BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

B.Tech – CIVIL ENGINEERING

VISION

The Department of civil Engineering will strive to excel and lead in Education, Research, and Innovation contributing to the advancement of design, construction, and maintenance of infrastructure to enhance the quality of life for humanity in a sustainable way.

MISSION

Mission of the department is to achieve international recognition by:

MD1 - Creating an outstanding learning experience through rigorous curriculum of theory and practice that develops students' technical and professional skills to succeed in a wide range of careers.

MD2 - Providing quality education in undergraduate and postgraduate levels, with strong Emphasis on professional ethics and social commitment.

MD3 - Developing a scholastic environment for advance research through a culture of discovery, creativity, and innovation to benefit the humankind.

MD4 - Serving as highly capable resources to society, the profession through professional organizations, consultancy and continuing education.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

The Department of Civil Engineering is dedicated to the following program objectives:

PEO1: PREPARATION:

To provide students with sound fundamental in Mathematical, Scientific and Engineering fundamentals necessary to formulate, analyse, and comprehend the fundamental concepts in Civil Engineering.

PEO2: CORE COMPETENCE:

To apply critical reasoning, quantitative, qualitative, designing and programming skills, to identify, solve problems and to analyze the experimental evaluations, and finally making appropriate decisions, and to enhance the techniques in the field of construction of civil engineering structures, Environmental Engineering,

PEO3: PROFESSIONALISM:

To broaden knowledge to establish themselves as creative practicing professionals successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative insight so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL:

To provide Industry based training for developing professional skills and soft skills such as proficiency in languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional with innovative ideas for a sustainable development

PEO5: ETHICS:

To demonstrate sensitivity towards ethical issues, environmental and societal responsibilities; contributing to the socio-economic development of the society.

MAPPING BETWEEN MISSION Vs PEOs

PEOs/ Missions	DM1	DM2	DM3	DM4
PEO1	✓	✓	✓	
PEO2	✓	✓	✓	✓
PEO3	✓	✓	✓	✓
PEO4		✓	✓	
PEO5	✓	✓		✓

PROGRAMME OUTCOMES (POs)

On completion of B.Tech in Civil Engineering Programme, Graduates will have to

1) **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex civil engineering problems

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

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

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

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

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

7) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with t h e 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.

8) **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.

9) **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.

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

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

12) **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.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Ability to demonstrate proficiency in one of the following specialized areas of Civil Engineering i) Construction Materials and Management ii) Structural and Geotechnical Engineering iii) Environmental, water resources and Transportation Engineering.

PSO2: Ability to apply principles of civil engineering for the entire life cycle of the project ranging from initial design to the closure of the project.

MAPPING BETWEEN PROGRAMME EDUCATIONAL OBJECTIVES &PROGRAMME OUTCOMES

PEOs\POs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	3	3	3	2	3	2	2	2	3	3
2	2	3	3	3	3	2	1	2	2	2	2	2
3	2	2	2	3	2	1	2	3	3	3	2	1
4	2	2	2	2	2	2	3	3	3	3	2	3
5	2	2	2	2	2	3	2	3	2	2	2	3

MAPPING BETWEEN CORE COURSE & PROGRAMME OUTCOMES (Semester wise)

Sem	Courses\POs	1	2	3	4	5	6	7	8	9	10	11	12
	THEORY												
	Communicative English	3	2	3	3	3	2	3	1	2	3	3	3
	Engineering Mathematics – I	1	-	1	-	2	-	-	2	1	1	-	-

I	Introduction to Mechanics	3	2	2	2	1	-	-	2	2	3	2	-
	Engineering Chemistry	1	2	2	1	-	2	-	-	2	1	1	2
	Programme for Problem Solving	3	3	1	-	-	2	-	-	3	-	2	2
	Engineering Graphics & Design	3	-	2	-	-	2	3	-	2	-	2	2
	PRACTICAL												
	Physics Lab	3	-	3	3	-	-	-	3	1	2	-	-
	Chemistry Lab	-	-	2	2	-	-	2	-	-	2	2	2
	Programme for Problem Solving Laboratory	2	2	3	1	-	-	-	-	-	-	-	2
II	**THEORY**												
	Technical English	2	3	3	-	-	2	-	2	1	-	3	3
	Engineering Mathematics-II	3	-	1	-	-	-	2	-	2	2	-	-
	Waves and Optics	3	2	2	2	1	-	-	2	2	3	2	-
	Environmental Sciences	3	3	-	1	-	-	2	-	3	2	-	2
	Biology for Engineers	2	3	1	2	-	2	1	-	1	1	2	2
	Basic Electrical and Electronics Engineering	3	3	2	2	3	2	2	-	-	-	3	2
	PRACTICAL												
	Physics Lab	3	-	3	3	-	-	-	3	1	2	-	3
	Chemistry Lab	-	-	2	2	-	-	2	-	-	2	2	-
	Work/Manufacturing practices Laboratory	3	3		3		2		2	2		2	-
	Basic Electrical & Electronics Engineering Laboratory	2	2	1	-	_	1	2	3	1	_	1	2
III	**THEORY**												
	Transforms & Partial Differential Equations	3	3	3	3	-	-	2	-	-	-	1	-
	Computer Aided Civil Engineering Drawing	3	2	2	2	3	-	-	2	2	-	2	3
	Engineering Mechanics	3	3	3	3	-	-	2	-	-	-	1	-
	Engineering Geology	2	-	2	1	3	1	2	-	-	1	-	-
	Transform & PDE	1	3	3	-	-	-	-	1	-	-	1	2
	Construction Technology	3	3	1	-	-	2	-	-	3	-	2	2
	Introduction to Civil Engineering	3	2	-	-	-	-	-	-	2	-	-	2
	Surveying & Geomatics	2	-	2	1	3	1	2	-	-	1	-	2
	PRACTICAL												
	Computer Aided Civil Engineering Drawing Laboratory	-	3	2	-	2	-	-	-	-	2	3	3
	Surveying & Geomatics Laboratory	3	3	1	-	-	2	-	-	3	-	2	-
	Engineering Geology Laboratory	2	-	2	1	3	1	2	-	-	1	-	-
	THEORY												
	Reinforced Concrete Design	2	3	2	2	-	-	-	-	--	-	2	3
	Introduction to Fluid Mechanics	3	3	1	-	-	2	-	-	3	-	2	-

IV	Introduction to Solid Mechanics	3	3	1	-	-	2	-	-	3	-	2	-
	Building Materials & Testing Methods	3	2	2	3	-	-	-	2	2	2	3	2
	Geotechnical Engineering	3	-	-	2	3	-	-	2	-	2	-	2
	Probability Theory &Statistics	3	2	2	3	-	-	-	2	2	2	3	2
	PRACTICAL												
	Geotechnical Engineering Laboratory	1	3	3	2	2	-	-	-	-	-	2	3
	Fluid Mechanics Laboratory	3	3	1	-	-	2	-	-	3	-	2	-
	Building Materials & Testing Laboratory	3	3	3	-	2	-	-	2	2	3	3	-
V	**THEORY**												
	Structural Analysis I	3	3	3	-	-	-	-	1	-	2	-	3
	Hydraulic Engineering	-	3	3	-	2	-	-	3	2	-	2	-
	Foundation Engineering	-	3	3	-	2	-	-	3	2	-	2	2
	Hydrology and Water Resources Engineering	2	1	3	-	1	-	-	1	1	-	1	2
	Environmental Engineering	3	3	3	3	-	-	2	-	-	-	1	2
	PRACTICAL												
	Hydraulic Engineering Laboratory	2	3	1	-	-	-	-	2	2	-	3	3
	Environmental Engineering Laboratory	2	3	-	-	1	1	-	2	2	-	3	-
VI	**THEORY**												
	Structural Analysis II	2	1	3	-	3	1	-	1	1	-	3	3
	Estimation & Costing	2	3	1	-	-	-	-	2	2	-	3	-
	Physico Chemical Process for Water & Waste water Treatment	3	3	3	3	-	-	2	-	-	-	1	-
	Design of Steel Structures	2	1	3	-	3	1	-	1	1	-	3	-
	PRACTICAL												
	Estimation & Costing Lab	2	3	-	-	1	1	-	2	2	-	3	2
VII	**THEORY**												
	Disaster Preparedness & Planning Management	3	2	2	-	-	-	-	-	-	-	2	3
	Professional Practice, Law & Ethics	-	-	-	-	-	-	-	-	-	-	-	2
	Transportation Engineering	2	1	3	-	3	1	-	1	1	-	3	-
	PRACTICAL												
	Project - 1	-	3	3	2	2	2	-	1	2		3	3
	Internship	-	-	3	2	3	-	-	1	2	1	3	-
	Comprehension	3	2	2	-	-	-	-	-	-	-	2	-
VIII	**PRACTICAL**												
	Project -2	-	3	3	2	2	2	-	1	2		3	3

MAPPING BETWEEN PROFESSIONAL ELECTIVES (PEs) AND PROGRAMME OUTCOMES (POs)

PE	Courses\POs	1	2	3	4	5	6	7	8	9	10	11	12
I	Infrastructure Planning & Design	-	2	2	-	2	-	2	-	-	2	-	3
	Repairs & Rehabilitation of Structures	3	3	3	-	-	-	-	1	-	2	-	2
	Rural Water Supply and Onsite Sanitation Systems	-	1	2	3	3	-	2	3	2	-	3	2
	Environmental Fluid Mechanics	-	3	3	-	-	-	-	2	-	2	3	1
	Design of Hydraulic Structures/Irrigation Engineering	-	2	2	-	2	-	2	-	-	2	-	3
	Concrete Technology	3	3	3	-	-	-	-	1	-	2	-	-
	Advanced Soil Mechanics	-	1	2	3	3	-	2	3	2	-	3	-
	Geometric Design of Highways	-	3	3	-	-	-	-	2	-	2	3	1
II	Urban Transportation & Planning.	3	3	1	-	-	2	-	-	3	-	2	3
	Construction Cost Analysis	3	3	3	3	3		3	3	3	3	2	2
	Transport of Water and Wastewater	3	3	3	2	3	2	-	3	-	-	3	2
	Open Channel flow	-	3	3	-	-	-	-	3	-	1	2	1
	Ground Water Engineering	3	3	1	-	-	2	-	-	3	-	2	3
	Design of Concrete Structures	3	3	3	3	3		3	3	3	3	2	-
	Ground Improvement Techniques	3	3	3	2	3	2	-	3	-	-	3	-
	Public Transportation Systems	-	3	3	-	-	-	-	3	-	1	2	1
III	Remote Sensing & GIS	3	2	2	-	3	2	-	3	-	-	3	3
	Construction Productivity	2	3	2	-	2	-	-	2	1	2	1	2
	Biological Processes for Contaminant Removal	3	3	1	-	-	2	-	-	3	-	2	2
	Surface Hydrology	-	2	3	-	2	-	-	1	1	-	1	1
	Remote Sensing and GIS for Hydrology and Water Resource Management	3	2	2	-	3	2	-	3	-	-	3	3
	Pre stressed Concrete	2	3	2	-	2	-	-	2	1	2	1	-
	Geotechnical Design	3	3	1	-	-	2	-	-	3	-	2	-
	Construction Equipment& Automation	-	2	3	-	2	-	-	1	1	-	1	1
IV	Traffic Engineering and Management	3	2	2	1	1	-	-	1	1	1	-	3
	Sustainable Construction Methods	3	2	2	1	1	-	-	1	1	1	-	2

	Solid and Hazardous Waste Management	3	2	2	1	3	2	2	-	2	1	1	2
	Pipeline Engineering	3	2	2	1	3	2	2	-	2	1	1	3
	Urban Hydrology and Hydraulics	3	2	2	1	1	-	-	1	1	1	-	2
	Metal Structure Behaviors	2	2	-	3	-	-	1	-	-	1	-	2
	Industrial Structures	-	2	3	-	2	-	-	1	1	-	1	1
	Environmental Geo-technology	3	2	2	1	1	-	-	1	1	1	-	3
V	Pavement Design	-	2	-	-	3	-	-	2	2	2	-	-
	Construction Engineering Materials	3	3	2	2	2	2	2	1	2	2	1	-
	Air and Noise Pollution and Control	3	3	-	-	3	-	1	2	-	2	3	1
	Transients in closed conduits	2	2	-	3	2	-	1	-	2	-	-	3
	Water & Waste Water Treatment	-	2	3	-	2	-	-	1	1	-	1	2
	Earthquake Engineering	3	2	2	1	1	-	-	1	1	1	-	2
	Rock Mechanics	2	3	2	-	-	-	-	2	-	-	-	1
	Structural Dynamics	3	2	2	1	1	-	-	1	1	1	-	3
VI	Railway Engineering	3	2	3	-	1	-	3	2	1	-	2	-
	Construction Project Planning &System	2	3	2	-	-	-	-	2	-	-	-	-
	Environmental Impact Assessment and Life Cycle Analyses	3	2	2	1	1	-	-	1	1	1	-	1
	Basics of computational hydraulics	2	3	3	-	3	2	3	2	3	2	3	3
	River Engineering	2	3	2	-	-	-	-	2	-	-	-	2
	Engineering Materials for Sustainability	3	2	2	1	1	-	-	1	1	1	-	2
	Offshore Engineering	-	2	3	-	2	-	-	1	1	-	1	1
	Masonry Structures	3	2	2	1	1	-	-	1	1	1	-	3
VII	Airport Planning and Design	3	2	3	-	1	-	3	2	1	-	2	-
	Contracts Management	2	3	2	-	-	-	-	2	-	-	-	-
	Environmental Laws and Policy	3	2	2	1	1	-	-	1	1	1	-	1
	Hydraulic Modelling	2	3	3	-	3	2	3	2	3	2	3	3
	Water Resources Field Methods	-	3	3	-	-	-	-	3	-	1	2	2
	Bridge Engineering	3	2	2	-	3	2	-	3	-	-	3	2
	Structural Geology	3	2	2	1	1	-	-	1	1	1	-	1
	Ecological Engineering	2	3	3	-	3	2	3	2	3	2	3	3

CURRICULUM AND SYLABUS (R2018)

B – FACT: Flexible Accommodative choice based credit system for Technology

(Applicable to the batches admitted from July 2018)

B.Tech – CIVIL ENGINEERING - FULL TIME

I – VIII SEMESTERS

SEMESTER I								
Sl.No	**Course Code**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18HSEN101	HS	Communicative English	4	2	0	2	3
2	U18BSMA101	BS	Engineering Mathematics –I	4	4	0	0	4
3	U18BSPH 101	BS	Waves and Optics	3	3	0	0	3
4	U18BSCH101	BS	Engineering Chemistry	3	3	0	0	3
5	U18ESCS101	ES	Problem Solving and Python Programming	3	3	0	0	3
6	U18ESME101	ES	Engineering Graphics & Design	5	1	0	4	3
PRACTICAL								
7	*U18BSPH2L1	BS	Wave Optics and Mechanics Lab	3	0	0	3	0
	*U18BSCH2L4	BS	Chemistry Lab	3	0	0	3	0
8	U18ESCS1L1	ES	Problem Solving and Python Programming Laboratory	3	0	0	3	1.5
ACTIVITY BASED COURSES								
9	U18MCAB101	MC	Physical health – Sports & Games	2	0	0	2	0
10	U18MCAB102	MC	Gardening & Tree Plantation -	2	0	0	2	0
			Total	**35**	**16**	**0**	**19**	**20.5**

SEMESTER II								
Sl. No.	**Course Code**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18HSEN201	HS	Technical English	3	2	1	0	3
2	U18BSMA201	BS	Engineering Mathematics-II	4	4	0	0	4
3	U18BSPH201	BS	Introduction to Mechanics	3	3	0	0	3
4	U18BSCH201	BS	Environmental Sciences	3	3	0	0	3
5	U18BSBT101	BS	Biology for Engineers	2	2	0	0	2
6	U18ESEE101	ES	Basic Electrical & Electronics Engineering	3	3	0	0	3
PRACTICAL								

7	*U18BSPH2L1	BS	Wave Optics and Mechanics Lab	3	0	0	3	1.5
8	*U18BSCH2L4	BS	Chemistry Lab	3	0	0	3	1.5
9	U18ESME1L2	ES	Workshop/Manufacturing Practices Lab	5	1	0	4	3
10	U18ESEE1L3	ES	Basic Electrical & Electronics Engineering Laboratory	3	0	0	3	1.5
ACTIVITY BASED COURSES								
11	U18MCAB203	MC	Yoga	2	0	0	2	0
12	U18MCAB204	MC	Physical health – NCC	2	0	0	2	0
			Total	**36**	**18**	**1**	**17**	**25.5**

SEMESTER III								
Sl. No.	**Course Code**	**Category**	**Course Title Theory**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18BSMA306	BS	Transform &Partial Differential Equations	3	2	1	0	3
2	U18ESCE301	ES	Computer-aided Civil Engineering Drawing	2	2	0	0	2
3	U18ESME301	ES	Engineering Mechanics	4	3	1	0	4
4	U18PCCE301	PC	Engineering Geology	2	2	0	0	2
5	U18PCCE302	PC	Construction Technology	3	3	0	0	3
6	U18PCCE303	PC	Introduction to Civil Engineering	3	3	0	0	3
7	U18PCCE304	PC	Surveying & Geomatics	2	1	1	0	2
PRACTICAL								
8	U18ESCE3L1	ES	Computer aided Civil Engineering DrawingLaboratory	2	0	0	2	1
9	U18PCCE3L2	PC	Surveying & GeomaticsLaboratory	2	0	0	2	1
10	U18PCCE3L3	PC	Engineering Geology Laboratory	2	0	0	2	1
ACTIVITY BASED COURSES								
11	U18MCAB305	MC	Culture- Learning an art form	2	0	0	2	0
12	U18MCAB306	MC	Culture – Intangible Cultural, heritage(festivals, Food ways, Local games)	2	0	0	2	0
			Total	**29**	**16**	**3**	**10**	**22**

SEMESTER IV								
Sl. No.	**Course Code**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18BSMA402	BS	Probability, Statistics & Numerical Methods	4	3	1	0	4
2	U18PCCE401	PC	Reinforced Concrete Design	3	3	0	0	3
3	U18PCCE402	PC	Introduction to Fluid Mechanics	2	2	0	0	2
4	U18PCCE403	PC	Introduction to Solid Mechanics	2	2	0	0	2
5	U18PCCE404	PC	Building Materials & Testing Methods	2	1	1	0	2
6	U18PCCE405	PC	Geotechnical Engineering	2	2	0	0	2
7	U18MCTH401	MC	Constitution of India	2	2	0	0	0
PRACTICAL								
8	U18PCCE4L1	PC	Geotechnical Engineering Laboratory	2	0	0	2	1
9	U18PCCE4L2	PC	Fluid Mechanics Laboratory	2	0	0	2	1
10	U18PCCE4L3	PC	Building Materials & Testing Laboratory	2	0	0	2	1
ACTIVITY BASED COURSES								
11	U18MCAB407	MC	Literature & Media – Literature, Cinema & Media	2	0	0	2	0
12	U18MCAB408	MC	Literature & Media –Group Reading of Classics	2	0	0	2	0
Total				**27**	**15**	**2**	**10**	**18**

SEMESTER V								
Sl. No.	**Course Code**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PCCE501	PC	Structural Analysis-I	3	3	0	0	3
2	U18PCCE502	PC	Hydraulic Engineering	3	3	0	0	3
3	U18PCCE503	PC	Foundation Engineering	3	3	0	0	3
4	U18PCCE504	PC	Hydrology and Water Resources Engineering	3	3	0	0	3
5	U18PCCE505	PC	Environmental Engineering	3	3	0	0	3
6		PE	Professional Elective-I	3	3	0	0	3
7	U18HSBA501	HS	Organizational Behavior	3	3	0	0	3
8	U18MCTH502	MC	Universal Human Values	2	2	0	0	0

PRACTICAL								
9	U18PCCE5L1	PC	Hydraulic Engineering Laboratory	2	0	0	2	1
10	U18PCCE5L2	PC	Environmental Engineering Laboratory	2	0	0	2	1
ACTIVITY BASED COURSES								
11	U18MCAB509	MC	Self Development – Spiritual, Mindfulness & Meditation	2	0	0	2	0
12	U18MCAB510	MC	Self Development - religion and Inter-faith	2	0	0	2	0
			Total	**31**	**23**	**0**	**8**	**23**

SEMESTER VI								
Sl. No.	**Course Code**	**Category**	**Course Title Theory**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PCCE601	PC	Structural Analysis-II	**3**	**3**	**0**	**0**	**3**
2	U18PCCE602	PC	Estimation & Costing	3	2	1	0	3
3	U18PCCE603	PC	Physico-Chemical Processes for Water and Wastewater Treatment	3	3	0	0	3
4	U18PCCE604	PC	Design of Steel Structures	3	3	0	0	3
5		PE	Professional Elective-II	3	3	0	0	3
6		PE	Professional Elective-III	3	3	0	0	3
7		OE	Open Elective-I	3	3	0	0	3
8	U18MCTH603	MC	Essence of Indian Knowledge Tradition	2	2	0	0	0
PRACTICAL								
9	U18PCCE6L1	PC	Estimation & Costing Laboratory	2	0	0	2	1
ACTIVITY BASED COURSES								
10	U18MCAB611	MC	Social Services – Social Awareness	2	0	0	2	0
11	U18MCAB612	MC	Social Services – NSS	2	0	0	2	0
			Total	**29**	**22**	**1**	**6**	**22**

SEMESTER VII								
Sl. No.	**Course Code**	**Category**	**Course Title Theory**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PCCE701	PC	Disaster Preparedness & Planning Management	3	3	0	0	3
2	U18PCCE702	PC	Professional Practice, Law & Ethics	2	2	0	0	2
3	U18PCCE703	PC	Transportation Engineering	2	2	0	0	2
4		PE	Professional Elective-IV	3	3	0	0	3
5		PE	Professional Elective V	3	3	0	0	3
6		OE	Open Elective-II	3	3	0	0	3
PRACTICAL								
7	U18PCCE7P1	EE	Project-1 (Mini-project)	6	0	0	6	3
8	U18PCCE0T1	EE	Term paper	2	0	0	2	1
9	U18PCCE0C1	EE	Comprehension	2	0	0	2	1
ACTIVITY BASED COURSES								
10	U18MCAB713	MC	Behavioral and interpersonal skills	2	0	0	2	0
11	U18MCAB714	MC	Nature – Nature club	2	0	0	2	0
			Total	**30**	**16**	**0**	**14**	**21**

SEMESTER VIII								
Sl. No.	**Course Code**	**Category**	**Course Title Theory**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1		PE	Professional Elective VI	3	3	0	0	3
2		PE	Professional Elective VII	3	3	0	0	3
4		OE	Open Elective-III (MOOC course)	2	2	0	0	2
PRACTICAL								
5	U18PCCE8P2	EE	Project-2	18	0	0	18	9
ACTIVITY BASED COURSES								
6	U18MCAB815	MC	Innovation–Project based– Sc., Tech, Social, Design & Innovation	2	0	0	2	0
			Total	**28**	**8**	**0**	**20**	**17**

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**
Credits	**20.5**	**25.5**	**22**	**18**	**23**	**22**	**21**	**17**	**169**

LIST OF PROFESSIONAL ELECTIVE COURSES

PROFESSIONAL ELECTIVE –I (PE –I)

S.No	Course Code	Specialization	Subject Name	L	T	P	C
1.	U18PECE011	Transportation Engineering	Infrastructure planning and design	3	0	0	3
2.	U18PECE012	Construction Engineering & Management	Repairs and Rehabilitation of Structures	3	0	0	3
3.	U18PECE013	Environmental Engineering	Rural Water Supply and Onsite Sanitation System.	3	0	0	3
4.	U18PECE014	Hydraulic Engineering	Environmental Fluid Mechanics	3	0	0	3
5.	U18PECE015	Hydraulic Engineering	Design of Hydraulic Structures/Irrigation Engineering.	3	0	0	3
6.	U18PECE016	Structural engineering	Concrete Technology	3	0	0	3
7.	U18PECE017	Geotechnical Engineering	Advanced Soil Mechanics	3	0	0	3
8.	U18PECE018	Transportation Engineering	Geometric Design of Highways	3	0	0	3

PROFESSIONAL ELECTIVE –II (PE –II)

S.No	Course Code	Specialization	Subject Name	L	T	P	C
1	U18PECE021	Transportation Engineering	Urban Transportation & Planning	3	0	0	3
2	U18PECE022	Construction Engineering & Management	Construction Cost Analysis	3	0	0	3
3	U18PECE023	Environmental Engineering	Transport of Water and Wastewater	3	0	0	3
4	U18PECE024	Hydraulic Engineering	Open Channel flow	3	0	0	3
5	U18PECE025	Hydrology & Water Resources Engineering	Ground Water Engineering	3	0	0	3
6	U18PECE026	Structural engineering	Design of Concrete Structures	3	0	0	3
7	U18PECE027	Geotechnical Engineering	Ground Improvement Techniques	3	0	0	3
8	U18PECE028	Transportation Engineering	Public Transportation Systems	3	0	0	3

PROFESSIONAL ELECTIVE –III (PE-III)

S.No	Course Code	Specialization	Subject Name	L	T	P	C
1.	U18PECE031	Transportation Engineering	Remote Sensing & GIS	3	0	0	3
2.	U18PECE032	Construction Engineering & Management	Construction Productivity	3	0	0	3
3.	U18PECE033	Environmental Engineering	Biological Process for Contaminant Removal	3	0	0	3

4.	U18PECE034	Hydraulic Engineering	Surface Hydrology	3	0	0	3
5.	U18PECE035	Hydrology & Water Resources Engineering	Remote Sensing and GIS for Hydrology and Water Resource Management	3	0	0	3
6.	U18PECE036	Structural engineering	Pre stressed Concrete	3	0	0	3
7.	U18PECE037	Geotechnical Engineering	Geotechnical Design	3	0	0	3
8.	U18PECE038	Construction Engineering & Management	Construction Equipment & Automation	3	0	0	3

PROFESSIONAL ELECTIVE –IV (PE –IV)

S.No	Course Code	Specialization	Subject Name	L	T	P	C
1.	U18PECE041	Transportation Engineering	Traffic Engineering and Management	3	0	0	3
2.	U18PECE042	Construction Engineering & Management	Sustainable Construction Methods	3	0	0	3
3.	U18PECE043	Environmental Engineering	Solid and Hazardous Waste Management	3	0	0	3
4.	U18PECE044	Hydraulic Engineering	Pipeline Engineering	3	0	0	3
5.	U18PECE045	Hydrology & Water Resources Engineering	Urban Hydrology and Hydraulics	3	0	0	3
6.	U18PECE046	Structural engineering	Metal Structure Behaviors	3	0	0	3
7.	U18PECE047	Structural engineering	Industrial Structures	3	0	0	3
8.	U18PECE048	Geotechnical Engineering	Environmental Geo-technology	3	0	0	3

PROFESSIONAL ELECTIVE –V (PE –V)

S.No	Course Code	Specialization	Subject Name	L	T	P	C
1	U18PECE051	Transportation Engineering	Pavement Design	3	0	0	3
2	U18PECE052	Construction Engineering & Management	Construction Engineering Materials	3	0	0	3
3	U18PECE053	Environmental Engineering	Air and Noise Pollution and Control	3	0	0	3
4	U18PECE054	Hydraulic Engineering	Transient in closed conduits	3	0	0	3
5	U18PECE055	Environmental Engineering	Water & Waste water Treatment	3	0	0	3
6	U18PECE056	Structural engineering	Earthquake Engineering	3	0	0	3
7	U18PECE057	Geotechnical Engineering	Rock Mechanics	3	0	0	3
8	U18PECE058	Structural engineering	Structural Dynamics	3	0	0	3

PROFESSIONAL ELECTIVE –VI (PE –VI)

S.No	Course Code	Specialization	Subject Name	L	T	P	C
1.	U18PECE061	Transportation Engineering	Railway Engineering	3	0	0	3
2.	U18PECE062	Construction Engineering & Management	Construction Project Planning and Systems	3	0	0	3
3.	U18PECE063	Environmental Engineering	Environmental Impact Assessment and Life Cycle Analyses	3	0	0	3
4.	U18PECE064	Hydraulic Engineering	Basics of Computational Hydraulics	3	0	0	3
5.	U18PECE065	Hydraulic Engineering	River Engineering	3	0	0	3
6.	U18PECE066	Structural engineering	Engineering Materials for sustainability	3	0	0	3
7.	U18PECE067	Geotechnical Engineering	Offshore Engineering	3	0	0	3
8.	U18PECE068	Structural engineering	Masonry Structures	3	0	0	3

PROFESSIONAL ELECTIVE –VII (PE –VII)

S.No	Course Code	Specialization	Subject Name	L	T	P	C
1	U18PECE071	Transportation Engineering	Airport Planning and Design	3	0	0	3
2	U18PECE072	Construction Engineering & Management	Contract Management	3	0	0	3
3	U18PECE073	Environmental Engineering	Environmental Laws and Policy	3	0	0	3
4	U18PECE074	Hydraulic Engineering	Hydraulic Modeling	3	0	0	3
5	U18PECE075	Hydrology & Water Resources Engineering	Water Resources Field Methods	3	0	0	3
6	U18PECE076	Structural engineering	Bridge Engineering	3	0	0	3
7	U18PECE077	Geotechnical Engineering	Structural Geology	3	0	0	3
8	U18PECE078	Environmental Engineering	Ecological Engineering	3	0	0	3

*** OPEN ELECTIVES FROM CIVIL ENGINEERING**

OPEN ELECTIVE								
Sl.No.	**Course Code**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
1	U18OECE001	OE	Metro Systems and Engineering	3	3	0	0	3
2	U18OECE002	OE	Pollution Regulations	3	3	0	0	3
3	U18OECE003	OE	Road Safety	3	3	0	0	3
4	U18OECE004	OE	Infrastructure Development	3	3	0	0	3
5	U18OECE005	OE	Project Safety Management	3	3	0	0	3
6	U18OECE006	OE	Environment, Health and Safety in Industries	3	3	0	0	3

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES INCLUDING MANAGEMENT COURSES (HS)

Sl. No.	Course Code	Category	Course Title	Contact Periods	L	T	P	C
THEORY								
1	U18HSMC111	HS	Communicative English	4	2	0	2	3
2	U18HSMC121	HS	Technical English	2	1	1	0	2
3	U18HSBA501	HS	Organisational Behavior	3	3	0	0	3
Total Credits								**7**

ENGINEERING SCIENCE COURSES (ES)

Sl. No.	Course Code	Category	Course Title	Contact Periods	L	T	P	C
THEORY								
1	U18ESC111	ES	Programming for Problem Solving Basic	3	3	0	0	3
2	U18ESC112	ES	Engineering Graphics & Design	5	1	0	4	3
3	U18ESC121	ES	Basic Electrical & Electronics Engineering	3	3	0	0	3
4	U18ESCE301	ES	Computer Aided Civil Engineering Drawing	2	2	0	0	2
5	U18ESME301	ES	Engineering Mechanics	4	3	1	0	4
PRACTICAL								
4	U18ESC122L	ES	Workshop/Manufacturing Practices Laboratory	5	1	0	4	3
5	U18ESC121L	ES	Basic Electrical & Electronics Engineering Laboratory	3	0	0	3	1.5
6	U18ESCE3L1	ES	Computer Aided Civil Engineering Drawing	2	0	0	2	1

PROFESSIONAL CORE COURSES

Sl.No.	Course Code	Category	Course Title	Contact Periods	L	T	P	C
THEORY								
1	U18PCCE301	PC	Engineering Geology	2	2	0	0	2
2	U18PCCE302	PC	Construction Technology	3	3	0	0	3
3	U18PCCE303	PC	Introduction to Civil Engineering	3	3	0	0	3
4	U18PCCE304	PC	Surveying and Geomatics	2	1	1	0	2
5	U18PCCE401	PC	Reinforced concrete Design	3	3	0	0	3
6	U18PCCE402	PC	Introduction to Fluid Mechanics	2	2	0	0	2
7	U18PCCE403	PC	Introduction to Solid Mechanics	2	2	0	0	2
8	U18PCCE404	PC	Building Materials & Testing Methods	2	1	1	0	2
9	U18PCCE405	PC	Geotechnical Engineering	2	2	0	0	2
10	U18PCCE501	PC	Structural Analysis I	3	3	0	0	3
11	U18PCCE502	PC	Hydraulic Engineering	2	2	0	0	2
12	U18PCCE503	PC	Foundation Engineering	3	3	0	0	3
13	U18PCCE504	PC	Hydrology and Water Resources Engineering	3	3	0	0	3
14	U18PCCE505	PC	Environmental Engineering	3	3	0	0	3
15	U18PCCE601	PC	Structural Analysis II	3	3	0	0	3
16	U18PCCE602	PC	Estimation & Costing	3	2	1	0	3
17	U18PCCE603	PC	Physico-Chemical Processes for Water and Wastewater Treatment	3	3	0	0	3
18	U18PCCE604	PC	Design of Steel Structures	3	3	0	0	3
19	U18PCCE701	PC	Disaster Preparedness & Planning Management	3	3	0	0	3
20	U18PCCE702	PC	Professional Practice, Law &Ethics	2	2	0	0	2
21	U18PCCE703	PC	Transportation Engineering	2	2	0	0	2

PRACTICALS								
22	U18ESCE3L1	ES	Computer Aided Civil Engineering Drawing	2	0	0	2	1
23	U18PCCE3L2	PC	Surveying and Geomatics	2	0	0	2	1
24	U18PCCE3L3	PC	Engineering Geology Laboratory	2	0	0	2	1
25	U18PCCE4L1	PC	Geotechnical Engineering Laboratory	2	0	0	2	1
26	U18PCCE4L2	PC	Fluid Mechanics Laboratory	2	0	0	2	1
27	U18PCCE4L3	PC	Building Materials & Testing Laboratory	2	0	0	2	1
28	U18PCCE5L1	PC	Hydraulic Engineering Laboratory	2	0	0	2	1
29	U18PCCE5L2	PC	Environmental Engineering Laboratory	2	0	0	2	1
30	U18PCCE6L1	PC	Estimation & Costing Laboratory	2	0	0	2	1

MANDATORY COURSES (MC)

Sl. No.	Course Code	Category	Course Title	Contact Periods	L	T	P	C
THEORY								
1	U18MCTH121	MC	Environmental Sciences	4	2	0	2	0
2	U18MCTH401	MC	Constitution of India	2	2	0	0	0
3	U18MCTH501	MC	Universal Human Values	2	2	0	0	0
4	U18MCTH601	MC	Essence of Indian Knowledge Tradition	2	2	0	0	0
ACTIVITY BASED COURSES								
1	U18MCAB111	MC	Physical health – Sports & Games	2	0	0	2	0
2	U18MCAB112	MC	Gardening & Tree Plantation -	2	0	0	2	0
3	U18MCAB122	MC	Yoga	2	0	0	2	0
4	U18MCAB123	MC	Physical health – NCC	2	0	0	2	0
5	U18MCAB305	MC	Culture- Learning an art form	2	0	0	2	0
6	U18MCAB306	MC	Culture – Intangible Cultural,	2	0	0	2	0

			heritage(festivals, Food ways, Local games)					
7	U18MCAB407	MC	Literature & Media – Literature, Cinema & Media	2	0	0	2	0
8	U18MCAB408	MC	Literature & Media – Group Reading of Classics	2	0	0	2	0
9	U18MCAB509	MC	Social Services – Social Awareness	2	0	0	2	0
10	U18MCAB510	MC	Social Services – NSS	2	0	0	2	0
11	U18MCAB611	MC	Self Development – Spiritual, Mindfulness & Meditation	2	0	0	2	0
12	U18MCAB612	MC	Self Development - religion and Inter-faith	2	0	0	2	0
13	U18MCAB713	MC	Behavioral and interpersonal skills	2	0	0	2	0
14	U18MCAB714	MC	Nature – Nature club	2	0	0	2	0
15	U18MCAB815	MC	Innovation – Project based – Sc., Tech, Social, Design & Innovation	2	0	0	2	0
			Total Contact Hours	**40**	**8**	**0**	**32**	**0**

SUMMARY OF CURRICULUM STRUCTURE AND CREDIT & CONTACT HOUR DISTRIBUTION

S.No	Sub Area	Credit As per Semester								No. of Credit	% of credit
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities & Social Sciences including Management Ccourses (HS)	3	3	-	-	3	-	-		9	5.33
2	Maths&Basic Sciences (BS)	10	15	3	4	-	-	-		32	18.93
3	Engineering Sciences (ES)	7.5	7.5	7	-	-	-	-		22	13.02
4	Professional Core (PC)	-	-	12	14	17	13	7		63	37.28
5	Core Electives (PE)	-	-	-	-	3	6	6	6	21	12.43
6	Open Electives (OE)	-	-	-	-	-	3	3		6	3.55
7	Massive Open Online Course(MOOC)	-	-	-	-	-	-	-	2	2	1.18
8	Employment Enhancement Courses (EEC)	-	-	-	-	-	-	5	9	14	8.28
9	Mandatory courses(MC)	-	-	-	-	-	-	-			100%
	Total Credit	20.5	25.5	22	18	23	22	21	17	169	
	Total Contact Hour	35	36	29	26	30	29	29	28	242	

SEMESTER I

U18HSEN101	**COMMUNICATIVE ENGLISH**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	2	0	2	3
	Prerequisite – School English				
	Course Designed by – Department of English				

OBJECTIVES: To gain fundamental knowledge of language and the uses in daily life.

UNIT I SPEAKING **6**

Speaking- Pronunciation, Intonation, Stress and Rhythm -Common Everyday Situations: Conversations and Dialogues -Communication at Workplace -Interviews -Formal Presentations -introducing oneself – exchanging personal information- narrating events, -incidents , speaking about one's friend/pet -Wh- Questions- asking and answering-yes or no questions- parts of speech. Vocabulary development– prefixes- suffixes- articles, prepositions.

UNIT II READING **6**

Reading – comprehension (multiple choice questions, short questions) - short narratives and descriptions from newspapers including dialogues and conversations also used as short reading texts-- and longer passages - understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences vocabulary and structures- Vocabulary Building -The concept of Word Formation

UNIT III LISTENING **6**

Listening – listening to longer texts and filling in the table- product description- asking about routine actions and expressing opinions. –Listening to telephonic conversations -degrees of comparison- pronouns- direct vs indirect questions- Vocabulary development – single word substitutes- adverbs- Identifying Common Errors in Writing - Subject-verb agreement - Noun-pronoun agreement

UNIT IV WRITING **6**

Writing- letter writing, formal and personal letters- after listening to dialogues or conversations and completing exercises based on them. Understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences -Tenses- simple present-simple past- present continuous and past continuous- Vocabulary development- synonyms-antonyms- phrasal verbs- Articles - Prepositions.

UNIT V LANGUAGE DEVELOPMENT **6**

Writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing- listening to talks, conversations to complete the remaining, participating in conversations- short group conversations-Language development-modal verbs- present/ past perfect tense.– paragraph writing- topic sentence- main ideas short narrative descriptions . Synonyms, antonyms, and standard abbreviations- Basic Writing Skills- Sentence Structures- Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents- Techniques for writing precisely

SOFTSKILL LABORATORY

LIST OF EXPERIMENTS / EXCERCISES

1. Group discussion
2. Making effective presentations
3. Watching interviews & conversations

4. Reading different genres of texts
5. International English Language Testing System (IELTS)
6. Test of English as a Foreign Language (TOEFL)
7. Mock interviews
8. Time management &stress management
9. Role play
10. Listening to lectures, discussions from TV/ Radio.
11. Articulation of sounds - intonation.
12. Creative and critical thinking.

TEXT BOOKS:

1. English A Course book for Under Graduate Engineers and Technologists. Orient Black Swan Limited,Hyderabad:2015
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
3. Dutt P. Kiranmai and RajeevanGeeta. Basic Communication Skills, Foundation Books: 2013
4. Means,L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning ,USA: 2007
5. Practical English Usage. Michael Swan. OUP. 2005.
6. Remedial English Grammar. F.T. Wood. Macmillan.2007
7. On Writing Well. William Zinsser. Harper Resource Book. 2001

COURSE OUTCOMES (COs)	
CO1	The student will be able to comprehend the text with clarity
CO2	The capacity to read and listen will improve
CO3	Writing technical report will be learnt properly
CO4	Speaking skills will be acquired
CO5	Overall communication skills will make them employable

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H										H		H	
	CO2		M							M			M	H	
	CO3			H							H			H	
	CO4				H		M						L	H	
	CO5					H		H	L					H	
3	Category	Humanities and Social Studies (HS)													
4	Approval	Meeting of Academic Council, May 2018													

U18BSMA101	Engineering Mathematics – I (Common to B.Tech - Mech, Mechatronics, Automobile, Aero, Aerospace, EEE, EIE, ECE, CSE, IT, Civil & Bio Medical)	L	T	P	C
	Total Contact Periods – 60	3	1	0	4
	Prerequisite – School Level Mathematics				
	Course Designed by Department of Mathematics				

OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate integration analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT I DIFFERENTIAL CALCULUS - One Variable (9+3)

Representation of functions – limit of a function – continuity – Derivatives – Differentiation rule – Maxima and minima of functions of one variable – Rolle's Theorem – Mean Value Theorem – Taylor's and Maclaurin's Theorem with remainders.

UNIT II INTEGRAL CALCULUS - One Variable (9+3)

Definite integrals – Substitution rule – Techniques of integration – Integration by parts – Trigonometric integrals – Trigonometric substitutions – Integrations of rational functions by partial fractions – Integrations of irrational functions- Integration of improper functions - Beta, Gamma functions and their properties.

UNIT III DIFFERENTIAL CALCULUS - Several Variables (9+3)

Partial derivatives –Euler's theorem on Homogeneous functions - directional derivatives – total derivative – Jacobian – Maxima and minima of two variables.

UNIT IV MULTIPLE INTEGRALS - Several Variables (9+3)

Double integrals in Cartesian co-ordinates – Change of order of integrations – Area as a double integral – Triple integrals in Cartesian co-ordinates –Volume as triple integrals – Double integrals in polar co-ordinates – simple problems.

UNIT V MATRICES (9+3)

Characteristic Equations – Eigenvalue and Eigenvectors of the real matrix– Properties–- Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic form.

TEXT BOOKS

1. Grewal B. S, Higher Engineering Mathematics, Khanna Publisher, Delhi – 2014.
2. Kreyszig. E, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, Singapore, 2012.

REFERENCE BOOKS

1. Veerarajan T, Engineering Mathematics, II edition, Tata McGraw Hill Publishers, 2008.
2. Kandasamy P &co., Engineering Mathematics, 9th edition, S. Chand & co Pub., 2010.
3. N.P.Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. Narayanan S., Manicavachagam Pillai T.K., Ramanaiah G., Advanced Mathematics for Engineering students, Volume I (2nd edition), S.Viswanathan Printers and Publishers,
5. George B. Thomas ,Jr ,Maurice D.Weir, Joel Hass., Thomas' Calculus ,Twelfth Edition Addison-Wesley, Pearson.

COURSE OUTCOMES (COs)	
CO1	To apply both the limit definition and rules of differentiation to differentiate functions.Also they will have a basic understanding of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
CO2	To apply definite integrals of algebraic and trigonometric functions using formulas and substitution. Also they will have a basic understanding of Beta and Gama functions.
CO3	To apply differential and integral calculus to notions of curvature. Also apply differentiation to find maxima and minima of functions.
CO4	To apply multiple integrals to compute area and volume over curves, surface and domain in two dimensional and three dimensional spaces.
CO5	Identify Eigenvalue problems from practical areas using transformations; Diagonalising the matrix would render the Eigen values.

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H				M		L			L			H	
	CO2	H		H	L	M			M				M	H	
	CO3	H				M				L				H	
	CO4	H	M			M				L			L	H	
	CO5	H		H		M				M	L			H	
3	Category	Basic Science (BS)													
4	Approval	Meeting of Academic Council, May 2018													

U18BSPH101	Waves and Optics	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Higher Secondary School Physics				
	Course designed by – Department of Physics				

OBJECTIVES: To develop Physics and Engineering strategies of Waves and Optics and to discuss their functionalities in modern optoelectronics.

UNIT I NON-DISPERSIVE TRANSVERSE AND LONGITUDINAL WAVES IN ONE DIMENSION 9

Introduction - Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, standing waves, longitudinal waves and the wave equation for them, acoustics waves and speed of sound. Waves with dispersion, superposition of waves, wave groups and group velocity.

UNIT II ULTRASONIC WAVES 9

Production of ultrasonic by magnetostriction and piezoelectric methods - acoustic grating – Detection - Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Industrial and Medical applications – Sonogram.

UNIT III THE PROPAGATION OF LIGHT AND GEOMETRIC OPTICS 9

Fermat's principle of stationary time and its applications e.g. in explaining mirage effect, laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations,

reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave. Mirrors and lenses and optical instruments based on them

UNIT IV WAVE OPTICS **9**

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer. Fraunhofer diffraction from a single slit and a circular aperture, Diffraction gratings and their resolving power

UNIT V LASERS **9**

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers(Neodymium), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, applications of lasers in science, engineering and medicine.

