyse	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	-	-	-	-
Understand	60	50	40	50
Apply	30	30	30	30
Analyse	10	20	30	20
Evaluate	-	-	-	-
Create	-	-	-	-

18CE914	INDUSTRIAL WASTEWATER MANAGEMENT		3/0/0/3
Nature of Course	Theory Application		
Pre requisites	Environmental Engineering		
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	Understand the sources, characteristics and composition of industrial wastewater		[U]
C914.2	Understand the various effects caused by the industrial effluent to human health		[U]
C914.3	Learn the types of conventional and advanced treatment systems adopted for various industrial effluents		[AP]
C914.4	Understand the concepts involved in sludge processing and disposal		[AP]
C914.5	Understand the basics of hazardous wastes and its causes and effects		[AP]
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 Publishing Co., 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., New Delhi., 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 Bloom's Taxonomy)

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

Course Outcome	Revised Bloom's Level	Assessment Component	Marks
C914.1,2	Understand	Online Quiz	5
C914.3	Apply	Group Assignment	5
C914.4	Apply	Technical Presentation	5
C914.5	Apply	Surprise Test	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	50	30	50	50
Apply	50	70	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE915	IRRIGATION ENGINEERING		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	Nil		
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	Understand the Irrigation and its method		[U]
C915.2	Analyze various hydraulic structures		[AN]
C915.3	Remember the concepts of irrigation water management		[R]
C915.4	Apply the concepts of irrigation water management		[AP]
C915.5	Design the various hydraulic structures		[AP]
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 B Lal, "Irrigation and Water Power Engineering", Laxmi Publications Pvt Ltd., New Delhi, 2009.		
3.	Sahasra Budhe 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.	Gurcharan Singh., "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	Understand	Online Quiz	5	
C915.2	Analyse	Group Assignment	5	
C915.3	Understand	Group Assignment	5	
C915.4 & C915.5	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	30	20	20	10
Understand	30	30	30	10
Apply	40	30	30	40
Analyse	-	20	20	40
Evaluate	-	-	-	-
Create	-	-	-	-

18CE91 6	REMOTE SENSING AND GIS APPLICATIONS	3/0/0/3
Nature of Course	Theory Concepts	
Pre requisites	Nil	
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	To understand the basic components of remote sensing techniques	[U]
C916 .2	To Apply the concepts of remote sensing techniques for atmospheric characteristics analysis	[AP]
C916 .3	To understand the positions of satellites and its uses in remote sensing technology	[U]
C916 .4	To study the basics of Geographical Information systems and its uses in remote sensing technologies	[U]
C916 .5	To 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. Anji Reddy.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 Veeranna Bommakanti, “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_introductory_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	Understand	Online Quiz	5
C916.2	Apply	Group Assignment	5
C916.3 & C916.4	Understand	Technical Presentation	5
C916.5	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	-	-	-	-
Understand	60	50	40	50
Apply	40	50	60	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE917	SOLID AND HAZARDOUS WASTE MANAGEMENT	3/0/0/3
Nature of Course	Theory Analytical	
Pre requisites	Nil	
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 (MSW) management system	[U]
C917.2	Evaluate the various processing technologies for MSW	[AP]
C917.3	Analyze the various options for disposal of MSW	[AN]
C917.4	Identify and classify the hazardous wastes	[U]
C917.5	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- Characterisation-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.	George Tchobanoglous, Hilary Theisen and Samuel Vigil. "Integrated Solid Waste Management", McGraw-Hill Publishers, 1993.	
2.	Bhide A.D and Sundaresan, B.B. "Solid Waste Management Collection,	

	Processing and Disposal”, 2001.
3.	John Pichtel. Waste management Practices Municipal, hazardous and Industrial Taylor and Francis 2005.

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 Worrel W.A “ Solid Waste Engineering” –, Cengage Learning 2011.
4.	Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. “Environmental Engineering” McGraw-Hill Publishers, 2013.