TEXT BOOKS

1) M.N. Avadhanulu and P.G. Kshirsagar, "A Textbook of Engineering Physics" S.Chand Publishers, 2016 (for Units 1,3,4 & 5)
2) G.Senthil Kumar, "Engineering Physics", VRB publishers, Chennai, 2015 (for Unit 2)

REFERENCE BOOKS

1) BrijLal and Subramanian, "Waves and Oscillation", VikasPublishsing House, 2011
2) R.Murugesan,"Optics and Spectroscopy", S.Chand Publishers, 2015
3) BrijLal and Subramanian,"Optics", S.Chand Publishers 2006
4) Ian G. Main, "Vibration and waves in physics", Cambridge University Press, 1978
5) H.J. Pain, "The physics of vibrations and waves", 6th edition, Wiley 2006
6) AjoyGhatak, "Optics", Tata McGraw-Hill publishing company, New Delhi, 2009
7) O. Svelto, "Principles of Lasers", Springer, 2010
8) Online reference Wikipedia.org

COURSE OUTCOMES (COs)	
CO1	Understand the basic concept of waves and lights
CO2	Understand the importance of Ultrasonic waves and Non-Destructive Testing
CO3	Understand the propagation of light and geometrical optics
CO4	Understand the optical phenomenon like interference, diffraction and superposition of waves
CO5	Understand the concept of laser and its applications

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H	H	M	H	M			M	H	H			H	
	CO2	L	H	M	M	H			M		L	H	M	H	
	CO3	H	L			L			M	M		M		H	
	CO4	H	L			L			M	M		M	L	H	
	CO5	H	M	M	M				M		H	L		H	
3	Category	Basic Science (BS)													
4	Approval	Meeting of Academic Council, May 2018													

U18BSCH101	ENGINEERING CHEMISTRY	L	T	P	C
	Total Contact Periods – 45	3	0	0	3
	Prerequisite – School Level Chemistry				
	Course Designed by – Department of Chemistry				

OBJECTIVES: To gain fundamental knowledge of Engineering Chemistry and its applications

UNIT I WATER TECHNOLOGY 9

Introduction - Characteristics: Hardness of Water – Types - Temporary and Permanent Hardness - Estimation by EDTA method. Alkalinity – Types of Alkalinity - Phenolphthalein and Methyl Orange Alkalinity - Determination – Domestic Water Treatment – Disinfection methods (Chlorination, Ozonation, and UV Treatment). Boiler feed water – Requirements – Disadvantages of using hard water in boilers (Caustic embrittlement, Boiler corrosion, Priming and foaming) – Prevention of scale formation – softening of hard water - Internal treatment (Calgon treatment method) – External treatment – Demineralization process – Desalination and Reverse osmosis.

UNIT II PHASE RULE AND ALLOYS 9

Introduction: Statement of Phase Rule and Explanation of terms involved – One component system – Water system – Construction of phase diagram by thermal analysis - Condensed phase rule - Two Component System : Simple eutectic systems (lead-silver system) – eutectic temperature – eutectic composition – Pattinson's Process of desilverisation of Lead.

Alloys: Importance, ferrous alloys – nichrome and stainless steel – 18/8 stainless steel -heat treatment of steel – annealing –hardening – tempering - normalizing – carburizing - nitriding. Non- ferrous alloys: Brass and Bronze.

UNIT III NON-CONVENTIONAL ENERGY SOURCES & STORAGE DEVICES 9

Introduction: Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions – nuclear chain reactions – nuclear energy critical mass - super critical mass - sub - critical mass Light water nuclear reactor for power generation – breeder reactor. Solar energy conversion – solar cells – wind energy. Fuel cells – hydrogen – oxygen fuel cell. Batteries: Primary and secondary Batteries – differences between Primary and secondary Batteries Secondary batteries: Lead–acid storage battery –working –uses. Nickel–cadmium battery -working –uses. Solid – state battery: Lithium battery.

UNIT IV FUELS 9

Introduction: Calorific value – types of Calorific value - gross calorific value – net calorific value. Analysis of Coal – Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke –manufacture by Otto-Hoffmann method. Petroleum processing and fractions– cracking – catalytic cracking – types – fixed bed catalytic cracking method- Octane number and Cetane number. Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG. Flue gas analysis – importance - Orsat apparatus.

UNIT V NANOCHEMISTRY 9

Introduction: Nanochemistry: Definition - Classification based on dimensions - Size dependent properties. Types of nanomaterials: Nanoparticles: Synthesis by Bottom-up and top-down approaches - Nanoporous materials: Synthesis by sol-gel method. Nanowires: Synthesis by VLS mechanism. Carbon Nanotubes (CNTs): Single walled and Multi walled nanotubes - Mechanical and electrical properties of CNTs - Applications of CNTs - Synthesis of CNTs by

Electric arc discharge method and Laser ablation method. Nanochemistry in biology and medicines – nanocatalysis. NanocomSOsites – sensors and electronic devices.

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand&Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, "Engineering Chemistry, Volume 1", Crystal Publications, Chennai, (2007).
4. S. Vairam, P. Kalyani and Suba Ramesh, ―Engineering Chemistry‖, Wiley India PVT, LTD, New Delhi, 2013.
5. G. B. Sergeev, Nano chemistry, Elsevier Science, New York, 2006.

REFERENCES:

1. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).

COURSE OUTCOMES (COs)	
CO1	To impart knowledge to the Students about the principles, water characterization, conversant with boiler feed water requirements and water treatment techniques.
CO2	To make them understand the industrial importance of Phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys
CO3	To make the students to be well versed with the principles of Conventional and non-conventional energy sources and energy storage devices.
CO4	To make the students to have a deep knowledge of the Chemistry of Fuels and calorific value, manufacture of solid, liquid and gaseous fuels.
CO5	To make them understand the Nanochemistry, Types of nanomaterials: Nanoparticles, Nanochemistry in biology and medicines.

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H			M		H		H		L			H	
	CO2		L	H		M		H		M		L	M	H	
	CO3		M		H		L				M			H	
	CO4	H		M	L			M			H		L	H	
	CO5		L		L		M				H			H	
3	Category	Basic Science (BS)													
4	Approval	Meeting of Academic Council, May 2018													

U18ESCS101	**PROBLEM SOLVING AND PYTHON PROGRAMMING**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	**3**	**0**	**0**	**3**
	Prerequisite – NIL				
	Course Designed by – Department of Computer Science & Engineering				

OBJECTIVES: To gain fundamental knowledge of algorithmic problem solving and python programming.

MODULE 1 :ALGORITHIMIC PROBLEM SOLVING 9

Introduction to components of a computer system - disks, memory, processor, operating system, compilers – Problems, Solutions, Idea of Algorithm –Representation of Algorithm. Building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart,programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Problem Illustrations

MODULE 2: DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list;variables, expressions, statements, tuple assignment, precedence of operators, comments; modulesand functions, function definition and use, flow of execution, parameters and arguments; Illustrativeprograms: exchange the values of two variables, circulate the values of n variables, distance betweentwo Points.

MODULE 3: CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

MODULE 4: LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, listparameters;Tuples: tuple assignment, tuple as return value; Dictionaries: operations andmethods;advanced list,Processing list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

MODULE 5: FILES, PACKAGES 9

Files and exception: text files, reading and writing files, errors and exceptions, handlingexceptions, packages: NumPy, SciPy, Matplotlib, Scikit-learn, Scilab Interface.

TEXT BOOKS:

1. Allen B. Downey, 'Think Python: How to Think Like a Computer Scientist', 2nd edition, Updated for Python3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updatedfor Python 3.2, Network Theory Ltd., 2011.

REFERENCES

1. John V Guttag, ―Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
4. Kenneth A. Lambert, ―Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
5. Charles Dierbach, ―Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.

6. Paul Gries, Jennifer Campbell and Jason Montojo, ―Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013

COURSE OUTCOMES (COs)	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Demonstrate programs using simple Python statements and expressions.
CO3	To gain knowledge regarding control flow and functions associated with python
CO4	Use Python data structures – lists, tuples & dictionaries for representing compound data
CO5	To gain knowledge on files, exception, modules and packages in Python for solving problems

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H	H	H	M	H	M	L		M	L	M		H	
	CO2	H	H	M	M		M		L			M	M	H	
	CO3	M	M	L	H	M		L		L		M		H	
	CO4	M	M	L	M	H	M	L	M	L		M	L	H	
	CO5	M	H	L	M	M			M	M	L			H	
3	Category	Engineering Sciences (ES)													
4	Approval	Meeting of Academic Council, May 2018													

U18ESME101	**Engineering Graphics & Design (Theory & Lab.)**	**L**	**T**	**P**	**C**
	Total Contact Periods – 75	1	0	4	3
	Prerequisite – +12 Level Maths and Physical Science				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES: To Prepare students to design a system, component, or process to meet desired needs, using the techniques, skills, and modern engineering tools necessary for engineering practice

Traditional Engineering Graphics:
Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Computer Graphics:
Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

(Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)

MODULE 1: INTRODUCTION TO ENGINEERING DRAWING (9+2)

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain, Diagonal and Vernier Scales; Draw simple annotation, dimensioning and scale. Construction of Conic sections; Cycloid, Epicycloid, Hypo cycloid and Involute of circle;

MODULE 2: ORTHOGRAPHIC PROJECTIONS (10+2)

Principles of Orthographic Projections; Conventions; Projections of points and Orthographic projection of lines in first quadrant - Parallel to both the planes – Perpendicular to oneplane – Parallel to one plane and inclined to other plane – Inclined to both the planes;Projections of planes inclined to either HP or VP;

MODULE 3: PROJECTIONS OF REGULAR SOLIDS& ISOMETRIC PROJECTIONS (10+3)

Projection of solids in first quadrant – Prism, Pyramid, Cone and Cylinder inclined to one plane; Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions - Isometric Views of Simple Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa;

MODULE4:SECTIONSOF SOLIDS AND DEVELOPMENT OF SURFACE (10+3)

Sectional view of Prism, Cylinder, Pyramid, Cone (simple position in first quadrant) with cutting planesperpendicular to one plane and parallel or inclined to another plane– True shape of sections; Development of lateral surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone;

MODULE 5: BUILDING DRAWING (9+2)

Introduction to building drawing; Types of Projection adopted in Building Drawing; Scales for various types of Drawings,Symbols, Conventions and Abbreviations.Drawing of residential single and two storied buildingswith detail of Line plan, Foundation Plan, Ground floor Plan, First floor plan, Elevation and Sections

MODULE 6: OVERVIEW OF COMPUTER GRAPHICS (12+3)

Introduction to CAD; Basic commands; Coordinate systems; Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Setup a drawing with proper scale – Dimensioning commands, Editing Dimensions and Dimension text; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;Create basic drawing of objects such as polygon and general multi-line figures; Creating orthographic views of simple solids like prism, pyramid, cylinder, cone. Drawing sectional views of prism, pyramid, cylinder and cone; Preparation of fabrication drawing (Development of surfaces); Drawing front view, top viewand side view of objects from the given pictorial view; Creation of 3-D models of simple objects.

TEXT BOOKS:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals

COURSE OUTCOMES (COs)	
CO1	Students will gain Exposure to engineering communication.
CO2	Students will learn standards of engineering graphics.
CO3	Students willgetExposure to basics of building construction
CO4	Students willgetExposure to computer-aided geometric design
CO5	Student will gain basic knowledge and Exposure to the visual aspects of Engineering Design.

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H			M			H						H	
	CO2	H	H	L		H	M						M	H	
	CO3			H										H	
	CO4											H	L	H	
	CO5	H						L						H	
3	Category	Engineering Sciences (ES)													
4	Approval	Meeting of Academic Council, May 2018													

U18BSPH2L1	WAVE OPTICS AND MECHANICS LABORATORY (Common to B.Tech-Civil, Mech, Mechatronics, Aero, Aerospace, Auto & Nano Tech)	L	T	P	C
	Total Contact Hours - 45	**0**	**0**	**3**	**1.5**
	Prerequisite – Higher Secondary School Physics				
	Course designed by – Department of Physics				

OBJECTIVES: To impart knowledge practical physics to the students

Physics Lab experiments for Semester I & II

List of Experiments for Waves and Optics – Common for all branches

1) Ultrasonic Interferometer
2) Air-wedge Experiment
3) Particle size determination
4) Determination of acceptance angle
5) Determination of Laser Wavelength
6) Spectrometer – Determination of wavelength using grating

List of Experiments for Mechanics

1) Torsional Pendulum – without symmetrical mass
2) Torsional Pendulum – With symmetrical mass
3) Young's Modulus – Non-uniform bending
4) Young's Modulus – Uniform Bending
5) Compound Pendulum
6) Coefficient of viscosity of the given liquid – Poiseuille method

COURSE OUTCOMES (COs)	
CO1	Understand the fundamental concept of optics
CO2	Understand the concept of production of ultrasonic waves
CO3	Understand the basic concept of Mechanics

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H		H	H						H	L		H	
	CO2	H	H	L								L	M	H	
	CO3	H	H	L								M		H	
3	Category	Basic Sciences (BS)													
4	Approval	Meeting of Academic Council, May 2018													

U18BSCH2L4	CHEMISTRY LABORATORY	L	T	P	C
	Total Contact Hours – 45	0	0	3	1.5
	Prerequisite – Engineering Chemistry				
	Course Designed by – Department of Chemistry				

OBJECTIVES: To enhance the practical knowledge on Chemistry through Volumetric and circuit experiments

LIST OF EXPERIMENTS

1. Determination of Total Hardness, Temporary Hardness and Permanent hardness of Water by EDTA method
2. Estimation of Alkalinity - Titrimetry
3. Estimation of Dissolved Oxygen
4. Estimation of Chlorides in Water by Argentometric Method (MOHR'S Method)
5. Estimation of Copper by EDTA method
6. Estimation of Iron in Water by Spectrophotometry
7. Conductometric Titration of Strong Acid with Strong Base
8 Determination of Molecular weight of a polymer by Viscosity Average Method
9. pH measurements for Acid - alkali Titrations
10 Determination of rate of corrosion by weight loss method.
11. Conductometric Precipitation titration
12. Determination of Water Crystallization

REFERENCES

1. R. Jeyalakshmi, "Practical Chemistry", Devi Publications 2014.
2. S.S. Dara, A text book on experiments and calculation Engg.

COURSE OUTCOMES (COs)	
CO1	Students will able to analyze - hardness, Alkalinity, Dissolved oxygen, Chlorides in Water by Argentometric Method, Determination of Water of Crystalliza and as well as estimation of Copper by EDTA method using volumetric analysis.
CO2	Students will understand basic principle of spectrophotometric method

CO3	Students will learn Conductometric Titration of Strong Acid with Strong Base andConductometric Precipitation titration.
CO4	Student will be able to analyze Determination of Molecular weight of a polymer by Viscosity Average Method
CO5	Student will understand about pH measurements for Acid - alkali Titrations and rate of corrosion by weight loss method

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H		M	M		H		H		L			H	
	CO2	L	H			M		H		M		L	M	H	
	CO3		M		M						M			H	
	CO4	H		M				M				H	L	H	
	CO5		H		L		M				H			H	
3	Category	Basic Sciences (BS)													
4	Approval	Meeting of Academic Council, May 2018													

U18ESCS1L1	**PROBLEM SOLVING AND PYTHON PROGRAMMINGLABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	1.5
	Prerequisite – NIL				
	Course Designed by – Department of Computer Science & Engineering				

OBJECTIVES: To enhance the practical knowledge on writing programs using Python

LIST OF EXPERIMENTS FOR PROBLEM SOLVING AND PYTHON PROGRAMMING LAB

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. ExSOnentiation (SOwer of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Find the most frequent words in a text read from a file
11. Simulate elliptical orbits in Pygame
12. Simulate bouncing ball using Pygame
13. Simulate matrix operations with Scilab
14. Simulate fitting curve with NumPy and Matplotlib

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux and Scilab

COURSE OUTCOMES (COs)	
CO1	Write, test, and debug simple Python programs.
CO2	Implement Python programs with conditionals and loops
CO3	Develop Python programs step-wise by defining functions and calling them
CO4	Use Python lists, tuples, dictionaries for representing compound data
CO5	Read and write data from/to files in Python and to simulate using the packages Scilab, NumPy and Matplotlib

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H	H	M	H	H	M	M	M	M		M		H	
	CO2	H	H	L	H	H	M	L	M	M	M	M	M	H	
	CO3	H	H	M	M	M	M		M	M	M	M		H	
	CO4	H	M	H	H	H	M	M	M	M	L		L	H	
	CO5	H	H	M	H	M	M		M	M	L	M		H	
3	Category	Engineering Sciences (ES)													
4	Approval	Meeting of Academic Council, May 2018													

SEMESTER II

U18HSEN201	**TECHNICAL ENGLISH**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	2	1	0	3
	Prerequisite – I semester English				
	Course Designed by – Department of English				

OBJECTIVES: To gain fundamental knowledge of English language and its usage in day to day life.

UNIT I LISTENING 9

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- Speaking –Asking for and giving directions- extended definitions –listening to daily issue- -Vocabulary Development- technical vocabulary - Language Development –subject verb agreement – compound words.

UNIT II READING 9

Reading – reading longer technical texts- identifying the various transitions in a text- interpreting charts, graphs after reading the, practice in speed reading- vocabulary Development-vocabulary used in formal letters/emails and reports -Language Development personal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING 9

Writing after listening to classroom lectures- talk should be on engineering /technology– introduction to technical presentations- longer texts both general and technical, Describing a process, use of sequence words- Vocabulary Development- sequence words- Misspelled words.

UNIT IV FORMAL WRITING 9

Writing- email etiquette- job application – cover letter –Resume preparation (via email and hard copy)- analytical essays and issue based essays–Vocabulary Development- finding suitable synonyms-paraphrasing-. Language Development- clauses- dependant, independent, if conditionals.

UNIT V LANGUAGE DEVELOPMENT 9

Speaking –participating in a group discussion – role play, Writing– Writing reports- minutes of a meeting- accident and survey-Vocabulary Development- transitive, intransitive verbs, Language Development- reported speech.

TEXT BOOKS:

1. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

REFERENCES

1. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges Cengage

Learning, USA: 2007

COURSE OUTCOMES (COs)	
CO1	The student will acquire basic proficiency in English
CO2	Reading and listening ability will improve.
CO3	Comprehension techniques will develop.
CO4	writing and speaking skills will be acquired
CO5	Overall communication skills will make them employable.

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	M										H		H	
	CO2		H							M			M	H	
	CO3			H							H			H	
	CO4				M		H						L	H	
	CO5					M		M	L					H	
3	Category	Humanities and Social Studies (HS)													
4	Approval	Meeting of Academic Council, May 2018													

U18BSMA201	**Engineering Mathematics II (Common to B.Tech - Mech, Mechatronics, Automobile, Aero, Aerospace, EEE, EIE, ECE, CSE, IT, Civil & Bio Medical)**	**L**	**T**	**P**	**C**
	Total Contact Periods - 60	**4**	**0**	**0**	**4**
	Prerequisite – School Level Mathematics				
	Course Designed by Department of Mathematics				

OBJECTIVE: The objective of this course is to equip the students of Engineering and Technology with techniques in ordinary equations, vector calculus, complex variables and Laplace transform with advanced level of mathematics and applications that would be essential to formulate problems in engineering environment.

UNIT I ORDINARY DIFFERENTIAL EQUATIONS (9+3)

Higher order linear differential equations with constant coefficients – linear differential equations with variable coefficients– Euler's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients- Method of variation of parameters.

UNIT II VECTOR CALCULUS (9+3)

Scalar and vector point function - Gradient, Divergence and curl – Directional derivatives – Angle between two surfaces - Irrotational and Solenoidal vector fields – Line Integral - Green's theorem – Gauss divergence theorem and Stokes' theorem – Simple applications involving cubes and rectangular parallelepipeds.

UNIT III ANALYTIC FUNCTIONS (9+3)

Functions of complex variable - Analytic functions – Necessary and sufficient conditions (without proof), Cauchy Riemann Equations in Cartesian and polar form – Harmonic functions – properties of analytic functions – Construction of analytic functions using Milne Thomson method –Conformal mapping : and Bilinear Transformation.

UNIT IV COMPLEX INTEGRATION (9+3)

Cauchy integral theorem – Cauchy's integral formula – problems – Taylor's and Laurent's Series – classification of Singularities – Poles and Residues – method of finding residues - Cauchy's residue theorem and its applications to evaluate real integrals – contour integration.

UNIT V LAPLACE TRANSFORMS (9+3)

Transforms of elementary functions – Basic properties – Shifting theorem- Transforms of derivatives and integrals – Initial and final value theorem – Laplace transform of Periodic Functions – Inverse Laplace transform – Convolution theorem – Periodic Functions – Applications of Laplace transform for solving linear ordinary differential equations up to second order with constant coefficient.

TEXT BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Willie & Sons, 2006.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

REFERENCE BOOKS

1. Venkataraman. M. K, Engineering Mathematics, National Publishing Company, 2000.
2. Bali .N.P and Manish Goyal, A Text book of Engineering Mathematics, Eighth Edition, Laxmi Publications Pvt Ltd., 2011.
3. Veerarajan T, Engineering Mathematics, II edition, Tata McGraw Hill Publishers, 2008.
4. George B. Thomas Jr., Maurice D. Weir, Joel R. Hass., Thomas' Calculus, 12th Edition, Addison-Wesley, Pearson.

COURSE OUTCOMES (COs)	
CO1	The mathematical tools for solution of differential equation that model physical process.
CO2	To evaluate the line, surface and volume integrals using Green's, Stoke's and Gauss Theorems and their verification.
CO3	To understand the analytic functions, conformal mapping and complex integration and their applications.
CO4	To evaluate real and complex integrals using the Cauchy's integral formula and Residue theorem.
CO5	To apply the concept of Laplace Transformation in analysis and solve differential equations.

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	M		L		H				M		H		H	
	CO2	H	M			H			M		L			H	
	CO3	H		L				M		H				H	
	CO4								H	M	M	L		H	
	CO5	H		L	L			M				H		H	
3	Category	Basic Science (BS)													

4	Approval	Meeting of Academic Council, May 2018

U18BSPH201	**INTRODUCTION TO MECHANICS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Higher Secondary School Physics				
	Course designed by – Department of Physics				

OBJECTIVES: To impart basic knowledge of mechanics involving 1D, 2D and 3D motions ofa rigid body

UNIT 1 **9**

Forces in Nature; Newton's laws and its completeness in describing particle motion; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates

UNIT 2 **9**

Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical and parabolic orbits;

UNIT 3 **9**

Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance

UNIT 4 **9**

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion, Kinetic energy of a rotating body

UNIT 5 **9**

Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed

TEXT BOOKS

1. Dr.R.K.Bansal, "A Text Book of Engineering Mechanics", Laxmi publication (P) Ltd. 6th edition, 2013.

REFERENCE BOOKS

1. R.K.Gaur and S.L.Gupta, "Engineering Physics" DhanpatRai Publications" 2012.
2. M.K. Harbola, "Engineering Mechanics", 2nd edition, Cengage, 2013.
3. M.K. Verma, "Introduction to Mechanics", 1st edition, CRC press, 2009.
4. D.Kleppner&R.Kolenkow, "An Introduction to Mechanics", McGraw Hill Education, 2017
5. JL Meriam and L.G.Kraige, "Engineering Mechanics – DynamicsVol 2", 7th ed. Wiley, 2012
6. JP Den Hartog, "Mechanical Vibrations", Dover Publications, Inc., 1985
7. WT Thomson, "Theory of Vibrations with Applications", Pearson, 5th edition, 1997.
8. Online References: Wikipedia org

COURSE OUTCOMES (COs)	
CO1	Understand and solve the various equation of motions in different coordinates
CO2	Understand the conservation of energy and angular momentum
CO3	Understand the concept of harmonic motion in different damped conditions
CO4	Understand the rigid body motion in different criteria
CO5	Understand the rigid body motion in 3D

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1			L	L					M				H	
	CO2	H		L	L	H				M		L		H	
	CO3	M				M				H				H	
	CO4	H		L	L					M		L		H	
	CO5	L		H	H	M				M		L		H	
3	Category	Basic Science (BS)													
4	Approval	Meeting of Academic Council, May 2018													

U18BSCH201	ENVIRONMENTAL SCIENCE	L	T	P	C
	Total Contact Periods – 45	3	0	0	3
	Prerequisite – NIL				
	Course Designed by – Department of Chemistry				

OBJECTIVES: To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

UNIT I -NATURAL RESOURCES **9**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people –Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems - Food resources: World food problems, changes caused by agriculture and overgrazing, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Equitable use of resources for sustainable lifestyles.

UNIT II -ECOSYSTEMS **9**

Introduction: concepts of an ecosystem. Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem :- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)- Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation - Ethics : Issues and Possible Solutions, Climate change, global warming, acid rain, ozone layer depletion.

UNIT III -BIODIVERSITY AND ITS CONSERVATION 9

Introduction and Definition - genetic, species and ecosystems diversity, Biogeographical classification of India - Value biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and local levels. India as a mega diversity nation, Hot-spots of biodiversity - Threats to biodiversity, habitat, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation biodiversity - In-situ and Ex-situ conservation of biodiversity.

UNIT IV-ENVIRONMENTAL SOLLUTION 9

Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - pollution case studies - Disaster Management: floods earthquake, cyclone and landslides.

UNIT V- SOCIAL ISSUES AND HUMAN SOPULATION 9

Social issues: Environmental Protection Act, Air (Prevention and Control of pollution) Act, Water (Prevention and Control of pollution) Act, Wildlife protection Act, Forest Conservation Act, Public awareness – Fireworks and its impact on the Environment – Chemicals used in Fireworks – (Fuel –oxidizing Agent – Reducing Agent –Toxic Materials – Fuel –Binder-Regulator) – Harmful nature of ingredients – chemical effects on health due to inhaling fumes.
Human population: population growth, variation among nations, Population explosion-Family Welfare programs, Environment and human health, Human Rights, Value Education, HIV and AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human health - Case Studies.

TEXT BOOKS:

1. Gilbert M. Masters, Introduction to Environmental Engineering and Science‘, 2nd edition, Pearson Education 2004.
2. Benny Joseph, Environmental Science and Engineering‘, Tata McGraw-Hill, New Delhi, 2006.
3. R.K. Trivedi, Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards‘, Vol. I and II, Enviro Media.
4. Rajagopalan, R, Environmental Studies-From Crisis to Cure’, Oxford University Press 2005.
5. K.V.B. Raju and R.T. Ravichandran, “Basics of Civil Engineering”.

REFERENCES:

1. Cunningham, W.P. Cooper, T.H. Gorhani, Environmental Encyclopedia‘, Jaico Publ., House, Mumbai, 2001.
2. Dharmendra S. Sengar, Environmental law‘, Prentice hall of India PVT LTD, New Delhi, 2007.

COURSE OUTCOMES (COs)	
CO1	Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving
CO2	Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
CO3	Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems

CO4	Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales
CO5	Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H			M		H		H		L			H	
	CO2	L	H	H		M		H		M		L		H	
	CO3		M				L			H	M			H	
	CO4	H		M	L			M				M		H	
	CO5		H		L		M				H			H	
3	Category	Basic Science (BS)													
4	Approval	Meeting of Academic Council, May 2018													

	BIOLOGY FOR ENGINEERS	**L**	**T**	**P**	**C**
U18BSBT101	Total Contact Hours - 30	2	0	0	2
	Prerequisite – Higher Secondary level biology, basic concepts in cell signaling				
	Course Designed by – Dept of Industrial Biotechnology				

OBJECTIVES: To provide a basic understanding of the biological systems and its applications in the industrial sector

UNIT I INTRODUCTION TO LIFE 6

Characteristics of living organisms-Basic classification-cell theory-structure of prokaryotic and eukaryotic cell- Introduction to biomolecules - general classification and important functions of carbohydrates-lipids-proteins-nucleic acids – vitamins

UNIT II BIODIVERSITY 6

Plant System: basic concepts of plant growth-nutrition-photosynthesis-Animal System: elementary study of digestive-respiratory-circulatory-excretory systems and their functions. Microbial System -types of microbes-economic importance and control of microbes.

UNIT III GENETICS AND IMMUNE SYSTEM 6

Evolution: theories of evolution- evidence of laws of inheritance-variation and speciation- nucleic acids as a genetic material-central dogma - immunity-antigens-antibody-immune response.

UNIT IV HUMAN DISEASES 6

Definition- causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertension, AIDS and Hepatitis

UNIT V BIOLOGY AND ITS INDUSTRIAL APPLICATION 6

Transgenic plants and animals-stem cell and tissue engineering-bioreactors-biopharming-recombinant vaccines-cloning-bioremediation-biofertilizer-biocontrol- biosensors-biopolymers-bioenergy-biomaterials-biochips

TEXT BOOKS:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications,

2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

REFERENCE BOOKS

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

COURSE OUTCOMES (COs)	
CO1	To understand the basic concepts of the cell and its structure
CO2	To understand about biodiversity and its conservation
CO3	To know the fundamentals of genetics and the immune system
CO4	To create an awareness about human diseases
CO5	To give a basic knowledge of the applications of transgenics

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H					M	M			H	M		H	
	CO2	H			M		H		M	M				H	
	CO3	M		M			M							H	
	CO4							H			M	M		H	
	CO5	H	H					H	M	M				H	
3	Category	Basic Science (BS)													
4	Approval	Meeting of Academic Council, May 2018													

U18ESEE101	**BASIC ELECTRICAL & ELECTRONICS ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	**3**	**0**	**0**	**3**
	Prerequisite – School Level Physics				
	Course Designed by – Department of Electrical & Electronics Engineering				

OBJECTIVES: To gain fundamental knowledge of Electrical and Electronics Engineering and its applications

MODULE 1 : DC CIRCUITS **12**

Electrical circuit elements, voltage and current sources, Fundamentals Relationship of VI for RLC circuit, Ohms Law, Source Transformation ,Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Basics of Superposition, Thevenin and Norton Theorems,Maximum Power Transformations Theorem.

MODULE 2: AC CIRCUITS **9**

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), resonance. Time-domain analysis of first-order RL and RC circuits. Three-phase balanced circuits, voltage and current relations in star and delta connections.

MODULE 3: ELECTRICAL MACHINES & TRANSFORMERS 9

Principles of operation and characteristics of; DC machines,Synchronous machines, three phase and single phase induction motors. Transformers (single and three phase) regulation and efficiency,all day efficiency and auto-transformer .

MODULE 4: SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier and its applications, Introduction to OP-AMP.

MODULE 5: DIGITAL ELECTRONICS 6

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – Fundamentals of A/D and D/A Conversion.

TEXT BOOKS:

1. John Bird, Electrical Circuit Theory & Technology,Taylor & Francis Ltd, 6th, edition. 2017.
2. Smarajit Ghosh, Fundamentals of Electrical and Electronics Engineering, Second Edition, PHI Learning, 2007.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 10th Edition, 2011.
5. V. D. Toro, "Electrical Engineering Fundamentals", Pearson, 2nd Edition, 2015.
6. Millman and Halkias, "Integrated Electronics", McGraw Higher Ed, 2nd Edition, 2011.
7. Vincent Del Toro, `Electrical Engineering Fundamental, Prentice Hall, 2nd Edition, 2015.
8. K.A.Krishnamurthy and M.R.Raghuveer, `Electrical and Electronics Engineering for Scientists', New Age International Pvt Ltd Publishers, 2011.

REFERENCES:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, Third Reprint,2016.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", Mcgraw Higher Ed, 1st Edition, 2011.
3. Jacob Millman and Christos C-Halkias,"Electronic Devices and Circuits", Mcgraw Higher Ed, 4th Edition, 2015.

COURSE OUTCOMES (COs)	
CO1	To gain knowledge regarding the various laws and principles associated with DC Circuits.
CO2	To gain knowledge regarding fundamentals of AC circuits.
CO3	To gain knowledge regarding electrical machines and transformers.
CO4	To gain knowledge regarding various types of semiconductor devices and small signal amplifiers.
CO5	To gain knowledge on principles of digital electronics systems.

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H	L			M				H		L		H	
	CO2	H	L			M				H		L		H	
	CO3	H	M			M				H		L		H	
	CO4	H	L			M				H		L		H	
	CO5	H	L			M				H		L		H	
3	Category	Engineering Sciences (ES)													
4	Approval	Meeting of Academic Council, May 2018													

U18ESME1L2	**Workshop/Manufacturing Practices Lab (Theory & Lab.)**	**L**	**T**	**P**	**C**
	Total Contact Periods – 75	1	0	4	3
	Prerequisite – NIL				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES: To educate the students on common manufacturing processes employed in Industries.

Lectures & videos: **(15 hours)**

Detailed contents

- Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lecture)**
- CNC machining, Additive manufacturing **(2 lecture)**
- Fitting operations & power tools **(2 lecture)**
- Carpentry **(2 lecture)**
- Plastic moulding, glass cutting **(2 lecture)**
- Metal casting **(2 lecture)**
- Welding (arc welding & gas welding), brazing **(2 lecture)**

WORKSHOP PRACTICE:

1. Machine shop **(6 hours)**
   a) Facing
   b) Turning
   c) Drilling Practice
2. Fitting shop **(6 hours)**
   a) Fitting Exercises–Preparation of square fitting
   b) Vee–fittingmodels.
3. Carpentry **(9 hours)**
   a) Preparation Lap joints.
   b) Mortise and Tenonjoints.
   c) Cross Half.
   d) Dove Tail.
4. Welding shop **(Arc welding 6 hrs + gas welding 3 hrs) (9 hours)**
   Preparation of butt joints, lap joints and tee joints
5. Sheet Metal working **(9 hours)**
   a) Forming &Bending:
   b) Model making–Trays, funnels, etc.
   c) Different type of joints

6. Demonstration **(6 Hours)**
   Smithy operations, upsetting, swaging, setting down and bending. Example–Exercise–Production of hexagonal headed bolt.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

SUGGESTED TEXT/REFERENCE BOOKS:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers Private Limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

COURSE OUTCOMES (COs)	
CO1	Students will gain knowledge of the different manufacturing processes.
CO2	Students will be able to fabricate components with their own hands.
CO3	Students will gain practical knowledge of the dimensional accuracies and dimensional tolerances.
CO4	Students will be able to produce small devices of their interest.

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1											H		H	
	CO2			H	M							H		H	
	CO3		M											H	
	CO4	H			L							H		H	
3	Category	Engineering Sciences (ES)													
4	Approval	Meeting of Academic Council, May 2018													

U18ESEE1L3	**BASIC ELECTRICAL AND ELECTRONIC ENGINEERING LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	1.5
	Prerequisite – School Level Physics & Basic Electrical and Electronic Engineering				
	Course Designed by – Department of Electrical & Electronics Engineering				

OBJECTIVES: To enhance the practical knowledge on basics of electrical and electronics components and circuits.

LIST OF EXPERIMENTS FOR BASIC ELECTRICAL ENGINEERING LAB

1. Verification of Ohms and Kirchoff's Voltage and Current Laws

2. Measurement of the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification.
3. Fluorescent lamp wiring
4. Staircase wiring
5. Measurement of energy using single phase energy meter
6. Observation of the no-load current waveform on an oscilloscope and Measurement of Primary and secondary voltages and currents of a Transformer
7. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
8. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

LIST OF EXPERIMENTS FOR BASIC ELECTRONICS ENGINEERING LAB

1. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
2. Characteristics – Half wave and Full wave Rectifiers
3. Characteristics – Common Base transistor configuration
4. Verification of truth tables of OR, AND, NOT, NAND, NOR gates and Flip-flops - JK and RS
5. Applications of Operational Amplifier

COURSE OUTCOMES (COs)	
CO1	To handle basic electrical equipment and verify current and voltage law
CO2	To understand the steady-state and transient time-response of R-L, R-C, and R-L-C circuits .
CO3	To understand domestic wiring procedures practically.
CO4	To analyze ac signal parameters using cathode ray oscilloscope and function generator
CO5	To understand all the fundamental concepts semiconductor Diode and Transistor

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	H	H			H				H		M		H	
	CO2	H	H			H				H		M		H	
	CO3	H	H			H				H		M		H	
	CO4	H	H			H				H		M		H	
	CO5	H	H			H				H		M			
3	Category	Engineering Sciences (ES)													
4	Approval	Meeting of Academic Council, May 2018													

SEMESTER III

U18BSMA306	**TRANSFOR AND PARTIAL DIFFERENTIAL EQUATIONS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	2	1	0	3
	Prerequisite – Engineering Mathematics I & II				
	Course Designed by – Dept of Civil Engineering				
	➢ Grasp the Fourier series expansion for given periodic function in specific intervals and their different forms. ➢ Learn techniques of solving the standard types of first order and second order partial differential equations. ➢ Learn solving wave and heat equation using Fourier series. Understand the problems using Fourier transform and their properties				

UNIT I FOURIER SERIES **12**

Dirichlet's conditions – General Fourier Series – Half range Sine and Cosine series – Parseval's Identity.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS **12**

Formation – Solutions of standard types of first order equations – Lagrange's linear equations – Linear partial differential equation of second and higher order with constant coefficients.

UNIT III BOUNDARY VALUE PROBLEMS FOR PARTIAL DIFFERENTIAL EQUATIONS **12**

Classifications second order linear partial differential equations – Solution of one dimensional wave equation – One dimensional heat equation – Steady state solution of two dimensional heat equation.

UNIT IV FOURIER TRANSFORMS **9**

Fourier integral theorem (without proof) – Fourier transform pairs – Fourier sine and cosine transform – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Willie & Sons, 2006.

REFERENCE BOOKS

1. R. Haberman, Elementary Applied partial differential equations with Fourier Series and Boundary Value Problems, 4th Ed., Prentice Hall, 1998.
2. Manish Goya and .N.P Bali l, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.
3. Venkataraman. M. K. "Engineering Mathematics Volume III" , 13th Edition National Publishing Company, Chennai, 1998.
4. George B. Thomas Jr., Maurice D. Weir, Joel R. Hass., Thomas' Calculus, 12thEdition, Addison-Wesley, Pearson.
5. S. J. Farlow, Partial Differential Equations for Scientist and Engineers, Dover Publications 1993.
6. https://www.academia.edu/38267463/Higher_engineering_mathematics_bs_grewal
7. https://soaneemrana.org/onewebmedia/ADVANCED%20ENGINEERING%20MATHEM

ATICS%20BY%20ERWIN%20ERESZIG1.pdf
8. http://issc.uj.ac.za/appliedmaths/honours/pde/Haberman,%20R-Elementary%20Applied%20Partial%20Differential%20Equations%20With%20Fourier%20Series%20And%20Boundary%20Value%20Problems-Prentice%20Hall%20PTR%20(1987).pdf

COURSE OUTCOMES (COs)	
CO1	Expand given function using the knowledge of Fourier Series.
CO2	Solve PDE and higher order with constant coefficients and physically interpret the results.
CO3	Boundary Value Problems and Differential Equations will be knowledgeable about and will be able to analyze solutions to two-point boundary value problems, boundary value problems for partial differential equations.
CO4	Solve many problems in automobile, medicine, electronic engineering by applying Fourier transform with the possible special cases with attention to their applications.

U18ESCE301	**COMPUTER- AIDED CIVIL ENGINEERING DRAWING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**2**	**0**	**0**	**2**
	Prerequisite: Engineering graphics and design				
	Course Coordinator Name & Department: Ms.Thendral, Civil Engineering				

COURSE OBJECTIVES: Develop Parametric design and the conventions of formal engineering drawing. Produce and interpret 2D & 3D drawings. Communicate a design idea/concept graphically/ visually.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Understand the benefits of computer aided design	U
CO2	Knowledge of symbols and sign conventions.	R
CO3	To Understand the arrangement bonds.	U
CO4	Students learn 2D modeling	Ap
CO5	Students learn modeling 3d Drawings	Ap
CO6	To learn the pictorial view of the buildings	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			1				3				1	3	3
	CO2	3									3			2	
	CO3		2			2				3				3	2
	CO4	3									2				2
	CO5							3					1	3	3
	CO6	1			1				2		3				2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	**Engg. Sciences (ES)**	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION 6

Introduction to concept of drawings, Interpretation of typicaldrawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, co-ordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

UNIT II SYMBOLS AND SIGN CONVENTIONS 6

Materials, Architectural, Structural,Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards

UNIT III MASONRY BONDS 6

Masonry, Types of Masonry, Brickwork, Bond**,** English Bond and Flemish Bond – Corner wall and Crosswalls - One brick wall and one and half brick wall

UNIT IV BUILDING DRAWING 6

Terms, Elements of planning, building, drawing, Methodsof making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity

UNIT V PICTORIAL VIEW 6

Principles of isometrics and perspective drawing. Perspectiveview of building. Fundamentals of Building Information Modeling (BIM)

TEXT BOOKS:

1. Verma B.P ,"Civil Engg. Drawing & House planning", Khanna publishers, Delhi, 2014
2. Building Design and Drawing by A. D. Pawar, V. S. Limaye and V. G. Shetti,2015
3. Shah M.G. Kalec. M. & Patki SY Building Drawing, Tata Mcgraw Hill, New Delhi, 2000

REFERENCES:

1. M. G. Shah, C. M. Kale, S. Y. Patki ,"Building drawing", Tata McGraw-Hill, 2002
2. Kumaraswamy N, Kameswara Rao A,"Building Planning & Drawing", Charotar Publishing House, 2013
3. https://openlibrary.org/works/OL16752086W/A_handbook_for_mapping_engineering_and_architectural_drawing
4. https://openlibrary.org/works/OL1892570W/Architectural_drafting_and_design
5. https://openlibrary.org/works/OL5646378W/Building_construction_and_drawing

Course Coordinator HOD

U18ESME301	ENGINEERING MECHANICS	L	T	P	C
	Total Contact Hours: 30	3	1	0	4
	Prerequisite: Wave Optics and Mechanics				
	Course Coordinator Name & Department: Mr.S.Vinothkumar, Civil Engineering				

COURSE OBJECTIVES: The objective of this Course is to provide an introductory treatment of Engineering Mechanics to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters. A working knowledge of statics with emphasis on force equilibrium and free body diagrams.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	Use scalar and vector analytical techniques for analysing forces in statically determinate structures	An
CO2	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems, Apply basic knowledge of math and physics to solve real-world problem	Ap
CO3	Apply basic knowledge of math and physics to solve real-world problems	Ap
CO4	Understand basic dynamics concepts – force, momentum, work and energy	U
CO5	Understand and be able to apply Newton's laws of motion	U
CO6	To learn about beams and its types	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3									2				2
	CO2							3					1	3	3
	CO3	1			1				2		3				2
	CO4	3	3		3				2				3		
	CO5					3			3		2			3	
	CO6	3							3	2			1		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	**Engg. Sciences (ES)**	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION TO ENGINEERING MECHANICS 12

Force Systems Basic concepts,Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- 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 and Spatial Systems; Static Indeterminacy

UNIT II FRICTION, BASIC STRUCTURAL ANALYSIS, 12

Types of friction, Limiting friction, Laws of Friction, Staticand Dynamic Friction; Motion

of Bodies, wedge friction, screw jack & differential screw jack; Equilibrium in three dimensions; Method ofSections; Method of Joints; determinination of member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines; Area moment of inertia.

UNIT III VIRTUAL WORK AND ENERGY METHOD 12

Virtual displacements, Centroid and Centre of Gravity covering principle of virtualwork for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium. Rectilinear motion.

UNIT IV INTRODUCTION TO KINETICS OF RIGID BODIES 12

Basic terms, general principlesin dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

UNIT V MECHANICAL VIBRATIONS 12

Basic terminology, free and forced vibrations,resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums.

TEXT BOOKS:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. Hibbeler R. C. (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press.

REFERENCE

1. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
2. Hibbeler R.C. and Gupta. A (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
3. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
4. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
5. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
6. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications
7. https://openlibrary.org/works/OL1698695W/Engineering_mechanics
8. https://openlibrary.org/works/OL1440581W/Vector_mechanics_for_engineers
9. https://openlibrary.org/works/OL15244490W/Engineering_mechanics

Course Coordinator **HOD**

	ENGINEERING GEOLOGY	L	T	P	C
U18PCCE301	Total Contact Hours: 30	**2**	**0**	**0**	**2**
	Prerequisite: Environmental Sciences				
	Course Coordinator Name & Department: Dr.Venkata Krishnaiah, Civil Engineering				
COURSE OBJECTIVES: The objective of this Course is to focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Through lectures, labs, and case study					

examination student will learn to couple geologic expertise with the engineering properties of rock and unconsolidated materials.		
COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice	An
CO2	Rock mass characterization and the mechanics of planar rock slides and topples.	C
CO3	Evaluate rock-mass quality and perform a kinematic analysis.	C
CO4	To Apply the method of slices and factor of safety equation to solve rotational slide problem.	Ap
CO5	The mechanics of soils and fluids and their influence on settlement, liquefaction, and soil slope stability.	C
CO6	To learn about different seismic zones in India	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	3		3				2				3		
	CO2					3			3		2			3	
	CO3	3							3	2			1		3
	CO4	3	2											3	3
	CO5							1			3				
	CO6	3			3					3			1	3	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT 1 GENERAL GEOLOGY 6

Introduction-Branches of geology useful to civil engineering, scope of geologicalstudies in various civil engineering projects,Weathering. Department dealing with this subject in India and their scope of work- GSI, Granite Dimension Stone Cell, NIRM.Mineralogy-Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, SEM, XRD.

UNIT II PETROLOGY 6

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

UNIT III STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS 6

Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to

civil engineering. Geophysical methods – Seismic and electrical methods for subsurface investigations

UNIT IV GEOLOGICAL HAZARDS 6

Rock Instability and Slope movement: Concept of slidingblocks. Different controlling factors. Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth.

UNIT V GEOLOGICAL INVESTIGATION 6

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings.Coastal protection structures. Investigation of Landslides and earthquakes - causes and mitigation , seismic zonation – seismic zones of India.

TEXT BOOKS

1. Engineering and General Geology, Parbin Singh, Published by *S.K. Kataria & Sons*, (2014).
2. Engineering Geology for Civil Engineers, Varghese P.C, PHI Learning Pvt. Ltd., (2011)

REFERENCES

1. Text Book of Engineering Geology, N. Chenna kesavulu, 2nd Edition Macmillan Publishers India. (2009),
2. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).
3. Engineering Geology, Subinoy Gangopadhyay, Publisher: Oxford University (2013).
4. http://www.sasurieengg.com/e-course-material/CIVIL/II Year%20Sem%203/CE6301%20Engineering%20Geology.pdf
5. https://www.goodreads.com/book/show/4874812-engineering-geology?ac=1&from_search=true
6. https://www.goodreads.com/book/show/17986288-engineering-geology?ac=1&from_search=true

Course Coordinator **HOD**

U18PCCE302	CONSTRUCTION TECHNOLOGY	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Nil				
	Course Coordinator Name & Department: Ms.K.Anitha, Civil Engineering				

COURSE OBJECTIVES: To make the student to become more familiar with the advanced construction methods and practice involved in heavy construction like box jacking, pipe jacking, basement tunneling techniques of off-shore platforms.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To know about the Specifications, details and sequence of activities in construction	E
CO2	To know about the Fabrication and erection of pre cast building components.	E
CO3	To learn the Sub Structure Construction Techniques	Ap
CO4	To understand the concepts involved in Super Structure Construction Techniques	U
CO5	To study the construction practices in industrial structure, braced domes and space decks.	An

CO6	To learn about prestressing in high rise structures.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	2							2		3	1	3	3
	CO2							1			3				
	CO3	3	2		3					3			1	3	2
	CO4	2										3		3	3
	CO5		2							2					
	CO6	2							2		3	3	3	3	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION 9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms.

UNIT II FABRICATION AND ERECTION 9

Fabrication and erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes – acoustic and fire protection;

UNIT III CONSTRUCTION TECHNIQUES 9

Sub Structure Construction- Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation;

UNIT IV SUPER STRUCTURE CONSTRUCTION 9

Super Structure Construction- Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures,

UNIT V CONSTRUCTION EQUIPMENTS 9

Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks;

TEXT BOOKS:

1. S.P. Arora & S.P. Bindra, A Text Book of Building Construction, Dhanpat Rai & Sons,

New Delhi, 2010.
2. S.K. Sarkar and S. Saraswati, Construction Technology, Oxford University Press, New Delhi, 2008.
3. B.C. Punamia, Building Construction, Laxmi Publications, New Delhi, Eleventh Edition, 2016.
4. S.C. Rangwala, Building Construction, Charotar Publication Pvt Ltd. Anand,Thirty Third Edition, 2017.

REFERENCES:

1. R. Chudley, Construction Technology Vol. I, II, III, IV, Longman Group Limited,London, Twenty Third Edition, 2005.
2. R. Chudley (revised by R. Greeno), Building Construction Handbook, Addison Wesley, Longman Group, England, 3rd ed., 1999.
3. S.S. Ataev, Mir Publishers, Moscow, 1999.
4. https://openlibrary.org/works/OL5647089W/Building_construction
5. https://openlibrary.org/works/OL17354199W/Building_construction
6. https://openlibrary.org/works/OL3479737W/Construction

Course Coordinator **HOD**

U18PCCE303	**INTRODUCTION TO CIVIL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Introduction to mechanics				
	Course Coordinator Name & Department: Ms.P.Mugilvani, Civil Engineering				

COURSE OBJECTIVES: To impart basic knowledge on Civil. To familiarize the materials used in Civil Engineering structures. To provide the exposure on the fundamental elements of civil engineering fields.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Understanding monumental buildings	U
CO2	To study buiding materials and construction management and to uderstand repairs & rehabilitation of structures.	E
CO3	To familiarize various fields of civil engineering including environmental impact.	An
CO4	Understand the basics in specialized fields of civil engineering.	U
CO5	Introduction to advanced analytical methods and general purpose FEM program.	C
CO6	To get knowledge on softwares used in Civil Engineering	An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2				2	3					3		3	3
	CO2		2							2					
	CO3	2					3		2		3	3	3	3	2
	CO4	3			2	3								1	
	CO5	3	3	3				2		2	2			1	2
	CO6				2		3					2		1	3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I: BASICS OF CIVIL ENGINEERING & HISTORY OF ARCHITECTURE 9

Broad disciples of Civil Engineering / Infrastructure, Scopes for career. Construction and development over time. Material developments, Construction methods Eminent works. Construction industries, 5-year plan outlay, Budgets for Infrastructures. Aesthetics in Civil Engineering - Fundamentals of architectural design, town planning; Building System (HVAC, LEED) ratings – Smart Cities.

UNIT II: BUILDING MATERIALS AND CONSTRUCTION MANAGEMENT 9

Stones, bricks, mortars, Plain- Reinforced and prestressed Concrete. Chemicals in Construction. Structural Steels, High tensile Steel, Carbon Composites, Plastics, Recycling and disposal of Demolition wastes. Temporary structures in Construction, Costruction methods for various structure, Contrction Equipments, Management System; Importance of Costruction Management. Repairs & Rehabilitation of Structures: Basics of corrosion phenomena and otherstructural distress mechanisms; simple systems of rehabilitation of structures.

UNIT III CIVIL ENGINEERING - I 9

Environmental Engineering & Sustainability: Water, Effluenttreatment treatment systems; Solid waste management;

Geotechnical Engineering:, rock mechanics and geology;various types of foundations; basics of rock mechanics & tunnelling

Hydraulics, Hydrology &Water Resources Engineering: Fundamentals of fluid flow,basics of water supply systems; Underground Structures; Underground Structures

Ocean Engineering: Basics of Wave and Current Systems; Sediment transport systems;Ports & Harbours and other marine structures

Surveying & Geomatics: Basic surveying techniques, Total Stations,
GPS, LIDAR;

UNIT IV CIVIL ENGINEERING - II 9

Traffic & Transportation Engineering: Development and challenges in integrated transport development in India: road, rail, air. Intelligent Transport Systems; Urban Public and Freight Transportation; Road Safety under heterogeneous traffic;

Power Plant Structures: Chimneys, Natural & Induced Draught Cooling towers, coal handling systems, ash handling systems; nuclear containment structures; hydro power projects

Structural Engineering: Types of buildings; tall structures; various types of bridges;
Water retaining structures; Other structural systems;
Wind tunnel studies;

UNIT V COMPUTATIONAL METHODS IN CIVIL ENGINEERING 9

Computational Methods, IT in Civil Engineering: Typical software used in CivilEngineering-Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; Highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB, ETAB, NASTRAN, NISA, MIKE 21, MODFLOW, REVIT, TEKLA,

AUTOCAD,…GEOSTUDIO, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM, …). Industrial lectures: Case studies of large civil engineering projects by industryprofessionals, covering comprehensive planning to commissioning;

TEXT BOOKS

1. The National Building Code, BIS, (2017)
2. RERA Act, (2017)
3. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
4. Chandiramani, Neelima (2000), the Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
5. Avtarsingh (2002), Law of Contract, Eastern Book Co.

REFERENCE:

1. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
2. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern Book Co.
3. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
4. P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency
5. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
   Bare text (2005), Right to Information Act.
6. https://openlibrary.org/works/OL18169263W/Introduction_to_autocad_2008_for_civil_engineering_applications
7. https://www.goodreads.com/book/show/14827751-civil-engineering
8. https://civilenglineering.files.wordpress.com/2014/10/the-civil-engineering-handbook.pdf

Course Coordinator **HOD**

U18PCCE304	SURVEYING AND GEOMATICS	L	T	P	C
	Total Contact Hours: 45	1	1	0	2
	Prerequisite: Engineering Graphics & design				
	Course Coordinator Name & Department: Ms. Maria Subhashini, Civil Engineering				

COURSE OBJECTIVES: To develop mid level professionals in *Surveying*/*Geomatics* with adequate knowledge and skills also in social and human sciences that is necessary to deal with issues related to land-man relation such as Land Reform and Management, Hydropower, Irrigation, Road, Building Construction, Aviation, Land Resource Planning

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Carry out preliminary surveying in the field of civil engineering applications	An
CO2	Set out curves, buildings, culverts and tunnels.	C
CO3	Have knowledge to modern methods of surveying like Total station, Hydrographic survey and cartography	An
CO4	Have knowledge to modern methods of surveying like Photogrammetry	An
CO5	Apply the concepts of Electro Magnetic energy, spectrum and spectral signature curves in the practical problems	Ap
CO6	To learn about sensors and digital image processing.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			2	3		2		3		3		1	
	CO2	3	3	3				2		2	2		1	1	2
	CO3	2			2		3					2		1	3
	CO4									2					
	CO5	3		3		3			3		2			3	3
	CO6	3	1			3		3		3		3	1		

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION TO SURVEYING 6

Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.Triangulation and Trilateration.

UNIT II THEODOLITE SURVEY AND CURVE 6

Theodolite survey: Instruments, Measurement ofhorizontal and vertical angle; Horizontal and vertical control - methods -triangulation - network- Signals. Baseline - choices - instruments and accessories - extension of base lines - corrections - Satellite station - reduction to centre - Intervisibility of height and distances - Trigonometric leveling - Axis single correctionsElements of simple and compound curves – Method of settingout– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves

UNIT III MODERN FIELD SURVEY SYSTEMS 6

Principle of Electronic DistanceMeasurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

UNIT IV PHOTOGRAMMETRYSURVEYING 6

Introduction, Basic concepts, perspectivegeometry of aerial photograph, relief and tilt displacements, terrestrial photo grammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.

UNIT V REMOTESENSING 6

Introduction –Electromagnetic Spectrum, interactionof electromagnetic radiation with the

atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

TEXT BOOKS:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010.

REFERENCE:

1. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
2. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
3. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.
4. https://www.goodreads.com/book/show/1664828.Elementary_Surveying?from_search=true
5. https://openlibrary.org/works/OL1864858W/Surveying
6. https://openlibrary.org/works/OL241021W/Surveying

Course Coordinator **HOD**

U18ESCE3L1	**COMPUTER-AIDED CIVIL ENGINEERING DRAWING LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: Engineering Graphics & design				
	Course Coordinator Name & Department: Ms. R.Chitra, Civil Engineering				

COURSE OBJECTIVES: To introduce the students to draw the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Carry out preliminary surveying in the field of civil engineering applications	M
CO2	Set out curves, buildings, culverts and tunnels	M
CO3	Have knowledge to modern methods of surveying like Total station, Hydrographic survey and cartography	COR
CO4	Have knowledge to modern methods of surveying like Photogrammetry	M
CO5	Apply the concepts of Electro Magnetic energy, spectrum and spectral signature curves in the practical problems	A
CO6	To learn about remote height using total station.	P

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1						3			2				2	2
	CO2	3		3		3			3		2			3	3
	CO3	3	1		2	3		3		3		3	1	3	3

	CO4		2			2			2		2				
	CO5	2					3		3	2				1	1
	CO6		2		1						3	2	1		

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	**Engg. Sciences (ES)**	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF DRAWING EXPERIMENTS:

1. Buildings with load bearing walls including details of doors and windows.
2. Standard drawings of a typical two storeyed building including all.
3. Electrical Circuit drawing for Single storeyed building
4. Plumbing connection drawing for single storeyed building.
5. RCC framed structures
6. Reinforcement drawings for typical slabs,
7. Reinforcement drawings for beams and columns
8. Reinforcement drawing for spread footings
9. Industrial buildings - North light roof structures – Trusses
10. Perspective view of one and two storey buildings

TEXT BOOKS:

1. Verma B.P ,"Civil Engg. Drawing & House planning", Khanna publishers, Delhi, 2014
2. Building Design and Drawing by A. D. Pawar, V. S. Limaye and V. G. Shetti,2015
3. Shah M.G. Kalec. M. & Patki SY Building Drawing, Tata Mcgraw Hill, New Delhi, 2000

REFERENCES:

1. M. G. Shah, C. M. Kale, S. Y. Patki ,"Building drawing", Tata McGraw-Hill, 2002
2. Kumaraswamy N, Kameswara Rao A,"Building Planning & Drawing", Charotar Publishing House, 2013

Course Coordinator **HOD**

U18ESCE3L2	**SURVEYING AND GEOMATICS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: Engineering Graphics & design				
	Course Coordinator Name & Department: Ms.Marisubhashini, Civil Engineering				

COURSE OBJECTIVES: To understand and posses the knowledge about field techniques in Surveying. To understand field problems like tachometry, setting out for foundation marking etc. The student is also exposed to the Modern Surveying methods.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about drawing of Residential Building using Autocad	O
CO2	To study about drawing of symbols and sign	O
CO3	To study about drawing of RCC framed using Autocad	O
CO4	To study about drawing of various types of RCC structures	O

CO5	To study about drawing of various types of Truss	COR
CO6	To learn about Traversing and Contouring using total station.	COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	2			2			2		2		3	3	
	CO2	2					3		3	2				1	1
	CO3		2		1						3	2	1		3
	CO4	3				3		2	3					2	2
	CO5			2				2		2	3		1		
	CO6	3		2		3		2	1		3			1	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	**Engg. Sciences (ES)**	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF EXPERIMENTS

1. a) Simple chain survey - problems involving instruments such as optical and prism Square - cross staff.
   b) Overcoming obstacles in chaining and ranging.
2. a) Measurement of bearing of survey lines by prismatic compass.
   b) Running closed and open compass traverse.
   c) Plotting and Adjustments of traverse.
3. a) Plane table survey of building or a park or a road by different methods. ‘
   b) Field solution of two and three point problems.
   c) Problems in leveling.
4. Traversing using total station.
5. Contouring using total station.
6. Determination of remote height using total station.
7. Stake out using total station. Distance, gradient ,diff, height between two inaccessible points using total station.

TEXT BOOKS:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011

REFERENCE

1. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
2. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
3. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.

Course Coordinator **HOD**

U18ESCE3L3	**ENGINEERING GEOLOGY LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: Environmental Sciences				
	Course Coordinator Name & Department: Mr.Vinothkumar, Civil Engineering				

COURSE OBJECTIVES: Engineering geology is an applied geology discipline that involves the collection, analysis, and interpretation of geological data and information required for the safe development of civil works. Engineering geology also includes the assessment and mitigation of geologic hazards such earthquakes, landslides, flooding; the assessment of timber harvesting impacts; and groundwater remediation and resource evaluation.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice	A
CO2	Rock mass characterization and the mechanics of planar rock slides and topples.	M
CO3	Evaluate rock-mass quality and perform a kinematic analysis.	A
CO4	To Apply the method of slices and factor of safety equation to solve rotational slide problems.	COR
CO5	The mechanics of soils and fluids and their influence on settlement, liquefaction, and soil slope stability.	P
CO6	To learn the Use of clinometers compass and Burton compass	COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				3		2	3					2	2
	CO2			2				2		2	3		1		
	CO3	3		2		3		2	1		3			1	2
	CO4	2					3		3	2				1	1
	CO5		2		1						3	2	1		3
	CO6	3				3		2	3					2	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	**Engg. Sciences (ES)**	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)

4	Approval	Meeting of Academic Council, May 2018

LIST OF EXPRIEMENTS:

1. Study of Physical properties of minerals
2. Identification of rocks forming silicate and ore minerals
3. Recognition of rocks
4. Use of clinometers compass and Burton compass for measurement dip and strike of formations.

5. Geological cross sections and study of geological maps.
6. Study of models of geological structures and out crops patterns of different types of rocks and land forms

REFERENCES

1.Engineering and General Geology, Parbin Singh, 8th Edition , S K Kataria & Sons Publishers (2010)
2. Text Book of Engineering Geology, N. Chenna kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

Course Coordinator **HOD**

U18MCAB305	**CULTURE-LEARNING AN ART FORM**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: Nil				
	Course Coordinator Name & Department: Ms.Mugivani.P, Civil Engineering				

COURSE OBJECTIVES: To know the concept of Culture, Civilization and Heritage. To know more in the subject of general characteristics of culture and importance of culture in human life.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about concept of culture	O & A
CO2	To study about culture and civilization	O & A
CO3	To study about culture and heritage	O & A
CO4	To study about characteristics of culture	O & A
CO5	To study about importance of culture in human life	O & P
CO6	To learn the diversity and ideational in culture	O & P

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1			2				2		2	3		1	3	3
	CO2	3		2		3		2	1		3			1	2
	CO3	2					3		3	2				2	1
	CO4		2		1						3	2	1		3
	CO5	3				3		2	3					2	2
	CO6			2				2		2	3		1		

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**

4	Approval	Meeting of Academic Council, May 2018

UNIT I: CONCEPT OF CULTURE 6

Culture, food you eat, the clothes you wear, the language you speak in aspects of culture, Art, music, literature, architecture, sculpture, philosophy, religion and science in aspects of culture.

UNIT II: CULTURE AND CIVILIZATION 6

Culture and civilization, Culture different from civilization, Humans: physical, mental and spiritual, social and political civilization.

UNIT III: CULTURE AND HERITAGE 6

Cultural development is a historical process, ancestors, cultural heritage, human heritage, architectural creations, monuments, material artifacts, the intellectual achievements, philosophy, and treasures of knowledge, scientific inventions and discoveries

UNIT IV: GENERAL CHARACTERISTICS OF CULTURE 6

Culture is learned and acquired, Culture is shared by a group of people, Culture is cumulative, Culture changes, Culture is dynamic, Culture gives us a range of permissible behavior patterns, Culture is diverse, and Culture is ideational.

UNIT V: IMPORTANCE OF CULTURE IN HUMAN LIFE 6

Culture and life, traditions, beliefs, way of life, fundamental element of culture, religious belief and its symbolic expression, three eternal and universal values of Truth, Beauty and Goodness are closely linked with culture, philosophy and religion.

TEXT BOOKS:

1. Chakravarti, Ranabir: Merchants, Merchandise & Merchantmen, in: Prakash, Om (ed.): The Trading World of the Indian Ocean, 1500-1800 (History of Science, Philosophy and Culture 361 in Indian Civilization, ed. by D.P. Chattopadhyaya, vol. III, 7), Pearson, Delhi, 2012, pp. 53- 116.
2. Chaudhuri, Kirti N.: Trade and Civilisation in the Indian Ocean, CUP, Cambridge, 1985.
3. Malekandathil, Pius: Maritime India: Trade, Religion and Polity in the Indian Ocean, Primus
4. Books, Delhi, 2010. McPherson, Kenneth: The early Maritime Trade of the Indian Ocean, in: ib.: The Indian.

REFERENCE:

1. Ocean: A History of People and The Sea, OUP, 1993, pp. 16-75. Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV
2. Christie, J.W., 1999, The Banigrama in the Indian Ocean and the Java sea during the earlyAsian trade boom, Communarute‘s maritimes de l‘ocean indien, Brepols

Course Coordinator HOD

U18MCAB306	**CULTURE-LEARNING AN ART FORM**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: Nil				
	Course Coordinator Name & Department: Ms.Saritha, Civil Engineering				
COURSE OBJECTIVES: Describe the distinctive features of Indian culture; Identify the central points and uniqueness of Indian culture; Discuss the importance of spirituality in Indian culture; Explain the points of diversity and underlying unity in it; and Trace the process of infusion into and integration of elements from other cultures in Indian culture. The importance of festivals, food and sports of India.					

COURSE OUTCOMES (COs):		Revised Bloom's Taxonomy
CO1	To study about concept of culture	A & GR
CO2	To study about culture and civilization	A & GR
CO3	To study about culture and heritage	A & GR
CO4	To study about characteristics of culture	A & GR
CO5	To study about importance of culture in human life	A & GR
CO6	To learn the social and cultural values in sports	A & GR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2					3		3	2				2	1
	CO2		2		1						3	2	1		3
	CO3	3				3		2	3					2	2
	CO4	3	2			3		2	3					2	2
	CO5		3	2				2		2	3		1		
	CO6	3		2		3		2	1		3			1	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I: CHARACTERISTICS OF INDIAN CULTURE **6**

Indian culture, physical and social environment, continuity and change, variety and unity, secular outlook, universalism, materialistic and spiritualistic.

UNIT II: CULTURAL IDENTITY, RELIGION, REGION AND ETHNICITY 6

Religion and region, cultural influences, Cultural synthesis, spirituality, Adaptability as a characteristic of Indian culture, unity in diversity.

UNIT III: FESTIVALS, HOLIDAYS, CELEBRATIONS **6**

Diwali, Holi, Rakhi, Lohri, Eid, Christmas, Indian Independence DayIndian Republic Day and Gandhi Jayanti.

UNIT IV: FOOD **6**

Indian foods,traditional foods,traditional food practices,food preparation, Indian food systems, food-ways, food habits, food ingredients land of spices, Mughlai food, regional foods, beverages, types of beverages

UNIT V: TRADITIONAL SPORTS OF INDIA **6**

Traditional sports in India, Festival sports, social and cultural values in sports, Chaupar/

Pachisi, Kabaddi, Kho-Kho Mallakhamb, Gilli-Danda, Jallikattu, Kalaripayattu

TEXT/ BOOKS:

1. Chakravarti, Ranabir: Merchants, Merchandise & Merchantmen, in: Prakash, Om (ed.): The Trading World of the Indian Ocean, 1500-1800 (History of Science, Philosophy and Culture 361 in Indian Civilization, ed. by D.P. Chattopadhyaya, vol. III, 7), Pearson, Delhi, 2012, pp. 53- 116.
2. Chaudhuri, Kirti N.: Trade and Civilisation in the Indian Ocean, CUP, Cambridge, 1985.
3. Malekandathil, Pius: Maritime India: Trade, Religion and Polity in the Indian Ocean, Primus
4. Books, Delhi, 2010. McPherson, Kenneth: The early Maritime Trade of the Indian Ocean, in: ib.: The Indian.

REFERENCE:

1. Ocean: A History of People and The Sea, OUP, 1993, pp. 16-75. Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV
2. Christie, J.W., 1999, The Banigrama in the Indian Ocean and the Java sea during the early
3. Asian trade boom, Communarute‘s maritimes de l‘ocean indien, Brepols

Course Coordinator **HOD**

SEMESTER IV

U18BSMA402	PROBABILITY, STATISTICS AND NUMERICAL METHODS	L	T	P	C
	Total Contact Hours – 60	3	1	0	4
	Prerequisite – Basic knowledge in probability and statistics and Engineering Mathematics I & II				
	Course Designed by – Dept of Mathematics				
OBJECTIVES	➢ The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate integration analysis and linear algebra. ➢ It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.				

UNIT 1 PROBABILITY DISTRIBUTION (9+3)Hrs

Probability – Axioms of probability – Conditional probability – Baye's theorem – Random variables – Binomial – Poisson – Geometric – Uniform – Exponential and normal distribution and their properties.

UNIT II STATISTICS AND TESTING OF HYPOTHESIS (9+3)Hrs

Measures of central tendency – Moments – Skewness and kurtosis – Correlation and Regression – Rank correlation – Test of significance: Large sample test for single proportion, difference of proportions – Chi Square test for goodness fit and independence of attributes.

UNIT III SOLUTION OF POLYNOMIAL AND TRANSCENDENTAL EQUATIONS (9+3)Hrs

Fixed Point Iteration methods - Newton-Raphson method and Regula-Falsi method for single variable-solutions of linear system of equations by Gaussian, Gauss-Jordan, Jacobian and Gauss-Siedel methods.

UNIT IV FINITE DIFFERENCE AND INTERPOLATION (9+3)Hrs

Finite differences -Relation between finite difference operators- Interpolation using Newton's forward and backward difference formulae, Interpolation with unequal intervals-Newton's Divided difference formula, Lagrange's Interpolation formula.

UNIT V NUMERICAL DIFFERNTIATION AND INTEGRATION (9+3)Hrs

Numerical Differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's both $1/3^{rd}$ and $3/8^{th}$ rules. Double integration using Trapezoidal rule and Simpson rule.

TEXT BOOKS

1. Sastry. S. S "Introductory Numerical Methods" PHI, 2010.
2. Jain K.K. Iyengar, S.R.K and Jain, R.K. "Numerical Methods for Scientific and Engineering Computation" 4rd edition, 2005.
3. S.C.Gupta&V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi, 2003.

REFERENCEBOOKS

1. Grewal, B.S. "Higher Engineering Mathematics (42nd edition)" Khanna Publication Delhi, 2016.
2. P.Kandasamy, K.Thilagavathy, K.Gunavathi- Numerical methods, S.Chand& Company, 2nd Edition 2010.
3. Veerarajan T. "Probability Statistics and Random Process" Tata McGraw Hill, New Delhi 2003.

COURSE OUTCOMES (COs)	
CO1	Evaluate the probability using addition and multiplication theorem. Apply Baye's Theorem for practical problems to find the probability. Apply the discrete and continuous distribution for solving practical problems. Evaluates the moments of distributions using moment generating functions.
CO2	Learn the basic idea of statistics including measures of central tendency Identify the appropriate hypothesis testing procedure based on type of outcome variable and number of samples
CO3	Gain knowledge for solving equations by Newton-Raphson and Regula-Falsi methods and system of linear equations by various methods.
CO4	Interpolate the value of a dependent variable in the given data by Newton's forward and backward difference formulae and also unequal intervals.
CO5	Understand the concept of numerical differentiation and integration using Trapezoidal and Simpson's rules.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
CO1	H	M		L	H	M	L	M	M	L	M	H		
CO2	H		H	L	M	L	L	M		M	S	M	H	
CO3	H				M	L			L		M	M		L
CO4	H	M			M		M		L		M	M`		H
CO5	H		H		M	M		M	M	L	M	H	H	M
Category	BASIC SCIENCE (BS)													
Approval	48th Meeting of the Academic Council													

U18PCCE401	**REINFORCED CONCRETE DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Engineering Mechanics				
	Course Coordinator Name & Department: Ms.R.Chitra, Civil Engineering				

COURSE OBJECTIVES: To study the strength behavior and design of reinforced concrete members subjected to moment shear and axial forces including the properties of concrete material behavior.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Design RC concrete structural elements using various methods.	C
CO2	Design reinforced concrete slabs and beams by WSD for flexure	C
CO3	Design various basic elements of reinforced concrete structures like slabs, beams, columns and footings by LSD	C
CO4	Design reinforced concrete slabs and beams for shear and torsion by LSD	C
CO5	Design reinforced concrete Footing	C
CO6	To learn the design philosophy in concrete behavior	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-

Medium, 1-Low															
1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2					3		3	2				2	3
	CO2		2		1						3	2	1		3
	CO3	3				3		2	3					2	2
	CO4		2		1						3	2	1		3
	CO5	3				3		2	3					2	2
	CO6			2				2		2	3		1		
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	**Professional Core (PC)**		Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I INTRODUCTION 9

Concrete - Properties of ingredients, properties of fresh concrete, defects in concrete and influence of other factors - study and strength behavior of concrete – Introduction to working stress method – design of singly and doubly reinforced beams.

UNIT II WORKING STRESS METHOD 9

Design of continuous beams and slabs – axially and eccentrically loaded column footings for individual columns and combined rectangular footings for two columns.

UNIT III LIMIT STATE DESIGN OF BEAMS 9

Introduction to Limit state method - Limit state design of rectangular T and L shaped beams for flexure, shear, bond torsion, - design of one way slab, two way slab – Lintels – sun shades.

UNIT IV DESIGN OF COLUMNS 9

Limit state design of short rectangular and circular columns for axial and eccentric loads using SP- 16 design of long columns.

UNIT V DESIGN OF FOOTING 9

Limit state design of square / rectangular footings for axially and eccentrically loaded columns combined rectangular footings for two columns.

TEXT BOOKS:

1. Krishnaraju, N. ‘Reinforced Concrete Design’, CBS Publishers and Distributors, Delhi. 2016.
2. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., New Delhi. 2002.
3. Gambhir.M.L., “Fundamentals of Reinforced Concrete Design”, Prentice Hall of India Private Limited, New Delhi. 2006.
4. Subramanian,N., ”Design of Reinforced Concrete Structures”, Oxford University Press, New Delhi. 2013.

REFERENCES:

1. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.
2. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009.
3. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.
4. https://onlinelibrary.wiley.com/doi/book/10.1002/9781118635360
5. https://bitsathy.ac.in/civil/syllabus/pg/2015.pdf
6. http://www.sasurieengg.com/e-course material/CIVIL/IIIyear%20Sem%205/CE6505%20Design%20of%20Reinforced%20Concrete%20Elements.pdf

Course Coordinator **HOD**

U18PCCE402	**INTRODUCTION TO FLUID MECHANICS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**2**	**0**	**0**	**2**
	Prerequisite: Introduction to Mechanics				
	Course Coordinator Name & Department: Mr.Rajesh, Civil Engineering				

COURSE OBJECTIVES: The objective of this course is to introduce the concepts of fluid mechanics useful in Civil Engineering applications A training to analyze engineering problems involving fluids – such as those dealing with pipe flow, open channel flow, jets, turbines and pumps, dams and spillways, culverts, river and groundwater flow - with a mechanistic perspective is essential for the civil engineering students.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To learn about the basics of fluid mechanics and various properties of fluids	Ap
CO2	Understand the broad principles of fluid statics	U
CO3	To have a clear understanding about fluid kinematics	U
CO4	Understand the broad principles of fluid dynamics	U
CO5	To apply the continuity, momentum and energy principles	Ap
CO6	To learn the basic concepts of design flow	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2					3		3	2				2	
	CO2		2		1						3	2	1		3
	CO3	3				3		2	3					2	2
	CO4		2		1						3	2	1		
	CO5	3				3		2	3					2	2
	CO6		2		1						3	2	1		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I BASICS OF FLUID MECHANICS 6

Basic Concepts and Definitions – Distinction between a fluid and a solid;Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

UNIT II FLUID STATICS 6

Fluid Pressure: Pressure at a point, Pascals law, pressure variationwith temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.Buoyancy and stability of floating bodies.

UNIT III BASIC CONCEPTS OF FLUID FLOW 6

Classification of fluid flow : steady and unsteady flow; uniformand non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

UNIT IV DYNAMICS 6

Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation;Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube.

UNIT V MOMENTUM PRICIPLES OF FLUDIS 6

Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.

TEXT BOOKS

1.A Textbook of Fluid Mechanics by R K Bansal, Laxmi Publication (2010)

2. Textbook of Hydraulics and Fluid Mechanics by R.S. Khurmi, S. Chand Publishing (2015)

3. Fluid Mechanics, Hydraulics and Hydraulic Machines, KR Arora, Standard Publishers Distributors (2005)

REFERENCES

1.Fluid Mechanics and Machinery, C.S.P.Ojha, .Berndtsson and P. N. Chadramouli, Oxford University Press, (2010)

2.Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House Publishers (2015).

3. https://books.google.co.in/books?id=6PJ6CgAAQBAJ&pg=PA695&lpg=PA695&dq=Fluid+Mechanics,+Hydraulics+and+Hydraulic+Machines,+KR+Arora,
4. https://www.scribd.com/document/337067093/R-K-Bansal-A-Textbook-of-Fluid-Mechanics-and-Hydraulic-Machines-9th-Revised-Edition-SI-Units-Chp-1-11-Laxmi-Publications-2010-pdf

Course Coordinator **HOD**

U18PCCE403	**INTRODUCTION TO SOLID MECHANICS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**2**	**0**	**0**	**2**
	Prerequisite: Introduction to Mechanics				
	Course Coordinator Name & Department: Ms. Anitha, Civil Engineering				

COURSE OBJECTIVES: The objective of this Course is to introduce to continuum mechanics and material modeling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To apply the fundamental concepts of stress and strain in the design of various structural components and machines	Ap
CO2	To determine the bending, shear stresses and deflection produced in a beam subjected to system of loads	E
CO3	To study about the Shear stress distribution across varioussections	U
CO4	To determine deflection at any point on a beam subjected to a combination of loads; solve for stresses and deflections	E
CO5	To solve torsion problems in bars and thin walled members	An
CO6	To get knowledge in bending and shear stresses	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2		1						3	2	1		3
	CO2	3				3		2	3					2	2
	CO3		2		1						3	2	1		2
	CO4	3						2	2					3	
	CO5		2		1						3				3
	CO6	3						2				2		2	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I CONCEPTS OF SIMPLE STRESSES AND STRAINS 6

Stress and strain at a point – Tension, Compression, Shear Stress – Hooke's Law –

Relationship among elastic constants – Stress Strain Diagram for Mild Steel, TOR steel, Concrete – Ultimate Stress – Yield Stress – Factor of Safety – Thermal Stresses – Thin Cylinders and Shells – Strain Energy due to Axial Force – Resilience – Stresses due to impact and Suddenly Applied Load – Compound Bars.

UNIT II BENDING MOMENT AND SHEAR FORCE 6

Beams and Bending- Types of loads, supports, Bending moment and Shear Force diagrams for cantilevers, simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads and uniformly distributed loads, uniformly varying loads, application of moments.

UNIT III STRESSES AND SIMPLE BENDING 6

Derivation of bending equation - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections. Shear Stresses- Derivation of formula –Shear stress distribution across variousbeam sections like rectangular, circular, triangular, I, T angle sections.

UNIT IV SLOPE DEFLECTION AND TORSION 6

Relationship between moment, slope and deflection,Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams. Torsion- Derivation of torsion equation and its assumptions. Applications of theequations. Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs.

UNIT V THIN CYLINDERS AND SPHERES 6

Thin Cylinders and Spheres- Derivation of formulae and calculations of hoopstress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

TEXT BOOKS

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, (2007).
2. Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, (2010).
3. Strength of Materials, RK Bansal, Laxmi Publications (2010)

REFERENCES

1. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, (2009).
2. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van Nos Reinbhold, New Delhi (1995).
3. Vazirani.V.N and Ratwani.M.M, "Analysis of Structures", Vol I Khanna Publishers, New Delhi,(1995).
4.https://www.svce.ac.in/departments/cve/downloads/Mechanics%20of%20Solids/Unit%20I%20-%20PPT.pdf
5.https://www.lecturenotes.in/notes/20733-note-for-engineering-mechanics-em-by-engineering-kings/6

Course Coordinator HOD

U18PCCE404	BUILDING MATERIALS & TESTING METHODS	L	T	P	C
	Total Contact Hours: 30	1	1	0	2
	Prerequisite: Construction Technology				
	Course Coordinator Name & Department: Ms.Arunya.A, Civil Engineering				

COURSE OBJECTIVES: The objective of this Course is to deal with an experimental determination and evaluation of mechanical characteristics and advanced behavior of metallic and non-metallic structural materials. The course deals with explanation of deformation and fracture behavior of structural materials.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the materials used in engineering	U
CO2	To envisage the properties of materials used in engineering	R
CO3	To know about the testing of various materials	R
CO4	To evaluate the behavioral properties of engineering materials	E
CO5	To know the testing procedures for Civil engineering materials	R
CO6	To get knowledge in fracture mechanics for different materials	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				3		2	3					2	2
	CO2		2		1					2	3	2	1		2
	CO3	3						2	2					3	
	CO4	2		3		2							2		3
	CO5		2					2		2	2				
	CO6	2			2		1		1			2		2	1

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION TO ENGINEERING MATERIALS 6

Introduction to Engineering Materials –Manufacturing of bricks, Cements, M-Sand, Various types of concrete , Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes.

UNIT II MATERIAL PROPERTIES 6

Introduction to Material,Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals. Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on)

UNIT III BEHAVIOUR OF MATERIALS 6

True stress - Strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundaments and characteristics; concept of fatigue materials; Introduction to brittle material behaviors.

UNIT IV EVALUATION OF MATERIALS 6

Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; IS code; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture Mechanics – background;Hardness testing on different materials.

UNIT V MATERIAL TESTING 6

Testing of bricks, Fine aggregate, coarse aggregate, concrete. Testing of special materials - Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties.

TEXT BOOKS

1. Non-Destructive Test and Evaluation of Materials, Second Edition,J Prasad, C. G. Krishnadas NairPublisher: McGraw-Hill Education (2011)
2.Chudley, R., Greeno,'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann Publisher (2006)

REFERENCES

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition (2013)
2. Highway Engineering, Engineering, Kadiyali, Khanna Book Publishing Co. (P) Ltd., Delhi (2017).
3.http://site.iugaza.edu.ps/mymousa/files/Material_-Testing-lab-manual.pdf
4.https://www.tcu-via.com/attachments/article/236/construction-handbook-chudley.pdf

Course Coordinator **HOD**

U18PCCE405	GEOTECHNICAL ENGINEERING	L	T	P	C
	Total Contact Hours: 30	2	0	0	2
	Prerequisite: Engineering Geology				
	Course Coordinator Name & Department: Mr.P.Dayakar, Civil Engineering				

COURSE OBJECTIVES: The objective of this Course is to explain what Geotechnical Engineering is and how it is important to civil engineering, to explain how three phase system is used in soil and how are soil properties estimated using three phase system, to explain role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated, to determine shear parameters and stress changes in soil due to foundation loads and to estimate the magnitude and time-rate of settlement due to consolidation.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To carry out soil classification	An
CO2	To solve three phase system problems	An
CO3	To solve any practical problems related to soil stresses estimation, permeability and seepage including flow net diagram.	An
CO4	To estimate the stresses under any system of foundation loads.	U
CO5	To solve practical problems related to consolidation settlement and time rate of settlement	An
CO6	To learn the difference in compaction and consolidation	An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2		3		2							2	3	3
	CO2		2					2		2	2				
	CO3	2			2		1		1			2		2	1
	CO4		2		1					2	3	2	1		2
	CO5	3						2	2					3	
	CO6	2		3		2							2		3
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	**Professional Core (PC)**		Professional Core Elective (PE)		Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)		Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018													

UNIT I INTRODUCTION 6

Types of soils and their formation and deposition, Scope of soil engineering. Soil as three-phase system, Basic Definitions and phase relationships-, Determination of Index Properties, Plasticity Characteristics of Soil - consistency limits- Classification of Soils-Introduction of soil classification: particle size classification, Indian standard soil classification system.

UNIT II SOIL WATER AND WATER FLOW 6

Soil water - Capillary rise in soils, Permeability of Soil - Darcy's law, Determination of coefficient of permeability: Laboratory and Field methods: Permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis- characteristics of flow nets, Effective stress Concept in Soils, quick sand condition, Stress distribution in soil media –Boussinesq Formula- Use of influence charts

UNIT III COMPACTION AND CONSOLIDATION OF SOIL 6

Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density, Field compaction control, comparison between compaction and consolidation, Components of settlement - Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory.

UNIT IV SHEAR STRENGTH OF SOIL 6

Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behavior of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. Unconfined compression test, vane shear test.

UNIT V SLOPE STABILITY AND SOIL EXPLORATION 6

Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, Swedish circle method, Friction circle method, stability numbers and charts. Methods of site exploration and soil investigation, methods of boring, soil samplers, sampling

procedures, trail pits, borings, penetrometer tests, borehole logs, geophysical methods.

TEXT BOOKS:

1. Punmia P.C., "Soil Mechanics and Foundations ", Laxmi Publications Pvt. Ltd., New Delhi 2017
2. Principles of Geotechnical Engineering, Braja Das, Cengage 8Th Edition, 2014
3. Basic and applied Soil Mechanics, Rajan & Rao, New Age International Publishers,2007
4. Soil Mechanics & Foundation Engineering, KR Arora, Standard Publishers,7Th Edition,2014

REFERENCES:

1. Soil Mechanics by Craig R.F., Chapman & Hall,7Th Edition,2014
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
4. Essentials of Soil Mechanics and Foundations: Basic Geotechnics by David F. McCarthy.
5. https://books.google.co.in/books?id=lUZOCgAAQBAJ&pg=PA234&lpg=PA234&dq=4.%09Soil+Mechanics+%26+Foundation+Engineering,+KR+Arora,+Standard+Publishers,7Th+Edition,2014
6. https://aunotes.in/t/ce8491-soil-mechanics-notes/513

Course Coordinator **HOD**

U18MCTH401	CONSTITUTION OF INDIA	L	T	P	C
	Total Contact Hours: 30	2	0	0	0
	Prerequisite: +2 Level				
	Course Coordinator Name & Department: Ms.Mariasubhashini, Civil Engineering				

COURSE OBJECTIVES: The ability to identify reflects upon, evaluate and apply different types of information and knowledge to form independent judgments. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	To Understand the functions of the Indian government.	U
CO2	To Understand and abide the rules of the Indian constitution.	U
CO3	To Understand central and state government functionalities in India.	U
CO4	To Understand Constitutional Amendments.	U
CO5	To Understand the Indian Society.	U
CO6	To Understand the Constitutional functionaries and assesments of the Indian government.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2		1					2	3	2	1		2

	CO2	3						2	2					3	
	CO3	2		3		2							2		3
	CO4	3									2	2		3	
	CO5	2		3		2			2				2	3	3
	CO6		2					2		2	2		1		

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION 6

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT 6

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT 6

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV CONSTITUTION FUNCTIONS 6

Indian Federal System – Center – State Relations – President‟s Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

UNIT V INDIAN SOCIETY 6

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

TEXT BOOKS:

1. Durga Das Basu, “Introduction to the Constitution of India “, Prentice Hall of India, New Delhi,2015.
2. The Constitution of India, PM Bhakshi, Universal Law,2013.
3. R.C.Agarwal, “Indian Political System”, S.Chand and Company, New Delhi.
4. Maciver and Page, “ Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, “ Introduction to the Constitution of India:, Prentice Hall of India, NewDelhi,2011.
2. U.R.Gahai, “Indian Political System “, New Academic Publishing House, Jalaendhar.

3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd,2015.
4. http://mls.org.in/books/Salient%20Features%20of%20the%20Constitution%20of%20India.pdf

Course Coordinator **HOD**

U18PCCE4L1	**GEOTECHNICAL ENGINEERING LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: Engineering Geology Laboratory				
	Course Coordinator Name & Department: Dr.R.VenkataKrishnaiah, Civil Engineering				

COURSE OBJECTIVES: The ability to identify reflects upon, evaluate and apply different types of information and knowledge to form independent judgments. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To learn about different types of soil according to their classification and their size distribution.	O & A
CO2	To determine soil properties and their Atterberg's limits.	M
CO3	To have a clear knowledge about determining the optimum moisture content and maximum dry density of Soil.	M
CO4	To know about the compressive strength of the soil which is obtained from the site.	M
CO5	To know about permeability and consolidation characteristics of soil.	M
CO6	To learn about different types of Atterbergs limits.	M

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3						2	2					3	
	CO2	2		3		2							2		3
	CO3	3									2	2		3	
	CO4		2		1					2	3	2	1		2
	CO5	2		3		2							2		3
	CO6	3									2	2		3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF EXPERIEMENTS

1. Field Density using Core cutter method.
2. Field Density using Sand replacement method.
3. Natural moisture content using Oven drying method.
4. Field identification of Fine grained soils.
5. Specific gravity of soils.
6. Grain size distribution by Sieve analysis.
7. Grain size distribution by Hydrometer analysis.
8. Consistency limits by Liquid limit test.
9. Consistency limits by Plastic limit test.
10. Consistency limits by Shrinkage limit test.
11. Permeability test using Constant-head method.
12. Permeability test using Falling-head method.
13. Compaction test: Standard Proctor test.
14. Compaction test: Modified Proctor test.
15. Relative density.
16. Consolidation test.
17. Triaxial shear test (UU)
18. Vane shear test
19. Direct shear test
20. Unconfined Compression Strength test.