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	Understand	Online Quiz	5
C917.2	Apply	Technical Presentation	5
C917.3	Analyse	Group Assignment	5
C917.4,5	Understand	Surprise Test	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	20	20	20
Understand	40	30	30	30
Apply	30	30	30	20
Analyse	-	20	20	30
Evaluate	-	-	-	-
Create	-	-	-	-

18CE918	WATER RESOURCES ENGINEERING		3/0/0/3
Nature of Course	Theory Concepts		
Pre requisites	Nil		
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	Understand the basics concepts of Water resource		[U]
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]
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	Understand	Online Quiz	5	
C918.2	Analyse	Group Assignment	5	
C918.3	Apply	Self-Support Assignment	5	
C918.4	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	30	20	10	10
Understand	30	30	20	20
Apply	20	30	40	40
Analyse	-	20	30	30
Evaluate	-	-	-	-
Create	-	-	-	-

Elective Stream III : Transportation / Construction Engineering

18CE919	AIRPORTS, DOCKS AND HARBOURS	3/0/0/3
Nature of Course	Theory Analytical	
Pre-requisites	Nil	
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	Understand the aircraft characteristics, components of airport.	[U]
C919.2	To design the runways and taxiways & present the final layout.	[AP]
C919.3	To Plan the layout of harbour	[AP]
C919.4	Understand the components of docks and harbours.	[U]
C919.5	To know new concepts involved in airports, docks and harbours	[U]
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.		
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.		
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, 2006.	
2.	Bindra S. P., “A Course in Docks and Harbour Engineering”, Dhanapat Rai and Sons, New Delhi, 2013.	
3	Saxena Subhash 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, 2008.
3.	Rangwala, " Airport Engineering ", Charotar Publishing House, 2009
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	Understand	Group Assignment	5
C919.5	Understand	Surprise test	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	10	10
Understand	30	30	30	30
Apply	40	40	40	40
Analyse	20	20	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

18CE920	ENGINEERING RISK BENEFIT ANALYSIS		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	Nil		
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	Identify elements of Risk analysis and its types		[AP]
C920.2	Identify the types of risk assessment methods		[AP]
C920.3	Understand the methods of Decision making		[U]
C920.4	Apply the concepts of Cost Benefit Analysis in cases of uncertainty		[AP]
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 2008.		
2.	Richard Wilson and Edmund A.C. Crouch, "Risk Benefit Analysis", Harvard centre for risk analysis,2004.		
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,2008.		
2.	B. M. Ayyub,"Risk Analysis in Engineering and Economics", Chapman-Hall/CRC Press, 2010.		
3.	Vose, David , "Risk Analysis: A Quantitative Guide "3rd Edition, John Wiley & Sons Ltd, 2008		

4.	Boardman, T. et al. Cost-Benefit Analysis: Concepts and Practice (Upper Saddle River, NJ: Prentice-Hall) 2001.			
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	Apply	Online Quiz		5
C920.2	Apply	Group Assignment		5
C920.3	Understand	Technical Presentation		5
C920.4	Apply	Case study		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
Understand	80	50	70	50
Apply	-	50	30	30
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE921	MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	Concrete Technology		
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	Define the different repair and maintenance strategies.		[U]
C921.2	Summarize the concept of serviceability and durability of concrete		[U]
C921.3	Discuss about various special materials and assessment methods for repair		[U]
C921.4	Understand and apply retrofitting methods for structures.		[AP]
C921.5	Apply the different techniques for repair 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	Understand	Technical Presentation	5	
C921.2	Understand	Group Assignment	5	
C921.3	Understand	Group Assignment	5	
C921.4 & C921.5	Apply	Case Study	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	-	-	-	-

18CE922	PAVEMENT ENGINEERING		3/0/0/3
Nature of Course	Theory Analytical		
Pre requisites	Highway Engineering		
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	Identify the factors governing the design		[U]
C922.2	Analyse and design flexible and rigid pavements.		[AP]
C922.3	Implement maintenance and evaluation procedure of the pavement		[AN]
C922.4	Analyze the warping, friction, wheel load stress and calculate the combined stress.		[AP]
C922.5	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, Nem chand & Sons publisher, 2017.		
2.	Pratab Chraborthy and Animesh Das., Principles of Transportation Engineering, PHI Learning Pvt. Ltd, 2017.		
3.	Yoder E. J and Witczak M. W., Principles of Pavement Design, Wiley India Pvt Ltd; Second edition, 2011.		
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	Understanding	Group Assignment		5
C922.2				
C922.3	Apply	Group Assignment		5
C922.4	Apply	Online Quiz		5
C922.5	Analyse	Surprise Test		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	-	-	-	-