REFERENCES:

1. Lambe T.W., "Soil Testing for Engineers ", John Wiley and Sons, New York, 1990.
2. "I. S. Code of Practice (2720) Relevant Parts ", as amended from time to time.
3. "Soil Engineering Laboratory Instruction Manual", Published by the Engineering College Co-operative Society, Chennai.
4. https://www.gopalancolleges.com/gcem/course-material/civil/lab-manuals/sem-VI/10CVL67_Geotechnical-Engineering_LAB.PDF
5. https://www.iare.ac.in/sites/default/files/lab1/IARE_GTE_Lab_Manual.pdf

Course Coordinator **HOD**

U18PCCE4L2	**FLUID MECHANICS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: Nil				
	Course Coordinator Name & Department: Mr.Vinoth, Civil Engineering				

COURSE OBJECTIVES: The ability to understand the concepts of liquid flow will be the main objective of learning this subject.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To learn about the basics of fluid mechanics and various properties of fluids	O
CO2	Understand the broad principles of fluid statics	M
CO3	To have a clear understanding about fluid kinematics	M
CO4	Understand the broad principles of fluid dynamics	O
CO5	To apply the continuity, momentum and energy principles	M
CO6	To learn about the applications of different pumps.	M & COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2		1					2	3	2	1		2
	CO2	2		3		2							2		3
	CO3	3									2	2		3	
	CO4	2		3		2							2		3
	CO5	3									2	2		3	
	CO6	2		3		2			2				2	3	3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF EXPERIMENTS :

A. Flow Measurement

1. Calibration of Venturimeter / Orificemeter
2. Bernoulli's Experiment

B. Losses in Pipes

3. Determination of friction factor in pipes
4. Determination of minor losses

C. Pumps

5. Characteristics of Centrifugal pumps
6. Characteristics of Gear pump
7. Characteristics of Submersible pump
8. Characteristics of Reciprocating pump

D. Turbines

9. Characteristics of Pelton wheel turbine
10. Characteristics of Francis turbine/Kaplan turbine

REFERENCES:

1. Sarbjit Singh."Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi,(2009).
2. "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, (2004).
3. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, (2000).
4. Subramanya K. "Flow in open channels", Tata McGraw Hill Publishing.Company, (2001).
5. https://www.vidyarthiplus.com/vp/Thread-CE6461-Fluid-Mechanics-and-Machinery-Laboratory-Manual-RVS-Edition#.XcESEtIzYdU
6. https://www.technicalsymposium.com/newmech_labprograms.html

Course Coordinator **HOD**

U18PCCE4L3	**BUILDING MATERIALS & TESTING LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: Construction Technology				

	Course Coordinator Name & Department: Ms.Arunya.A, Civil Engineering

COURSE OBJECTIVES: The objective of this Course is to deal with an experimental determination and evaluation of mechanical characteristics and advanced behavior of metallic and non-metallic structural materials. The course deals with explanation of deformation and fracture behavior of structural materials.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the materials used in engineering	O
CO2	To envisage the properties of materials used in engineering	M
CO3	To know about the testing of various materials	M
CO4	To evaluate the behavioral properties of engineering materials	M
CO5	To know the testing procedures for Civil engineering materials	M
CO6	To learn about the preliminary test on materials.	M

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3									2	2		3	
	CO2	2		3		2							2		3
	CO3	3									2	2		3	
	CO4	2		3		2							2		3
	CO5	3									2	2		3	
	CO6		2		1					2	3	2	1		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF EXPERIMENTS

1. Compression test on wood
2. Torsion test on mild steel rod
3. Impact test on metal specimen (Izod and Charpy)
4. Hardness test on metals (Rockwell and Brinell Hardness Tests)

TEST ON AGGREGATES

a. Specific Gravity
b. Water Absorption of Aggregates

TEST ON BITUMEN

a) Specific Gravity of Bitumen
b) Penetration Test
c) Viscosity Test
d) Softening Point Test
e) Ductility Test

TEST ON BITUMINOUS MIXES

a) Determination of Binder Content
b) Marshall Stability and Flow Values

REFERENCES

1. Highway Materials and Pavement Testing, Nem Chand and Bros., Roorkee, Revised Fifth Edition, 2009
2. "Soil Engineering Laboratory Instruction Manual" published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
3. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
4. IS1786-2008 (Fourth Revision, Reaffirmed 2013), 'High strength deformed bars and wires for concrete reinforcement – Specification', 2008.
5. http://standardtestinglab.com/building-material.html
6. http://site.iugaza.edu.ps/mymousa/files/Material_-Testing-lab-manual.pdf

Course Coordinator **HOD**

U18MCAB407	**LITERATURE & MEDIA – LITERATURE, CINEMA & MEDIA**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: +2 Level Language				
	Course Coordinator Name & Department: Mr,Anish.C, Civil Engineering				

COURSE OBJECTIVES: The objective of this Course is to deal with importance of literature in tele media & mass media. The main goal is to make the students aware about the interpretation of data & literature in the field of cinema & media.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the mass media	O & S
CO2	To evaluate the theories of audience	GR
CO3	To study about the Approaches to media analysis	GR
CO4	To study about the Cultural Studies approach	O & A
CO5	To know about the media culture	O
CO6	To learn about the people culture Versus popular culture.	O & S

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3				3		2	2		3	
	CO2		2		1					2	3	2	1	2	2
	CO3	2		3		2							2		3
	CO4	3					3		2	2	3			3	
	CO5	2		3		2							2		3
	CO6	3			2		3		3		2	2		3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION TO MASS MEDIA 6

Understanding mass media. Characteristics of mass media. Effects of mass media on individual, society and culture-basic issues. Power of mass media. Media in Indian society. Definition, nature and scope. Function of mass media.

UNIT II AUDIENCE ANALYSIS 6

Media Audience analysis (mass, segmentation, product etc, social uses). Audience making. Active Vs Passive audience: Some theories of audience-Uses and Gratification, Uses and Effects.

UNIT III MEDIAANALYSIS 6

Media as text. Approaches to media analysis Marxist, Semiotics, Sociology, Psychoanalysis. Media and realism-class, gender, race, age, minorities, children .

UNIT IV MULTI FACE APPROACH OF MASS MEDIA 6

Media as consciousness Industry. Social construction of reality by media. Rhetoric of the image, narrative etc. Media myths (representation, stereotypes etc.) - Cultural Studies approach to media, audience as textual determinant, audience as readers, audience positioning, establishing critical autonomy.

UNIT V SOCIOLOGY AND MEDIA 6

Media and Popular culture-commodities, culture and sub-culture, popular texts, popular discrimination, politics popular culture, popular culture Vs people's culture, celebrity industry-personality as brand name, hero-worship etc. Acquisition and transformation of popular culture

TEXT BOOKS

1. Potter, James W, Media Literacy.Sage Publications (1998)
2.Grossberg, Lawrence , Media-Making: Mass Media in a popular culture. Sage Publications (1998)

REFERENCES

1.Berger, Asa Authur , Media Analysis Technique.Sage Publications (1998).
2. http://ac-journal.org/journal/vol3/Iss1/reviews/kandath.htm
3.https://pdfs.semanticscholar.org/6485/198762836f7d8073242a6617f4523ab57670.pdf

Course Coordinator HOD

U18MCAB408	**LITERATURE & MEDIA – GROUP READING OF CLASSICS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**

	Prerequisite: +2 Level Language
	Course Coordinator Name & Department: Dr.S.J.Mohan, Civil Engineering

COURSE OBJECTIVES: The objective of this Course is to make the students to acquire wide knowledge regarding the classic works, which in turn shall develop their knowledge they envisage in literature and general media.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the Cultural Studies approach	O & S
CO2	To know about the communication patterns	GR
CO3	To study about the Writing commercials	GR
CO4	To study about the Information society	O & A
CO5	To know about the Principles of publication design	O
CO6	To learn about the writing of script for radio, TV and online content,.	O & S

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2		3		2							2		3
	CO2	3					3		2	2	3			3	
	CO3	2		3		2							2		3
	CO4	3			3				3		2	2		3	
	CO5		2		1					2	3	2	1	2	2
	CO6	2		3		2							2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I ORGANIZATIONAL BEHAVIOR 6

Behavior in media Organization and Organizational Behavior. Nature and Structure of different Media Organizations-AIR/DD, Private Satellite Channels, Production Houses, employment opportunities in Indian Media industry, Group Behavior, Innovation and Creativity, Culture of organization.

UNIT II INTERPERSONAL COMMUNICATION IN MEDIA 6

Theories and Models-Transactional analysis.Ideation and Creative Thinking-Lateral Thinking. Group communication: Theories and Models-Decision making process, leadership, team work communication patterns group context.

UNIT III MEDIA WORKSHOP 6

Workshop style classes: Write commercials and news script for broadcast use.Five different script writing assignments. Submit a record of news stories written by you for a newspaper, a feature for a magazine, a script for a radio Programme, a script for a TV programme and an online content for an e-zine, e-newspaper or blog.

UNIT IV MEDIA INFORMATION SYSTEM 6

Information society – concepts and theories of information society – information super highway – knowledge society and knowledge gap theory – Technological determinism and Global village.

UNIT V ARTICULATION AND PUBLICATION 6

Elements and Principles of publication design. Page-makeup & Layout. Types of Layout-Books, Magazines, Brochures, Catalogues etc. Typography, copy fitting, communication through typography. Special designs .

TEXT BOOKS

1. Teach Yourself Photoshop, Jennifer Alspach & Linda Richards, IDG Books, New Delhi, (2000).
2. Multimedia: An Introduction by John Villamil & Louis Moloina Prentice Hall, New Delhi, (1998).

REFERENCES

1. Multimedia – Making it work, Tay Vaughan, Mc Graw Hill, NewYork, (1998).
2. The Ultimate Multimedia Handbook, J. Keyes, Mc Graw Hill, NewYork, (2000).
3.http://ac-journal.org/journal/vol3/Iss1/reviews/kandath.htm
4.https://pdfs.semanticscholar.org/6485/198762836f7d8073242a6617f4523ab57670.pdf

Course Coordinator HOD

SEMESTER V

U18PCCE501	STRUCTURAL ANALYSIS – I	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Introduction to mechanics				
	Course Coordinator Name & Department: Ms.Thendral.S, Civil Engineering				

COURSE OBJECTIVES: To introduce the students about the advanced theory and concepts of structural analysis and the classical methods for the analysis of structures and also gives an introduction to finite element methods.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Direct stiffness method of structural analysis	An
CO2	Introduction to flexibility method	U
CO3	Numerical analysis of plane trusses, grids and frames	An
CO4	Virtual work and energy principles	R
CO5	Introduction to the finite element method for plane stress and plane strain	U
CO6	To learn the analysis of determinate and indeterminate structures.	An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3					3		2	2	3			3	
	CO2	2	3	3		2		2					2		3
	CO3	3			3				3		2	2		3	
	CO4		2					3							2
	CO5	2		3		2							2		3
	CO6	3	1				3		2	2	3			3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I ENERGY PRINCIPLES 9

Conservative and non-conservative systems – Strain energy and complimentary energy – Beam in bending – Shear and torsion - Castigliano's first theorem, Engesser's theorem, castigliano's second theorem, Maxwell's theorem.

UNIT II PRINCIPLE OF VIRTUAL WORK METHOD 9

2 D State of Stress – 2 D Normal and Shear Stresses on any plane – Principal Stresses and Principal Planes – Mohr's circle – Plane trusses: Analysis of plane trusses – method of joints – method of sections – virtual work method

UNIT III FLEXIBILITY METHOD 9

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames.

UNIT IV STIFFNESS METHOD 9

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames.

UNIT V FINITE ELEMENT METHOD 9

Introduction to the finite element method for plane stress and plane strain - numerical analysis of plane trusses, grids and frames - Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements.

TEXT BOOKS:

1. Analysis of Structures-Vol I & Vol II by V.N. Vazirani & M.M.Ratwani, Khanna Publications, New Delhi, 2015.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi,2011.
3. Structural Analysis by S S Bhavikatti ,Vikas Publishing House,2013.

REFERENCES:

1. M.L.Gambir, "Fundamentals of mechanics and analysis" PHI Learning Pvt.Ltd.,2011.
2. R.S.Khurmi, "Theory of Structures",S.Chand Publishing, 2013.
3. Russell C.Hibbeler, Tankiang Hwee," Structural Analysis", Prentice Hall,2012.
4. https://nptel.ac.in/courses/105105166/#
5. https://lecturenotes.in/notes/5683-notes-for-structural-analysis-1-sa-1-by-sushant-kumar
6. https://drive.google.com/file/d/1r4mPLen9qaRf1CLug6lFTKrxmRdSMvVp/view

Course Coordinator **HOD**

U18PCCE502	**HYDRAULIC ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**3**	**0**	**0**	**3**
	Prerequisite: Introduction to Fluid Mechanics				
	Course Coordinator Name & Department: Mr.Rajesh, Civil Engineering				

COURSE OBJECTIVES: To introduce the students about the advanced theory and concepts of structural analysis and the classical methods for the analysis of structures and also gives an introduction to finite element methods.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Be able to apply their knowledge of fluid mechanics in addressing problems in Pipes.	Ap
CO2	To apply their knowledge of fluid mechanics in addressing problems in Laminar and Turbulent Flow.	Ap
CO3	They will have knowledge in Open Channel Flow.	U
CO4	They will have knowledge in measurement of Discharge and Velocity	U
CO5	They will have knowledge in Dimensional Analysis.	U

CO6	To know the concept of boundary layer theory.	R

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2					3						2	2
	CO2	2		3		2							2		3
	CO3	3	1				3		2	2	3			3	
	CO4	2									2				2
	CO5	2	3	3		2		2					2		3
	CO6	3			3				3		2	2		3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I FLOW THROUGH PIPES 6

Flow through Pipes: Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks.

UNIT II LAMINAR FLOW AND TURBULENT FLOW 6

Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Turbulent Flow- Reynolds experiment,. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Moody's diagram.

UNIT III OPEN CHANNEL FLOW 6

Introduction- Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section, Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient, Most economical section of channel.

UNIT IV VARIED FLOW 6

Non-Uniform Flow- Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Measurement of Discharge and Velocity Venturi Flume, Standing Wave Flume, Parshall Flume, Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Hydraulic Jump – Type of Jump, Location of Jumps – Energy losses in Jumps – Surges in Canal – Types of Surges.

UNIT V BOUNDARY LAYER AND DIMENSIONAL ANALYSIS 6

Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer

thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate, Dimensional homogeneity, Rayleigh method, Buckingham's Pi method and other methods. Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problem.

TEXT BOOKS:

1. Bansal R K., A Text Book of Fluid Mechanics & Hydraulic Machines – Laxmi Publications 2017
2. Rajput R.K, A Text of Fluid Mechanics & Hydraulic machines – S.Chand & Co.P.Ltd 2015
3. Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House
4. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.

REFERENCES:

1. Subramanya K., "Flow in Open channels ", Tata McGraw Hill Publishing Company 2008
2. Kumar K.L., "Engineering Fluid Mechanics ", Eurasia Publishing House (P) Ltd. New Delhi, 2008.
3. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill.
4. Burnside, C.D., "*Electromagnetic Distance Measurement*," Beekman Publishers.
5. https://drive.google.com/file/d/1SvzbHC-Umdf6glpjhoOBW32hJo6oRpyU/view
6. https://drive.google.com/file/d/1oGEFW8EqCqnuamZnLWe9Q85FKWctevbH/view

Course Coordinator **HOD**

U18PCCE503	**FOUNDATION ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**3**	**0**	**0**	**3**
	Prerequisite: Geotechnical Engineering				
	Course Coordinator Name & Department: Mr.P.Dayakar, Civil Engineering				

COURSE OBJECTIVES: To impart knowledge on common method of sub soil investigation and design of foundation and to acquire the capacity to investigate the soil condition and to select and design a suitable foundation.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Select type of foundation required for the given soil condition.	R
CO2	Design the type of foundation for different types of soil	C
CO3	To determine the dimensions and settlements of pile foundations	E
CO4	Carryout earth pressure and stability analysis of retaining walls	An
CO5	To check the stability of slopes	U
CO6	To learn the concepts of Coloumb's wedge theory and Graphical method .	R

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2									2				2
	CO2	2	3	3		2		2					2		3
	CO3	3			3				3		2	2		3	

	CO4	3	1				3		2	2	3			3	
	CO5	2									2				2
	CO6	2	3	3		2		2					2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018									

UNIT I BEARING CAPACITY 9

Introduction – Location and depth of foundation – codal provisions – bearing capacity of shallow foundation on homogeneous deposits – bearing capacity from in-situ tests – Factors influencing bearing capacity – codal provisions – Settlement – Components of settlement – Settlement of foundations on granular and clay deposits – Allowable and maximum differential settlements of buildings – Codal provision – Methods of minimizing settlement.

UNIT II DESIGN OF FOOTING 9

Types of foundation – structural design of spread footing – Design aspects of combined and mat foundation – Codal provisions.

UNIT III PILE FOUNDATION 9

Types of piles – Factors influencing the selection of pile – Carrying capacity in granular and cohesive soils – Static and dynamic formulae – Capacity from in-situ tests– Piles subjected to uplift – Negative skin friction – Group capacity – Settlement of pile groups – Interpretation of pile load test – Pile caps – Codal provisions

UNIT IV RETAINING WALLS 9

Earth pressure theory – Plastic equilibrium in soils – active and passive states – Rankine's theory – Coloumb's wedge theory – Classical and limit equilibrium solution – Earth pressure on retaining walls of simple configurations – pressure on the wall due to single line load alone – Graphical method (Culmann's method alone) – Stability of retaining wall.

UNIT V SLOPE AND UNDERGROUND STRUCTURES 9

Slope failure mechanisms - Types - Infinite slopes - Finite slopes - Total stress analysis for saturated clay - Method of slices - friction circle method - Use of stability number - Slope protection measures.

TEXT BOOKS

1. Punmia, B.C., Soil mechanics and foundations, Laxmi publications pvt. Ltd., New Delhi.

REFERENCES

1. A. Singh, Modern Geotechnical Engineering, 3rd Ed., CBS Publishers, New Delhi, 1999.
2. B.M. Das, Principles of Foundation Engineering, 5th Ed., Thomson Asia, Singapore, 2003.
3. N. Som, Theory and Practice of Foundation Design, Prentice Hall, New Delhi, 2003.

4. Khan, I.H., A text book of Geotechnical Engineering, Prentice Hall of India, New Delhi, 1999.
5. Arora K.R. Soil mechanics and foundation engineering, standard publishers and distributors, New Delhi, 1997.
6. Bowles J.E. Foundation analysis and design, McGraw Hill, 1994.
7. Gopal Ranjan and Rao, A.S.R. Basic and applied soil mechanics, Wiley Eastern Ltd., New Delhi (India), 1997.
8. https://openlibrary.org/works/OL18095451W/The_Engineering_Foundation
9. https://openlibrary.org/works/OL17004244W/Report_geotechnical_engineering_recommendations

Course Coordinator **HOD**

U18PCCE504	**HYDROLOGY AND WATER RESOURCES ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Introduction toFluid Mechanics				
	Course Coordinator Name & Department: Ms.B.Saritha, Civil Engineering				

COURSE OBJECTIVES: To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology..

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To Measure the rainfall intensity, duration and frequency	U
CO2	To Assess the losses of precipitation due to evaporation	E
CO3	To Prepare the unit hydrograph for surface runoff	Ap
CO4	To Design the canal Systems.	C
CO5	To Prepare the Design considerations for Dams and Spillways.	Ap
CO6	To learn the concepts of SCS-CN method of estimating.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3				3		2	2		3	
	CO2	3			3				3		2	2		3	
	CO3	2	3	3		2		2					2		3
	CO4	3			3				3		2	2		3	
	CO5	2	3	3		2		2					2		3
	CO6	3			3				3		2	2		3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I HYDROMETEOROLOGY 9

Hydrological cycle -Hydro meteorological factors -water-budget equation, history of hydrology, sources of data-types of precipitation- Forms for precipitation- Density and Adequacy of rain gauges – Recording and non-recording gauges, mean precipitation over an area, depth area- duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

UNIT II PRECIPITATION AND ABSTRACTIONS 9

Spatial distribution – Consistency analysis – Frequency analysis – Intensity, duration, frequency relationships- Evaporation, measurement of evapotranspiration, evapotranspiration equations, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices

UNIT III GROUND WATER AND WELL HYDROLOGY 9

Runoff - runoff volume, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph surface water resources of India, environmental flows. Forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells.

UNIT IV DISTRIBUTION SYSTEMS 9

Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.

UNIT V DAMS AND SPILLWAYS 9

Embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

TEXT BOOKS:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill,2013.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc-Graw Hill,2014.

REFERENCES:

1. G L Asawa, Irrigation Engineering, Wiley Eastern,2011.
2. L W Mays, Water Resources Engineering, Wiley,2010.
3. J D Zimmerman, Irrigation, John Wiley & Sons
4. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford,2008.
5. https://archive.org/stream/hydrologyfundame00mead?ref=ol#page/n8/mode/2up
6. https://openlibrary.org/account/login?redirect=/books/OL4717807M/Water-resources_engineering/borrow?action=join-waitinglist

Course Coordinator HOD

U18PCCE505	ENVIRONMENTAL ENGINEERING	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Environmental Sciences				
	Course Coordinator Name & Department:Dr.A.Mani, Civil Engineering				

COURSE OBJECTIVES: To Understand the impact of humans on environment and environment on humans.Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil. Be able to plan strategies to control, reduce and monitor pollution. Be able to select the most appropriate technique for the treatment of water, wastewater solid waste and contaminated air.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To Plan water supply system for developing area	Ap
CO2	To Design the various treatment plant in water supply system	C
CO3	To Understand about the composition of air, noise control	U
CO4	To Design the water distribution systems	C
CO5	To Principles of design of water supply and drainage in buildings	C
CO6	To study the recycling and reuse concepts.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2	3	3		2		2					2		3
	CO2	3			3				3		2	2		3	
	CO3	3	1	2			3		2	2	3			3	2
	CO4	2									2				2
	CO5	2	3	3		2		2					2	2	3
	CO6										2				

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I WATER SUPPLY SYSTEMS 9

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water- Surface and Groundwater – selection of source – Source Water quality – Characterization – Water Treatment-aeration, sedimentation, coagulation flocculation, filtration, disinfection.

UNIT II WATER DISTRIBUTION 9

Requirements of water distribution – Methods of Distribution-Systems of Water Supply -

Service reservoirs –Types - Layout of Distribution System – Layout of Distribution System – Appurtenances – Leak detection.

UNIT III SEWERAGE SYSTEMS 9

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design – Storm drainage-Storm runoff estimation – sewer appurtenances – corrosion in sewers – prevention and control – sewage pumping

UNIT IV AIR & NOISE POLLUTION CONTROL 9

Air and Noise Pollution and Control- Pollutants and their sources- Effect of pollution of human wealth, vegetation- Air pollution control legislation -noise pollution- sources and effects – Control measures.

UNIT V SOLID WASTE MANAGEMENT 9

Collection and Conveyance of Solid Wastes – Segregation of Solid Wastes – Sanitary Land Fill – Incineration – Recycling and Re-use Concepts – Disposal of Electronic Wastes.

TEXT BOOKS:

1. Environmental Engineering, SC Sharma, Khanna Publishing House ,2017
2. Basic Environmental Engineering, R.C. Gaur, Newage Publications,2017
3. Environmental Engineering, Dr. AK Jain (ISBN: 978-93-86173560)

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi,2015.
2. Garg, S.K., Environmental Engineering, Vols. I and II, Khanna Publishers, New Delhi, 2007
3. MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.
4. https://openlibrary.org/account/login?redirect=/books/OL1407472M/Environmental_engineering/borrow?action=join-waitinglist
5. https://easyengineering.net/environmental-engineering-books_18/

Course Coordinator HOD

U18HSBA501	ORGANIZATIONAL BEHAVIOR	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Nil				
	Course Coordinator Name & Department: Mr.C.Anish, Civil Engineering				

COURSE OBJECTIVES:

1. Understanding the basic approaches in organization
2. Knowledge on theories of Personality
3. Clear sight on the Decision Making in Groups
4. Analyse the behaviour of individuals and groups in organizations in terms of the key factors that influence organizational behaviour. Assess the potential effects of organizational - level factors (such as structure, culture and change) on organizational behaviour.

COURSE OUTCOMES (COs):	Revised Bloom's

		Taxonomy
CO1	Familiarity with the knowledge of Frame work of Organizational Behaviour	Ap
CO2	Knowledge of the Interpersonal perception	Ap
CO3	Awareness of the Merits and Demerits of Group decision making.	R
CO4	Understanding of the Sources of power	U
CO5	Familiarity with the knowledge of types of Conflicts	Ap
CO6	To learn the Power and Authority.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				3				2		3		3	3
	CO2		2	3				2							
	CO3	3									2		2		2
	CO4	3	1	2			3		2	2	3	2		3	2
	CO5	2				2					2				2
	CO6	3	1	2			3		2	2	3	3	3	3	2

3	Category	**Humanities & Social Sciences including Management Courses (HS)**	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I **9**

Orgnanizational Behavior – Definition, Need for studying Organizational Behavior, Disciplines involved in the study of Organizational Behavior, -Contributing disciplines and area - Application of Organizational Behavior in Business.

UNIT II **9**

Individual behaviour – personality, perception, learning, attitudes inter-personal behavior – Group and inter-group behaviour.

UNIT III **9**

Group Dynamics – Formal and Informal Group, Group Norms, Group Cohesiveness, Group Behaviour and Group Decision – Motivation – Need and Importance – Theories of Motivation

UNIT IV **9**

leadership-nature, stles and approaches, development of leadership including laboratory training. Power and Authority – Definition of Power – Types of Power.

UNIT V **9**

Management of change-conflict Management- Management of culture, Cross Cultural Management.

REFERENCES

1. Uma Sekaran, Organizational Behavior: Text and Cases TMH Publications
2. Ashwathappa K, Organizational Behavior: Text, cases and games, Himalaya Publishers
3. Chandhan JS, Organizational Behavior, Vikas Publishers
4. Stephen Robbins, Organizatonal Behavior, Pearson Education
5. RS Diwedi, Human Relations and Organizational Behavior, Mac Millan
6. https://openlibrary.org/account/login?redirect=/books/OL43353M/Organizational_behavior/borrow?action=borrow
7. https://openlibrary.org/account/login?redirect=/books/OL22745591M/Organizational_behavior/borrow?action=join-waitinglist

Course Coordinator **HOD**

U18MCTH502	**UNIVERSAL HUMAN VALUES**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**2**	**0**	**0**	**0**
	Prerequisite: Nil				
	Course Coordinator Name & Department: Mr.K.Venkatraman, Civil Engineering				

COURSE OBJECTIVES: The objective of the course is four fold:Sensitization of student towards self, family (relationship), society and nature.Understanding (or developing clarity) of nature, society and larger systems, on the basis of Human relationships and resolved individuals. Strengthening of self- reflection.Development of commitment and courage to act.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Students are expected to become more aware of their surroundings, society, social problems	An
CO2	Keep human relationships and human nature in mind	R
CO3	They would also become sensitive to their commitment towards what they believe in.	Ap
CO4	It is hoped that they would be able to apply what they have learnt	Ap
CO5	A beginning would be made in the direction to handle social problems and sustainable solutions	An
CO6	T o understand holistic perception of harmony at all levels of existence	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	1	2			3		2	2	3	2		3	2
	CO2	2				2					2				2
	CO3		2	3				2					2	3	
	CO4	3	3			1					2		2		2
	CO5	3	1	2			3		2	2	3	2		3	2
	CO6	2			2				2			2		3	1

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I COURSE INTRODUCTION **6**

Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–- its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations - Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority - Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario - Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT II: UNDERSTANDING HARMONY **6**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', needs of Self ('I') and 'Body' - Sukh and Suvidha-the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Swasthya.

UNIT III: HARMONY IN THE FAMILY AND SOCIETY **6**

Values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence - the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals.

UNIT IV HARMONY IN THE NATURE AND EXISTENCE **6**

Understanding the harmony in the nature - interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. existence as co-existence (*sah-astitva*) of mutually interacting units in all-pervasive space. holistic perception of harmony at all levels of existence

UNIT V HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS 6

Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems.

Course Coordinator **HOD**

U18PCCE5L1	HYDRAULIC ENGINEERING LABORATORY	L	T	P	C
	Total Contact Hours: 30	0	0	2	1
	Prerequisite: Fluid Mechanics Laboratory				
	Course Coordinator Name & Department: Mr.Rajesh, Civil Engineering				

COURSE OBJECTIVES: Students should be able to verify the principles studied in theory by performing the experiments in lab.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	To measure theoretical discharge in pipes, Venturimeter, orificemeter and notches	M
CO2	To measure discharge in Uniform Flow and Gradually Varied Flow.	M
CO3	To measure Discharge and Energy loses in Hydraulic Jump.	M
CO4	To find minor and major losses in pipe	M
CO5	To measure venture flume and standing wave flume	M
CO6	To understand the turbulent and lamiar flow in pipes.	M

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2	3			2			2		2			3	2
	CO2		2	3				2					2	3	
	CO3	3								3		2			3
	CO4			3					3		1			2	
	CO5	3	3			1					2		2		2
	CO6	3		2			3		2	2	3	2		3	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF EXPERIMENTS

1. Flow Visualization
2. Studies in Wind Tunnel
3. Boundary Layer
4. Flow around an Aerofoil / circular cylinder
5. Uniform Flow
6. Velocity Distribution in Open channel flow
7. Venturi Flume
8. Standing Wave Flume
9. Gradually Varied Flow

10. Hydraulic Jump
11. Flow under Sluice Gate
12. Flow through pipes
13. Turbulent flow through pipes
14. Laminar flow through pipes
15. Major losses / Minor losses in pipe

REFERENCES:

1. Dr.Modi P.N & Sethi S.M "Hydraulics and Hydraulic Mechanics". Standard, Publishing Co, New Delhi.
2. https://www.vidyarthiplus.com/vp/attachment.php?aid=48491
3. https://ia800309.us.archive.org/16/items/cihm_60249/cihm_60249.pdf

Course Coordinator **HOD**

U18PCCE5L2	**ENVIRONMENTAL ENGINEERING LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: Chemistry Laboratory				
	Course Coordinator Name & Department: Ms.B.Saritha, Civil Engineering				

COURSE OBJECTIVES: To understand sampling and preservation methods and significance and characterization of waste water.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To Have a fundamental knowledge to conduct various quality tests on water and waste water	O
CO2	To Have a well-founded knowledge to assess the suitability of water for drinking and irrigation purpose.	GR
CO3	To Acquire skills in assessing the suitability of water for concreting works	P
CO4	To know the parameter levels of COD, BOD.	A
CO5	To calculate the Ambient noise measurement and air quality modelling	COR
CO6	To check the level of Chlorine in bleaching powder	COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		2			2			3		2			3
	CO2	3		3		3			3		1		3	2	
	CO3		3							3		2			2
	CO4	3			3			3		2		2		3	
	CO5		3				2				2				2
	CO6	2					1				2			2	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF EXPERIMENTS

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic etc.
3. Determination of Alkalinity
4. Determination of Total Hardness
5. Estimation of Chlorides
6. Estimation of Sulphate
7. Optimum coagulant dose
8. Dissolved Oxygen (D.O)
9. Biochemical Oxygen Demand (BOD)
10. Chemical Oxygen Demand (COD)
11. Residual Chlorine
12. Available Chlorine in bleaching powder.

REFERENCES:

1. Research Institute Nagpur Publication.
2. Standard Methods for Examination of Water and Wastewater - APHA, AWAA and WPCF, 2012 Edition.
3. Trivedhi and Goel. Chemical and Biological Methods for Water Pollution studies.
4. A Course manual – Water and Waste Water Analysis, national Environmental Engineering
5. http://web.iitd.ac.in/~arunku/files/CVL212_Y15/Lab_CVL212v1.pdf
6. http://www.citchennai.edu.in/wp-content/uploads/2015/02/CE2356-Environmental-Engineering.pdf

Course Coordinator **HOD**

U18MCAB509	**SELF DEVELOPMENT – SPIRITUAL, MINDFULNESS & MEDITATION**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: +2 Level Education				
	Course Coordinator Name & Department: Ms.Hemapriya, Civil Engineering				

COURSE OBJECTIVES: The objective of this Course is to make the students to know the importance of Spiritual, Mindfulness and Meditation in the daily life.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the Mind – Body Medicine.	P
CO2	To know about the meditation types.	O
CO3	To know about the effects of meditation.	P
CO4	To study how to manage the stress in daily life.	P

CO5	To know about the importance of developing theOptimism thoughts.	S
CO6	To develop optimism and balanced mindset.	S

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3			3		2		2		3	
	CO2		3				2				2				2
	CO3	3			3			3		2		2		3	
	CO4	2	3			2			2		2			3	2
	CO5		2	3				2					2	3	
	CO6	3								3		2			3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I **6**

Theory and evidence behind the idea of mind-body medicine. Introduction to the basics of Mindfulness based stress Reduction (MBSR), including mindful eating, mindful breathing, and the body scan exercise.

UNIT II **6**

Spiritual meditation - Mindfulness meditation - Movement meditation - Focused Meditation- Visualization meditation-Chanting Meditation.

UNIT III **6**

Introduction toapplication of mindful practice to stressful situations - unhealthy or self-defeating patterns of thought, emotion, and behavior.

UNIT IV **6**

Interpersonal mindfulness, which applies to person-to-person communications, situations that can be accompanied by stress, anxiety, or other difficult emotions - practice of mindfulness into everyday life.

UNIT V **6**

Methods to develop optimism and balanced mindset. Exercise for Positive emotions.

TEXTBOOKS:

1. Elisha Goldstein and Bob Stahl, MBSR Every Day: Daily Practices from the Heart of Mindfulness-Based Stress Reduction 1st Edition, Kindle Edition.

REFERENCE BOOKS:

1. Bob Stahl (Author) and Florence Meleo-Meyer,A Mindfulness-Based Stress Reduction

2. Workbook, Kindle Edition.
3. Practice of Nature Cure - By Henry Lindlahr
4. History & Philosophy of Nature Cure - By S.J. Singh
5. My Nature Cure - By Sh. M. K. Gandhi
6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5645519/
7. https://pdfs.semanticscholar.org/93e2/3b6797aa3e8e9c31d1fb6d0d5e551be299b9.pdf

Course Coordinator **HOD**

U18MCAB510	**SELF DEVELOPMENT – RELIGION AND INTER-FAITH**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: +2 Level Education				
	Course Coordinator Name & Department: Ms.R.Chitra, Civil Engineering				

COURSE OBJECTIVES: To gain knowledge about the beliefs and philosophies of different religions on issues like environment, gender equality, unity, financial equality etc.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about different religious faiths.	O
CO2	To know about philosophies issues.	M
CO3	To know about chronology issues.	M
CO4	To study the interfaith issues including contemporary situations worldwide.	GR
CO5	To acquire religious knowledge from scholars speech.	COR
CO6	To know about Reconciliatory Approaches.	O

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		3				2				2				2
	CO2	3			3			3		2		2		3	
	CO3	3			3			3		2		2		3	
	CO4	2	3			2			2		2			3	2
	CO5	3		3		3			3		1		3	2	
	CO6		3							3		2			2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I **6**

A snapshot survey of World Religions; antiquity, diversity and graphical locations; Opening Questions related to the study of World Religions; critical methods; ambivalent, contradictory

and complementary paradigms.

UNIT II **6**

The Origin of Religion / The Evolutionists Approaches; Anthropological and Sociological Approaches; Reductive and Functionalist Approaches.

UNIT III **6**

Experiential Approaches: Phenomenological; Approaches to Mysticism; Psychoanalytical Approaches.

UNIT IV **6**

Symbolic Approaches; Exegetical and Hermeneutical Approaches.

UNIT V **6**

Feminism and Religion; Inter-faith dialogue and Reconciliatory Approaches.

TEXTBOOKS:

1. "Anthology of Living Religions" by Mary Pat Fisher, Lee W. Bailey, Pearson Publisher.
2. "Living Religions: A brief Introduction" by Mary Pat Fisher, Pearson Publisher.

REFERENCE BOOKS:

1. "On God Book" by J Krishnamurti, Krishnamurti Foundation India.
2. W.C. Smith. The Meaning and End of Religion.
3. Jan De Vries. The Study of Religion: A Historical Approach.
4. Josoph M. Kitagawa. History of Religions: Essays in Methodology.
5. Toynbee, Arnold J. Historical Approach to Religion.
6. G. Van der Leeuw. Religion in Essence and Manifestation.
7. M. Weber, "Sociology of Religion".
8. https://www.gmu.edu/programs/icar/ijps/vol1_1/smoker.html
9. https://www.tandfonline.com/doi/full/10.1080/00344087.2017.1383869

Course Coordinator **HOD**

SEMESTER VI

U18PCCE601	STRUCTURAL ANALYSIS – II	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Structural Analysis-I				
	Course Coordinator Name & Department: Ms.Hemapriya, Civil Engineering				

COURSE OBJECTIVES: To learn about the advanced theory and concepts of structural analysis and methods for the analysis of framed structures, indeterminate beams. To learn the concept of moving loads and influence line diagrams.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Approximate methods of frame analysis	An
CO2	Application to simple problems of beams and frames using stiffness matrix method	An
CO3	Application to simple problems of beams and frames using flexibility matrix method	An
CO4	Moving loads and Influence lines for determinate beams	Ap
CO5	Influence lines for Arches	C
CO6	To understand Influence lines for shear force and bending moment in beam sections	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		3				2				2				2
	CO2	3			3			3		2		2		3	
	CO3	2	3			2			2		2			3	2
	CO4		3				2				2				2
	CO5	3			3			3		2		2		3	
	CO6	3			3			3		2		2		3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I MOMENT DISTRIBUTION METHOD 9

Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway – Neylor"s simplification

UNIT II FRAME ANALYSIS 9

Analysis of building frames - Kani's, moment distribution and other methods like substitute frame method and moment distribution method and other approximate methods.

UNIT III MATRIX METHODS 9

Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous

beams, rigid jointed plane frames by using flexibility and stiffness matrix methods

UNIT IV MOVING LOADS AND INFLUENCE LINES 12

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads. Muller Breslau‟s principle – Influence lines for continuous beams and single storey rigid frames – Indirect model analysis for influence lines of indeterminate structures.

UNIT V ARCHES 6

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

TEXT BOOKS:

1. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", Laxmi Publications, 2004.
2. Vaidyanathan, R. and Perumal, P., "Comprehensive structural Analysis – Vol. I & II", Laxmi Publications, New Delhi, 2003
3. Negi L.S. & Jangid R.S., "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 2003.
4. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi, 2008

REFERENCES:

1. Ghali.A, Nebille,A.M. and Brown,T.G. "Structural Analysis" A unified classical and Matrix approach" 6th edition. Spon Press, London and New York, 2013.
2. Pandit G.S. & Gupta S.P. "Structural Analysis – A Matrix Approach", Tata McGraw Hill 2004.
3. William Weaver Jr. & James M. Gere, "Matrix Analysis of Framed Structures", CBS Publishers and Distributors, Delhi, 2004.
4. https://nptel.ac.in/courses/105105109/
5. https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_SA-II_LECTURE_NOTES.pdf

Course Coordinator HOD

U18PCCE602	ESTIMATION & COSTING	L	T	P	C
	Total Contact Hours: 45	2	1	0	3
	Prerequisite: Introduction to Civil Engineering				
	Course Coordinator Name & Department: Dr.A.Mani, Civil Engineering				

COURSE OBJECTIVES: To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	Will have knowledge about the importance of Economics and the factors affecting demand and supply	U
CO2	Will have a well-founded knowledge about the cost aspects and cost-output relationship	U

CO3	Will have a basic knowledge on various types of estimation	E
CO4	Will have knowledge on specifications and tendering process for contracts	E
CO5	Will have the knowledge of rate analysis of different items of work and Measurement Book and bill of quantities	E
CO6	To get knowledge on rate analysis.	E

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		1			1		2		2		3		2
	CO2													2	
	CO3		1												2
	CO4	3			3			3		2		2		3	
	CO5	2	3			2			2		2			3	2
	CO6		3				2				2		3		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I ESTIMATION **9**

Purpose – Methods of estimation – advantages – types of estimates – detailed estimates of residential buildings – single storied and multistoried buildings – earthwork – foundations – Super structure – Fittings including sanitary and electrical fittings – paintings.

UNIT II SPECIFICATIONS AND TENDERS **9**

Specifications – Detailed and general specifications – construction specifications – sources – types of specifications – Tender notices – types – corrigendum notice – tender procedures – Drafting model tenders

UNIT III CONTRACTS **9**

Contract – types of contracts – formation of contract – contract conditions – contract problems – contract for labor, material, design and construction – drafting of contract documents – construction contracts – arbitration and legal requirements.

UNIT IV RATE ANALYSIS AND PREPARATION OF BILLS **9**

Data – Rate analysis – abstract estimate – report to accompany estimate – measurement book – bills – types

UNIT V VALUATION **9**

Basic – Principles of valuation – Value and Cost – value engineering – value analysis – phases

in value engineering – information – function – escalation – evaluation – recommendation implementation – Audit

TEXTBOOKS:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering (Theory & Practice)", UBS Publishers, 2016.
2. Birdie G.S. "A text book on estimating and costing" — Dhanpat Rai and Sons, New Delhi.

REFERENCE BOOKS:

1. M Chakraborti, " Estimating, Costing Specifications & Valuation in Civil Engineering",2010.
2. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd., 2004
3. Jagannathan G, Getting more at less cost – The Value Engineering Way, Tata McGraw Hill, New Delhi, 1992.
4. https://www.slideshare.net/RANJITKUMARPANDA/estimating-andcosting-53811154
5. http://fmcet.in/CIVIL/CE6704_uw.pdf

Course Coordinator **HOD**

U18PCCE603	**PHYSICO – CHEMICALPROCESS FOR WATER AND WASTEWATER TREATMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Engineering				
	Course Coordinator Name & Department: Mr.Meikandaan, Civil Engineering				

COURSE OBJECTIVES: To educate the student on the working principles and design of various physical and chemical treatment systems for water and wastewater. To understand about design of industrial water treatment and reclamation.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To learn the water purification in natural systems, physical processes, chemical processes and biological processes.	U
CO2	To understand about the Filtration: filtration processes, Hydraulics of flow through porous media.	U
CO3	To understand in detail about the water quality modeling process ,dissolved oxygen models and models on Groundwater	U
CO4	To improve the types of disinfectants, Kinetics of disinfection, chlorination and its theory and design.	C
CO5	To know about design of industrial water treatment and reclamation	C
CO6	To understad the principles of chemical treatment	R

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		1			3			2		3			2	2
	CO2	3			3			3		2		2		3	

	CO3	3		2			2				2		2	3	3
	CO4		3						3						
	CO5									2				1	2
	CO6	2	3				3					3	1		
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)		Open Elective (OE)	Massive Open Online Course(MOOC)		Employment Enhancement Courses (EEC)	Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT-I INTRODUCTION 9

Pollutants in water and wastewater – characteristics, standards for performance – significant and need for physico – chemical treatment

UNIT-II PHYSICAL TREATMENT PRINICIPLES 9

Principles of screening – mixing, equalizations –sedimentation – filtration –backwashing – Adsorption-isotherms-principles - membrane separation, reverse osmosis, nano filtration- ultra filtration and hyper filtration – electro dialysis.

UNIT-III CHEMICAL TREATMENT PRINCIPLES 9

Principles of chemical treatment – coagulation -flocculation - Neutralisation - precipitation – floatation – disinfection -Ion exchange - advanced oxidation / reduction.

UNIT-IV CONVENTIONAL TREATMENT PLANTS 9

Conventional water treatment units –Screening – Types of aerators–chemical feeding – Methods - Mixing Devices - flocculation –clarifier – filters –rapid sand filter, slow sand filter, pressure filter-chlorinators.

UNIT-V INDUSTRIAL WATER TREATMENT AND RECLAMATION 9

Selection of process –design of softeners – demineralisers –wastewater reclamation –reverse osmosis plants –residue management – Operation and Maintenance aspects –recent advances .

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TEXT BOOKS:

1. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse Tata McGraw-Hill, New Delhi, 2010.
2. Manual on water supply and Treatment CPHEEO, Ministry of Urban Development ,GOI, New Delhi,1999.

REFERENCES:

1. Lee, CC and Shun dar Lin , Handbook of Environmental Engineering Calculations, McGraw- hill,Newyork , 2000.
2. Qasim,S.R motely, E.N., Zhu, G. Water Works Engineering – Planning, Design and Operation,Prentice Hall,New Delhi, 2002.

3. Casey, T.J.Unit Treatment Processes in Water and Wastewater Engineering, John Wiley and Sons, London2000.
4. https://drive.google.com/file/d/165EmQmwCMvH0e9arvHYW7WRyu1_6QlzW/view

Course Coordinator **HOD**

U18PCCE604	**DESIGN OF STEEL STRUCTURES**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Building Materials & Testing Methods				
	Course Coordinator Name & Department: Dr.S.J.Mohan, Civil Engineering				

COURSE OBJECTIVES: This course deals with some of the special aspects with respect to civil engineering structures in industries.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Design of plate girders, web and flange design, curtailment of flange plates.	C
CO2	Design of simple and built up columns subject to combined bending and axial loads	C
CO3	Design of flexural and compression members, Design of self supporting steel chimneys.	C
CO4	Design of overhead rectangular, cylindrical and pressed steel tanks	C
CO5	To study shape factor, plastic hinge ,plastic moment , plastic analysis of beams.	E
CO6	To understand the design concepts of gantry girders.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3			3		2		2		3	
	CO2	2	3			2			2		2			3	2
	CO3		3				2				2		3		2
	CO4		1			3			2		3			2	2
	CO5	3			3			3		2		2		3	
	CO6	3		2			2				2		2	3	3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION 9

Properties of materials - loads and stresses - Design of semi-rigid, rigid and moment resistant connections.

UNIT II TENSION MEMBERS 9

Design of tension members - Built-up sections subjected to axial tension and bending -splicing of tension member.

UNIT III COMPRESSION MEMBERS 9

Design of compression members -Design of simple and built up columns subject to combined bending and axial loads - design of column base and connections to foundation – Beam-column.

UNIT IV BEAMS 9

Design of columns and their bases - Design of flexural members and Plate girder - loads, specification - Design Industrial buildings – Introduction to plastic analysis.

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 9

Loads, design of purlins, trusses, bracings - Gantry girders - All design steps/process to as per the most recent BIS code of practices

TEXT BOOKS:

1. Design of Concrete Bridges by M.G.Aswani, V.N.Vazirani and M.M.Ratwani.
2. Design of Bridges Structure by T.R.Jagadish & M.A.Jayaram Prentice Hall.
3. Design of Bridges by N.Krishnam Raju, Oxford & IBH, Publishing Ltd.