18CE923	PROJECT MANAGEMENT		3/0/0/3
Nature of Course	Theory & analytical		
Pre requisites	Construction Engineering and Management		
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	Understand the basic concepts of Project Management techniques and tools		[U]
C923.2	Understand the types of estimates and estimation methods		[U]
C923.3	Apply various techniques to estimate project budget and control project cash flows		[AP]
C923.4	Analyze the risks in construction projects under certainty and uncertainty		[AN]
Course Contents:			
Module 1: Overview of Project Management, Concepts and Techniques			15 Hrs
Definition and objectives of Project Management, Characteristics of projects, Stages of Project Management, Project Life cycle, Project Initiation, Project Planning, execution, monitoring and closeout process - Establishing Project organization - Types of Organizations and Organizational structures.			
Module 2: Project Cost Estimating, Monitoring and control			15 Hrs
Types of Estimates-Methods of Estimation - Project cash flows- Project budgeting-Project Monitoring and Control, Procurement management, Materials management-Types of Inventory-Inventory Monitoring and control , Equipment management-Classification-Factors for selection-Methods of calculating Depreciation-Safety management , Contracts Management and Management of Special Projects.			
Module 3: Project Risk Analysis			15 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.	Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders,Prentice Hall, Pittsburgh, 2000.		
3.	Joy P K, Total Project Management: The Indian Context, Macmillan India Ltd, 2010.		
Reference Books:			
1.	Seetharaman S, "Construction Engineering and Management, Umesh Publishers, New Delhi, 2000.		

2.	Halpin,D.W., “Financial and cost concepts for construction Management”, JohnWiley and Sons, New York,2005.
3.	Lock, Gower, Project Management Handbook, 2013.
4.	Jimmie W.Hinze, “Construction Planning and Scheduling”, Prentice Hall Publication, 4thedition, 2011.

Web References:

1.	http://org.elon.edu/cmdept/procedures.htm
2.	http://www.manage.gov.in/studymaterial/PM.pdf

Online Resources:

1.	https://nptel.ac.in/syllabus/110101009/
2.	https://nptel.ac.in/courses/110104073/

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	Understand	Online Quiz	5
C923.2	Apply	Group Assignment	5
C923.3	Analyse	Group Assignment	5
C923.4	Evaluate	Surprise test	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	60	40	30	40
Apply	20	20	30	30
Analyse	-	20	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

18CE924	PROJECT SAFETY MANAGEMENT		3/0/0/3
Nature of Course	Theory and Concept		
Pre requisites	Construction Engineering and Management		
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	Understand the concepts of construction safety management		[U]
C924.2	Understand various construction accidents ,its causes and preventive measures		[U]
C924.3	Understand Safety systems in construction contracts and different Contractual Obligations		[U]
C924.4	Apply the safety measures for various construction works		[AP]
C924.5	Apply the safety consideration in handling various equipments		[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.	<u>Patrick X.W. Zou</u> and <u>Riza Yosia Sunindijo</u> , “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

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

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	Understand	Surprise Test	5
C924.2	Understand	Group Assignment	5
C924.3	Understand	Group Assignment	5
C924.4, C924.5	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	40	20	20	20
Understand	60	60	40	40
Apply	-	20	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE925	SUSTAINABLE CONSTRUCTION MATERIALS AND METHODS	3/0/0/3
Nature of Course	Theory application	
Pre requisites	Construction Materials and Techniques	
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	Understand the sustainability principles.	[U]
C925.2	Learn the green building concepts and technology.	[U]
C925.3	Know the green building certification process.	[U]
C925.4	Have a comprehensive knowledge of sustainable construction materials.	[U]
C925.5	Understand the cost analysis of sustainable construction process.	[U]
C925.6	Apply 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, GUrnel 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	Understand	Online Quiz	5	
C925.3	Understand	Technical Presentation	5	
C925.4 & C925.5	Understand	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	30	20	-	10
Understand	70	80	50	50
Apply	-	-	50	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE926	TRAFFIC ENGINEERING AND MANAGEMENT		3/0/0/3
Nature of Course	Theory analytical		
Pre requisites	Nil		
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	Illustrate the traffic facilities for road users and the need for traffic surveys.		[U]
C926.2	Design the elements of intersection, conflict points and signals.		[AP]
C926.3	Analysis of fundamental traffic flow		[AN]
C926.4	Demonstrate the traffic management systems.		[AP]
Course Contents:			
Module 1: Traffic Planning and Surveys			15 Hrs
Road Characteristics – Road user and vehicle characteristics – 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 - Fundamentals of Traffic Flow –Traffic Surveys – Speed, journey time and delay surveys – Origin Destination Survey- Vehicles Volume Survey including non- motorized transports – Cycle tracks and cycle ways Parking Survey –Pedestrian and Accident analyses.			
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 –Signal co-ordination. Significant roles of traffic control personnel - Networking pedestrian facilities & cycle tracks.			
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 for 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.	Partha Chraborthy & Animesh Das Principles of Transportation Engineering, Tata McGraw Hill Co Ltd, New Delhi, 2012.		
3.	Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.		