REFERENCES :

1. E.C Hambly, "Bridge Deck Behaviour", E & FN SPON Publications.
2. V.K. Raina , "Concrete Bridge Practice, Analysis, Design And Economics", Tata Mcgraw Hill
3. Publishing Company Limited.
4. R.Rajagopalan, "Bridge Superstructure", Tata Mcgraw- Hills Publishing Company Limited.
5. https://nptel.ac.in/courses/105106112/
6. https://nptel.ac.in/courses/105105162/
7. https://www.digimat.in/nptel/courses/video/105105162/L01.html

Course Coordinator **HOD**

U18MCTH603	**ESSENCE OF INDIA KNOWLEDGE TRADITION**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**2**	**0**	**0**	**0**
	Prerequisite: Nil				
	Course Coordinator Name & Department: Ms.Chitra, Civil Engineering				

COURSE OBJECTIVES: It will also focus on Indian philosophical, linguistic and artistic traditions, along with yoga and Indian perspective of modern scientific worldview. The course aims at imparting basic principles of thought process, reasoning and inferencing.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To develop the physical and social contexts in traditional knowledge	C
CO2	To understand the need for protecting traditional knowledge	U
CO3	The know Scheduled Tribes and Other Traditional Forest Dwellers	U
CO4	To get knowledge on Legal concepts for the protection of tradition	U & R
CO5	To learn the Importance of conservation and sustainable development of environment	U
CO6	To learn the differences in traditional knowledge Vs western knowledge	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3					2		1			2		1	3
	CO2		2										3		
	CO3			1						2				2	
	CO4	1	3				2				2		3		2
	CO5		1			3			2		3			2	2
	CO6	3			3			3		2		2		3	
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)		Professional Core Elective (PE)		Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I: INTRODUCTION TO TRADITIONAL KNOWLEDGE 6

Define traditional knowledge, nature andcharacteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II: PROTECTION OF TRADITIONAL KNOWLEDGE 6

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III: LEGAL FRAME WORK AND TK 6

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);

B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT IV: TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY 6

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT V: TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS 6

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development

of environment, Management of biodiversity, Food security of the country and protection of TK.

Course Coordinator **HOD**

U18PCCE6L1	**ESTIMATION & COSTING LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: Computer aided Civil Engineering DrawingLaboratory				
	Course Coordinator Name & Department: Mr.Meikandaan, Civil Engineering				

COURSE OBJECTIVES: To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Will have a basic knowledge on application of quantity estimation software.	COR
CO2	Will have the knowledge of rate analysis of different items of work.	COR
CO3	Will have the knowledge of detailed estimation of residential buildings	COR
CO4	Will have the knowledge of bill of quantities	COR
CO5	Will able to value a property, price escalation recommendations and auditing	COR & GR
CO6	To learn estimation for long and short wall method	COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3			2		2		2		3	
	CO2		3				2				2		3		2
	CO3	3	1			3			2		3			2	2
	CO4	3			3			3		2		2		3	
	CO5		3												1
	CO6	1				2			1				2	1	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	**Professional Core (PC)**	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF EXPERIMENTS

1. Estimation of Compound wall.
2. Estimation of building by using long wall method.
3. Estimation of building by using short wall method.

4. Rate Analysis of Earthwork Excavation.
5. Rate Analysis of PCC.
6. Rate analysis of Brickwork.
7. Rate analysis of RCC work in Beams.
8. Rate analysis of RCC work in Slabs.
9. Rate analysis of RCC work in Columns.
10. Rate Analysis of Plastering.

REFERENCES:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering (Theory & Practice)", UBS Publishers, 2016.
2. G.S.Birdie, " A text book on estimating and costing" Dhanpat Rai and Sons, New Delhi, 2014.
3. https://www.slideshare.net/alihyder790/rates-analysis
4. https://www.scribd.com/document/155339519/civil-engineering-Rate-Analysis

Course Coordinator **HOD**

U18MCAB611	**SOCIAL SERVICES – SOCIAL AWARENESS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: Literature & Media –Literature, Cinema & Media				
	Course Coordinator Name & Department: Dr. Venkata Krishnaiah, Civil Engineering				

COURSE OBJECTIVES: To acquire an understanding and knowledge of the history and philosophy of Social Work and its emergence as a Profession.To appreciate Social Work as a Profession and to recognize the need and importance of Social Work Education, Training and Practice.To provide an awareness of various methods and Fields of Professional Social Work Practice.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To understanding and knowledge of social service and social welfare.	P
CO2	To know about Historical development of Social Work.	O
CO3	To understand about social work profession.	GR
CO4	To know about Indian Constitution and its implication of Social Welfare.	O
CO5	To understand about Role of Voluntary Organizations and emerging trends	COR
CO6	To learn Principles, Philosophy and values and Code of Ethics of Social Work Profession	COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3					2				2			2	2
	CO2			2						2					
	CO3	3			3			2		2		2		3	
	CO4		3				2				2		3		2
	CO5		3				2				2		3		2
	CO6	3	1			3			2		3			2	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I SOCIAL WORK 6

Concept, Definition, Objectives and Scope – Basic Concepts in Social Work : Social Service, Social Welfare, Social Assistance, Social Development, Social Security, Social Justice, Social Reform, Social Defense, Social Policy, Social Legislation, Social Education, Social Inequality, Social Organization and Social Disorganization.

UNIT II HISTORICAL DEVELOPMENT OF SOCIAL WORK IN UK, USA AND INDIA 6

Social Work Literature - Contribution of Indian Social Reformers to Social Welfare – Contribution of Social Reformers to Social Welfare in Tamil Nadu - Social Movements – Religio - Philosophical foundation of Social Work Practice in India. - Gandhi an Philosophical Foundation to Social Work in India.

UNIT III SOCIAL WORK PROFESSION 6

Origin and Growth of Social Work in India - Principles, Philosophy and values and Code of Ethics of Social Work Profession - Social work profession as a change agent-Integrated social work and place in social work practice - Fields and Methods of Social Work – Roles and Skills of Social Worker. Social Work Education: Evolution of Social Work Education- Social Work Curriculum.

UNIT IV INDIAN CONSTITUTION & ITS IMPLICATION OF SOCIAL WELFARE 6

Fundamental Rights Part -III, Fundamental Duties Part-IV A, Directive principles of State Policy Part-IV, Human Rights**,** According to U.N Charter and Indian Constitution.

UNIT V VOLUNTARY ORGANIZATION 6

Role of Voluntary Organizations and emerging trends - Voluntary Social Work: Role of Government and Voluntary Organizations in promoting Social Welfare - Changing trends in social work and the role of social worker and the government in promotingsocial work profession in India.

TEXT BOOKS:

1. Batra, Nitin (2004) Dynamics of Social Work in India, Jaipur : Raj Publishing House.
2. Bradford, W. Sheafor, Charles, R. Horejsi, Gloria A. - Fourth Edition Techniques and Guidelines for Social Work, London : Allyn and Bacon, A Viacom Company.
3. Dasgupta, Sugata Towards a Philosophy of Social Work in India, New Delhi : Popular Book Services.

REFERENCES:

1. Charles, Guzzetta, Katz Arthur J. and English Rechard A. (1984) Education for Social Work Practice, Selected International Models, New York : Council on Social Work Education

2. Desai, Murali (2002) Ideologies and Social Work (Historical and Contemporary Analysis),Jaipur : Rawat Publication.
3. Diwakar, V. D. (1991) Social Reform Movement in India, Mumbai : Popular Prakashan
4. Dubois, Brenda, Krogsrud, Karla, Micky - Third Edition (1999) Social Work - An Empowering Profession, London : Allyn and Bacon.

Course Coordinator **HOD**

U18MCAB612	SOCIAL SERVICES – NSS	L	T	P	C
	Total Contact Hours: 30	0	0	2	0
	Prerequisite: Literature & Media –Literature, Cinema & Media				
	Course Coordinator Name & Department: Mr.Meikandaan, Civil Engineering				

COURSE OBJECTIVES: To Understand the community in which they work and their relation. Identify the needs and problems of the community and involve them in problem-solving. Develop capacity to meet emergencies and natural disasters. Practice national integration and social harmony and Utilize their knowledge in finding practical solutions to individual and community problems.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To Understand the community in which they work and their relation	GR
CO2	To Identify the needs and problems of the community and involve them in problem-solving	GR
CO3	To Develop capacity to meet emergencies and natural disasters	GR
CO4	To Practice national integration and social harmony	A
CO5	To Utilize their knowledge in finding practical solutions to individual and community problems.	P
CO6	To learn the use of the mass media in the N.S.S. activities.	GR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				1					2		1		1
	CO2		2						1					2	
	CO3			1							1				3
	CO4	3			3			2		2		2		3	
	CO5		3				2				2		3		2
	CO6	3			3			2		2		2		3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

UNIT I: NATIONAL SERVICE SCHEME **6**

History and its Objectives-Organizational structure of N.S.S. at National, State, University and College Levels-Advisory committee and their functions with special reference to college principal, Programme officer, N.S.S. group leader and N.S.S. volunteers in the implementation**.**

UNIT II: NATIONAL INTEGRATION 6

Need of National integration-Various obstacles in the way of National Integration; such as caste, religion, language and provisional problems etc.

UNIT III: SPECIAL PROGRAMME 6

Legal awareness-Health awareness-First-aid-Career guidance-Leadership training - cum - Cultural Programme-Globalization and its Economic Social Political and Cultural impacts,

UNIT IV: SPECIAL CAMPING PROGRAMME 6

Nature and its objectives-Selection of camp site and physical arrangement-Organization of N.S.S. camp through various committees and discipline in the camp-Activities to be undertaken during the N.S.S. camp-Use of the mass media in the N.S.S. activities.

UNIT V: N.S.S. REGULAR ACTIVITIES 6

Traffic regulation-Working with Police Commissioner's Office-Working with Corporation of Chennai-Working with Health Department-Blind assistance-Garments collection-Non-formal education-Environmental Education, Awareness and Training (EEAT)'-Blood donation.

TEXT BOOKS:

1. National Service Scheme Manual, Government of India,2006.
2. Training Programme on National Programme scheme, TISS.
3. Orientation Courses for N.S.S. Programme officers, TISS.

REFERENCES:

1. Case material as Training Aid for field workers, Gurmeet Hans.
2. Social service opportunities in Hospitals, Kapil K.Krishan,TISS.
3. Social Problems in India, Ram Ahuja, 2014.

Course Coordinator HOD

SEMESTER VII

U18PCCE701	**DISASTER PREPAREDNESS & PLANNING MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Engineering				
	Course Coordinator Name & Department: Mr.P.Dayakar, Civil Engineering				

COURSE OBJECTIVES: The overall aim of this course is to provide broad understanding about the basic concepts of Disaster Management with preparedness as a Civil Engineer. Further, the course introduces the various natural hazards that can pose risk to property, lives, and livestock, etc.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To Understand basic concepts in Disaster Management	U
CO2	To Understand Definitions and Terminologies used in Disaster Management	U
CO3	To Understand Types and Categories of Disasters	U
CO4	To Understand the Challenges posed by Disasters	U
CO5	To understand Impacts of Disasters Key Skills	U
CO6	To gain knowledge on sustainable and environmental friendly development methods	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		3				2				2		3		2
	CO2		3				2				2		3		2
	CO3	3	1			3			2		3			2	2
	CO4		3				2			2	2		3		2
	CO5	3				1					2		1		1
	CO6		2						1					2	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT 1: INTRODUCTION **9**

Introduction-Concepts and definitions: disaster, hazard, vulnerability, risks-severity, frequency and details, capacity, impact, prevention, mitigation).

UNIT II: **DISASTERS CLASSIFICATION** **9**

Disasters-Disasters classification; natural disasters (floods, draught, cyclones,volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India,

mountain and coastal areas, ecological fragility.

UNIT III: **DISASTER IMPACTS** **9**

Disaster Impacts-Disaster impacts (environmental, physical, social, ecological,economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT IV: DISASTER MANAGEMENT **9**

Disaster Risk Reduction (DRR)-Disaster management cycle – its phases;prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNITV: DISASTER RECOVERY **9**

Disasters, Environment and Development-Factors affecting vulnerability such asimpact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

TEXT BOOKS:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

REFERENCE:

1. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of
2. California, EMSA no.214, June 2003
3. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.
4. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
5. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

Course Coordinator **HOD**

U18PCCE702	**PROFESSIONAL PRACTICE LAW & ETHICS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**2**	**0**	**0**	**2**
	Prerequisite: Estimation & Costing				
	Course Coordinator Name & Department: Mr.Anish.C, Civil Engineering				

COURSE OBJECTIVES: To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession. To develop some ideas of the legal and practical aspects of their profession.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To familiarise the students to what constitutes professional practice, introduction of various	Ap

	stakeholders and their respective roles; understanding the fundamental ethics governing the profession	
CO2	To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement of labour.	U
CO3	To give an understanding of Intellectual Property Rights, Patents.	U
CO4	To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession.	U
CO5	To develop good ideas of the legal and practical aspects of their profession.	R
CO6	To get knowledge on labour & other construction-related laws	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				1					2		1		1
	CO2		2						1					2	
	CO3		3				2				2		3		2
	CO4		3				2				2		3		2
	CO5	3	1			3			2		3			2	2
	CO6		3				2				2		3		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I PROFESSIONAL PRACTICE & ETHICS 6

Respective roles of various stakeholders: Government,Standardization Bodies (ex. BIS, IRC) professional bodies (ex. Institution of Engineers(India), Clients/ owners, Developers Consultants Contractors, Manufacturers/ Vendors/ Service agencies,Definition of Ethics, Professional Ethics, Business Ethics,Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India);
Profession, Professionalism, Professional Responsibility, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures.

UNIT II GENERAL PRINCIPLES OF CONTRACTS MANAGEMENT 6

Indian Contract Act, 1972 andamendmentscovering General principles of contracting; Contract Formation & Law; Privacyof contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium;; Tenders, Request For Proposals, Bids & Proposals; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Contract documentation; Contract Notices.

UNIT III ARBITRATION 6

Arbitration – meaning, scope and types - Arbitration and expert determination; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement,Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality.

UNIT IV LABOUR & OTHER CONSTRUCTION-RELATED LAWS 6

Role ofLabour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

UNIT V LAW RELATING TO INTELLECTUAL PROPERTY 6

Meaning of intellectualproperty, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright, Ownership of copyrights and assignment, Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Process of obtaining patent – application, examination, opposition and sealing of patents,Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;

TEXT BOOKS

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. The National Building Code, BIS, 2017
3. RERA Act, 2017
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset

REFERENCE:

1. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
2. Avtarsingh (2002), Law of Contract, Eastern Book Co.
3. Dutt (1994), Indian Contract Act, Eastern Law House
4. Anson W.R. (1979), Law of Contract, Oxford University Press
5. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India, Indian Council of
6. Arbitration. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
7. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
8. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/110105097/lec1.pdf
9. https://nptel.ac.in/courses/110105097/
10. http://ethics.iit.edu/publication/CODE--Exxon%20Module.pdf

Course Coordinator HOD

U18PCCE703	TRANSPORTATION ENGINEERING	L	T	P	C
	Total Contact Hours: 30	2	0	0	2
	Prerequisite: Design of Steel Structures				
	Course Coordinator Name & Department: Ms.Hemapriya, Civil Engineering				

COURSE OBJECTIVES: To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To carry out surveys involved in planning and highway alignment	E
CO2	To design the geometric elements of highways and expressways	C
CO3	To carry out traffic studies and implement traffic regulation and control measures and intersection design.	E
CO4	To characterize pavement materials.	An
CO5	To design flexible and rigid pavements as per IRC.	C
CO6	To get knowledge on Materials used in Highway Construction	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	2			3					3			3	
	CO2														3
	CO3			3					3		2			3	
	CO4	3				1					2		1		1
	CO5		2						1					2	
	CO6		3				2				2		3		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I HIGHWAY DEVELOPMENT AND PLANNING 6

Significance of highway planning – Modal limitations towards sustainability - History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 6

Typical cross sections of Urban and Rural roads — Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

UNIT III TRAFFIC ENGINEERING & CONTROL 6

Traffic Characteristics, traffic engineering studies,traffic flow and capacity, traffic regulation and control; design of road intersections; design ofparking facilities; highway lighting; problems,Intelligent Transport System For Traffic Management, Enforcement And Education.

UNIT IV PAVEMENT MATERIALS 6

Materials used in Highway Construction- Soils, Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements. Problems

UNIT V DESIGN OF PAVEMENTS 6

Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems

TEXT BOOKS:

1. Transportation Engineering, Kadiyali, (ISBN: 978-81-87325-72-7), Khanna Book Publishing Co. (P) Ltd., Delhi,2016
2. Highway Engineering, Khanna & Justo, Nemchand & Bros,2015.

REFERENCE

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017.
2. Principles of Transportation Engineering, Chakrobarty, PHI Learning,2003.
3. https://nptel.ac.in/courses/105101087/
4. https://nptel.ac.in/courses/105101008/
5. https://nptel.ac.in/courses/105107123/

Course Coordinator HOD

U18PCCE7P1	**PROJECT I – (Mini Project)**	**L**	**T**	**P**	**C**
	Total Contact Hours: 90	**0**	**0**	**6**	**3**
	Prerequisite: Environmental Science, Professional core & Professional Elective				
	Course Coordinator Name & Department: Dr.A.Mani, Civil Engineering				

COURSE OBJECTIVES: To provide exposure to the studentsto do projects based on identification of the problem based on the literature review on the topic referring to latest literature available.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To identify the area of research.	P
CO2	To prepare list of literatures in the relevant area.	O & P
CO3	Compile the abstract from the literatures.	M
CO4	Focus the search to a well defined theme and title.	A
CO5	Make and exhaustive report by compiling all the literatures those students surveyed.	P & M
CO6	To carry out the experimental investigations according to methodology,	GR & COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		2	3				3		3	2		3	3
	CO2						3			2					
	CO3		3				2			2	2		3	3	2
	CO4	3	1	2		3			2		3	2		2	2
	CO5		3				2				2		3		2
	CO6		3				2				2		3		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	**Employment Enhancement Courses (EEC)**	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

LIST OF TASKS

1. **PREPARING PROPOSAL**
   Proposed Research Topic
   Purposes
   Background
   Method: (suggested methods – develop your own to suit your research topic)

2. **CONDUCTING LITERATURE REVIEW**
   Exploring and Sharpening your Topic
   Evaluating Information
   Taking Notes and Keeping Records

3. **COMPLETING ANNOTATED BIBLIOGRAPHY**
   Citing Your Sources and Avoiding Plagiarism
   Writing and Annotated Bibliography

4. **IDENTIFYING PROBLEM STATEMENT**
   Meeting the Challenges of Research
   Developing New Information

5. **COMPLETING OUTLINE FOR THE RESEARCH**
   Organizing Your Project into an outline
   Pick up your critique paper and begin editing and incorporate the suggestions from guide

6. **SUBMITTING FIRST DRAFT**
   Drafting your Project
   Entering Conversations and Supporting Your Claims

7. **SUBMITTING WORKS CITED**
   Create the individual citations
   Apply the formatting rules

8. **SUBMITTING FULL PAPER**

Revising, Editing, and Proofreading
Designing and Presenting Your Project
Conducting Research in the Disciplines
Documenting Sources

REFERENCES:
1. Website.
2. Printed Journals.

Mini Project will have mid semester presentations and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment ofMini Project at Mid Sem and End Sem will be monitored by the departmental committee.

Course Coordinator **HOD**

U18PCCE0T1	**TERM PAPER**	**L**	**T**	**P**	**C**
	Total Contact Hours: 15	**0**	**0**	**2**	**1**
	Prerequisite: Construction Technoloy				
	Course Coordinator Name & Department: Mr.P.Dayakar, Civil Engineering				

COURSE OBJECTIVES: To obtain knowledge from the industries, to develop team spirit, coordinating with higher officials and to know about importance of field activities.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To identify the area of research.	P
CO2	To prepare list of literatures in the relevant area.	O
CO3	Compile the abstract from the literatures.	M
CO4	Focus the search to a well defined theme and title.	A
CO5	Make and exhaustive report by compiling all the literatures that students surveyed.	P & M
CO6	To carry out the experimental investigations according to methodology,	GR & COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		3				3			2	2		3	3	2
	CO2	3	1	2		3			2		3	2		2	2
	CO3														
	CO4	1	2						2		2			3	
	CO5		3				2			2	2		3	3	2
	CO6	3	1	2		3			2		3	2		2	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	**Employment Enhancement Courses (EEC)**	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

SYLLABUS

The student shall submit a brief report on the training undergone and a certificate from the organization concernedat the end of Industrial / Practical training / internship / Summer Project. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Department. Certificates (issued by the Organization) submitted by the student shall be attached to the mark list and sent to the Controller of Examinations by the Head of the Department.

Course Coordinator **HOD**

	COMPREHENSION	**L**	**T**	**P**	**C**
U18PCCE0C1	Total Contact Hours: 30	**0**	**0**	**2**	**1**
	Prerequisite: All the Professional courses upto VI semester				
	Course Coordinator Name & Department: Dr.S.J.Mohan, Civil Engineering				

COURSE OBJECTIVES: To provide a complete review of Civil Engineering topics covered up to VI semesters, so that a comprehensive understanding is achieved.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To get familiarize with subject core.	A
CO2	To understand the principle concepts in all subjects	P & S
CO3	To acquire knowledge in formulas and its applications	M
CO4	To understand the clarity of choices.	S
CO5	To recollect the concept of all subjects.	M
CO6	To differentiate the purpose and needs for all core subjects.	P

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		2	3				3		3	2		3	3
	CO2						3			2					
	CO3		3				2			2	2		3	3	2
	CO4	3	1	2		3			2		3	2		2	2
	CO5		3				2				2		3		2
	CO6		3				2				2		3		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	**Employment Enhancement Courses (EEC)**	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

SYLLABUS

The comprehension course is offered to recollect the concepts of all the core subjects from Semester II to Semester VI. Test will be conducted at the end of the semester and evaluated by a written test.

Course Coordinator **HOD**

U18MCAB713	**BEHAVIORAL AND INTERPERSONAL SKILLS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: Culture learning an art form				
	Course Coordinator Name & Department: Ms.Mariasubhashini, Civil Engineering				

COURSE OBJECTIVES: The objective of this course is to make the students aware Motivational lectures, Group Discussions/activities, Case Study, Games/Stimulation Exercises, Role-Playing, Mindfulness training.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To help the students to understand their real self by recognizing different aspects of their self-concept that will lead to an increased self-confidence.	S
CO2	To train the students for communicating effectively in both formal as well as in informal settings.	GR
CO3	To help the students to understand Emotion and emotional intelligence, Managing ones' own emotional reservoirs, effective dealing with emotions at work	GR
CO4	To help the students to understand the importance of non-verbal aspects of effective communication.	GR
CO5	To facilitate the students in understanding the formation and function of group and team and to help them to learn the skills of a successful leader.	COR
CO6	To empower themselves to be the source of their own growth and development.	COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		3				2			2	2		3	3	2
	CO2	3	1	2		3			2		3	2		2	2
	CO3		3				2				2		3		2
	CO4		1			3					1			3	2
	CO5	3		2	3				3		3	2		3	3
	CO6						3			2					

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

SYLLABUS **30**

Each individual has behavior patterns that are shaped by the context of his or her past. Most often, adapting the behaviour to the changing context of the reality a person lives in becomes difficult which may lead to the reduction in personal effectiveness and natural self-expression. The main focus of this course is to equip the students with useful approaches to help in the deeper understanding of self and help individuals empower themselves to be the source of their own growth and development. The course will help students to learn effective communication skills, Group and team building skills and will help them learn the goal setting process and thus become more effective in achieving their goals.

Course Coordinator **HOD**

U18MCAB714	**NATURE – NATURE CLUB**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: NSS				
	Course Coordinator Name & Department: Mr.Rajesh, Civil Engineering				

COURSE OBJECTIVES: The objective of this course is to Search and explore patents and rights related to animals, trees etc.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Identify a tree fruit flower peculiar to a place or having origin from the place	GR
CO2	Making high resolution big photographs of small creatures (bees, spiders, ants. mosquitos etc	COR
CO3	People can recognize games on recognizing animals/plants	P
CO4	Videography/ photography/ information collections on specialties/unique features of different types of common creatures	GR
CO5	Studying miracles of mechanisms of different body systems	M
CO6	To appreciate the difference in the local biodiversity .	P

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		2	3				3		3	2		3	3
	CO2						3			2					
	CO3		3				2			2	2		3	3	2
	CO4	3	1	2		3			2		3	2		2	2
	CO5		3				2				2		3		2
	CO6		3				2				2		3		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

SYLLABUS **30**

Impart knowledge and inculcate the habit of taking interest and understanding biodiversity in and around the college campus. The students should be encouraged to take interest in bird watching, recognizing local plants, herbs and local animals. The students should be encouraged to appreciate the difference in the local biodiversity in their hometown, in the place of their study and other places they visit for vacation/breaks etc.

Course Coordinator **HOD**

SEMESTER VIII

U18PCCE8P2	PROJECT - 2	L	T	P	C
	Total Contact Hours: 270	0	0	18	9
	Prerequisite: Environmental Science, Professional core & Professional Elective				
	Course Coordinator Name & Department: Dr.A.Mani, Civil Engineering				

COURSE OBJECTIVES: To provide exposure to the studentsto do projects based on identification of the problem based on the literature review on the topic referring to latest literature available.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	To identify the area of research.	P
CO2	To prepare list of literatures in the relevant area.	O & P
CO3	Compile the abstract from the literatures.	M
CO4	Focus the search to a well defined theme and title.	A
CO5	Make and exhaustive report by compiling all the literatures that students surveyed.	P & M
CO6	To carry out the experimental investigations according to methodology,	GR & COR

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		2	3				3		3	2		3	3
	CO2						3			2					
	CO3		3				2			2	2		3	3	2
	CO4	3	1	2		3			2		3	2		2	2
	CO5		3				2				2		3		2
	CO6		3				2				2		3		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	**Employment Enhancement Courses (EEC)**	Mandatory Courses (MC)

4	Approval	Meeting of Academic Council, May 2018

LIST OF TASKS

1. PREPARING PROPOSAL

Proposed Research Topic
Purposes
Background
Method: (suggested methods – develop your own to suit your research topic)

2. CONDUCTING LITERATURE REVIEW

Exploring and Sharpening your Topic
Evaluating Information
Taking Notes and Keeping Records

3. **COMPLETING ANNOTATED BIBLIOGRAPHY**
   Citing Your Sources and Avoiding Plagiarism
   Writing and Annotated Bibliography

4. **IDENTIFYING PROBLEM STATEMENT**
   Meeting the Challenges of Research
   Developing New Information

5. **COMPLETING OUTLINE FOR THE RESEARCH**
   Organizing Your Project into an outline
   Pick up your critique paper and begin editing and incorporate the suggestions from guide

6. **SUBMITTING FIRST DRAFT**
   Drafting your Project
   Entering Conversations and Supporting Your Claims

7. **SUBMITTING WORKS CITED**
   Create the individual citations
   Apply the formatting rules

8. **SUBMITTING FULL PAPER**
   Revising, Editing, and Proofreading
   Designing and Presenting Your Project
   Conducting Research in the Disciplines
   Documenting Sources

REFERENCES:

1. Website.
2. Printed Journals.

Mini Project will have mid semester presentations and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment ofMini Project at Mid Sem and End Sem will be monitored by the departmental committee.

Course Coordinator **HOD**

U18MCAB815	**INNOVATION–PROJECT BASED– Sc., TECH, SOCIAL, DESIGN & INNOVATION**	**L**	**T**	**P**	**C**
	Total Contact Hours: 30	**0**	**0**	**2**	**0**
	Prerequisite: Nil				
	Course Coordinator Name & Department: Mr.P.Dayakar, Civil Engineering				

COURSE OBJECTIVES: The students should be encouraged to undertake technology projects of social relevance.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Students may be encouraged to take up projects which are aimed at providing solutions to	COR

	societal problems	
CO2	To reduce drudgery and improving efficiency in rural work	COR
CO3	To adopt to green technologies, utilization of rural and urban waste	A
CO4	To encourage sanitation and public health, utilizing	GR
CO5	Use of non -conventional energy sources	M
CO6	To work with prototype models.	A

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2	3		2		3			2		2			3
	CO2		3				2			2	2		3	3	2
	CO3	3	1	2		3			2		3	2		2	2
	CO4	1		2				3			1		1		
	CO5	3		2	3				3		3	2		3	3
	CO6						3			2					1

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	Professional Core Elective (PE)	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	**Mandatory Courses (MC)**
4	Approval	Meeting of Academic Council, May 2018								

SYLLABUS **30**

Many students, when they enter engineering, are full of enthusiasm to understand new areas, to build systems and to experiment and play with them. This enthusiasm is to be tapped and to direct it to exploration and sustained pursuit by the student which may result in development of a working system, a prototype, or a device or material, etc. They are not required or even expected to produce research or an innovation.

Course Coordinator **HOD**

LIST OF PROFESSIONAL ELECTIVE COURSES

PROFESSIONAL ELECTIVE - I (PE – I)

U18PECE011	**INFRASTRUCTURE PLANNING AND DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Construction Technology				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: This course focuses on the physical infrastructure systems that support society, including transportation, communications, power, water, and waste. To get idea about public private sector participation in infrastructure projects.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To get a basic knowledge about infrastructure planning.	Ap
CO2	To know the rise in demands in infrastructure.	U
CO3	To learn the forecasting techniques.	U
CO4	To identify the areas of development.	An
CO5	To understand the evaluation concepts of risk management .	U
CO6	To understanding stakeholders' concerns, regulatory framework, risk management in infrastructure projects.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		3			3		1	2		2		2	2
	CO2										2				
	CO3	2	3		1		2			2	2		3	3	2
	CO4	3	1	2		3			2		3	2		2	2
	CO5		3				2				2		3		2
	CO6		1			3			2		1			3	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I BASICS OF INFRASTRUCTURE 9

Introduction – Definition of basic terminologies, role of infrastructure in economic development, types of infrastructure, measurement of infrastructure capacity - bases for quantification of demand and supply of various types of infrastructure - Indian scenario – adequacy and quality, Infrastructure planning – goals & objectives.

UNIT II DEMAND FOR INFRASTRUCTURE 9

Identification and quantification – demand for infrastructure – application of techniques to estimate supply – use of econometric, social and land use indicators – forecast on demand and service of infrastructure – impact on land use.

UNIT III FORECASTING TECHNIQUES IN INFRASTRUCTURE 9

Views in forecasting techniques - identify and prioritize areas of development, Integration of strategic planning – infrastructure at urban, regional and national levels – case studies in infrastructure planning.

UNIT IV: EVALUATION OF INFRASTRUCTURE INVESTMENTS 9

Infrastructure Management: Concepts, Common aspects of urban and rural infrastructure management systems; pavement and bridge management systems, Integrated infrastructure management.

UNIT V CASE STUDIES 9

Emerging trends in infrastructure: Overview of Public-Private Sector Participation in infrastructure projects, Understanding stakeholders' concerns, regulatory framework, risk management in infrastructure projects, public policy for infrastructure Sectoral Overview: Highways, railways, waterways, airports, urban and rural infrastructure: roads, housing, water supply, sanitation – case study examples.

TEXTBOOKS:

1. Alvin S. Goodman and Makarand Hastak, "Infrastructure Planning Engineering and Economics, McGraw – Hill Publications, Second edition, 2015.
2. James Parkin and Deepak Sharma, ICE Publishing, 2015.
3. De Neufville (1990) Applied Systems Analysis: Engineering Planning and Technology Management. McGraw-Hill Publishing Company. Chapters 1-6.
4. De Neufville (1990) Applied Systems Analysis: Engineering Planning and Technology Management. McGraw-Hill Publishing Company. Chapters 10-13.

REFERENCE:

1. Deepty Jain, Geetam tiwari, "NMT Infrastructure in India: Investment, Policy and Design", federal Ministry for the Environment, Federal Republic of Germany 2013.
2. Goodman and Hastak, "Infrastructure Planning Handbook: Planning, Engineering, and Economics. McGraw Hill / ASCE Press. Chapter 1 2006.
3. Sanhita Sapatnekar, Ila Patnaik and Kamal Kishore, "Regulating Infrastructure Development in India",www.nipfp.org.in/publications/working-paper.
4. nptel.ac.in/courses/105106115
5. nptel.ac.in/content/syllabus_pdf/105106188.pdf

Course Coordinator **HOD**

U18PECE012	**REPAIR & REHABILITATION OF STRUCTURES**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Construction Technology				
	Course Coordinator Name & Department: Civil Engineering				
COURSE OBJECTIVES: To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.					
COURSE OUTCOMES (COs):					**Revised**

		Bloom's Taxonomy
CO1	To know about Maintenance and Repair Strategies.	U
CO2	To know about the Strength and Durability Of Concrete.	U
CO3	To learn the about Special types of Concrete.	R
CO4	To learn about techniques for Repair and Protection Methods.	R
CO5	To learn about Non-Destructive testing systems.	R
CO6	To understand the difference in Repair, Rehabilitation and Retrofitting of Structures	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		3			3				3			3	
	CO2		2			2			1				2		3
	CO3	1									2				
	CO4		3				2			2	2		3	3	2
	CO5	3	1	2		3			2		3	2		2	2
	CO6	1		2				3			1		1		

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration;

UNIT II STRENGTH AND DURABILITY OF CONCRETE 9

Strength and Durability Of Concrete- Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete – Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion – Effects of cover thickness;

UNIT III SPECIAL CONCRETES

Special Concretes- Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self-compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes;

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9

Techniques for Repair and Protection Methods- Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection; Repair, Rehabilitation and Retrofitting of Structures- Evaluation of root causes; Underpinning &

shoring; some simple systems of rehabilitation of structures; Guniting, shotcreting;

UNIT VREPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9

Non-Destructive testing systems; Use of external plates, carbon fibre wrapping and carbon composites in repairs. Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Demolition Techniques – Engineered demolition methods – Case studies.

TEXT BOOKS:

1. Concrete Structures Repair Rehabilitation and Retrofitting, J.Bhattacharjee, 2017.
2. Building Repair And Maintenance Management, Gahlot P. S, 2006.
3. Repair and Rehabilitation of Concrete Structures, 2016by Poonam I. Modi, Chirag N. Patel.

REFERENCES:

1. Dodge Woodson.R,"Concrete Structures – protection, repair and rehabilitation", Elsevier Butterworth – Heinmann, UK, 2009.
2. Peter H.Emmons, "Concrete Repair and Maintenance Illustrated", Galgotia Publications Pvt. Ltd., 2001.
3. www.thefreedictionary.com/repa
4. www.merriam-webster.com/dictionary/repair

Course Coordinator **HOD**

U18PECE013	**RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEM**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Sciences				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To educate the students on the principles of rural water supply and sanitation and to develop understanding of factors governing the aspects in rural water supply and sanitation. Design of septic tanks single pit and double pit toilet.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Study the need for water treatment	U
CO2	Understand the concept of water treatment system.	U
CO3	Understand in detail about the Basic requirement of sanitation	U
CO4	Study about the biological treatment system	R
CO5	Know about the sewage disposal and recycle of sewage	U
CO6	To learn Salt water intrusion and remediation process.	R

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	1	2		3			2		3	2		2	2
	CO2	1		2				3			1		1		
	CO3	3		2	3				3		3	2		3	3
	CO4						3			2					1

	CO5	3		3			3				3			3	
	CO6		2			2			1				2		3
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)		**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)		Employment Enhancement Courses (EEC)	Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNITI NEED FOR WATER TREATMENT 9

Attributes of water supply systems, drinking water quality. Relationships between diseases and water quality, hygiene and sanitation. Need for water treatment.

UNITII WATERTREATMENT 9

Point of use water treatment systems, filters, bio-sand filters, disinfection systems for rural areas, chlorination, Solar disinfection systems, removal of arsenic, fluoride and iron. Onsite sanitation systems.

UNITIII SANITATION 9

Basic requirement of sanitation; Decentralized / onsite wastewater management; small bore / settled effluent sewer system – Design and operation.

UNITIV SEWAGE TREATMENT 9

Nexus between water quality and sanitation. Importance of hydrogeology on selection of onsite sanitation systems, Design of Septic tanks, single pit and double pit toilets. Small bore systems, bio digesters, reed beds, constructed wetlands, sludge/septage management systems.

UNITV SEWAGE DISPOSALAND REUSE 9

Methods of disposal, Land disposal, sewage farms – Artificial recharge of ground water; Recycle and Reuse of sewage – Grey water Harvesting – Salt water intrusion and remediation – Ground water pollution and remediation.

TEXT BOOKS:

1. Metcalf & Eddy, Wastewater Engg. Treatment and Reuse, Tata McGraw Hill, New Delhi (2003).
2. Todd, D.K. Ground Water Hydrology, John Wiley & Sons, New York(2000).
3. F.R. Spellman, Hand Book of Water and Wastewater Treatment Plant operations CRC Press, New York(2009).

REFERENCES:

1. CPHEEO Manual on Water Supply and Treatment, Govt. of India(2003).
2. CPHEEO Manual on Sewerage and Sewage Treatment, Govt. of India(1999).
3. www.izito.ws/**Water Systems**
4. lecturenotes.in/notes/3319-notes-for-water

Course Coordinator HOD

U18PECE014	ENVIRONMENTAL FLUID MECHANICS	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Introduction to Fluid Mechanics				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyze and appreciate the complexities involved in solving the fluid flow problems. To introduce the basics of hydrostatic forces involved in fluid mechanics and also to acquaint the students to learn about the theorems on Pascal's law and buoyancy.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To learn about the basics of fluid mechanics and various properties of fluids	U
CO2	To learn about the various forces on plane and curved surfaces and the concepts of buoyancy	U
CO3	To have a clear understanding about fluid kinematics and dynamics	U
CO4	To study the basics of boundary layer flow and flow through pipes	R
CO5	To study about various models like distorted models and various dimensionless numbers	R
CO6	To understand the concepts of Rayleigh's method and Buckingham PI-Theorem	R

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3					3			2			3		3
	CO2		2								1			2	
	CO3	2	3		2		3			2		2			3
	CO4		3				2			2	2		3	3	2
	CO5	3	1	2		3			2		3	2		2	2
	CO6	1		2				3			1		1		

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I DEFINITIONS &FLUID PROPERTIES 8

Definitions – Fluid and Fluid Mechanics – Dimensions and units – Fluid properties continuum Concept of system and control volume.

UNIT II FLUID STATICS 8

Pascal's law and hydrostatic equation – Forces on plane and curved surfaces – Buoyancy-Pressure measurement.

UNIT III FLUID DYNAMICS & KINEMATICS 11

Fluid Kinematics - Stream, steak and path lines, Classification of flows-continuity equation,

Stream and Potential functions, Flow nets, Velocity measurement. Euler and Bernoulli's equations- Application of Bernoulli's equation-Discharge measurement-laminar flows through pipes and between plates – Hagen Poisuille equation – Turbulent flow, DancyWeisbach formula - moody Diagram – Momentum Principle- Impact of jets on plane and curved plates.

UNIT IV BOUNDARY LAYER AND FLOW THROUGH PIPES 9

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 in series and in parallel pipe network.

UNIT V SIMILITUDE AND MODEL STUDY 9

Dimensional analysis – Rayleigh's method – Buckingham PI-Theorem- Similitude and Models – Scale effect and distorted models.

TEXT BOOKS

1. Kumar K.L "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi.

REFERENCES

1. Streeter, Victor, L, and Benjamin., "Fluid Mechanics", McGraw-Hill Ltd., 1998
2. Natarajan M.K. "Principles of Fluid Mechanics", Agencies, Vidayal Karuppur, Kumbakonam, 1995.
3. Fox Robert W. and McDonald. Man T., Introduction Fluid Mechanics", John Wiley & Sons,1995.
4. www.nptelvideos.in/2012/11/fluid-mechanics.html
5. www3.eng.cam.ac.uk/~em257/LectNotes_all.pdf

Course Coordinator **HOD**

U18PECE015	**DESIGN OF HYDRAULIC STRUCTURES / IRRIGATION ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Introduction to Fluid Mechanics				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To present the basic theory and practice for various areas of Agricultural Engineering, application of engineering to the problems of agricultural production.To train the students and develop basic understanding of soil water plant relationship and select and design appropriate method of water application in varied situations.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To gain knowledge on soil water conservation, irrigation engineering and farm structures.	Ap
CO2	To understand the basic requirements of irrigation and various irrigation techniques, requirements of the crops.	U
CO3	To understand the basics of design of unlined and lined irrigation canals design.	U
CO4	To apply math, science, and technology in the field of water resource Engineering.	Ap
CO5	To design the Hydraulic structures.	C
CO6	To know about Participatory Irrigation Management	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High,

2-Medium, 1-Low														
1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	1	2		3			2		3	2		2	2
	CO2	1		2				3			1		1		
	CO3				2					2					2
	CO4	3	1	2		3			2		3	2		2	2
	CO5	1		2				3			1		1		
	CO6	3		2	3				3		3	2		3	3
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)		Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I IRRIGATION AS A SCIENCE 9

Definition, Need, Benefit, Historical Development, Scope in the country and the state - Sources for irrigation, wells, springs, rivers, streams, tanks, reservoirs - Flow and Lift irrigation. Methods of flow irrigation - Devices and equipments for lift irrigation - Duty, different concepts of duty and factors affecting duty.

UNIT II CROP WATER REQUIREMENTS 9

Soil – plant – water relationship - Evapotranspiration – consumptive use - Perennial, Annual and Seasonal crops - Principal irrigated, dry and wet irrigated crops - Assessment of crop water requirements - Effective rainfall - Net irrigation requirements for principal crops - Irrigational quality - Salt resistant crops - Water logging, remedial measures.

UNIT III CONVEYANCE &DISTRIBUTION OF IRRIGATION WATER 9

Head works – Diversion and storage structures -Canals unlined and lined. Canal alignments - contour ridge, Branch canals, minors, water course and notches - Control structures - drops, escapes, shutters and operating devices, division boxes - Cross drainage structures- undertunnels, aqueducts, siphons, siphon aqueducts - Cross masonry structures - road and railway bridges.

UNIT IVIRRIGATION WATER MANAGEMENT 9

Need for optimization of water use - Management and productivity - Minimizing irrigation water losses - Operational rules for regulation - physical structures for management on farm development works - Participatory Irrigation Management (PIM) - Water Users Associations (WUA) - Training the water users.

UNIT VDESIGN OF IRRIGATION STRUCTURES 9

Sluices and surplus weirs in tanks - Earthdam section, homogenous and zoned. Anicuts and weirs on solid and permeable foundation - Head regulators, canal drops, canal syphones and aqueducts, undertunnels - Simple design of masonry and earthdams- Designing channels- Computer aided designs.

TEXT BOOKS

1. Sharma R.K.Irrigation Engineering and Hydraulic Structures, Oxford and IBII Publishing Company, New Delhi, 2002.
2. Sathyanarayanan Murthy, Irrigation Design and Drawing, Published by Mrs.L.Banumathi, Tuni, East Godavari District. A.P. 1998.
3. S.K.Garg,Irrigation Engineering and Hydraulic structures,Khanna Publishers.2011.

REFERENCES

1. Michael A.M.Irrigation – Theroy and practice, Vikas Publishing House, 2000.
2. Hand Book on irrigation system operation Practices, Water Management and training Project Technical Report No.33. CWC, 1990.
3. Hand Book for improving Irrigation System maintenance Practices, Water Management and Training Report No.19A, CWC, Delhi, 1989.
4. www.nptel.ac.in/courses/105105110.

Course Coordinator **HOD**

U18PECE016	**CONCRETE TECHNOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Building Materials & Testing Methods				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the various properties of concrete materials	U
CO2	To understand the behavior of fresh and hardened concrete	U
CO3	To identify the design concrete mixes as per IS and ACI codes	Ap
CO4	To understand the need for special concretes	U
CO5	To knowthe concept of concreting methods	U
CO6	To learn the special concreting methods.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	1	2		3			2		3	2		2	2
	CO2	1		2				3			1		1		
	CO3				2					2					2
	CO4	3	1	2		3			2		3	2		2	2
	CO5	1		2				3			1		1		
	CO6									3					3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I CONCRETE MAKING MATERIALS 9

Concrete; Properties of ingredients, tests, Grades of cement - Chemical composition, Hydration of cement - Production of concrete, mixing, compaction curing - Properties of fresh concrete

UNIT II CONCRETE 9

Properties of fresh concrete, Hardened concrete - Defects in Concrete, Concrete additivesBehavior of concrete in tension and compression, shear and bond - Influence of various factors on test results - Time dependent behavior of concrete - Creep, shrinkage and fatigue

UNIT III MIX DESIGN 9

Concrete mix design - Proportioning of concrete mixes, basic considerations, cost specifications, factors in the choice of mix proportion, different method of mix design. Quality control, Behavior of concrete in extreme environment

UNIT IV SPECIAL CONCRETE 9

Light Weight concrete, Fly ash concrete, Fibre reinforced concrete, Polymer Concrete, Super plasticized concrete, Epoxy resins and screeds for rehabilitation - Properties and Applications- High performance concrete.

UNIT V CONCRETING METHODS 9

Process of manufacturing of concrete, methods of transportation, placing and curing - Temperature problem in concreting, hot weather, cold weather and under water conditions, Resistance to freezing - special concreting method.