Reference Books:				
1.	JotinKhisty C and B. Kent Lall, "Transportation Engineering", Prentice Hall of India Private Limited, New Delhi, 2011s			
2.	Hobbs.F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005			
3.	Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd. 1996.			
4.	Sankara Subramanian.V, "Traffic Engineering and Management", <u>Lakshmi Publications</u> , India, 2013.			
Web References:				
1.	https://www.slideshare.net/NayanaD123/ce2026-traffic-engineering-and-management-notes			
2.	https://www.monash.edu/engineering/its/publications/tem2017			
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			
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	Understand	Surprise Test	5	
C926.2	Apply	Group Assignment	5	
C926.3	Analyze	Group Assignment	5	
C926.4	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	10	10	10	10
Understand	30	30	30	30
Apply	40	40	40	40
Analyse	20	20	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

18CE927	VALUATION OF CIVIL ENGINEERING STRUCTURES		3/ 0/ 0/ 3
Nature of Course	Theory Concept		
Pre- requisites	Nil		
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	To perform valuation of a properties with appropriate methods.		[AP]
C927.2	To analyse different legal norms and constraints involved in valuation of properties		[AN]
C927.3	To understand Indian accounting standards as applicable to real estate valuation		[U]
C927.4	To analyse the different approaches to value – income , market and cost approach.		[AN]
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, 1882and 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

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
C927.1	Understand	Online Quiz	5
C927.2	Understand	Group Assignment	5
C927.3	Understand , Analyze	Group Mini Project	5
C927.4	Remember , Understand	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	40	40	30	20
Understand	60	60	40	60
Apply	-	-	-	-
Analyze	-	-	30	20
Evaluate	-	-	-	-
Create	-	-	-	-

OPEN ELECTIVES

18CE001	DISASTER MANAGEMENT	3/ 0/ 0/ 3
Nature of Course	Theory Concept	
Pre Requisites	Nil	
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 analyze the risk and vulnerability in disaster management	
Course Outcomes		
Upon completion of the course, students shall have ability to		
C001.1	Remember the principle, components of disaster management and disaster management schemes	[R]
C001.2	Understand recent trends in disaster management	[U]
C001.3	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]
C001.4	Apply disaster management in Forecasting and warning of disasters and disaster management technique in Statistical seismology	[AP]
C001.5	Develop Emergency Management System	[AP]
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.	Sulphey 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.	Sathish Modh, 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	Remember	Surprise Test	5
C001 .2	Understand	Group Assignment	5
C001 .3	Analyze	Group Assignment	5
C001 .4, C001 .5	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	40	30	30	30
Understand	40	30	20	20
Apply	20	40	30	30
Analyze	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

18CE002	ENGINEERING RISK AND UNCERTAINTY		3/0/0/3
Nature of Course	Theory and Application		
Pre requisites	Nil		
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	Understand the Qualitative and Quantitative assessments of risk		[U]
C002.3	Identify, rank and predict the contributors to risk		[AP]
C002.4	Analyse the measures of uncertainty and the methods for assessing propagation		[AN]
C002.5	Understand the quantitative uncertainty analysis and risk assessment with emphasis on engineering applications.		[U]
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 practise – 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, 2003.		
2.	Mohammad Modarres, “Risk Analysis in Engineering- Techniques, Tools and Trends”, CRC- Taylor & Francis Group CRC Press, Florida,2007		
3.	Mohammad Modarres, Mark P.Kaminskiy and Vasiliy Krivitsov, “Reliability Engineering and Risk Analysis”, CRC- Taylor & Francis Group CRC Press, Florida. (Edition 2017)		
4.	Ehsan Goodarzi, Mina Ziaei and Lee Teang Shui, “ Introduction to risk and uncertainty in hydrosystem engineering”, Springer, 2013		
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", Hydroscience Inc., 2011

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	Apply	Online Quiz	5
C002.2 & C002.5	Understand	Group Assignment	5
C002.3	Apply	Case study	5
C002.4	Analyse	Poster 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	50	40	30	30
Apply	30	30	30	40
Analyse	20	30	40	30
Evaluate	-	-	-	-
Create	-	-	-	-

18CE003	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	Nil		
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	Review the key concepts of environmental and social impact assessment and the current legislation covering it		[U]
C003.2	Understand the 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	Understand and analyse the 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]
Course Contents:			
Module 1: Introduction to EIA and Methodologies			15 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			15 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.	Riki Therivel, "Methods of Environmental and Social Impact Assessment", Routledge Publisher, 2017			
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.	Salim Momtaz, Zobaidul Kabir 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	Understand	Online Quiz	5	
C003.2				
C003.3	Analyze	Power point presentation	5	
C003.4	Analyze	Case Study	5	
C003.5	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	-	-	-	-
Understand	20	60	20	30
Apply	70	20	40	40
Analyse	10	20	40	30
Evaluate	-	-	-	-
Create	-	-	-	-

18CE004	GEOGRAPHICAL INFORMATION SYSTEMS		3/0/0/3
Nature of Course	Theory application		
Pre requisites	Nil		
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	Understand the input data analysis using GIS software		[U]
C004.3	Learn the complete error analysis using various methods		[U]
C004.4	Apply the basic concepts involved in GIS by using modern methods		[AP]
C004.5	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.	Wilpen L.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	Apply	Online Quiz	5	
C004.2 & C004.3	Understand	Group assignment	5	
C004.4	Apply	Technical Presentation	5	
C004.5	Apply	Case study	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	60	50	40	50
Apply	40	50	60	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE005	INDUSTRIAL POLLUTION PREVENTION		3/0/0/3
Nature of Course	Theory application		
Pre requisites	Nil		
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	Understand the Government legislations in Industries related to environmental protection		[R]
C005.2	Recognize the types and sources of industrial pollutants		[U]
C005.3	Apply pollution prevention and waste minimization assessments and management strategies to industrial and business processes		[AP]
C005.4	Suggest suitable technology for industries for safe and cleaner environment		[AP]
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 minimisation methods - Zero Effluent Discharge-ETP & CETP - Air pollution source-cause- emissions 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
Reference Books:			
1.	Rao. C.S., “Environmental Pollution and Control Engineering ”, 2 nd Edition, Revised, Wiley Eastern Limited, India, 2006		
2.	Mahajan. S.P., “ Pollution Control in Process Industries ”, Tata-McGraw Hill, New Delhi, 1985		
3.	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		
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	Remember	Classroom or Online Quiz		5
C005.2	Understand	Technical Class Presentation/Power point presentation		5
C005.3	Apply	Group Assignment on case studies		5
C005.4	Apply	Surprise Test		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
Understand	70	60	50	20
Apply	10	40	50	60
Analyse	-	-	-	
Evaluate	-	-	-	-
Create	-	-	-	-

18CE006	SMART MATERIALS & SMART STRUCTURES		3/0/0/3
Nature of Course	Theory application		
Pre requisites	Nil		
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 the concept of smart materials and their structural applications.		[U]
C006.2	Study about the vibration absorbers and its applications		[U]
C006.3	Apply the measuring techniques using strain gauges		[AP]
C006.4	Apply the techniques in Civil Engineering		[AN]
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, 2005		
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.	Gandhi, M.V and Thompson, B.S., "Smart Materials and Structures", Chapman and Hall, 1992.			
2.	Srinivasan A.V and Michael McFarland, " Smart structures", Cambridge University press, 2009			
3.	Rajan Vepa, "Dynamics of smart structures", Wiley, 2008			
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	Understand	Group assignment	5	
C006.3	Apply	Case study	5	
C006.4	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	-	-	-	-

EMERGING ELECTIVE COURSES

18CE007	BUILDING SERVICES PLANNING AND MANAGEMENT	3/0/0/3
Nature of Course	Theory Concept	
Pre requisites	Architecture and Computer Aided Planning	
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.	
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.	[U]
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: Machineries 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 fire fighting 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", John Wiley and Sons, New Delhi, 2008.	
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	Apply	Group Assignment	5	
C007.2	Analyse	Case Study	5	
C007.3	Understand			
C007.4	Apply	Case Study Report	5	
C007.5	Apply			
C007.6	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	20	20	20	20
Understand	60	20	20	20
Apply	20	40	40	40
Analyse	-	20	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