TEXTBOOKS:

1. Gupta.B.L., Amit Gupta, “Concrete Technology”, Jain Book Agency, 2010.
2. Shetty,M.S, “Concrete Technology”, S.Chand And Company Ltd, New Delhi, 2003

REFERENCES:

1. Santhakumar,A.R; “Concrete Technology” , Oxford University Press, New Delhi, 2007
2. Neville, A.M; “Properties Of Concrete”, Pitman Publishing Limited, London,2010
3. Gambir, M.L; “Concrete Technology”, 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
4. IS10262-2009 Recommended Guidelines For Concrete Mix Design, Bureau Of Indian Standards, New Delhi.
5. https://nptel.ac.in/courses/105102012/
6. https://nptel.ac.in/courses/105102012/#

Course Coordinator HOD

U18PECE017	ADVANCED SOIL MECHANICS	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Geotechnical Engineering				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To understand stability and failure mechanisms of substructure. To design the suitable foundation in the problematic soils with necessary instruments.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To understand slope stability and failure mechanisms	U
CO2	To solve problems related to earth pressures	E
CO3	To solve practical problems related to stability of retaining walls	E
CO4	To design the pile foundation in problematic soils	C
CO5	To determine the soil structure interaction by using modern instruments	E
CO6	To learn the pore pressure measurements.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	1		2				3			1		1	3	
	CO2				2					2					2
	CO3	3	1	2		3			2		3	2		2	2
	CO4	3					3			2			3		3
	CO5		2								1			2	
	CO6	2	3		2		3			2		2			3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I SLOPE STABILITY 9

Slope failure mechanisms - Types - Infinite slopes - Finite slopes - Total stress analysis for saturated clay - Method of slices - friction circle method - Use of stability number - Slope protection measures.

UNIT II EARTH PRESSURES 9

Earth pressure theory – Plastic equilibrium in soils – active and passive states – Rankine's theory – Coloumb's wedge theory – Classical and limit equilibrium solution – Earth pressure on retaining walls of simple configurations – pressure on the wall due to single line load alone.

UNIT III ANALYSIS OF RETAINING WALLS 9

Types of retaining walls- Analysis of retaining walls- Graphical method - Culmann's method

– Rehbhan's method- Stability of retaining wall.

UNIT IV PILE FOUNDATION 9

Types of piles – Factors influencing the selection of pile – cuts and excavations - Sheet Piles – Codal provisions

UNIT V INSTRUMENTATION 9

Instrumentation in soil engineering, strain gauges, resistance and inductance type, load cells,earth pressure cells, settlement and heave gauges, pore pressure measurements – slopeindicators, sensing units, case studies.

TEXT BOOKS:

1. Punmia, B.C., Soil mechanics and foundations, Laxmi publications pvt. Ltd., New Delhi.

REFERENCES:

1. Khan, I.H., A text book of Geotechnical Engineering, Prentice Hall of India, New Delhi, 1999.
2. Arora K.R. Soil mechanics and foundation engineering, standard publishers and distributors, New Delhi, 1997.
3. Bowles J.E. Foundation analysis and design, McGraw Hill, 1994.
4. Gopal Ranjan and Rao, A.S.R. Basic and applied soil mechanics, Wiley Eastern Ltd., New Delhi (India), 1997.
5. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/lecture-notes/
6. http://www.nptelvideos.in/2012/11/soil-mechanics.html

Course Coordinator **HOD**

U18PECE018	**GEOMETRIC DESIGN OF HIGHWAYS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Surveying & Geomatics				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: The students can apply the Interpretation of geometric design fundamentals in the field. To learn about IRC standards and guidelines for design problems. Also design of intersections and drainage facilities are very important applications of this course.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To know the design provision as per IRC guidelines.	U
CO2	To know the design principles of grade intersections.	U
CO3	To know the design principles of grade interchanges.	An
CO4	To learn the concepts of non motorized traffic zones.	An
CO5	To learn the geometric design of air fields.	An
CO6	To understand the Right of way and width considerations for roadway, shoulders, kerbs traffic barriers, medians, frontage roads.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	1	2		3			2		3	2		2	2
	CO2	1		2				3			1		1		
	CO3									3					3
	CO4	1		2				3			1		1	3	
	CO5				2					2					2
	CO6	3	1	2		3			2		3	2		2	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT 1 INTRODUCTION 9

Introduction - Classification of rural highways and urbanroads. Objectives and requirements of highway geometric design; Design Controls: Topography, vehicle characteristics and design vehicle, driver characteristics, speed, traffic flow and capacity, levels of service, pedestrian and other facilities, environmental factors.

UNIT II DESIGN OF AT GRADE INTERSECTIONS & INTERCHANGES 9

Design Of Intersections: Characteristics and design considerations of at-grade intersections; Rotary intersections; - Design of Parking lots - Principles of design, channelization, roundabouts, staggered intersections, Grade separations and interchanges: Design of interchanges - Major and minor interchanges, entrance and exit ramps, acceleration and deceleration lanes

UNIT III GEOMETRIC DESIGN 9

Geometric design provision for various transportation facilities as per IRC guidelines, geometric design of horizontal and vertical alignment, design of expressways/ high speed corridors - Facilities for non motorized traffic - Bicycles and pedestrian facility design, slow carriagewaysbuses and trucks, Pavement surface characteristics - types, cross slope, skid resistance, unevenness.

UNIT IV DESIGN COMPONENTS 9

Design Elements: Sight distances, Horizontal alignment - design considerations, stability at curves, super elevation, widening, transition curves; curvature at intersections, vertical alignment - grades, ramps, Cross Section Elements: Right of way and width considerations, roadway, shoulders, kerbs traffic barriers, medians, frontage roads.

UNIT V DESIGN OF DRAINAGE FACILITIES 9

Design of summit and valley curves, combination of vertical and horizontal alignment including design of hair pin bends, design of expressways, IRC standards and guidelines for design problems; Importance,Principle, drainage of various geometric elements, surface and subsurface drainage.

TEXTBOOKS:

1. Keith M. Wolhuter, “Geometric Design of Handbook” by CRC press, 2017.
2. Mannering Fred L., Kilarski Walter P. and Washburn Scott S., “Principles of Traffic Engineering and Traffic Analysis”, Third Edition, Wiley 2007
3. Kadyali L.R. and Lal N.B., “Principles and Practices of Highway Engineering”, Khanna Publishers 2006.
4. O’Flaherty, A. Coleman, “Highways: the Location, Design, Construction and Maintenance of Road Pavements”, 4thEd. , Elsevier 2006.

REFERENCES:

1. Daniel .J Findley “highway engineering planning design” Butterworth-Heinemann; First Edition 2015.
2. Roess, R. P., Prassas, E. S., and McShane, W. R., “Traffic Engineering, 4th Edition, Prentice Hall, 2010.
3. Chakroborty Partha and Animesh Das, “Principles of Transportation Engineering”, Prentice hall, 2005
4. Salter. R.I and Hounsell N.B, " Highway Traffic Analysis and design", Macmillan Press Ltd.1996.
5. www.civil.iitb.ac.in/tvm/nptel/301_IntroGD/web/
6. libvolume3.xyz/civil/btech/semester7/highwaygeometric

Course Coordinator **HOD**

PROFESSIONAL ELECTIVE - II (PE –II)

U18PECE021	URBAN TRANSPORTATION & PLANNING	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Surveying & Geomatics				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well. To learn about growth factor models, gravity models and opportunity modes.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Analyze National policies and strategies on issues related to Urban development	An
CO2	To learn about different types of plan, formulation and evaluation.	U
CO3	To understand the concepts of plan implementation and urban management.	U
CO4	To learn about sustainable urban and transport principles.	U
CO5	To analyze the future Scenarios and shape of Urban Region.	An
CO6	To understand the Economic Benefits of Sustainable Transportation .	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1									3					3
	CO2	1		2				3			1		1	3	
	CO3				2					2					2
	CO4	3	1	2		3			2		3	2		2	2
	CO5	1		2				3			1		1		
	CO6				2					2					2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I URBAN PLANNING AND DEVELOPMENT 9

Introduction-Definition of terms, Explanation of concepts, National policies and strategies on issues related to Urban development – Trends of Urbanization- Positive and Negative impacts of Urban development Principles of planning – Types and levels of Urban plans, Stages in the planning process.

UNIT II DEVELOPMENT PLANS, FORMULATION & EVALUATION 9

Scope and content of Regional Plan, Master Plan, Detailed Development Plan, Structure Plan, Sub Regional Plan, DCR planning and developments of industrial estates, SEZ, Development strategies, formulation and evaluation.

UNIT III PLAN IMPLEMENTATION AND URBAN MANAGEMENT 9

Constraints for plan implementation – Industrial, Financial and Legal Constraints, Institutional Arrangements for Urban Development – Financing of Urban Developments - Decision Support System for Urban Management – Involvement of public, private, NGO, CBO & Beneficiaries.

UNIT IV SUSTAINABLE URBAN AND TRANSPORT PRINCIPLES 9

Urban Environmental Sustainability, Urban Sustainable Development, Methods and Tools for Sustainable Appraisal, Sustainable Transportation – Principles, indicators and its implications Environment and Resources- Economic Benefits of Sustainable Transportation.

UNIT V URBAN REGION AND ENVIRONMENT 9

Sustainability Assessment, Future Scenarios, Shape of Urban Region, Managing the change, Integrated Planning, Sustainable Development- City Centre, Development Areas, Inner City Areas, Suburban Areas, Periurban and Country side, Economy and Society.

TEXTBOOKS:

1. Pratap Rao .M " Urban planning theory and practice'' publisher CBS 2012.
2. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 201.
3. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010.
4. Goel .S.L Urban, "Development and Management", Deep and Deep publications, New Delhi,2002.
5. Michael D. Meyer and Eric J.Miller, "Urban Transportation Planning" McGraw Hill Publications, Second edition, 2000.

REFERENCES:

1. CMDA,"Second Master Plan for Chennai", Chennai 2008.
2. Sustainable Transportation and TDM – Planning the balances, "Economic, Social and Ecological objectives"; Victoria Transport Policy Institute, 2007.
3. Singh .V.B, "Revitalized Urban Administration in India", Kalpaz publication, Delhi 2001.
4. Joe Ravetz, "City Region 2020 – Integrated Planning for a Sustainable Environment", 2000.
5. https://nptel.ac.in/courses/105107067/
6. http://www.nptelvideos.in/2012/11/urban-transportation-planning.html
7. https://www.academia.edu/15029943/NPTEL_Introduction_to_Transportation_Planning
8. http://vssut.ac.in/doc/Transportation-1_Lecture-Note.pdf

Course Coordinator **HOD**

U18PECE022	**CONSTRUCTION COST ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Construction Technology				
	Course Coordinator Name & Department: Civil Engineering				
COURSE OBJECTIVES: To study the concepts of Construction Economics and Finance such as comparing alternatives proposals, evaluating alternative investments, management of funds, and management of accounting.					
COURSE OUTCOMES (COs):					**Revised Bloom's**

		Taxonomy
CO1	To know about basic principles like Time Value of Money, Cash Flow diagram, Nominal and effective interest	U
CO2	To know about the Comparing alternatives such as Present Worth Analysis, Annual Worth Analysis etc;	U
CO3	To understandthe concept of evaluating alternative investments.	U
CO4	To understand the methods of Project Finance and Working Capital Management.	U
CO5	To understand the basics of Management accounting and Financial accounting principles.	U
CO6	To get knowledge on International financial management foreign currency management.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	2		3			2			3		2	1	3
	CO2	3		2						3		3			3
	CO3	1		2		3		3	2		1		1	3	
	CO4		2		2		2			2					2
	CO5							2			3	2			
	CO6	3			3						3			3	1

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I BASIC PRINCIPLES 9

Time Value of Money – Cash Flow diagram – Nominal and effective interest- continuous interest . Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)– Problem time zero (PTZ)- equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient(G), Geometric Gradient (C).

UNIT II COMPARING ALTERNATIVES PROPOSALS 9

Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR)Analysis, Benefit/Cost Analysis, Break Even Analysis.

UNIT III EVALUATING ALTERNATIVE INVESTMENTS 9

Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation.

UNIT IV FUNDS MANAGEMENT 9

Project Finance – Sources of finance - Long-term and short -term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management foreign currency management.

UNIT V FUNDAMENTALS OF MANAGEMENT ACCOUNTING 9

Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement.

TEXT BOOKS:

1. Blank, L.T., and Tarquin,a.J (2012) Engineering Economy,7th Edn. Mc-Graw Hill Book Co.
2. Collier C and GlaGola C (1998) Engineering Economics & Cost Analysis, 3nd Edn. Addison Wesley Education Publishers.
3. Patel, B M (2007) Project management- strategic Financial Planning, Evaluation and Control, Vikas Publishing House Pvt. Ltd. New Delhi.

REFERENCES:

1. Shrivastava,U.K., (2000)Construction Planning and Management,2nd Edn. Galgotia Publications Pvt. Ltd. New Delhi.
2. Steiner, H.M. (1996) Engineering Economic principles, 2nd Edn. Mc-Graw Hill Book, New York.
3. http://fmcet.in/CIVIL/CE6704_uw.pdf
4. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105104161/lec1.pdf
5. https://nptel.ac.in/courses/105103023/#
6. https://www.cmu.edu/cee/projects/PMbook/12_Cost_Control,_Monitoring,_and_Accounting.html

Course Coordinator **HOD**

U18PECE023	**TRANSPORT OF WATER AND WASTE WATER**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Introduction to Fluid Mechanics				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To educate the students in detailed design concepts related to water transmission mains, water distribution system, sewer networks and storm water drain, with emphasis on computer application.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To make them understand the fundamentals design for external loads, maintenance and operation. Sanitary Sewerage Systems.	U
CO2	To understand about the populationforecasting Design period - Variation in demand - Factors Affecting per capita consumption.	U
CO3	To understand in detail Water transmission main design methods for analysis and optimization Laying and maintenance.	U
CO4	To improve the knowledge of Flow estimation, and sewer design, conventional and model based design, sewage pumps.	Ap
CO5	To know about the Drainage layouts, storm runoff estimation, hydraulics of flow in storm water drains.	An
CO6	To get knowledge on conventional and model based design pumps.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2

2	CO1	3	2		2		2			2			2		2
	CO2							2			3	2			
	CO3	3			3						3			3	1
	CO4	3		2						3		3			3
	CO5	1		2		3		3	2		1		1	3	
	CO6		2		2		2			2					2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018									

UNIT I WATER SUPPLY SYSTEMS 9

Storage requirements, impounding reservoirs, intake structures, pipe, hydraulics, design of distribution systems, distribution and balancing reservoirs, pipe materials, appurtenances, design for external loads, maintenance and operation. Sanitary Sewerage Systems:

UNITII POPULATIONFORECASTING 9

Forecasting of population - Arithmatic Increase - Geometrical Increase - Incremental Increase - Graphical Methods - Logistic Curve Method - Per capita consumption - Design period - Variation in demand - Factors Affecting per capita consumption.

UNIT IIIDISTRIBUTION 9

Water transmission main design - pipe materials - economics - water distribution pipe networks - methods for analysis and optimization - Laying and maintenance, insitu lining - appurtenances.

UNIT IV - SANITARYSEWERAGE SYSTEMS 9

Flow estimation, sewer materials, hydraulics of flow in sewers, sewer layout, sewer transitions, materials for sewers, appurtenances, manholes, sewer design, conventional and model based design, sewage pumps and pumping stations, corrosion prevention, operation and maintenance, safety.

UNIT V STORM WATER 9

Drainage layouts, storm runoff estimation, hydraulics of flow in storm water drains, materials, cross sections, design of storm water drainage systems, inlets, storm water pumping, operation and maintenance

TEXT BOOKS:

1. Joanne E. Drinan (Author), Water and Wastewater Treatment ,July , 2012
2."Manual on water supply and Treatment", CPHEEO, Ministry of Urban Development, GoI, New Delhi, 2009.
3."Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban Development, GoI, New Delhi, 2003.

REFERENCES

1. Hammer.M.J. "Water and Wastewater Technology",Regents/ Prentice Hall, New Jercy2001.

2.Rakesh Kumar and R N Singh "Municipal Water and Waste Water Treatment"2012
3. Sonthosh kumar Garg "Water Supply Engineering"2/khana publications 2010 edition
4. https://easyengineering.net/waste-water-engineering-books/
5. https://nptel.ac.in/courses/105104102/
6. https://www.researchgate.net/publication/221911472_Wastewater_Management
7.https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and wastewater-treatment-engineering-spring-2006/lecture-notes/

Course Coordinator **HOD**

U18PECE024	OPEN CHANNEL FLOW	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Hydraulics Engineering				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: Application of principles of fluid mechanics to the solution of problems encountered in both natural and constructed water systems. Use of model studies and computers in solving a host of problems in hydraulic engineering.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	The students will be apply their knowledge about fluid mechanics in addressing problems in open channels	Ap
CO2	They will develop skills to solve problems using software.	An
CO3	They will be able to make flow measurements in fields.	C
CO4	To design channels for sediment transport	C
CO5	To design hydraulic models	C
CO6	To learn the design concepts of stable channels and regime channels.	C

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2	2		3					2		2		3	
	CO2			2			2				1				2
	CO3	3								3			2	2	
	CO4		2		3			2			2				
	CO5	3		2						3		3		1	3
	CO6	1		2		3		3	2		1		1	3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I BASIC PRINCIPLES **9**

Basic concepts of uniform flow - computations. Specific energy and specific force concepts – applications.

UNIT II STEADY VARIED FLOWS IN OPEN CHANNELS 9

Dynamic equation for spatially varied flows. Flow profile computations. Introduction to HEC-RAS. Spatially varied flows and rapidly varied flows – applications.

UNIT III UNSTEADY FLOWS IN OPEN CHANNELS 9

Equations of motion. Uniformly progressive wave. Rapidly varied unsteady flow – positive and negative surges. Dam break problem. Flood routing in large channel networks, Flood routing in compound channels; Flood routing in channels with flood plains, Surface irrigation flow modeling

UNIT IV SEDIMENT TRANSPORT 9

Sediment properties – inception of sediment motion – bed forms. Bed load suspended load – Total sediment transport. Design of stable channels and regime channels. Reservoir sedimentation and trap efficiency.

UNIT V FLOW MEASUREMENTS AND HYDRAULIC MODELING 9

Sharp-Crested weirs, broad-crested weirs, critical depth flumes. Recent advancement in open channel flow measurements. Physical modeling in hydraulics. Dimensional analysis. Modeling closed flows and free surface flows. Distorted models. Design of physical models.

TEXT BOOKS

1. Sturm T.W., Open Channel Hydraulics – Tata-McGraw Hill 2 nd edition, New Delhi 2011. ISBN:978-1-25-900225-0
2. Wurbs R.A., and James W.P. Water Resources Engineering. Prentice Hall of India, Eastern Economic Edition. ISBN: 81-203-2151-0, New Delhi, 2007.
3. Subramanya K., Flow in Open Channels (2nd ed.) Tata McGraw Hill, ISBN 00-746- 2446-6, New Delhi 2003.

REFERENCES

1. Chaudhry M. H., Open Channel Flow. Prentice Hall of India, Eastern Economic Edition, ISBN: 81-203-0863-8, New Delhi. 1994.
2. Chow Ven-te Open Channel Hydraulics McGraw Hill, New York NY 1959.
3. French, R. H., Open Channel Hydraulics McGraw Hill, New York NY 1985.
4. Srivastava R. Flow through Open Channels Oxford University Press New Delhi
5. https://easyengineering.net/open-channel-flow-made-easy/
6.http://web.iku.edu.tr/~asenturk/Microsoft%20PowerPoint%20-%20open-channel%201.pdf7.
7. https://lecturenotes.in/u/saurabh25
8.https://www.engineeringonyourfingertips.ooo/2019/09/pdf-strength-of-materials-books-collection-free-download.html

Course Coordinator **HOD**

U18PECE025	**GROUNDWATER ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Foundation Engineering				
	Course Coordinator Name & Department: Civil Engineering				
COURSE OBJECTIVES: The objective of this course is enable to the student to understand the basic empirical knowledge of the residence and movement of groundwater, as well as a number of quantitative aspects.					
COURSE OUTCOMES (COs):					**Revised Bloom's**

		Taxonomy
CO1	Able to evaluate the aquifer parameters and groundwater resources for different hydro-geological boundary conditions	E
CO2	Formulate and solve conjunctive use of surface water and groundwater resource utilization problems	An
CO3	Identify sites for artificial recharge of groundwater	An
CO4	To imparts exposure towards well design and practical problems of ground water aquifers.	An
CO5	To study about groundwater quality and contamination	U
CO6	To understand the Evaluation of well loss parameters.	E

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2			3			2			3		1	2	3
	CO2		3												
	CO3						1	2		1	3	2			2
	CO4	3			3						3			3	1
	CO5	3	3	2			3			3		3			3
	CO6	1		2		3		3	2		1		1	3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I GROUNDWATERBASICS 8

Introduction to Groundwater – Hydro meteorology – Groundwater in Hydrologic Cycle – Occurrence of groundwater – zone of Aeration and Saturation – Hydrogeology — Types of aquifers soil sample analysis - Water bearing materials – Aquifer parameters and its determination.

UNIT II GROUNDWATER HYDRAULICS 10

Groundwater Movement - Darcy's law and its limitations - Stream lines and flow net analysis – Potential flow theory – Discharge and draw down for various condition of groundwater flow - Principles of groundwater flow and its equation – Dupuit – Forchheimer assumptions – Influent and Effluent streams - Evaluation of well loss parameters – Partial penetration of wells – Interference of wells

UNIT III PUMPING TEST ANALYSIS 10

Determining aquifer parameters for unconfined, leaky and non-leaky aquifers – steady and transient conditions - Slug test – Locating hydro geological boundaries – Image well theory – Determination of well characteristics and specific capacity of wells – Well characteristics of large diameter wells.

UNIT IV WELL DESIGN AND CONSTRUCTION 8

Well design criteria – Construction of wells – Well drilling methods – Filter design – Artificial and natural packing – Well casings and screens – Production test – Maintenance of production wells – Pumping Equipment – protection of wells and Rehabilitation – Horizontal wells - Collector wells and Infiltration galleries

UNIT V SPECIAL TOPICS 9

Methods of artificial groundwater recharge – Groundwater Basin Management and conjunctive use - Groundwater assessment and balancing – Seawater intrusion in coastal aquifers – Land Subsidence – Groundwater flow in Hard Rock System: conceptual models – structure and hydrodynamic properties of hard rock aquifers.

TEXT BOOKS

1. Todd D.K., Groundwater Hydrology, John Wiley & Sons, Inc, New York, 2011
2. Bear J., Hydraulics of Groundwater, McGraw-Hill, New York, 2007
3. Bouwer H., Groundwater Hydrology, McGraw-Hill, New York, 2013.

REFERENCES:

1. Driscoll, Groundwater and Wells, Johnson Filtration Systems, Inc., 2014
2. Hantush M.S., Hydraulics of wells in Advances in Hydro science, Academic Press, 1964.
3. Ojha, C.S.P, Berndtsson, R and Bhunya, P., Engineering Hydrology, Oxford University Press,New Delhi, 2008.
4. Rastogi A.K. , Numerical Groundwater Hydrology, 2011
5.https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-72-groundwater-hydrology-fall-2005/lecture-notes/
6. https://nptel.ac.in/courses/105105042/
7. https://nptel.ac.in/courses/105105106/
8. https://mvsrcivil1.blogspot.com/2016/02/groundwater-hydrology-text-books-notes.html
9.http://www.riversimulator.org/Resources/farcountry/Hydrogeology/GroundwaterHydraulicsLohman1972pp708.pdf

Course Coordinator **HOD**

U18PECE026	**DESIGN OF CONCRETE STRUCTURES**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Reinforced Concrete Design				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To impart concepts of design of reinforced concrete structures such as, retaining walls water tanks, components of bridge.To make the students know the concepts of design of structures like prestressed concrete continuous beams.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To design the reinforced concrete elements using limit state and working stress methods	C
CO2	To study about the design of types of reinforced concrete slab using limit state method	C
CO3	To understand the design concept of shear, bond, anchorage and torsion.	U
CO4	To know the limit state design of reinforced concrete column	An
CO5	To know he limit state design of reinforced concrete footing	An
CO6	To learn the detailing for earthquake resistant construction.	An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		3		3				2		3		2		2
	CO2	3					1	2		1	3	2		2	2
	CO3			2			2				1				2
	CO4	3				1				3			2	2	
	CO5		2		3			2			2				1
	CO6	3		2						3		3		1	3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I RETAINING WALLS 9

Design of cantilever and counter-fort type retaining wall - All design steps/process to as per the most recent BIS code of practices

UNIT II WATER TANKS 9

Water tank and staging - Introduction, Design criteria - Design of rectangular and circular water tank - Design of Intze tank - Staging for overhead tank

UNIT III BRIDGES 9

Introduction to bridge engineering - Investigation for bridges, IRC loadings - Design of slab culvert

UNIT IV PRE STRESSED CONCRETE 9

Design of end block - Pre-stressed concrete - Introduction,Principles of Pre–stressing pre-stressing system - losses in pre-stress

UNIT V DESIGN OF BEAMS AND FRAMES 9

Design of continuous beams and building frames -Moment redistribution, Estimation of wind and seismic loads - Desirable features of earthquake resistant construction -Detailing for earthquake resistant construction.

Text Books:

1. Krishnaraju, N. 'Reinforced Concrete Design', CBS Publishers and Distributors, Delhi. 2016
2. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi. 2002.
3. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi 2007.

REFERENCES:

1. Rajagopalan, N, "Prestressed Concrete", Alpha Science, 2010.

2. Lin T.Y. & Ned H.Burns,"Design of prestressed concrete structures",Wiley IndiaPrivate Limited,2010.
3. Punmia B.C.,Jain A.k.,Jain A.K.,"RCC Designs", Laxmi Pub.(P) Ltd.,2003.
4. IS 1343 – 2012Code of Practice for Prestressed Concreteby Bureau of Indian Standards.
5. IS 456-2000: Plain and Reinforced Concrete – Code of Practice by Bureau of Indian Standards.
6. https://nptel.ac.in/courses/105105105/
7. http://www.nptelvideos.com/video.php?id=1646&c=11
8. http://www.nptelvideos.in/2012/11/design-of-reinforced-concrete-structures.html
9. https://lecturenotes.in/subject/167/design-of-concrete-structures-dcs
10. https://easyengineering.net/design-of-reinforced-concrete-structures-by-subramanian/
11. https://drive.google.com/file/d/1H-x7BRsjRKPz5Wv2o8s9RQdTscSMr7Gr/view

Course Coordinator **HOD**

U18PECE027	**GROUND IMPROVEMENT TECHNIQUES**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Geotechnical Engineering				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To develop an understanding of the ground improvement techniques and use of new materials and its behaviour for ground improvement techniques.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To develop an awareness of problematic soils and selection of ground improvement techniques based on soil conditions	U
CO2	To understand drainage, dewatering, grouting technique in ground improvement method	U
CO3	To understand the in situ densification of cohesion less and cohesive soils	U
CO4	To understand the applications of grouting and its materials	U
CO5	To get the awareness of the ground improvement techniques and to study the applications of geosynthetics.	An
CO6	To learn the procedures for piles-installation techniques.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3						3			3	1
	CO2	3	3	2			3			3		3			3
	CO3	1		2		3		3	2		1		1	3	
	CO4			2			2				1				2
	CO5	3				1				3		1	2	2	
	CO6		2		3			2			2				1

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I GEOTECHNICAL PROBLEMS **9**

Ground improvement - Role of ground improvement infoundation engineering, Methods of ground improvement, Geotechnicalproblems in alluvial, lateritic and black cotton soils, Selection of suitable ground improvement techniquesbased on soil conditions

UNIT II DEWATEREING **9**

Dewatering Techniques - Well points, Vacuum and electro-osmotic methods, Seepage analysis for two dimensional flow - fully andpartially penetrated slots in homogeneous deposits (Simple cases only)

UNIT III METHODS OF GROUND IMPROVEMENT **9**

In-situ densification of cohesion-less soils andconsolidation of cohesive soils: Dynamic compaction Vibroflotation, Sand compactionpiles. Consolidation: Preloading with sand drains, and fabric drains, Stone columns, Lime piles-installation techniques only – relative meritsand limitations – deep soil mixing

UNIT IV GROUTING TECHNIQUE **9**

Grouting - Types of grouts – Suspension grouts - solutions grouts, Grouting equipment and method - Grouting with soil, Bentonite - cement mixes and asphalt – Grout monitoring schemes

UNIT V GEOSYNTHETICS APPLICATIONS **9**

Geosynthetics - Functions of Geotextiles – Separation – Filtration – Drainage - reinforcement - Geomembranes - Containments and barriers - Application to Ground Anchors.

TEXT BOOKS

1. Purushothama Raj. P, “Ground Improvement Techniques”, Laxmi Publications (P) Ltd. New Delhi, 2000.

REFERENCE BOOKS

1. Koerner. R. M, “Construction and Geotechnical Methods in Foundation Engineering”, McGraw Hill, new York, 1984.
2. Moseley. M.P, “Ground Improvement”, Blockie Academic and Professional, Chapman and Hall, Glassgow, 1998.
3. Winterkorn .H .F and Fang. H. Y, “Foundation Engineering Hand Book”, Van Nostrand Reinhold, 1994.
4. Koerner. R. M, “Designing with Geosynthetics” (Fourth Edition), Prentice Hall, New Jersey, 1999.
5. IS: 13094:1992- “Selection of ground improvement techniques for foundations in weak soils”, BIS, New Delhi, 1992
6. Jie Han, “Principles and Practice of Ground Improvement”, John Wiley & Sons, Inc. 2015
7.https://lecturenotes.in/subject/228/ground-improvement-techniques-git
8.https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_GIT_NOTES_0.pdf

9. https://nptel.ac.in/courses/105108075/

Course Coordinator **HOD**

U18PECE028	**PUBLIC TRANSPORTATION SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Surveying & Geomatics				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: Student gains knowledge on various parts of public transport characteristics and the design considerations. Also get familiar with transit scheduling, components of scheduling Process, determination of service requirements.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Understand the importance of public transport activities.	U
CO2	To know about the transport travel characteristics.	U
CO3	To understand the concepts of trip.	U
CO4	To learn the ideas of transit network and scheduling	Ap
CO5	To know about transit system statistics	U
CO6	To understand the principles of good layout.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3						3			3	1
	CO2	3	3	2			3			3		3			3
	CO3	1		2		3		3	2		1		1	3	
	CO4	3			3						3			3	1
	CO5	3	3	2			3			3		3			3
	CO6	1		2		3		3	2		1		1	3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT 1 INTRODUCTION 9

Public Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the Cities, Freight Transportation, Future Developments, Urban Transportation System Planning - Conceptual Aspects - Transport Planning Process, Sequence of Activities Involved in Transport analysis.

UNIT II TRANSPORT TRAVEL CHARACTERISTICS 9

Transport travel characteristics – Trip chaining, technology of bus, rail, rapid transit systems,

basic operating elements, Trip Generation Analysis - Trip Production Analysis, Category Analysis, Trip Attraction Modelling. Trip Distribution Analysis - Presentation of Trip-Distribution Data, Basis of Trip Distribution, Gravity Model of Trip Distribution, Methods of Trip Distribution.

UNIT III TRANSIT NETWORK 9

Transit network planning – planning, objectives, principles, considerations, transit lines – types, geometry, transit routes and characteristics, timed transfer networks, prediction of transit usage, evaluation of network, accessibility considerations.

UNIT IV TRANSIT SCHEDULING 9

Components of scheduling process - determination of service requirements, scheduling procedure, marginal ridership, crew scheduling, transit agency and economics, organizational structure of transit agency, management and personnel, transit system statistics, performance and economic measures, operations, fare structure.

UNIT V DESIGN CONSIDERATIONS 9

Design of facilities – bus stops and terminals – principles of good layout, types of layout, depot location, twin depot concept, crew facilities and amenities.

TEXTBOOK:

1. Ashish verma.T.V, Ramanayya, "Public transport planning and management in developing countries", CRB press New York 2015.
2. Papacostas, C.S., and Prevedouros, P.D. "Transportation Engineering and Planning", Prentice - Hall of India Pvt Ltd., 3rd Edition, 2002,
3. Ponnuswamy .S, David Johnson victor, "Urban transportation planning operation and management "McGraw Hill Education (Indian) private limited, New Delhi.
4. John W.Dickey. (1975). Metropolitan Transportation Planning. McGraw Hill Book Company, New York.

REFERENCES:

1. Wright P.H. "Highway Engineers", John Wiley and Sons, Inc., New York, 2013.
2. Adib Kanafani (1983). Transportation Demand Analysis. McGraw Hill Series in Transportation, Berkeley.
3. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. McGraw Hill Book Company, New York.
4. John W.Dickey. (1975). Metropolitan Transportation Planning. McGraw Hill Book Company, New York.
5. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105106058/lec5.pdf
6. https://nptel.ac.in/courses/105107123/
7. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-1.pdf
8. https://pdfs.semanticscholar.org/be85/7421541858ae7f927067b2f7765f2b39522a.pdf
9. https://www.slideshare.net/EddyAnkitGangani/urban-transportation-system-mass-transit-system

Course Coordinator HOD

PROFESSIONAL ELECTIVE - III (PE – III)

U18PECE031	REMOTE SENSING AND GIS	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Surveying & Geomatics				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To introduce the students to the basic concepts and principles of various components of remote sensing. To provide an exposure to GIS and its practical applications in civil engineering.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	To study the basic concepts of Remote Sensing.	U
CO2	To know about the how the EMR interactions with water, atmosphere and earth surface materials.	U
CO3	To study and apply various image interpretation, enhancement and classification techniques.	Ap
CO4	To acquire knowledge about History, development of GIS and concept of Data Entry, Storage & Maintenance of the DBMS in GIS.	Ap
CO5	To Apply Remote Sensing and GIS in applications in land use, disaster management, and resource information systems.	Ap
CO6	To understand the various components of GIS.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			2			1			3		2		3
	CO2	1		2		3		3	2		1		1	3	
	CO3	3			3						3			3	1
	CO4	3	3	2			3			3		3			3
	CO5										2			2	
	CO6	2			3			3				2			2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I REMOTE SENSING 9

Definition Historical Components of Remote Sensing Principles & methods of remote sensing - Active and Passive remote sensing - Remote Sensing platforms -Electromagnetic radiation- Spectrum- Block body radiation – Planks law – Stefan – Boltzmann law – satellites classification – based on orbit- sun synchronous and Geosynchronous based on purpose Earth Resources satellites, communication satellite Weather satellites Spy satellites Sensors Description of sensor in landscape, spot, IRS series and current satellites- Radar-SLAR and

SAR.

UNIT II EMR INTERACTIONS 9

EMR Interaction with atmosphere- Scattering -Rayleigh, Mie, Non Selective and Raman Scattering, Back scattering- EMR Interaction with water and Ozone- Atmospheric windows and its significance -EMR interaction with the earth surface materials- Radiance, irradiance, Absorbed and Transmitting energy – Reflectance - Specular and diffuse surface, Spectral signature and curves, EMR interaction with soil- Resolution- Spectral, Spatial, Radiometric, and Temporal.

UNIT III DIGITAL IMAGE PROCESSING 9

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys - Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification – Supervised and Unsupervised Classification-DEM- Types, Sources of digital Elevation data-Shuttle Radar Topographic Mission (SRTM) data.

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9

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.

UNIT V REMOTE SENSING AND GIS APPLICATIONS 9

Integration of GIS and Remote Sensing – Applications - Urban Applications-– Water resources – Watershed Management – Rainfall-Runoff Modeling- Flood Mapping-Resources Information Systems and other applications.

TEXT BOOKS:

1. Anji Reddy, “Remote Sensing and Geographical Information Systems” , BS Publications 2001

REFERENCES:

1. Anand P.H,”Principles of remote Sensing and Geographical Information Systems”, Sri Venkateswara Publishers, 2003.
2. Lillesand T.M and Kiefer R.W. Remote sensing and Image, Interpretation, John Wiley and Sons, INC, New York, 1987.
3. Burrough P A,”Principle of GIS for land resource assessment”, Oxford University, 1990.
4. https://nptel.ac.in/courses/105108077/
5. https://nptel.ac.in/courses/105103193/

Course Coordinator HOD

U18PECE032	**CONSTRUCTION PRODUCTIVITY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Construction Technology				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To understand the factors that impact construction productivity, the use of management tools to develop construction productivity improvement programs.		
COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To know about the role of productivity in the construction.	U
CO2	To know Tools to measure productivity in Construction.	U
CO3	To learn the Productivity analysis from Daily Progress Reports.	An
CO4	To learn Techniques for Measuring and Improving Productivity at Construction Sites.	An
CO5	To understand theProductivity improvement measures.	U
CO6	To understand Techniques for Measuring and Improving Productivity at Construction Sites.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3						3			3	1
	CO2	3	3	2			3			3		3			3
	CO3	1		2		3		3	2		1		1	3	
	CO4	1		2		3		3	2		1		1	3	
	CO5	3			3						3			3	1
	CO6	1		2		3		3	2		1		1	3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION 9

Definition of Productivity, Impact of productivities on construction duration and costs, Factors Impacting Construction Productivity, role of productivity in the construction. Constructability and Off-site Construction.

UNIT II PRODUCTIVITY IN CONSTRUCTION 9

Tools to measure productivity in Construction, variousmeasuring productivities of construction equipment, Staff and Labour and typical benchmarks for the same, method of measuring the construction productivity, Factors Affecting Labor Productivity.

UNIT III PRODUCTIVITY ANALYSIS 9

Productivity analysis from Daily Progress Reports; what is Productivity?, Lean Construction concepts of Value Adding activities, Non-Value Adding Activities and Non-Value Adding but Necessary Activities;

UNIT IV FRAMEWORK AND MEASUREMENT 9

Framework for Productivity Improvement in Construction, Productivity measurements by special Lean Construction-oriented field methods such as Work Sampling, Techniques for

Measuring and Improving Productivity at Construction Sites, Takt time analysis, Foreman Delay Surveys;

UNIT V PRODUCTIVITY MANAGEMENT 9

Productivity improvement measures such as Value Stream Mapping, Location-Based management Systems, 5S, good Housekeeping, etc.; use of specialist software such as Vico for productivity studies.

TEXT BOOKS:

1. Construction Productivity:Measurement and Improvement,James J. Adrian, Champaign, IL, Stipes Publishing, L.L.C., 2004.
2. Baldwin, A. & Bordoli, D., A Handbook for Construction Planning and Scheduling, Blakwell Publishers, 2014.
3. Productivity Improvement in Construction, Oglesby, C., parker, H., and Howell, G. New York: McGraw Hill, 1989.

REFERENCES:

1. Construction Productivity- A Practical Guide for Building and Electrical Contractors, Ed: Eddy M. Rojas, J. Ross Publishing, 2008.
2. Knutson, K., Schexnayder, C. J., Fiori, C. & Mayo, R.E., Construction Management Fundamentals, MCGraw Hill Publishers, 2013.
3. https://nptel.ac.in/courses/105102088/
4. https://nptel.ac.in/courses/105106149/

Course Coordinator **HOD**

U18PECE033	**BIOLOGICAL PROCESS FOR CONTAMINANT REMOVAL**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Engineering				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To educate the students on principles and design of various biological treatment units used for wastewater treatment. To study about the treatment of Aerobic and anaerobic process.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Basics of microbiology, metabolism and energetic, bio kinetic parameter, reactors and reactor analyses	R
CO2	Aerobic treatment of wastewater and Process of design considerations.	C
CO3	understand in detail about Anaerobic Treatment of Wastewater	U
CO4	Improvement in the design of sludge	C
CO5	Know the Operations, Maintenance, Management and Case Studies	U
CO6	To carry out case studies on sewage treatment plants.	An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	1		2		3		3	2		1		1	3	
	CO2	3			3						3			3	1

	CO3	3	2		2			1		2	3		2		3
	CO4			2		3		3	2		1		1	3	
	CO5	3			3						3	1		3	1
	CO6		3	2			3			3		3			3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT-I INTRODUCTION 9

Understanding of basics of microbiology, metabolism and energetic, bio kinetic parameter, reactors and reactor analyses. Characterization of waste. Aerobic, anaerobic and anoxic systems. Suspended and attached growth biological systems.

UNIT-II AEROBIC TREATMENT OF WASTEWATER 9

Activated Sludge processand process modifications, Process design considerations, Treatment Ponds and aerated Lagoons, aerobic pond, facultative pond, anaerobic ponds, polishing ponds, constructed wet lands etc. Attached Growth Biological Treatment Systems, Trickling Filters, Rotating Biological Contactors. Activated Biofilters, Moving bed biological reactor (MBBR), Sequential Batch reactors (SBR), Membrane Biological Reactors (MBR)

UNIT-III ANAEROBIC TREATMENT OF WASTEWATER 9

Anaerobic processes, Process fundamentals, Standard, high rate and hybrid reactors, Anaerobic filters, Expanded /fluidized bed reactors, Upflow anaerobic sludge blanket reactors, Performance and design aspects, Expanded granular bed reactors, Two stage/phase anaerobic reactors. Sludge Digestion, anaerobic digestion, aerobic digestion

UNIT-IV SLUDGE TREATMENT AND DISPOSAL 9

Design of sludge management facilities, slude thickening, sludge digestion, biogas generation, sludge dewatering (mechanical and gravity)- upgrading existing plants-ultimate residue disposal- recent advances.

UNIT-V OPERATIONS,MAINTENANCE, MANAGEMENT AND CASE STUDIES 9

Operational problems-trouble shooting, planning, organizing and controlling of plants operations- capacity building, case studies on sewage treatment plants- sludge management facilities.

TEXT BOOKS:

1. Arecivala, S.J., Wastewater treatment for pollution control, TMH, New Delhi 2009.
2.Qasim S.R. Wastewater Treatment Plant, Planning, Design & Operation Technomic Publications, Newyork, 2002.
3.Manual on "Sewerage and sewage treatment" CPHEEO, ministry of Urban development, Gol, New Delhi 1999.

REFERENCES:

1. Metcalf & Eddy, INC , "wastewater Engineering treatment and Reuse. Third edition

Tata McGraw-hill publishing company limited, New Delhi, 2003.
2. Qasim S.R. Wastewater Treatment Plant, Planning, Design & Operation Technomic Publications, Newyork,2002.
3. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105105178/lec43.pf
4. https://nptel.ac.in/courses/105104102/

Course Coordinator **HOD**

U18PECE034	SURFACE HYDROLOGY	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Hydraulics Engineering				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Measure the rainfall intensity , duration and frequency	E
CO2	Assess the losses of precipitation due to evaporation	E
CO3	Prepare the unit hydrograph for surface run off	An
CO4	Solve the flood routine and channel routine problems	E
CO5	Conduct yield test on aquifers	An
CO6	To understand flood estimation by various concepts.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3			2			3			3	1
	CO2	3	3	2			3			3		3			3
	CO3					1			2		2		1	2	
	CO4	2			3			3				2			2
	CO5	3			3						3			3	1
	CO6	3	2		2			1		2	3		2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)

4	Approval	Meeting of Academic Council, May 2018

UNIT I HYDROMETEOROLOGY 9

Hydrological cycle -Hydro meteorological factors -Cloud formation- Winds and their movement -types of precipitation.- Forms for precipitation- Density and Adequacy of rain gauges – Recording and non-recording gauges.

UNIT II PRECIPITATION AND ABSTRACTIONS 9

Spatial distribution – Consistency analysis – Frequency analysis – Intensity, duration, frequency relationships- Evaporation –Infiltration- Norton's equation Infiltration indices – Types of streams – Stage discharge relationships – Flow measurements – Currents meter method for velocity measurements.

UNIT III HYDROGRAPH ANALYSIS 9

Factors affecting the shape of hydrograph- Components of DRH. Baseflow- Unit hydrograph - Scurve hydrograph- Synthetic unit hydrograph.

UNIT IV GROUND WATER HYDROLOGY 9

Occurrence of ground water – Types of aquifer – Dupuifs assumptions – Darcy's law – Estimation of aquifer parameters – Pump tests.

UNIT V FLOOD ANALYSIS 9

Flood estimation – Gumbel's method – log Pearson types III method – Reservoir flood routing, Channel routing, Other methods of routing.

TEXT BOOKS

1. Subramanya K. Engineering Hydrology, Tata McGraw Hill. Publishing Company Limited, 2006

REFERENCES

1. Raghunath H M, Hydrology, Witey Eastern Limited, New Delhi 1998.
2. Vijay Singh P, Elementary Hydrology -Prentice Hall of India, 1998.
3. Mutreja K N, Applied Hydrology, Tata McGraw Hill Publications, New Delhi, 1998.
4. Jayaram Reddy P Hydrology, Tata McGraw Hill Publications, New Delhi, 1998.
5. https://nptel.ac.in/courses/105103026/
6. https://nptel.ac.in/courses/105107129/

Course Coordinator **HOD**

U18PECE035	**REMOTE SENSING AND GIS FOR HYDROLOGY AND WATER RESOURCE MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Hydrology and Water Resource Engineering				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: This subject deals with the basics of hydrology and also various remote sensing and GIS applications in the field of hydrology and water resources.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study the basic knowledge of hydrologic data.	U
CO2	To study the watershed characteristics and its applications.	U
CO3	To acquire knowledge about irrigation and water quality parameters.	U
CO4	To study the ground water resources mapping by remote sensing & GIS.	U
CO5	To study the surface water resources mapping by remote sensing & GIS.	U
CO6	To Assess Groundwater potential zones and Groundwater mapping.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				3				2		2		1	3
	CO2														
	CO3	2	3			2			3				3		2
	CO4									2				2	
	CO5	2			3			3				2			2
	CO6	3			3						3			3	1
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**		Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I FUNDAMENTALS OF HYDROLOGY 9

Hydrological cycle – estimation of various components of hydrological cycle – clouds – rainfall – runoff – evaporation – transpiration – evapotranspiration – interception – depression storage – spectral properties of water – case studies.