18CE008	CONDITION ASSESSMENT OF MATERIALS AND STRUCTURES	3/0/0/3
Nature of Course	Theory Concept	
Pre requisites	Construction Materials and Techniques	
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	Understand the quality assessment methods of concrete	[U]
C008.2	Learn the non-destructive testing methods for concrete, masonry and timber structures.	[U]
C008.3	Understand the quality assessment methods of structural steel	[U]
C008.4	Learn the non-destructive testing methods for structural steel	[U]
C008.5	Understand the methods of structural health monitoring	[U]
C008.6	Apply 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	Understand	Assignment	5	
C008.2	Understand	Case Study	5	
C008.3 & C008.4	Understand	Technical Presentation	5	
C008.5 & C008.6	Apply	Quiz	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	20	10	10
Understand	80	80	40	40
Apply	-	-	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE009	INSTRUMENTATION AND SENSOR TECHNOLOGIES FOR ENGINEERING APPLICATIONS		3/0/0/3
Nature of Course	Theory Concept		
Pre Requisites	Nil		
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	Understand right use of sensors and instruments for differing applications along with limitations		[U]
C009.2	Differentiate the sensors and their modes of operation measurements		[AP]
C009.3	Suggest proper sensor technologies for specific applications		[AN]
C009.4	Design and set up measurement systems and do the studies		[AP]
C009.5	Analyse Frequency Domain Signal Processing		[AN]
Course Contents :			
Module 1: Fundamentals of Measurement, Sensing and Instrumentation		15 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		15 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	
C009.1	Apply	Group Assignment	5	
C009.2				
C009.3		Case Study	5	
C009.4	Analyse	Group Mini Project	10	
C009.5				
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	60	40	30	30
Apply	40	40	30	30
Analyse	-	20	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

18CE010	INTELLIGENT TRANSPORTATION SYSTEMS		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	Transportation Engineering		
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 about intelligent transport system and suggest the appropriate technologies for field conditions.		[U]
C010.2	Able to suggest the appropriate systems in various functional areas of transportation.		[U]
C010.3	Able to amalgamate the various systems, plan and implement the applications of ITS		[AP]
C010.4	Understand the ITS implementation in Various Countries		[U]
C010.5	Applying the Smart Route System in Transportation System		[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			
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, ITS in developing countries.			
Module 3: Advanced Transport System			15 Hrs
Advanced traveller and information system - Basic Advanced Transport Intelligent System Concepts – 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.		
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 & C010.2	Understand	Online Quiz	5	
C010.3	Apply	Group Assignment	5	
C010.4	Apply	Group Assignment	5	
C010.5	Apply	Case Study	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	50	20	30
Understand	80	50	50	50
Apply	-	-	30	20
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE011	METRO SYSTEMS AND ENGINEERING		3/0/0/3
Nature of Course	Theory Concept		
Pre requisites	Nil		
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	Understand the Metro planning and financials in Various systems		[U]
C011.2	Understand the working and methods for stations and bridges.		[U]
C011.3	Applying the civil engineering structures in metro engineering		[AP]
C011.4	Understand the electrical and electronics components in metro systems		[U]
C011.5	Applying the Power systems in metro engineering		[AP]
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, 2008.		
3.	Ramachandran M., “Metro Rail Projects in India: A study in Project Planning”, Oxford University Press; 2011.		
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	Understand	Online Quiz		5
C011.2	Understand	Group Assignment		5
C011.3 & C011.5	Apply	Group Assignment		5
C011.4	Understand	Classroom 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	-	-	20
Understand	80	50	70	50
Apply	-	50	30	30
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

18CE012	PRE - ENGINEERED INDUSTRIAL STRUCTURES		3/0/0/3
Nature of Course	Theory and Analytical		
Pre-requisites	Design of RC Elements		
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	Understand the classification and site layout of the industries.		[U]
C012.2	Analyse and design of Industrial structures		[AN]
C012.3	Apply appropriate principles to design industrial buildings		[AP]
C012.4	Understand the plan and framing transmission line towers		[U]
C012.5	Selection of appropriate sections for cold formed gauges		[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			
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, C012.2	Understand	Group Assignment	5	
C012.2	Analyse	Technical presentation	5	
C012.3	Apply	Class Room Quiz	5	
C012.4, C012.5	Understand	Case Study	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	-	-	-	-
Understand	60	60	20	20
Apply	40	40	40	40
Analyse	-	-	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

18CE013	SMART CITY PLANNING AND DEVELOPMENT		3/0/0/3
Nature of Course	Theory		
Pre-requisites	Nil		
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	Understand various characteristics of smart city		[U]
C013.2	Analyse the global and local context on smart cities		[U]
C013.3	Critically evaluate the implementation strategies and constraints of smart cities mission.		[AP]
C013.4	Understand the balance between smart and sustainability development of cities.		[U]
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	Remember	Online Quiz	4	
C013.2	Understand	Class Presentation	6	
C013.3 & C013.4	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	-	-	-	-