UNIT II DRAINAGE BASIN ASSESSMENT 9

Watershed divide – stream networks – Delineation and codification of watersheds – basin morphometric analysis – linear, aerial, relief aspects – Rainfall - runoff modeling – urban hydrology –flood forecasting, risk mapping, damage assessment - soil moisture area – drought forecasting and damage assessment – mitigation- GIS applications for hydrological disaster studies.

UNIT III IRRIGATION AND WATER QUALITY 9

Project investigation – implementation - maintenance stage - location of storage / diversion works – canal alignment – depth - area capacity curve generation - water quality parameters – physical, chemical, biological properties - water quality mapping and monitoring – correlation model for pollution detection and suspended sediment concentration– case studies.

UNIT IV - GROUND WATER RESOURCES APPLICATIONS 9

Types of Aquifers- Formations -confined and unconfined aquifers -Assessment of Groundwater potential zones and Groundwater mapping -Site selection for recharge structures- Hydrogeological Mapping -GIS applications to ground water studies.

UNIT V - SURFACE WATER RESOURCES APPLICATIONS 9

Surface water bodies- lakes, reservoirs, ponds, rivers, channels- mapping- change detection- Water harvesting structures, in-situ and Ex-situ, Mapping and monitoring of catchment and command area, Water logging and salt affected area mapping, Reservoir Sedimentation, sedimentation control-GIS applications to surface water studies

TEXT BOOKS:

1. Jayaram Reddy, "Engineering Hydrology", 2nd Edition, Laxmi publications Pvt. Ltd., New Delhi reprint 2008.
2. K Subramanya, "Engineering Hydrology", Tata Mc GrawHill Publishing Company Ltd., New Delhi, 3rd Edition, 2008.

REFERENCES:

1. Raghunath .H.M, "*Hydrology – Principles – Analysis – Design",* New Age International Publishers, New Delhi. 2006
2. Ramasamy .S.M, "*Remote sensing in water resources",* Rawat publications, New Delhi ,2005.
3. Murty.V.V.N, "*Land and Water Management Engineering"*, Kalyani Publishers, New Delhi – 2002.
4. Agarwal C.S and Garg.P.K, "*Text Book on Remote Sensing in Natural Resources, Monitoring and Management",* Wheeler publishing Co & Ltd., New Delhi, 2010/
5. https://nptel.ac.in/content/storage2/courses/105105110/pdf/m6l03.pdf
6. https://www.iitr.ac.in/departments/HY/pages/Activities+PGDiploma_and_MTech_programmes.html

Course Coordinator **HOD**

U18PECE036	**PRESTRESSED CONCRETE**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Reinforced Concrete Design				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To introduce the need for pre stressing as well as the methods, types and advantages ofprestressing. Students will be introduced to the design of pre stressed concrete structures subjected to flexure.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study the effect of pre-stressing on flexural members	An
CO2	To study the analyze and design procedure for end block	An
CO3	To know about the design of pre-stressed concrete tanks	U
CO4	To understand the concepts of flexural strength of structural members.	U
CO5	To study about the design of pre-stressed concrete bridges	C
CO6	To design anchorage zone reinforcement.	C

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2			3			3				2			2
	CO2	3			3						3			3	1
	CO3	3	2		2			1		2	3		2		3
	CO4	3	3	2			3			3		3			3
	CO5					1			2		2		1	2	
	CO6	2			3			3				2			2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic concepts – Advantages – Materials required – Systems and methods of prestressing - Study of strength, behavior - design of prestressed reinforced concrete members - structures, with primary emphasis on pretensioned - precast construction emphasis on the necessary coordination between design and construction techniques in prestressing.

UNIT II DESIGN OF END BLOCK 9

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block- Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing - Applications.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

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

UNIT IV DESIGN FOR FLEXURE AND SHEAR 9

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

UNIT V PRESTRESSED CONCRETE BRIDGES 9

General aspects pretensioned prestressed bridge decks - Post tensioned prestressed bridge decks - Advantages over R.C.bridges - Principles of design only.

TEXT BOOKS:

1. Krishna Raju N., “Prestressed concrete”, Tata McGraw Hill Company, New Delhi, 2007.
2. K.U.Muthu, Azmi Ibrahim, Maganati Janardhana & Vijaya anand, “Prestressed Concrete, Prentice Hall India Learning Private Limited, 2016.
3. Rajagopalan, N, “Prestressed Concrete”, Alpha Science, 2002
4. Lin T.Y. & Ned H.Burns, “Design of prestressed concrete structures”,Wiley IndiaPrivate Limited,2010.

REFERENCES:

1. IS 1343 – 2012 Code of Practice for Prestressed Concrete by Bureau of Indian Standards.
2. Prestressed Concrete Analysis and Design, Naaman, 2nd Edition, Techno Press 3000, 2004.

3. https://nptel.ac.in/courses/105106117/
4. https://www.scribd.com/doc/119985359/CURSO-NPTEL-Civil-Engineering-Pre-Stressed-Concrete-Structures

Course Coordinator **HOD**

U18PECE037	GEOTECHNICAL DESIGN	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Foundation Engineering				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To impart knowledge on common method of sub soil investigation and design of foundation and to acquire the capacity to investigate the soil condition and to select and design a suitable substructure.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To get well acquainted with the various investigation specifications as per the infrastructure to be build on the proposed site.	An
CO2	To know about the properties of materials required for the constructing a desired infrastructure	U
CO3	To be familiar with design concepts of various foundation systems	An
CO4	To be familiar with design of transportation facilities	An
CO5	To be familiar with methods and tools for structural design, reliability, safety and environmental protection	An
CO6	To identify Problems and solutions to retaining structures.	E

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3				1		3			3	1
	CO2	3	2		2			1		2	3		2		3
	CO3					2								3	
	CO4		2				2		3		2		2		2
	CO5											3			
	CO6	1		2			3			3				3	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I SUBSURFACE SITE EVALUATION **9**

Planning of Exploration and experimental programme, investigations, exploration for preliminary design, exploration for detailed design Geo-physical explorations (soundings,

probings, boring, boring methods), excavation methods for explorations, ground water investigations, rock boring, miscellaneous exploratory techniques

UNIT II DESIGN OF RETAINIG WALLS **9**

Introduction – Design of Retaining structures; Cantilever sheet pile walls; Anchored Sheet pile walls; Braced cuts; Dewatering; Problems and solutions to retaining structures

UNIT III DESIGN OF PAVEMENTS FOR AIRPORTS **9**

Factorsaffectingrigid pavements-Design procedures forrigid pavement– Slab thickness,dowel bar, tiebar,spacingofjoints–IRCguidelines–Airfieldpavements– Comparisonofhighwayandairfield pavements.

UNIT IV DESIGN OF DAMS **9**

Design steps for of gravity dam sections, Expected loadings for gravity dams, Stability analysis of gravity dam sections, Foundation preparation for gravity dams,

UNIT IV DESIGN OF MARINE STRUCTURES **9**

Methods and Tools for Loads and Load Effects;Methods and Tools for Strength Assessment; Experimental Analysis of Structures;Materials and Fabrication of Structures; Methods and Tools for Structural Design and Optimisation; andStructural Reliability, Safety and Environmental Protection.

TEXTBOOKS

1. B.M. Das, Principles of Foundation Engineering, 5th Ed., Thomson Asia, Singapore,2003.
2. N. Som, Theory and Practice of Foundation Design, Prentice Hall, New Delhi, 2003.

REFERENCES

1. Swami Saran, Analysis and design of substructures: Limit State design (2nd ed). Taylor & Francis, Leiden ; New York, 2006.
2. Bowles J.E. Foundation analysis and design, McGraw Hill, 1994.
3. https://nptel.ac.in/courses/105101001/
4. https://nptel.ac.in/courses/105106142/

Course Coordinator **HOD**

U18PECE038	**CONSTRUCTION EQUIPMENT & AUTOMATION**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Construction Technology				
	Course Coordinator Name & Department: Civil Engineering				

COURSE OBJECTIVES: To study and understand the various types of equipments used for earthwork, tunneling, drilling, blasting, dewatering, material handling conveyors and its applications in construction projects.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To know about the Conventional construction methods.	U
CO2	To know about the types of Advanced manual and automated Equipments.	U
CO3	To study about Prestressing jacks and grouting equipment.	U
CO4	To learn aboutthe various Heavy lifting equipments in the construction.	U
CO5	To know about Equipment Productivities in construction.	U
CO6	To identify uses of Drones for spread out sites.	An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		2		1				1		2		2	3
	CO2			3				3			3				
	CO3					2			2			2		2	
	CO4	3			3						3			3	1
	CO5	3	2		2			1		2	3		2		3
	CO6	3	3	2			3			3		3			3
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)		Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I INTRODUCTION 9

Factors affecting selection of equipment and methods – Technical and economic – Construction engineering fundamentals – Analysis of production and output costs;Conventional construction methods, Mechanized methods comparison of construction and Mechanized methods and advantages of latter;

UNIT II EQUIPMENT FOR EARTHWORK 9

Advanced manual and automated Equipment used for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Fundamentals of Earth Work Operations - Earth Moving operations-Types of Earthwork Equipment - Tractors, Motor Graders, Scrapers, Front end Loaders, Earth Movers – capacity calculations.

UNIT III OTHER CONSTRUCTION EQUIPMENT 9

Advanced and latest technology adopted in the plastering machines; Prestressing jacks and grouting equipment; Equipment for Dredging, Trenching, Tunneling, Drilling and Blasting. Equipment for compaction - Types of pumps used in Construction - Equipment for Grouting - Pile Driving Equipment- Equipment of Erection and demolition.

UNIT IV MATERIAL HANDLING EQUIPMENT 9

Heavy lifting equipments in the construction, Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Forklifts and related equipment - Portable Material Bins - Conveyors - equipment used in demolition – Chain Pulley Blocks. Crushers – Feeders - Screening Equipment - Batching and Mixing Equipment – Hauling equipment - Pouring and Pumping Equipment – Ready mixed concrete carriers.

UNIT V AUTOMATION IN CONSTRUCTION 9

Automation in construction, objective of automation, advantage and disadvantage of Automation in construction. Equipment Productivities; Use of Drones for spread out sites; Use of robots for repetitive activities.

TEXT BOOKS:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction Planning, Equipment and Methods, McGraw Hill, Singapore, 2006.
2. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 2008.

REFERENCES:

1. Construction Equipment and Methods: Planning, Innovation**,** by Leonhard E. Bernold, 2015.
2. Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
3. https://nptel.ac.in/courses/105103093/
4. https://nptel.ac.in/courses/105103023/

Course Coordinator **HOD**

PROFESSIONAL ELECTIVE - IV (PE – IV)

U18PECE041	TRAFFIC ENGINEERING & MANAGEMENT	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Design of Steel Structures				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well. To deal with problems in mixed traffic flow and case studies on accident analysis, accident statistical data, methods of representing accident rate.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Analyse traffic problems and plan for traffic systems various uses.	An
CO2	Respond to the situations where short reports and instructions are required.	C
CO3	Design Channels, Intersections, signals and parking arrangements.	C
CO4	Develop our confidence and authority in the practical use of language.	C
CO5	To understand the importance of traffic hazards.	U
CO6	To learn the Significant roles of Traffic control personnel.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				2			3			3			3
	CO2		2		2									2	
	CO3	3	2		2			1		2	3		2		3
	CO4					2								3	
	CO5	2	2				2		3		2		2		2
	CO6	1										3			

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I: **TRAFFIC PLANNING AND CHARACTERISTICS** **9**

Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town ,country ,regional and all urban infrastructure – Towards Sustainable approach – land use & transport and modal integration.

UNIT II: **TRAFFIC SURVEYS** **9**

Traffic Surveys – Speed, journey time and delay surveys – Vehicles - Volume Survey including non-motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation –

Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance

.

UNIT III: **TRAFFIC DESIGN AND VISUAL AIDS** **9**

Intersection Design - channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation - Traffic signs including VMS and road markings – Significant roles of Traffic control personnel - Networking pedestrian facilities & cycle tracks.

UNIT IV: **TRAFFIC SAFETY AND ENVIRONMENT9**

Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public transportation – Promotion of non-motorized transport.

UNIT V: **TRAFFIC MANAGEMENT** **9**

Area Traffic Management System - Traffic System Management (TS) with IRC standards – Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods Congestion and parking pricing – All segregation methods- Coordination among different agencies– Intelligent Transport System for traffic management, enforcement and education.

TEXTBOOKS:

1. Alexa Delbosc and William Young, “Traffic engineering and Management, Monarsh University, 2017.
2. V.Sanakara Subramaniyan, “Traffic Engineering and Management”, Lakshmi Publications, 2013.
3. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2011.
4. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
5. Salter. R.I and Hounsell N.B, " Highway Traffic Analysis and design", Macmillan Press Ltd.1996.

REFERENCES:

1. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, “Principles of Highway Engineering and Traffic Analysis”, Wiley India Pvt. Ltd., New Delhi, 2011
2. Hobbs.F.D. "Traffic Planning and Engineering", University of Birmingham, Peragamon Press Ltd, 2005
3. SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994
4. John E Tyworth, "Traffic Management Planning, Operations and control", Addison Wesly Publishing Company, 1996 .
5. Taylor MAP and Young W, " Traffic Analysis – New Technology and New Solutions", Hargreen Publishing Company, 1998.
6. https://nptel.ac.in/courses/105107123/
7. http://www.nptelvideos.in/2012/11/transportation-engineering-ii.html
8. https://theconstructor.org/transportation/sight-distance-highway-engineering/10977/

Course Coordinator **HOD**

U18PECE042	**SUSTAINABLE CONSTRUCTION METHODS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Design of Steel Structures				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To introduce the different concepts of sustainable design and green building techniques and how they may be synthesized to best fit a specific construction project.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To learn the Modular construction methods for repetitive works.	U
CO2	To know about the Precast concrete construction methods.	U
CO3	To learn to Identify cutting edge sustainable construction materialsand technologies.	U
CO4	To learn about highly successful recent green construction projects.	U
CO5	To know about the design, evaluation, and production of green construction materials.	C & E
CO6	To learn the Preparation for the LEED Green Associate professional licensing exam.	U & R

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		3				3		1	3		3	2	
	CO2	3				3			2			3			3
	CO3									3			2		
	CO4	2	2		2		2					2		2	2
	CO5	3	2		2			1		2	3		2		3
	CO6			1		2						1		3	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION 9

Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls); Modular construction methods for repetitive works;

UNIT II SUSTAINABLE METHODS OF CONSTRUCTION 9

Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges;

UNIT III TECHNIQUES AND EVELUATION 9

Identification of cutting edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to

reduce the negative environmental impacts of construction activity.

UNIT IV GREEN BUILDING CONCEPTS 9

Examination of the current LEED for New Construction rating system, and case study analysis of highly successful recent "green construction projects" through student team assignments and presentations. Preparation for the LEED Green Associate professional licensing exam.

UNIT V ENVIRONMENTAL IMPACT 9

Environmental impact of materials; life-cycle assessment; material selection to optimize performance; design, evaluation, and production of green construction materials.

TEXT BOOKS:

1. Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John Wiley and Sons Inc, 2001.
2. Energy Conservation Building Code, Bureau of Energy Efficiency, New Delhi,2007.
3. Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995.
4. Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministry of Non Conventional Energy Sources, 2002.
5. Moore, F., Environmental Control System, McGraw Hill Inc. 2002.
6. Tyagi, A.K. (Ed). Handbook on Energy Audits and Management Tata Energy Research Institute, 2000.

REFERENCES:

1. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery,John Wiley & Sons,2005.
2. Lynne Elizabeth, Cassandra Adams “Alternative Construction : Contemporary Natural Building Methods ”, Softcover, Wiley & Sons Australia, Limited, John,2005.
3. https://www.smartcitiesdive.com/ex/sustainablecitiescollective/best-practice-sustainable-construction/166496/
4. https://www.pmi.org/learning/library/sustainability-construction-industry-7099
5. https://nptel.ac.in/courses/105102195/

Course Coordinator **HOD**

U18PECE043	**SOLID AND HAZARDOUS WASTE MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To educate the students on the principles involved in the management of municipal solid waste and hazardous wastes- from source identification up to final disposal.

COURSE OUTCOMES (COs):		**Revised Bloom’s Taxonomy**
CO1	Understand the fundamentals Types and Sources of solid and hazardous wastes.	U
CO2	Understand about Waste generation rates and variation-Composition, physical, chemical and biological properties of solid wastes	U
CO3	Understand the Handling and segregation of wastes at source- storage and collection of municipal solid wastes.	U

CO4	Improve the Objectives of waste processing- material separation and processing technologies.	Ap
CO5	Know the Waste disposal options- Disposal in landfills.	R
CO6	To understand the Need for transfer and transport.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			2		2			3				2	3
	CO2		1								3		3		
	CO3	2			3			2						1	3
	CO4								1	3			2		
	CO5	2	2		2		2					2		2	2
	CO6	3	2		2			1		2	3		2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION 9

Types and Sources of solid and hazardous wastes-Need for solid and hazardous waste management- Elements of integrated waste management and roles of stakeholders- Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, lead acid batteries, plastics and fly ash,financing waste management.

UNIT II WASTE CHARACTERIZATION AND SOURCE REDUCTION 9

Waste generation rates and variation-Composition, physical, chemical and biological properties of solid wastes- Hazardous Characteristics- TCLP tests- waste sampling and characterization plan- source reduction of wastes- Recycling and reuse- waste exchange.

UNIT III STORAGE, COLLECTION AND TRANSPORT OF WASTES 9

Handling and segregation of wastes at source- storage and collection of municipal solid wastes- Analysis of collection systems- Need for transfer and transport- Transfer stations Optimizing Waste allocation- compatibility, storage, labeling and handling of hazardous wastes- hazardous waste manifests and transport.

UNIT IV WASTE PROCESSING TECHNIQUES 9

Objectives of waste processing- material separation and processing technologies- biological and chemical conversion technologies-method and controls of composting- thermal conversion technologies and energy recovery- incineration- solidification and stabilization of hazardous wastes- treatment of biomedical wastes.

UNIT V WASTE DISPOSAL 9

Waste disposal options- Disposal in landfills- Landfill Classification, types and methods- site

selection- design and operation of sanitary landfills, secure landfills and landfill bioreactors- leachate and landfill gas management- landfill closure and environmental monitoring- closure of landfills- landfill remediation.

TEXT BOOKS

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil "Integrated Solid Waste Management, McGraw- Hill International edition, New York, 2000.
2. M.N. Rao, Razia Sultana, Sriharsha Kota Solid and Hazardous Waste Management, Science and Engineering, , BSP Publishers, 2017
3. Kanthi. L. Shah, Basics of Solid and Hazardous Waste Management Technology, 2000

REFERENCES:

1. CPHEEO "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi, 2000.
2. Micheael D. Lagrega, Philip L Buckingham, Jeffrey C. E vans Environmental Resources Management, Hazardous waste Management, McGraw- Hill International edition, New york, 2001.
3. Vesilind P.A., Worrell W and Reinhart, Solid Waste Engineering, Thomson Learning Inc., Singapore, 2002.
4. https://nptel.ac.in/courses/105106056/
5. https://ec.europa.eu/environment/waste/studies/pdf/climate_change.pdf
6. https://www.epa.gov/homeland-security-waste/waste-management-options-homeland-security-incidents

Course Coordinator **HOD**

U18PECE044	**PIPELINE ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Introduction to Fluid mechanics				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To educate the students in detailed design concepts related to water transmission mains, water distribution system and buried pipes with emphasis on computer application.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To gain knowledge about water supply systems	Ap
CO2	To be able to understand hydraulic principles	U
CO3	To design storm water distribution network.	C
CO4	To to analyze pipe network problems using computer software .	An
CO5	The students will be able to get a basic knowledge of the design of pipe networks.	C & Ap
CO6	To understand the Basic equations of unsteady flows.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2				2			3			2		3
	CO2	2	2		2		2					2		2	2
	CO3	3	2		2			1		2	3		2		3

	CO4	2			3			2						1	3
	CO5								1	3			2		
	CO6	2	2		2		2					2		2	2
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)		Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I WATER SUPPLY SYSTEMS 9

Water requirement – sources of water – water demand – reservoir storage – nodal hydraulic gradient level values - water supply consideration, Types of water supply systems- piping system- distribution network- labeling- network components – Network models – design – optimization in practice.

UNIT II HYDRAULIC PRINCIPLES AND NETWORK PARAMETERS 10

Energy and hydraulic gradient lines – head loss in links – equivalent pipes – series – parallel pipes – path head loss and loop head loss – analysis of water distribution network- static node, dynamic node – network performance – flow analysis - Layout – in situ lining - pipes material – appurtenances – minimization of water losses – leak detection.

UNIT III STORM WATER DISTRIBUTION AND BURIED PIPES 9

Planning – runoff estimation – rainfall data analysis – storm water drain design Introduction to Buried pipes – external loads – gravity flow design, pressurized flow- rigid and flexible pipes – installation – trenchless technology

UNIT IV RELIABILITY ASSESSMENT AND DESIGN 8

Uncertainty and reliability – affecting events- assessment – reliability parameters- configurations. Design methodology - strengthening and expansion

UNIT V FLUID TRANSIENTS 9

Basic equations of unsteady flows through closed conduits. Method of characteristics. Transients caused by centrifugal pumps and hydroelectric power plants.

TEXT BOOKS

1. Bhave P. R, "Optimal design of water distribution networks", Narosa publishing House, New Delhi, 2003
2. Bajwa. G. S, "Practical handbook on Public Health Engineering", Deep publishers, Shimla 2003
3. Manual on water supply and treatment", CPHEEO, Ministry of Urban Development, GOI,New Delhi, 1999

REFERENCES:

1. B.A. Hauser, "practical hydraulics" Hand Book, Lewis Publishers, New York, 1991
2. Moser A. P, "Buried pipe Design", 3rd Edition, American Water Works Association
3. Robert van Bentum and Lan K. Smout, "Buried Pipe lines for surface Irrigation", The Water, Engineering and Development Centre, Intermediate Technology Publications,UK,1994

4. Wurbs R.A., and James W.P. "Water Resources Engineering". Prentice Hall of India, Eastern Economic Edition. ISBN: 81-203-2151-0, New Delhi, 2007. https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/98WR01377
5. https://becht.com/articles/fluid-transients-in-piping-systems-1
6. https://ascelibrary.org/doi/book/10.1061/9780784407455

Course Coordinator **HOD**

U18PECE045	**URBAN HYDROLOGY AND HYDRAULICS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Hydraulic Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: The primary objective is the demonstration and understanding of the fundamental concepts and processes associated with the hydraulic and water quality design, operation and performance aspects of urban drainage systems.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To develop understanding in current urban pollution problems, and to identify mitigation/rehabilitation measures	U
CO2	Students will gain a sound understanding of the modelling tools, which can be used to aid decision-making in urban water and urban pollution management	U
CO3	To get experience in the use of modelling tools through applications within the Integrated Project case studies	Ap
CO4	Students will be familiar with human influences on the quantity and quality of stormwater runoff from urban catchment	Ap
CO5	Able to apply continuity, energy and momentum principles to the analysis of flows and design of stormwater infrastructure	Ap
CO6	To understand the Computer models for urban storm water modeling in software applications.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1			3			3		1	3			2		1
	CO2	2	2		2		2					2		2	2
	CO3	3	2		2			1		2	3		2		3
	CO4	3				2			3			3			3
	CO5		2		2									2	
	CO6	3	2		2			1		2	3		2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I URBANIZATION 9

Introduction - Urbanization -Stormwater runoff quantity and quality issues – Rainfall design for urban catchments – Hydrologic and probabilistic description of rainfall – Design rainfall – Methods for construction of design storm hyetographs – Rainfall excess calculations – Computation of abstractions –Combined loss models. Calculation of runoff rates-basic concepts – elements of urban runoff hydrographs – Time of Concentration –Definition and calculation by various methods – Unit hydrograph method – NRCS method

UNIT II OPEN CAHNNEL FLOW 9

Open-channel flow – Definitions - States of open channel flows – Open Channel flow equations – Steady Gradually varied flow – Normal flow – Open channel rating curve – Overland flow – Kinematic wave model – overland flow on impervious and pervious surfaces – Channel flow routing– simplified and numerical models

UNIT III DESIGN OF DRAINAGE STRUCTURES 9

Design of storm water drainage structures –Drainage design for street pavements – Storm sewer systems – Culverts – Surface drainage channels Urban flooding and associated issues – Detention basins – Stage-discharge relationship - Detention basin design - Infiltration structures- Infiltration basins, Trenches

UNIT IV STORM WATER MODELS 9

Strom water quality control - Concepts of Best management Practices(BMP)and Low Impact developments(LID) – Advantages – Computer models for urban storm water modelling – Public domain and general packages of HEC-HMS, HEC-GeoHMS, EPASWMM.

UNIT V HYDRAULIC ANALYSIS OF DRAINAGE STRUCTURES 9

Hydraulic analysis and design of urban, highway, airport, and small rural watershed drainage problems;runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts.

TEXT BOOKS

1. Osman Akan, A and Robert J. Houghtalen, Urban Hydrology, Hydraulics, and Stormwater Quality: Engineering Applications and Computer Modeling, John Wiley and Sons, revised edition, 2013
2. Ven T Chow, David Maidment, and Larry Mays, Applied hydrology, Tata Mc-graw Hill, First edition, 2011

REFERENCES

1. National Engineering Handbook, Part 630, Natural Resources Conservation Service, United States Department of Agriculture
2. Storm Water Management Model Applications Manual, USEPA - EPA/600/R-09/077, July 2009
3. HEC-HMS Technical Reference Manual, US Army Corps of Engineers, CPD-74B, March 2013.
4. https://nptel.ac.in/courses/105101002/
5. https://flh.fhwa.dot.gov/resources/design/pddm/Chapter_07.pdf
6. https://www.integratedstormwater.eu/sites/www.integratedstormwater.eu/files/materials/urbanhydrology_by_juanjo_galan_aalto_university.pdf

Course Coordinator HOD

U18PECE046	METAL STRUCTURAL BEHAVIOUR	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Design of Steel Structures				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: This course deals with some of the special aspects with respect to Civil Engineering structures using steel material.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	Design of plate girders, web and flange design, curtailment of flange plates.	C
CO2	Design of simple and built up columns subject to combined bending and axial loads	C
CO3	Design of light gauge steel sections.	C
CO4	Design of special type of heavy-duty connections for steel frames.	C
CO5	To study shape factor, plastic hinge, plastic moment , plastic analysis of beams.	U
CO6	To Design flexural and compression members applications.	C

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2	2		2		2					2		2	2
	CO2	3	2		2			1		2	3		2		3
	CO3	2			3	1		2				2		1	3
	CO4								1	3			2		
	CO5	3	2		2			1		2	3		2		3
	CO6	3				2			3			3		1	3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT 1 COMBINED BENDING AND AXIAL LOADS 9

Design of simple and built up columns subject to combined bending and axial loads - design of column base and connections to foundation.

UNIT II PLATE GIRDER 9

Design of plate girders – web and flange design – curtailment of flange plates – Design of stiffeners and splices – tension field action- Design of gantry girder.

UNIT – III DESIGN OF CONNECTIONS 9

Types of connections – Design of framed beam connection – Seated beam connections – Unstiffened, Stiffened seat connections. Continuous beam-to-beam connections and continuous beam-to-column connection both welded and riveted.

UNIT IV PLASTIC THEORY 9

Introduction – shape factor – Moment redistribution – Static, Kinematic and Uniqueness theorems – Combined mechanism – Analysis of single bay and two bay portal frames – Methods of plastic moment distribution – Effect of axial force and shear force on plastic moments – Connections Moment resisting connection – Design of continuous beams.

UNIT V LIGHT GAUGE STEEL SECTIONS 9

Introduction to cold formed steel member geometric properties – Flat width – Effective width concepts, stiffened and un-stiffened compression elements and their stress distribution across the section. Behavior – Design of flexural and compression members.

TEXT BOOKS:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002
2. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.
3. https://nptel.ac.in/courses/105106053/
4. http://home.iitk.ac.in/~ag/ME721/intro.pdf
5. https://www.researchgate.net/publication/301358504_Plastic_theory_of_structures

Course Coordinator **HOD**

U18PECE047	**INDUSTRIAL STRUCTURES**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Foundation Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: This course deals with some of the special aspects with respect to Civil Engineering structures related to industries.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the design of industrial buildings frames	U & C
CO2	To know the analyze and design of chimney, tower	An
CO3	To understand the analysis and design of silos and bunkers	U & An
CO4	To study about the analysis and design of cylindrical shell structures, folded plates	U & An
CO5	To impart the students about the design concept of machine foundation	C
CO6	To get knowledge on Structural design of foundation.	An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	2		2			1		2	3		2		3
	CO2	2			3	1		2						1	3
	CO3		2				2			3			2		3
	CO4	2	2		2		2					2		2	2
	CO5	3	2		2			1		2	3		2		3
	CO6		2				2			3			2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I **9**

Industrial steel building frames - Types of frames, bracing, crane girders and columns, workshop sheds, trussed bents, Pressed steel tank, circular tank

UNIT II **9**

Transmission and Communication towers - Types and configuration - Analysis and design - Chimneys - Loads and stresses in chimney shaft, Earthquake and wind effect - Stresses due to temperature difference, combined effect of loads and temperature, temperature - Design of chimney

UNIT III **9**

Silos and Bunkers - Jassen's theory, Airy's theory, Shallow and deep bins, Rectangular bunkers with slopping bottom, Rectangular bunkers with high side walls - Steel stacks.

UNIT IV **9**

Introduction, force acting on a steel stack, design consideration, design example of stacks - Concrete Shell Structures - Folded plate and cylindrical shell structures - Introduction, structural behaviour of long and short shells, beam and arch action - Analysis and design of cylindrical shell structures - Analysis and design of folded plates.

UNIT V **9**

Machine foundations – Introduction to machine vibration - Structural design of foundation to rotary machines, impact machines, vibration characteristics - Design consideration of foundation to impact machine, grillage, pile and raft foundation.

TEXT BOOKS:

1. Ramamrutham.S., "Design of Reinforced Concrete Structures", Dhanpat Rai Publishing Pvt.Ltd.
2. Varghese.P.C., " Limit State Design of Reinforced Concrete", Prentice Hall.
3. Bhavikatti.S.S., "Design of Steel Structures", J.K. International Publishing HousePvt.Ltd

REFERENCES:

1. Henn W. “Buildings for Industry”, Vol.I and II, London Hill Books.
2. Swamy Saran, Analysis and Design of substructures, Oxford and IBH Publishing Ltd.SP32-1986, Handbook on Functional Requirements of Industrial buildings, Bureau of Indian Standards.
3. https://nptel.ac.in/courses/105105162/
4. https://www.researchgate.net/publication/305247433_What_Is_Industrial_Structure

Course Coordinator **HOD**

U18PECE048	**ENVIRONMENTAL GEOTECHNOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Geotechnical Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To develop an understanding of the geotechnical aspects in the disposal of wastematerials and the remediation of environmentally contaminated sites.

COURSE OUTCOMES (COs):		**Revised Bloom’s Taxonomy**
CO1	Learn the concept of interaction between waste and soiland pollutant movement in the ground.	U
CO2	Get familiarized with the role of geotechnical engineering in waste management.	R
CO3	Have an exposure to various waste disposal methods	R
CO4	Understand the landfills and land fill liners	U
CO5	Understand the relevance of various ground remediation technologies	U
CO6	To get knowledge on Ground water remediation technologies.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		3			3			3		2		2	3
	CO2				2				1	3			2		
	CO3	3	2		2			1		2	3		2		3
	CO4	3				2			3			3		1	3
	CO5	2	2		2		2					2		2	2
	CO6	3	2		2			1		2	3		2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION **9**

Introduction to environmental geotechnology , Environmental cycles & interaction, Soil water environment interaction, Causes of soil pollution, Factors governing soil pollutant interaction

UNIT II SOURCES OF WASTES ANDCONTAMINANT TRANSPORT9

Waste characteristics - Sources and types of wastes, Contaminant transport in sub surface : advection, diffusion, dispersion, Contaminant transformation : sorption, biodegradation, ion exchange, precipitation, Ground water pollution : pollution of aquifers bymixing of liquid waste – protecting aquifers.

UNIT III WASTE DISPOSAL METHODS 9

Objectives of waste disposal facilities – site selection, criteria for waste disposal, Methods of disposal: surface impoundment systems, Sub-surface disposal, passive containment systems, landfills.

UNIT IV: LANDFILLS 9

Landfill – types, requirements, components – Siteselection, Leachate and gas generation – primary and secondary, leachate, Leachate collection and removal system– gas collection and removal system, Landfill liners – compacted clay liners, geosyntheticclay liners, geomembrane liners.Landfill cover system – end uses of closed landfills.

UNIT V:GROUNDREMEDIATIONTECHNOLOGIES 9

Soil remediation technologies: soil washing, Electrokinetic remediation, Soil vapour extraction, bioremediation, stabilization, and solidification, Ground water remediation technologies, Pump and treat, insitu flushing, bioremediation, air sparging, reactive well.

TEXT BOOKS

1. Hsai- Yang Fang, “Introduction to Environmental Geotechnology,- CRC Press”, New York, 2009.

REFERENCES:

1. David. E. Daniel, “Geotechnical practice for waste disposal”– Chapman and Hall – London, 1993.
2. Wentz .C.A, Hazardous, “Waste Management”, McGraw Hill Publishing Company, Singapore, 1989.
3. https://www.sciencedirect.com/science/article/pii/S1110062118301375
4. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105105178/lec16.pf

Course Coordinator HOD

PROFESSIONAL ELECTIVE - V (PE – V)

U18PECE051	PAVEMENT DESIGN	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Reinforced Concrete Design				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, he/she will be in a position to assess quality and serviceability conditions of roads. Also get familiar with pavement design methods for highways and airports.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To know the different types of pavements.	R
CO2	Understand the importance of stress distribution.	U
CO3	To learn the design procedures of rigid pavements.	An
CO4	To learn the design procedures of flexible pavements.	An
CO5	To evaluate the performance and maintenance of the pavements.	E
CO6	To get knowledge on Testing and field control Stabilization for rural roads in India.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3		3				3			3			3	3
	CO2	2				2		2		2		2			
	CO3			2					3		2			3	2
	CO4	1	2				2			3			2		3
	CO5	2	2		2		2					2		2	2
	CO6	3	2		2			1		2	3		2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I: TYPE OF PAVEMENT AND STRESS DISTRIBUTION **8**

Introduction – Pavement as layered structure – Pavement types rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading.

UNIT II DESIGN OF FLEXIBLEPAVEMENTS **10**

Flexible pavement design factors influencing design of flexible pavement, Empirical - Semi empirical and theoretical methods – Design procedure as per IRC guidelines Design and specification of rural roads.

UNITIII DESIGN OF RIGID PAVEMENTS **9**

Cement concrete pavements factors influencing CC pavements Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNITIV PERFORMANCE EVALUATION &MAINTENANCE 9

Pavement Evaluation - causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural - Evaluation by Deflection Measurements Pavement Serviceability index - Pavement maintenance (IRC Recommendations only).

UNIT V STABILIZATION OFPAVEMENTS 8

Stabilization with special reference book to highway pavements – Choice of stabilizers – Testing and field control Stabilization for rural roads in India – use of Geosynthetics in roads.

TEXTBOOK:

1. Khanna, S.K., Justo C.E.G. and Veeraragavan. A., "Highway Engineering", NemChand and Brothers, 10th Edition, Roorkee, 2014.
2. Kadyali, L.R. Principles and Practice of Highway Engineering", Khanna tech.Publications, New Delhi, 2013.
3. Wright P.H. "Highway Engineers", John Wiley and Sons, Inc., New York, 1996.

REFERENCES:

1. Rajib B.Mallick, Tahar El-Korchi, "Pavement Engineering: Principles and Practice, 2nd Edition, CRC Press, 2013.
2. IRC-37–001, Indian roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi, 2001.
3. Yoder, R.J. and Witchak M.W. "Principles of Pavement Design", John Wiley 2000.
4. IRC 58-1998. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, New Delhi, 1991.
5. https://drive.google.com/file/d/1X41yOxW56wV1Vp_ZQVvF7wbfJOO2G0t9/w
6. https://archive.org/stream/textbookonroadsp00spalrich?ref=ol#page/8/mode/2up

Course Coordinator **HOD**

U18PECE052	**CONSTRUCTION ENGINEERING MATERIALS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Building Materials & Testing Methods				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To learn about properties of most common and advanced building materials and to understand the typical and potential applications of these materials.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To know about Concretes and behaviour of concretes.	U
CO2	To know about Coatings to reinforcement and anticorrosive polymer coating,	U
CO3	To learn about composites materials used in construction.	R
CO4	To know about Water Proofing Compounds.	R
CO5	To know about Smart and Intelligent Materials for intelligent buildings.	R
CO6	To learn the Application of carbon fibre reinforced polymers and glass fibre reinforced polymers.	R

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				2			3			3		1	3
	CO2	2	2		2		2					2		2	2
	CO3	3	2		2			1		2	3		2		3
	CO4	2		2				2				2		1	
	CO5			2					3		2			3	2
	CO6	1	2				2			3			2		3
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)		Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I BUILDING MATERIALS 9

Stone as building material; Requirement of good building stones, Deterioration and Preservation of stone work. Bricks; Classification, Manufacturing of clay bricks, Requirement of good bricks. Field and laboratory tests on bricks; Mortar: types and requirements.Concretes, - High Strength and High Performance Concrete – Fibre Reinforced Concrete- Light weight concrete - Polymer concrete - Self compacting concrete – Vaccum concrete - Alternate Materials to concrete

UNIT II METALS 9

Steels – New Alloy Steels – Aluminum and its Products –Coatings to reinforcement – anticorrosive polymer coating, anticorrosive treatment inhibited cement slurry coating, cement polymer composite coating and epoxy coated reinforcement – Applications.

UNIT III COMPOSITES 9

Composition – Constitutents – mouldings methods – tooling materials and their selection - Plastics – Representative polymers - Reinforced Polymers – Fibre reinforced polymer (FRP) – Fibre process and moulding process – Application of carbon fibre reinforced polymers and glass fibre reinforced polymers.

UNIT IV OTHER MATERIALS 9

Polymers in Civil Engineering-Structural Plastics And Composites- Polymer MembranesCoatings-Adhesives, Non - Weathering Materials-Flooring And Facade Materials-Glazed Brick, Photo Catalytic Cement, Acid Etched Copper And Composite Fiber. Precast Flat Panel System, 3d Volumetric Construction, Tunnel Boring Methods, Precast Foundations. Fabrication of Pre Cast And Pre Stressed Components.3 D printing, Recycling of Construction and Demolition wastes.

UNIT V SMART AND INTELLIGENT MATERIALS 9

Smart and Intelligent Materials for intelligent buildings - Matrix tool for assessing the performance of intelligent buildings –Intelligent buildings technology – Thermal comfort ,

Visual comfort and Indoor air quality – climate , building-climate interaction - Energy Management systems – Smart BuildingsEvalution Tool.

TEXT BOOKS:

1. Sushil Kumar "Building Materials and construction", 20th edition, reprint 2015, Standard Publishers.
2. Dr. B.C.Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) ltd., New Delhi, 2012
3. Rangawala S. C. "Engineering Materials", Charter Publishing House, Anand, India, 2017.

REFERENCES:

1. Ashby, M.F. and Jones.D.R.H.H. "Engineering Materials 1: An introduction to Properties, applications and designs", Elsevier Publications, 2005.
2. S.K.Duggal, "Building Materials", (Fourth Edition)New Age International (P) Limited, 2016.
3. national building code of india 2016 (nbc 2016).
4. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
5. M. S. Shetty, "Concrete Technology", S. Chand & Co. New Delhi, 2007.
6. https://easyengineering.net/ce6401-construction-materials-cm_15/
7. https://drive.google.com/file/d/140fhAAWFw-MEDHcc-JSqAshTgRYmtB5p/view

Course Coordinator **HOD**

U18PECE053	**AIR , NOISE POLLUTION AND CONTROL**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Sciences				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: This subject covers the sources, characteristics and effects of air and noise pollution and the methods of controlling the same. The student is expected to know about source inventory and control mechanism.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To make them understand the fundamentals characteristics and effects of air and noise pollution and the methods of controlling the same	U
CO2	To understand about the ambient air quality standards and air quality monitoring	
CO3	To know the Removal of gaseous pollutants by adsorption, absorption, reaction and other methods	R
CO4	To improve the knowledge Basics of acoustics and specification of sound	R
CO5	To know about the Psychoacoustics and noise criteria, effects of noise on health, annoyance rating schemes	R
CO6	To learn the Biological air pollution control technologies.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	2		2			1		2	3		2		3
	CO2	2			3	1		2						1	3

	CO3		2				2			3			2		3
	CO4	2	2		2		2					2		2	2
	CO5	3	2		2			1		2	3		2		3
	CO6		2				2			3			2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION 9

Air pollutants, Sources, classification, Combustion Processes and pollutant emission, Effects on Health, vegetation, materials and atmosphere, Reactions of pollutants in the atmosphere and their effects-Smoke, smog and ozone layer disturbance, Greenhouse effect..

UNIT II AMBIENT AIR QUALITY STANDARDS AND AIR QUALITY MONITORING 9

Air sampling and pollution measurement methods, principles and instruments, Ambient air quality and emission standards, Air pollution indices, Air Act, legislation and regulations, control principles

UNIT III REMOVAL OF AIR POLLUTANTS 9

Removal of gaseous pollutants by adsorption, absorption, reaction and other methods. Particulate emission control, settling chambers, cyclone separation, Wet collectors, fabric filters, electrostatic precipitators and other removal methods like absorption, adsorption, precipitation etc. Biological air pollution control technologies.

UNIT IV NOISE POLLUTION 9

Noise pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation;

UNIT V NOISE POLLUTION CONTROL 9

Psychoacoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Noise control methods.

TEXT BOOKS:

1.Air Pollution Control Engineering, Keshav Kant, Khanna Publishing House Keshav Kant, Rajni Kant 2018

2. Anjaneyulu D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.

3. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi,2003

4. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.

REFERENCES:

1. Stern A.C. *ed*, " Air Pollution Vol. I, II & III", Academic Press, New York, 1968
2. Cunniff P.F, "Environmental Noise Pollution", John Wiley & Sons, New York. 1977.
3. Docks H.M., "Environmental Pollution", John Wiley & Sons. New York 1981.
4. Chanlett T Emit,"Environmental Protection", McGraw Hill series in Water Resources and Environmental Engineering, New York. 1973.
5. Patrick C.F,"Environemental noise pollution", John Wiley & Sons, 1977.
6. https://gradeup.co › air-noise-pollution-study-notes-for-civil-engineering-i.
7. https://www.europarl.europa.eu › factsheets › sheet › air-and-noise-pollution
8. https://www.springer.com

Course Coordinator **HOD**

U18PECE054	**TRANSIENTS IN CLOSED CONDUITS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Hydrology and Water Resources Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To equip the students with the comprehensive knowledge of concepts of unsteady closed conduit flow by building on their steady flow understanding of the subject which was introduced to them in their undergraduate curriculum. Emphasis should be on use of computer programs for transient analysis.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Solve simple and varied hydraulic problems related to surge problems.	E
CO2	Formulation of boundary conditions for transient analysis.	E
CO3	Transient analysis for penstocks of hydroelectric schemes.	An
CO4	Design of air chambers, air valves, pressure regulating valves for transient loads.	C
CO5	To create software awareness for transient analysis.	C
CO6	To get awareness about commercially available software for transient analysis.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2	2		2		2					2		2	2
	CO2	3	2		2			1		2	3		2		3
	CO3	2		2				2				2		1	
	CO4			2					3		2			3	2
	CO5		2				2			3			2		3
	CO6	2	2		2		2					2		2	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT 1 INTRODUCTION TO PIPE HYDRAULICS 9

Pipes – Hydraulic of pressure flow. Steady state and unsteady state-Darcy's equation for flow thro' pipes. Analysis and design of pipe systems like pipes in series and parallel.

UNIT II PIPE NETWORKS 9

Design of pipes. Pipe networks - Analysis and design using various methods. Use of softwares in design. Practical examples, difficulties and solutions.

UNIT III UNSTEADY FLOW MEASUREMENTS 9

Flow measurements. Concepts of unsteady flow - Basic differential equations of unsteady flow in closed conduits – Solutions by method of characteristics – Algebraic and graphical water hammer. Additional boundary conditions and systems elements.

UNIT IV POWER PLANT HYDRAULICS 9

Methods for controlling transients in closed conduits. Application in Lift Irrigation, Hydropower, Urban and Rural water supply – Power Plant Hydraulics.

UNIT V FLUID TRANSIENTS 9

Formulation of boundary conditions; transients in pumping mains (power failure; pump start up); transients in penstocks of hydro-electric schemes; analysis for transient control using surge tanks;

TEXT BOOKS:

1. RW Fox & McDonald AT, "Introduction to Fluid Mechanics"– John Wiley, 2011
2. SW Yuan, "Foundations of Fluid Mechanics"- Prentice-Hall (India), 1988

REFERENCES:

1. Fluid Mechanics –Feathertone and Nallulri,2016
2. Hydraulic transients – Streeter ,McGraw-Hill, 2007
3. Fluid Mechanics – Wiley & Streeter,1996.
4. https://mountainscholar.org › bitstream › handle
5.https://baywork.org › 2017/07 › Hydraulics-Webinar-Slides_6-21-17
6. https://www.ijirset.com › upload › july › 323_Hydraulic

Course Coordinator **HOD**

U18PECE055	**WATER & WASTE WATER TREATMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Physico-Chemical Processes for Water and Wastewater Treatment				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To impart knowledge on fundamental theory underlying the unit processes utilized in the treatment of water for domestic and industrial usage, and in the treatment of domestic and industrial wastewaters.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Transportation through conduits and open channel and its design	C
CO2	Design of distribution system	C
CO3	Flow estimation, conventional and model based design of sewer pumps and pumping stations	An

CO4	Advances in Sewage Treatment.Removal of organic contents	U
CO5	Design of storm water drainage systems, inlets, storm water pumping, operation and maintenance.	C
CO6	To get knowledge on Biological treatment methods.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1			2					3		2			3	2
	CO2		2				2			3			2		3
	CO3	2	2		2		2					2		2	2
	CO4		2				2			3			2		3
	CO5	2	2		2		2					2		2	2
	CO6	3	2		2			1		2	3		2		3
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)		Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I TRANSPORT OF WATER 9

Transportation through conduits and open channel and use of same for the design, operation and maintenance of these systems. - Unit operations and processes - Principles, functions and design of flash mixers, floculators, sedimentation tanks and filters. Disinfection - Aeration – iron and manganese removal, defluoridation and demineralization – Water softening.

UNIT II WATER SUPPLY SYSTEM 9

Storage requirements, impounding reservoirs, intake structures, pipe hydraulics, design of distribution system, distributing and balancing reservoirs, pipe materials, appurtenances, design for external loads, maintenance and operations.

UNIT III SANITARY SEWERAGE SYSTEMS 9

Flow estimation, sewer material, hydraulics of flow in sewer, sewer layout, sewer transitions, materials of sewer, appurtenances, manholes, sewer design, conventional and model based design sewer pumps and pumping stations, corrosion prevention, operation and maintenance and safety.

UNIT IV SEWAGE TREATMENT

Primary Treatment– Unit Operations & Processes – Principles, functions and design of screen, grit chambers and primary sedimentation tanks.Secondary Treatment – Activated Sludge Processes and Trickling filter, Other treatment method. Stabilisation of Ponds and Septic tanks. Advances in Sewage Treatment.Removal of organic contents : Biological treatment methods, aerobic and anaerobic, digestion, tickling filters, stabilization ponds, activated sludge process – oxidation ditch.

UNIT V STORM WATER DRAINAGE SYSTEMS 8

Drainage lay-out, storm-run-off estimation hydraulics of flow in storm water drains, materials,

cross sections, design of storm water drainage systems, inlets, storm water pumping, operation and maintenance.

TEXT BOOKS

1. Garg S.K.Environmental Engineering, Vols. I and II, Khanna Publishers, New Delhi..
2. C.S.Shan, Water Supply and Sanitation, Galgotia Publishing Company, New Delhi

REFERENCES

1.. Industrial Water Pollution Control : Eckenfalder W.W. (200) McGraw Hill
2. Waste Water Treatment and Pollution control (1998) Arceivala S.J. Tata McGraw Hill
3. https://ocw.mit.edu › courses › civil-and-environmental-engineering › lect
4.https://www.cliffsnotes.com › microbiology › aquatic-microbiology › sewa
5.https://www.academia.edu › LECTURE_NOTES_ON_INDUSTRIAL_WAST

Course Coordinator **HOD**

U18PECE056	**EARTHQUAKE ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Foundation Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To study the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To understand the concept of vibration of elementary systems	U
CO2	To determine the response MDOF structural system subjected to vibration including earthquake	E
CO3	To know about the concept of seismology and theories	U
CO4	To apply the concept of earthquake resistant design & concept of lateral load distribution on buildings	Ap
CO5	To understand the Base isolation techniques.	U
CO6	To get knowledge on Biological treatment methods.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2				2			3			2		3
	CO2	2	2		2		2					2		2	2
	CO3		2				2			3			2		3
	CO4			2					3		2			3	2
	CO5		2				2			3			2		3
	CO6	2	2		2		2					2		2	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I THEORY OF VIBRATIONS 9

Theory of Vibrations; Concept of inertia and damping - Types of Damping - Difference between static forces and dynamic excitation - Degrees of freedom -SDOF idealization - Equations of motion of SDOF system for mass as well as base excitation Free vibration of SDOF system

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM 9

Response to harmonic excitation - Impulse and response tounit impulse - Duhamel integral; Multiple Degree of Freedom System; Two degree of freedom system - Normal modes of vibration - Natural frequencies - Mode shapes -Introduction to MDOF systems - Decoupling of equations of motion – Concept of mode superposition (No derivations); Elements of Seismology; Causes of Earthquake – Geological faults

UNIT III ELEMENTS OF SEISMOLOGY 9

Tectonic plate theory - Elastic rebound – Epicentre - Hypocentre - Primary, shear and Raleigh waves - Seismogram - Magnitude and intensity of earthquakes - Magnitude and Intensity scales - Spectral Acceleration - Information on some disastrous earthquakes;

UNIT IV DESIGN SPECTRA 9

Response of Structures to Earthquake- Response and design spectra - Design earthquake - concept of peak acceleration - Site specific response spectrum – Effect of soil properties - damping - Liquefaction of soils - Importance of ductility.

UNIT V DESIGN METHODOLOGY 9

Methods of introducing ductility into RC structures Design Methodology IS 1893, IS 13920 and IS 4326 - Codal provisions -Design as per the codes - Base isolation techniques - Vibration control measures – Importantpoints in mitigating effects of earthquake on structures

TEXT BOOK

1. Chopra, A.K., “Dynamics of Structures – Theory and Applications to Earthquake Engineering”.

2.Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd.

3.Mario Paz “Structural Dynamics”, CBS publishers.

REFERENCES

1. Biggs, J.M., “Introduction to Structural Dynamics”, McGraw Hill Book Co., New York.

2.Dowrick, D.J., “Earthquake Resistant Design”, John Wiley & Sons. .

3. Indian Standard Plain and Reinforced Concrete – Code of Practice (4th Revision), IS 456: 2000, BIS, New Delhi.
4. https://lecturenotes.in › notes › 16610-note-for-structural-dynamics-and-ea
5. https://lecturenotes.in › Subjects › Earthquake Engineering
6. https://www.slideshare.net › ifti313 › eq-tips-full

Course Coordinator HOD

U18PECE057	ROCK MECHANICS	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Engineering Geology				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To understand the basics and application of engineering geology technology.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	Define the properties (viz., physical, mechanical) of rocks and failure criterion of rockmass.	R
CO2	Use engineering rock mass classification (RMR, Q-system, RQD)	Ap
CO3	Analyse the stress distribution insitu and around an opening in underground structures (viz., mine openings, tunnels).	An
CO4	Understand the application of grout in rocks and bolting	U
CO5	Perform field Instrumentation techniques and laboratory studies. Understand the fundamentals of ground subsidence.	Ap & U
CO6	To learn the Theory of Wave Propagation.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2	2		2		2					2		2	2
	CO2		2				2			3			2		3
	CO3	2	2		2							2		2	2
	CO4	2	2		2						3	2		2	2
	CO5		2				2			3			2		3
	CO6	2	2		2		2					2		2	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I - INDEX PROPERTIES OF ROCK **9**

Introduction , Physical Properties of Rocks, Mechanical Properties of Rocks, Elastic Parameters of Rocks, Dynamic Property of Rocks, Static and Dynamic Module

UNITII - ROCK STRENGTH **9**

Types of Waves –Compressive – Measurements, Theory of Wave Propagation, Factors influencing Wave Velocity in Rock Mass, Modest of Rock Failure, Strength of Rock, Shear – Tensile – strength measurements, Compressive – strength Measurements.

UNIT III - DEFORMABILITY OF ROCKS AND STRESS **9**

Stress-Strain Behavior, Initial Stress, Influence of Joints, Distribution of Stresses, Measurements of Initial Stresses

UNIT IV -ROCK GROUTING **9**

Introduction, Grouting, Types of Grouting, Grouting materials, Operations and equipments, Pre grouting , Rock Bolt -Types – Systems, Testing of Rock Bolts.

UNIT V - ROCK ENGINEERING **9**

Introduction, Application, Merits and Demerits, Tunneling, Rock Openings, Rocks for Mining Subsidence, Dam and reservoir, Road Cuts, Slabs and Foundations.

TEXT BOOKS

1. Jaeger .C, "*Rock Mechanics for Engineers"*, Cambridge University Press, 2012.
2. Debasis Deb and Abiram Kumar Verma, Fundamentals and Applications of Rock Mechanics, Prentice Hall International, 2016

REFERENCE BOOKS

1.Goodman .P.E, "*Introduction of Rock Mechanics"*, John Wiley and Sons, 1989.
2.Stillburg, "*Professional User Handbook for Rock Bolting"*, Tran Tech Publications, 1989.
3.Brow .E.T, Rock Characterisation, "*Testing and Monitoring*", Pergman Press, 1981.
4.Hock and Bray.J, "*Rock Slate Engineering"*, Institute of Mining and Metallurgy", 1981.
5.https://www.slideshare.net › engineering-rock-mechanics-volume1
6.https://www.slideshare.net › engineering-rock-mechanics-volume1
7.https://lecturenotes.in › download › material › 25703-rock-mechanics-i

Course Coordinator **HOD**

U18PECE058	**STRUCTURAL DYNAMICS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Structural Analysis II				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To impart knowledge to establish the equations of motion and for the determination of structural response from dynamic loads and experience in the modeling and calculation of dynamic response for simple structural systems.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the discrete single-degree freedom system and calculation of the free and forced response of these systems	U & E
CO2	To study about the discrete multiple-degree freedom system and calculation of the free and forced response of these systems	U & E
CO3	To understand about the elements of seismology technique	U & R
CO4	To learn about the different methods for response of structures to earthquake	R
CO5	To know the earthquake design of structures using IS code method	C
CO6	To get knowledge on Detailing for earthquake resistant construction.	U & C

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2

2	CO1	2	2		2		2					2		2	2
	CO2	3	2		2			1		2	3		2		3
	CO3	2		2				2				2		1	
	CO4			2					3		2			3	2
	CO5	2	2		2						3	2		2	2
	CO6		2				2			3			2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT–ITHEORY OF VIBRATIONS **9**

Concept of inertia and damping – Types of Damping – Degrees of freedom – SDOF idealisation – Equations of motion of SDOF system for mass as well as base excitation – Free vibration of SDOF system – Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation - response spectrum concepts; simple inelastic structural systems- single-degree-of-freedom.

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM **9**

Two degree of freedom system – Normal modes of vibration – Natural frequencies - Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations).

UNIT III RESPONSE OF STRUCTURES TO EARTHQUAKE **9**

Response and design spectra – Design earthquake – concept of peak acceleration – Site specific response spectrum – Effect of soil properties and damping – Liquefaction of soils – Importance of ductility –Methods of introducing ductility into RC structures. Detailing for earthquake resistant construction – ductility criteria.

UNIT IV ELEMENTS OF SEISMOLOGY **9**

Causes of Earthquake – Geological faults – Tectonic plate theory – Elastic rebound – Epicentre – Hypocentre– Seismogram – Magnitude and intensity of earthquakes – Magnitude and Intensity scales – Spectral Acceleration - Information on some disastrous earthquakes - Introduction to systems with distributed mass and flexibility.

UNIT V INTRODUCTION TO EARTHQUAKE ENGINEERING

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.

TEXT BOOKS:

1. Chopra, A.K., “Dynamics of Structures Theory and Applications to Earthquake Engineering”, 4th Edition, Pearson Education.
2. Mario Paz “Structural Dynamics”, CBS publishers.

3. Basics of structural dynamics and A seismic Design by S.R.Damodrasamy and Kavitha.

REFERENCES:

1. Biggs, J.M., "Introduction to Structural Dynamics", McGraw Hill Book Co., New York.
2. Indian Standard Plain and Reinforced Concrete – Code of Practice (4th Revision), IS 456: 2000, BIS, New Delhi.
3. IS 1893(Part 1):2002 `Criteria for Earthquake Resistant Design of Structures : Part 1 General provisions and Buildings'
4. https://lecturenotes.in › Subjects › Structural Dynamics
5. https://www.academia.edu › STRUCTURAL_DYNAMICS-GR_VTU_NOT.
6. https://www.studocu.com › ... › Structural Dynamics

Course Coordinator **HOD**

PROFESSIONAL ELECTIVE - VI (PE – VI)

U18PECE061	RAILWAY ENGINEERING	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Transportation Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: The purpose of this course is to provide knowledge on components, geometric design, amenities and modern trends in the railway system. Also to learn about modern methods of track maintenance, rehabilitation and renewal of track.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To understand the importance of railways.	U
CO2	To know about railway components.	R
CO3	To know about geometric design.	U & C
CO4	To know about the amenities of rail track.	U
CO5	To know about track maintenance.	U
CO6	To get knowledge in signaling and interlocking facilities.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2				2			3			2		3
	CO2	3	2		2			2				3		2	2
	CO3		2				2			3			2		3
	CO4	2		2					3		2			3	2
	CO5		2				3			3			2		3
	CO6	2	2		2							2		1	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTION TO RAILWAY 9

Role of railway in transportation- historical development of railways in India classification in Indian railways-technical terms used in railway engineering-the permanent way-sub grade and embankments- ballast- sleepers.

UNIT II COMPONENTS OF RAILWAY TRACK 9

Rail- rail joints and welding of rails-track fittings and fastenings- coning of wheels - stresses in railway track- creep of rails-track alignment- surveying.

UNIT III GEOMETRIC DESIGN 9

Necessity of geometric design of railway track-gradient and grade compensation speed of train-radius of curvature-super elevation-curves-realignment of curves by string line method-widening of gauge on curves.

UNIT IV AMENITIES OF RAILWAY TRACK 9

Points and crossing- track junctions-stations and yards-equipment in station yards- signaling and control systems-interlocking of signals-construction of track

UNIT V MODERN TRENDS IN RAILWAYS 9

Track drainage-conventional maintenance of track-modern methods track maintenance-underground railwaysand tunneling-safety in railways- signaling and interlocking facilities – high speed trains - modern development in railways.

TEXT BOOKS:

1. Rangwala.P.S, "Railway Engineering", Charotar Publishing House, 26th Editions 2016.
2. Saxena Subhash, C. and Satyapal Arora,"Course in Railway Engineering", Dhanpat Rai and Sons, Delhi, 2010.
3. Agarwal.M.M, "Indian Railway Track", New Delhi.2010
4. Arora .S.P & Saxena .S.C, "A Textbook of Railway Engineering", Dhanpat Rai & Sons, 2005.

REFERENCES:

1. Satish Chandra & Agarwal .M.M, "Railway Engineering" Prabha &Co, Delhi, 2013.
2. Rangwala .S.C, revised by Rangwala .K.R & Rangwala .P.S, "Railway Engineering", Charotar Publishing House Pvt. Limited, 2th Editions, 2012.
3. Profillidis.V.A, "Railway Engineering" first published 2th Editions, 2009.
4. https://drive.google.com/file/d/1fyG5t25i2CN0wHOXlX6kNjBG4mvX7nc7/view
5. https://easyengineering.net/gps-for-land-surveyors-by-jan-van-sickle/

Course Coordinator HOD

U18PECE062	CONSTRUCTION PROJECT PLANNING & SYSTEMS	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Estimation & Costing				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To study and understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.

	COURSE OUTCOMES (COs):	**Revised Bloom's Taxonomy**
CO1	To know about Stages of project planning andprocess of development of plans and schedules.	U
CO2	To know about the Techniques of planning like CPM and PERT.	U
CO3	To learn the Control & monitoring of Construction methods.	U
CO4	To understand the basic concepts of planning and organizing.	U
CO5	To understand the Basics of Modern Project management systems.	U
CO6	Tounderstand the Automation & Robotics in Construction.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3					3			3		3			3
	CO2			3				3						3	
	CO3	2	1			2			2		3				2
	CO4											2			
	CO5	2	2				2			3			2		3
	CO6			2					3		2			3	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I CONSTRUCTION PLANNING 9

Definition of Projects; Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 9

Techniques of planning- basic terminology, types of precedence relationships, preparation of CPM networks, computation of float values, critical and semi critical paths, calendaring networks.PERTAssumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion. Allocation of Resources.

UNIT III COST CONTROL MONITORING AND ACCOUNTING 9

Control & monitoring; Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction, Importance of Contracts Management;

UNIT IV ORGANIZATION AND USE OF PROJECT INFORMATION 9

Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and S-Curves.

UNIT V QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Supervision, record keeping, periodic progress reports, periodical progress meetings. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents;

their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

TEXT BOOKS:

1. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 1998.
2. Calin M. Popescu, Chotchai Charoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.
3. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.

REFERENCES:

1. Project Scheduling and Management for ConstructionRevised Third Edition by David R. Pierce, Jr, 2004.
2. Construction Project Planning and Scheduling, Charles Patrick, 2003.
3. https://easyengineering.net/construction-management-by-jason-g-smith/
4. https://nptel.ac.in/content/storage2/courses/105103093/modules/partiv/testi/slides/slides1.htm

Course Coordinator **HOD**

U18PECE063	**ENVIRONMENTAL IMPACT ASSESSMNET AND LIFE CYCLE ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To educate the students on the scope, steps involved and various methods related to assessment of environmental impact due to development projects.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Know the General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of Risk.	U & R
CO2	To understand To Software packages for EIA-Expert systems in EIA.	U
CO3	To understand the concept of prediction, assessment of impacts and reporting of Environmental Management Systems	U
CO4	To study the Environmental Management Plan-preparation, implementation and monitoring programmes	Am
CO5	To know about the Cost Benefit Analysis; Life Cycle Assessment and Hydroelectric-Nuclear Power.	An
CO6	To understand the Quality aspects of Environmental Impact Assessment.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2					2		2			2			2
	CO2			2							2			1	
	CO3	2	2				2			3			2		3

	CO4	2		2					3		2			3	2
	CO5		2				2			3			2		3
	CO6	2	2		2		2					2		2	2
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)		Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I INTRODUCTION 9

Evolution of EIA: Concepts of EIA methodologies, Screening and scoping; Rapid EIA and Comprehensive EIA; General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of Risk.

UNIT II COMPONENTS AND METHODS 9

Components of EIA – Processes – screening – scoping – setting – analysis - mitigation. Matrices-Networks –Checklists – connections and combinations of processes – Cost benefit analysis - Analysis of alternatives - Software packages for EIA-Expert systems in EIA.

UNITIII PREDICTION, ASSESSMENT OF IMPACTS AND REPORTING 9

Matrix Method. Checklist method, Fault tree analysis, Consequence Analysis; Socioeconomic aspects, measures of effectiveness of pollution control activities. Environmental Legislation; Introduction to Environmental Management Systems; Environmental Statement - procedures

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 9

Environmental Management Plan-preparation, implementation and review- Mitigation and Rehabilitation Plans-Policy and guidelines for planning and monitoring programmes - post project audit-Ethical and Quality aspects of Environmental Impact Assessment.

UNIT V LIFE CYCLE ASSESEMENT CASE STUDIES 9

Environmental Audit: Cost Benefit Analysis; Life Cycle Assessment; Resource Balance, Energy Balance & Management Review; Operational ControlCase studies related to the following sectors-Infrastructure-Mining-industrial-Thermal Power –River valley and Hydroelectric-Nuclear Power.

TEXT BOOKS:

1. Lawrence, D.P., Environmental Impact Assessment - Practical Solutions to Recurrent Problems, Wiley- Interscience, New Jersey, 2003.
2. Environmental Life Cycle Assessment, Olivier Jolliet, Myriam Saade Sbeih, Shanna Shaked, CRC Group, Tayler and Francis Group, 2015
3. Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell Science London,2009

REFERENCES:

1. Canter, L.W., Environmental Impact Assessment , McGraw- Hill, New York,1996.
2. Biswas, A.K. and Agarwala, S.B.C. Environmental Impact Assessment for Developing Countries, Butterworth Heinemann, London,1994
3. Environmental Impact Assessment: A Comparative Review, Christopher Wood,

Routledge 2014.
4. https://www.degruyter.com/downloadpdf/j/manment.2017.22.issue-1/manment-2018-0010/manment-2018-0010.pdf
5. https://www.environment.gov.za/sites/default/files/docs/series9_lifecycle_assessment.pdf

Course Coordinator **HOD**

U18PECE064	**BASICS OF COMPUTATIONAL HYDRAULICS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Hydraulic Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: The main emphasis of the course is on understanding how the methods of finite differences is applied to solve unsteady free surface flow and transport equations.To understand the basics of computational fluid dynamics(CFD).

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To understand the equations describing flow and transport processes in free surface flows	U & An
CO2	To be able to understand the methods of characteristics, finite differences, finite elements, and finite volumes	U
CO3	To understand the application of the method of finite differences to ordinary and partial differential equations	U & Ap
CO4	To analyse the convergence, stability, and accuracy of numerical schemes	An
CO5	To understand three dimensional turbulent floe modeling using CFD	U
CO6	To understand the Finite difference methods applied to steady state and transient flow problems.	U & C

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				2			3		3		2		
	CO2	2		3			3					2		3	2
	CO3		2		1				2		2				
	CO4	2	2			2	2			3			2		3
	CO5	2		2					3		2			3	2
	CO6		2				2			3			2		3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT 1 INTRODUCTION TO EULER MODELS 9

Eulerian and Lagrangian models. Classification of partial differential equations, Types of differential equations governing flow - Laplace Equation for irrotational flow, diffusion equation in groundwater flow, St.Venant's equations for one-dimensional flow in channels, modified Navier-Stokes equations for two-dimensional flow problems, .

UNIT II INTRODUCTION TO ODE AND FINITE VOLUME METHODS 9

Numerical techniques to solve ordinary differential equations, overview of solution techniques for partial differential equations - finite difference, finite element and finite volume methods - Finite difference methods applied to steady state and transient flow problems – formulation and solution.

UNIT III FINITE ELEMENT METHODS 9

Basics of FEM, different formulations, variational, weighted residual and Galerkin methods, appropriateness of these formulations to different problems, domain discretisation - different types of elements, integral equations for element matrices, derivations of boundary conditions, sources and sinks, finite difference in time domain, matrix equations, solution techniques, examples.

UNIT IV HYDRAULIC MODELS 9

Solution of the advection-dispersion equation for solute transport by Eulerian and Lagrangian methods.Models for flow routing in reservoirs and channels. Models of coastal circulation and sediment transport.

UNIT V INTRODUCTION TO CFD 9

Computational Fluid Dynamics (CFD) software for three-dimensional turbulent flow modeling, Software for sub-surface flow simulation

TEXT BOOKS

1. ChunmiaoZheng and Gordon. D. Bennett,Applied Contaminant Transport Modeling, Van NostrandReinhold.1995
2. VenTeChow,Applied Hydrology, Tata McGraw Hill Education Pvt. Ltd. 2010
3. Christopher. G. Koutitas, Mathematical Models in Coastal Engineering, Pentech Press.1988
4. S. N. Ghosh, Tidal Hydraulic Engineering, Oxford and IBH Pub. Co. Pvt. Ltd.
5. S. C. Chapra, Surface Water Quality Modeling, McGraw Hill, Inc. 2008

REFERENCES

1. T. J. Chung, Computational Fluid Dynamics, Cambridge University Press. 2002K. Rastogi, Numerical Groundwater Hydrology, Penram International Publishing (India) Pvt. Ltd. 2012
2. VedatBatu, Applied Flow and Solute Transport Modeling in Aquifers, Taylor and Franics.2005
3. S. S. Rao, The Finite Element Method in Engineering, Elsevier.2010
4. J. N. Reddy and D. K. Garling, Finite Element Method in Heat Transfer and Fluid Mechanics, CRC Press.
5. O. C. Zienkiewicz and K. Morgan, Finite Elements and Approximations, John Wiley and Sons,1983.
6. https://www.elsevier.com/books/computational-hydraulics/brebbia/978-0-408-01153-2
7. https://www.researchgate.net/publication/290370515_Computational_Hydraulics_Numerical_Methods_and_Modelling

Course Coordinator HOD

U18PECE065	RIVER ENGINEERING	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Hydrology and Water Resources Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To understand theoretical concepts of water and sediment movements in rivers.To inculcate the benefits of fluvial system to the society.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	The students will be able to appreciate the complex behavior of rivers	Ap
CO2	They will gain the skills to take up research activities in river engineering.	E
CO3	To understand about river mechanics	U
CO4	To gain knowledge about river surveys	Ap
CO5	To be able to understand management of rivers	U
CO6	To learn Water Quality and ecological model.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1											2		3	
	CO2	2	2			2	2			3			2		3
	CO3	2		2				1	3		2			3	2
	CO4		2				2			3			2		3
	CO5	3			3			1			3			2	
	CO6		3				3			2			2		2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I RIVER FUNCTIONS 8

Primary function of a river – River uses and measures – Water and Sediment loads of river – Rivers in India, Himalaya and Peninsular.

UNIT II RIVER HYDRAULICS 10

Physical Properties and Equations – Steady flow in rivers – uniform and non uniform – Turbulence and velocity profiles – resistance coefficients – Boundary conditions and back waters – Transitions – Rating Curve – Unsteady flow in rivers : Propagative of surface waves – Characteristics, flood waves – kinematic and diffusion analogy – velocity of propagation of flood waves – Flood wave –Maximum

UNIT III RIVER MECHANICS 9

River Equilibrium : Stability of Channel – regime relations – river bend equilibrium – hydraulic geometry of downstream - Bars and meandering - River dynamics – degradation and aggradations of river bed – Confluences and branches – River Data base.

UNIT IV RIVER SURVEYS AND MODEL 9

Mapping – Stage and Discharge Measurements – Sediments – Bed and suspended load Physical hydraulic Similitude – Rigid and mobile bed – Mathematical – Finite one dimensional – multi – dimensional – Water Quality and ecological model

UNIT V RIVER MANAGEMENT 9

River training works and river regulation works – -Diversion and Coffer dams-Flood plain management – waves and tides in Estuaries - Interlinking of rivers – River Stabilization-Dredging and disposal-River restoration

TEXT BOOKS

1 Janson PL.Ph., Lvan BendegamJvanden Berg, Mdevries A. Zanen (Editors), Principles of River Engineering – The non tidal alluvial rivers – Pitman, 2002.

REFERENCES

1. Pierre Y. Julien ., River Mechanics ,Cambridge University Press, 2002.
2. Rao K.L , INDIA's WATER WEALTH – Orient Longman Ltd., 1979
3. https://johndfenton.com/Lectures/RiverEngineering/River-Engineering.pdf
4. https://civilenggforall.com/irrigation-and-water-resources-engineering-textbook-free-download-pdf

Course Coordinator **HOD**

U18PECE066	**ENGINEERING MATERIALS FOR SUSTAINABILITY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Building Materials & Testing Methods				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To introduce various sustainable materials like recyclable materials, natural materials in the construction field and study the efficient utilization of the materials.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To learn about sustainable construction materials.	U
CO2	To learn about the life cycle assessment of the material	R
CO3	To understand about the application of recyclable materials	U
CO4	To learn about the application of natural materials in construction field	R
CO5	To learn about the production of green construction materials	R
CO6	To learn Statistical Analysis of Environmental Data.	U & An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2		2				1	3		2			3	2
	CO2		2				2			3			2		3

	CO3	3			3			1			3			2	
	CO4	3				2				3		2		3	
	CO5		2					2			3				3
	CO6	1	1						1				2	2	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018									

UNIT I **9**

An Introduction to Sustainability Concepts and Life Cycle Analysis(LCA) - Introduction, Material flow and waste management - Risk and Life Cycle Framework for Sustainability.

UNIT II **9**

Engineering Materials for Sustainability. Environmental impact of materials - life-cycle assessment - Material selection to optimize performance - Design, evaluation, and production of green construction materials.

UNIT III **9**

Environmental Data Collection and LCA Methodology (Environmental Data Collection Issues, Statistical Analysis of Environmental Data, Common Analytical Instruments, Overview of LCA Methodology - Goal Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, LCA Software tools).

UNIT IV **9**

Design for Sustainability - Environmental Design for Sustainability: Economic, Environmental Indicators, Social Performance Indicators, Sustainable Engineering Design Principles and Environmental Cost Analysis.

UNIT V **9**

Case Studies: Odour removal for organics treatment plant, Comparison of hand drying methods, Biofuels for transportation, etc.

TEXT BOOKS:

1. SC Sharma ,"Environmental Studies" , Khanna Publishing House,2017.
2. V. Sivasubramanian, "Environmental Sustainability Using Green Technologies" CRC Press, 2016.
3. Annie R.Pearce,YongYong Han Ahn &Hanmiglobal,"Sustainable Buildings and Infrastructure", Paperback,2012.

REFERENCES:

1. Charles J. Kibert,"Sustainable Construction: Green Building Design & Delivery", John Wiley & Sons, 2016.
2. Kauffman, Joanne,Lee,Kun- Mo," Handbook of Sustainable Engineering", Springer link, 2013.

3. T. Allen David R. Shonnard, "Sustainable Engineering Concepts, Design and case Studies", Pearson, 2015.
4. Dhir Obe Ravindra K., "Sustainable Construction Materials", Elsevier Science, 2016.
5. https://www.taylorfrancis.com/books/9781315368665
6. https://civilenggforall.com/building-materials-and-construction-textbook-by-civilenggforall-free-download-pdf/

Course Coordinator **HOD**

U18PECE067	**OFFSHORE ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Introduction to Fluid mechanics				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: The student will get understanding of oil and gas field development, deep waterchallenges, riser systems, platform types, remote operated vessels, Mooring lines -Typical mooring, configuration, material and construction, anchors and ancillary equipment, static mooring analysis, etc.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Understand the various offshore structures and deep water challenges	U
CO2	Understand the different riser systems	U
CO3	Understand the anchors and static mooring analysis	U
CO4	Understand the vertex induced vibration	U
CO5	Understand the various remotely operated vehicles for navigation and control	U
CO6	To get knowledge on Oil and gas field development Options.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				2				3		2		3	
	CO2		2					2			3				3
	CO3	1	1						1				2	2	
	CO4	2		1				2			3			3	2
	CO5	2				2				1	3			3	
	CO6		2				1		3			1			3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I: INTRODUCTION OF OIL AND GAS FIELD **9**

Introduction to offshore structures; Oil and gas field development Options: Platform types, marine riser systems, current design trends anddeep-water challenges.

UNIT II: RISER SYSTEMS **9**

Flexible pipe structure and material, typical configurations, top tensioned vertical risers, hybrid risers.Flow assurance: multi-phase flow, deposition of solids, thermal management, corrosion. Riser analysis:governing equations, boundary conditions, natural frequency.

UNIT III: MOORING SYSTEM **9**

Mooring lines -Typical mooring configuration, material and construction, anchors and ancillary equipment,static mooring analysis.

UNIT IV: VORTEX INDUCED VIBRATION **9**

Vortex induced vibration: drag, vortex shedding, surface roughness, lift, Strouhal number, VIVassessment, fatigue life calculation.

UNIT V: REMOTELY OPERATED VEHICLES **9**

Remotely operated vehicles: ROV categories- Micro, mini, general, Light work class, Heavy work class,AVUs ROV-handling systems, construction and materials, navigation and control, ,

TEXT BOOKS

1. BC Grewick, Jr. Construction of marine and offshore structure, CRC Press, 2000.
2. RD Blevins, Flow induced vibrations, Van Nostrand Reinhold, 1990.
3. N Barltrop, Floating structures: A Guide for design and analysis, OPL, 1998.

REFERENCE BOOKS

1. EE Allimendinger, Submersible vehicle systems design. SNAME, 1990.
2. HO Bordeaux, Buoy engineering, John Wiley, 1975.
3. https://epdf.pub/introduction-to-marine-engineering-second edition1a8452aa51cb93b48a3d4458470f33c760674.html
4. https://www.sanfoundry.com/best-reference-books-introduction-offshore-engineering/

Course Coordinator **HOD**

U18PECE068	**MASONRY STRUCTURES**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Structural Analysis I				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To make the students get familiar about the clay and concrete masonry materials, unreinforced masonry design, reinforced masonry design and masonry structural components.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the basic masonry materials, including clay brick, concrete block, mortar, grout, and reinforcing accessories.	U
CO2	To analyze and design unreinforced masonry structures in compression	An
CO3	To understand the behavior of reinforced masonry structures, and be able to design for flexure, shear, axial forces, combined flexure and axial forces	U
CO4	To study about the design of load bearing masonry buildings using BIS code	C
CO5	To know the seismic behavior and design of earthquake resistant masonry buildings	U & C
CO6	To learn procedures for evaluating flexural and shear strength. Permissible stresses.	U & E

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				3					3			1	3
	CO2		3						3				3		
	CO3	2		2			2			2		2			2
	CO4	3			3			1			3		1	2	
	CO5	3				2				3		2		3	
	CO6		2				1	2			3				3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT –I INTRODUCTION 9

Introduction to analysis, design and construction of masonry structures, Mechanical properties of clay and concrete masonry units, mortar, and grout.

UNIT -II STRENGTH OF MASONRY IN COMPRESSION: 9

Compressive, tensile, flexural, and shear behavior of masonry structural components, Strength and behavior of unreinforced bearing walls - Behaviour of Masonry under compression.

UNIT -III FLEXURAL SHEAR AND BOND 9

Bond between masonry unit and mortar, tests for determining flexural and shear bond strengths, factors affecting bond strength, effect of bond strength on compressive strength, orthotropic strength properties of masonry in flexure, shear strength of masonry, test procedures for evaluating flexural and shear strength. Permissible stresses:

UNIT -IV DESIGN OF LOAD BEARING MASONRY BUILDINGS 10

Design of load bearing masonry for buildings up to 3 to 8 storey's using BIS codal provisions. Detailed design of reinforced masonry beams, columns, structural walls with and without openingsand complete lateral-force resisting building systems.

UNIT -V EARTHQUAKE RESISTANT MASONRY BUILDINGS 8

Behaviour of masonry during earthquakes, concepts and design procedure for earthquake resistant masonry, BIS codal provisions.

TEXT BOOKS:

1. Dayaratnam P, "Brick and Reinforced Brick Structures", Prentice Hall India Learning Private Limited, 2017.
2. Sinha B.P & Davis S.R., "Design of Masonry structures"- E & FN Spon, 2004.
3. K.S.Jagadish, "Structural Masonry", Prentice Hall India Learning Private Limited, 2015

REFERENCES:

1.Maurizio Angelillo, "Mechanics ofMasonry Structures", CISM 2014

2.Clement C.Williams, “The Design of Masonry Structures and Foundations”, FB Publishers,2018.
3.https://masonrysociety.org/product/masonry-structures-behavior-and-design-4th-edition-download-version/
4.https://www.crcpress.com/Design-of-Masonry-Structures/Hendry-Sinha-Davies/p/book/9780419215608

Course Coordinator **HOD**

PROFESSIONAL ELECTIVE - VII (PE – VII)

U18PECE071	**AIRPORT PLANNING & DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Design of Steel Structures				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: Students would have understood the basics of air route Planning, Network revenue Management. To know about the geometric design of the airfield. Determine runway capacity and delay. Also gain knowledge in designs of air freight terminals, airport access and landside planning.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To get ideas about airport planning.	U
CO2	To understand the environmental and social issues.	U
CO3	To know about the components of airport.	U
CO4	To get ideas about air route network.	Ap
CO5	To understand the concepts of scheduling and fleet assignment.	U
CO6	To understand Airline Fleet Planning Models.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3			3			1			3		1	2	2
	CO2	3				2				3		2		3	
	CO3		2				1	2			3				3
	CO4	2							1			3			
	CO5		2					2		3			2	3	2
	CO6				2							3			

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I AIRPORT PLANNING 9

Airport – Accessibility – Transport Connections – Road and Rail, Expansion – Feasibility Studies – Environmental and Social Issues – Forecasting Future Traffic – Airfield Capacity and Delay - Aircraft characteristics – Airport Site Selection

UNIT II AIRPORT COMPONENTS 9

Airport Classification, Planning of Airfield Components – Runway, Taxiway, Apron, Hanger, Passenger Terminals, drainage, cargo terminals. Air traffic control – surveillance facilities.

UNIT III AIR ROUTE PLANNING AND EVALUATION 9

Demand driven dispatch – Airline Fleet Planning Models – Network Revenue Management – Airport Performance, Slot Issues, Hub Operation, Demand Management, Multi-airport Systems

UNIT IV PASSENGER CHOICE, SCHEDULING AND FLEET ASSIGNMENT 9

Load Factor Analysis, Airline Schedule Development, Introduction to PODS Passenger Choice Models, Decision Window Model, Fleet Assignment

UNIT V AIRLINE ECONOMICS 9

Pricing – Privatization and Deregulation, Willingness to pay and Competitive Revenue Management – Case study on air traffic management and navigational aids.

TEXTBOOKS:

1. S.K.Khanna and M.G.Arora, "Airport Planning and Design", Sixth Edition 2012.
2. Young, S. B., and Wells, A. T. Airport Planning and Management, Sixth Edition, McGraw-Hill, New York, USA, 2011
3. Robert Honjeff, Francis X.Mckelvey, William J Sproule, and Seth Young "Planning and Design of Airports", Fifth Edition, McGraw Hill, New York, 2010.
4. Richard De Neufille and Amedeo Odoni, "Airport Systems Planning and Design", McGraw Hill, New York, 2003.

REFERENCE:

1. Norman J. Ashford, Saleh Mumayiz, Paul H. Wright; Airport Engineering Planning, Design, and Development of 21st century Airports, John Wiley & Sons, Inc.,2011
2. Horonjeff, R., McKelvey, F. X., Sproule, W. J., and Young, S. B. Planning and Design of Airports, Fifth Edition, McGraw-Hill, New York, USA, 2010.
3. Geoffrey D. Gosling; Airport ground access mode choice models, Transportation Research Board, Washington, D.C., 2008
4. Vazirani.V.N. and Chandola.S.P., Transportation Engineering-Vol.1, Khanna Technical Publications, New Delhi, 1991.
5. https://easyengineering.net/airport-engineering-planning-design-and/
6. https://soaneemrana.org/AIRPORT%20PLANNING%20AND%20MANAGEMENT%20BY%20SETH%20B.%20YOUNG%20&%20ALEXANDER%20T.%20WELLS1.pdf

Course Coordinator **HOD**

U18PECE072	**CONTRACTS MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Estimation & Costing				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To study the various types of construction contracts and their legal aspects and provisions.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To know about the Activities in Contract Management.	U & R
CO2	To know about the types of Contracts and Formulation of Contract.	U & R
CO3	To study about Performance parameters in contracts.	U & R
CO4	To learn aboutthe various Acts governing Contracts.	U & R
CO5	To know about Legal Aspects in Contract Management.	U & R
CO6	To understand Contract Management in Consultancy.	U & R

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2		2				1	3		2			3	2
	CO2		2				2			3			2		3
	CO3	3			3			1			3			2	
	CO4	3				2				3		2		3	
	CO5		2					2			3				3
	CO6	1	1						1				2	2	
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**		Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I INTRODUCTION 9

Contract Management – Introduction, Importance of Contracts, Overview of Contract Management, Overview of Activities in Contract Management; Planning and People-Resource Management;

UNIT II CONSTRUCTION CONTRACT 9

Types of Contracts, Parties to a Contract; Contract Formation, Formulation of Contract, Contract Start-Up, Managing Relationships; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price.

UNIT III CONTRACT PROCESS 9

Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Notices under contracts; Conventional and Alternative Dispute Resolution methods.

UNIT IV CONTRACT ACTS 9

Various Acts governing Contracts; Contract Administration and Payments- Contract Administration, Payments; Contract Management in Various Situations- Contract Management in NCB Works, Contract Management in ICB Works Contracts, Contract of Supply of GoodsDesign, Supply and Installation Contracts, Contract Management in Consultancy,;

UNIT V CONTRACT MANAGEMENT 9

Managing Risks and Change- Managing Risks, Managing Change; Contract Closure and ReviewEnding a Contract, Post-Implementation Review; Legal Aspects in Contract ManagementContract Management Legal View, Dispute Resolution, Integrity in Contract Management; Managing Performance- Introduction, Monitoring and Measurement.

TEXT BOOKS:

1. Introduction to Construction Contract Management, by Brian Greenhalgh, 2016.
2. Jimmie Hinze, “Construction Contracts ", 2nd Edition, McGraw Hill, 2001.

3. Fundamentals of Building Contract Management, Philip Davenport and Thomas E. Uher, 2002.

REFERENCES:

1. Joseph T. Bockrath, " Contracts and the Legal Environment for Engineers and Architects", 6th Edition, McGraw Hill, 2000.
2. Richard Hudson Clough, Glenn A. Sears, "Construction Contracting", J. Wiley, 21-Mar-2005.
3. http://www.ncc.org.zm/wp-content/uploads/2016/02/003-Training-Manual-Introduction-to-Contract-Management-and-Administration.pdf
4. https://www.cips.org/documents/CIPS_KI_Contract%20Management%20Guidev2.pdf

Course Coordinator **HOD**

U18PECE073	**ENVIRONMENTAL LAW AND POLICY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To educate Environment governance, Sustainable development, Carbon credit and foot print. To understand right to Environment as Human right, Humanitarian law and Environment.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To know the concept of laws and environmental laws and policies,.	U
CO2	To understand about the Environment and Governance, sustainable development and environment, understanding climate change, carbon crediting, carbon foot print	U
CO3	To understand in detail law pertaining to utilization of water and control effluent discharge	U
CO4	To know about the control of pollution. as amended by Amendment Act	R
CO5	To know about the Relevant notifications in connection with Hazardous Wastes	R
CO6	To get knowledge on Famous international protocols like Kyoto.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2							2				3		2
	CO2		2			2					2				
	CO3	1			3					3		2		2	
	CO4		2	1			1	2			3				3
	CO5	2							1			3			
	CO6		2		2			2		3			2	3	2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I INTRODUCTIONTO ENVIRONMENTAL LAW 9

Overview of environment, nature and eco system, Concept of laws and policies, origin of environmental law, Introduction to environmental laws and policies,

UNIT II SUSTAINABLEDEVELOPMENT 9

Environment and Governance, sustainable development and environment, understanding climate change, carbon crediting, carbon foot print etc.,

UNITIII INTRODUCTION TO TRADE AND ENVIRONMENT 9

Introduction to trade and environment. International environmental laws, Right to Environment as Human Right,International Humanitarian Law and Environment, environment and conflicts management,Famous international protocols like Kyoto.

UNITIV WATERACT 9

Water (prevention & control of pollution) Act 1974 as amended by Amendment Act 1988. Water (prevention and control of pollution) Rules 1975 Water (prevention & control or Pollution) Cess Act. 1977 as amended by Amendment Act 1987 and relevant notifications.

UNITV HAZARDOUSWASTEREGULATION 9

Relevant notifications in connection with Hazardous Wastes (management and handling) Biomedical wastes (management and handling), Noise pollution, Eco- labelling.

TEXT BOOKS:

1 VenketEnvironmental Law and Policy rentice Hall India Learning Private Limited (2011)
2. Pandey J.N., "Constitutional Law of India", (31st Edn.) Central Law Agency Allahabad2007.
3. Kesari U.P.D., "Administrative Law 12008", Universal Book TradeDelhi.
4. Constitution of India", Eastern Book Company Lucknow, 12thEdn.2007.

REFERENCES

1. Environmental Law, S C Shastri, Eastern Book Co (2017)
2. Tiwari H.N., "Environmental Law", Allahabad Law Agency2007.
3. Divan A., and Noble M., "Environmental Law and Policy in India (cases, Materials and Statutes)",Tripathi Bombay,2001.
4. "Environmental Policy, Forest Policy", Bare Acts - Government Gazette Notifiaciton.
5.https://cdem.somaiya.edu/media/pdf/Env%20Law%20and%20policy%20.pdf
6.https://wedocs.unep.org/bitstream/handle/20.500.11822/21491/MEA-handbook-Vietnam.pdf?sequence=1&isAllowed=y

Course Coordinator HOD

U18PECE074	HYDRAULIC MODELING	L	T	P	C
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Hydraulic Engineering				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: The objective of the course is to provide a physical understanding of phenomena and concepts in advanced water flows and to introduce calculation methods to analyze a number of important hydraulic problems.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Possess a solid understanding of the basic phenomena and processes that govern free-surface flows	U & An
CO2	Be able to formulate advanced models based on the governing equations for free-surface flows and to solve the equations for commonly encountered flow situations	E
CO3	Be able to analyze complex flow problems using dimensional analysis and to develop rules for experiments with scale models	An
CO4	To understand the impact of flowing water on submerged bodies and structures	U
CO5	To understand about hydraulic modelling	U
CO6	To get knowledge on Modelling of open channel systems.	Ap

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2	1			1	2			3				3
	CO2	2							1			3			
	CO3		2		2			2		3	2		2	3	2
	CO4	3													
	CO5		3			3		3			1			3	
	CO6				3							3			3

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT 1 INTRODUCTION 9

Basics of Hydraulic Modelling (similarity mechanics, model laws, distinction between numerical and hydraulic models, classification of hydraulic modelling, materials used in the model, scale effect, design, construction, operation and interpretation of the results)

UNIT II INTRODUCTION TO PHYSICAL MODELS 9

Development of physical models – dimensional analysis and principles of similitude, nondimensional numbers employed in hydraulic modelling, tools and procedures. Role of instrumentation and data processing; Gravity dominated models (modelling of energy

dissipaters, overflow spillways, siphon spillways, bridge piers, vortex formation, cavitation, flow induced vibrations);

UNIT III OPEN CHANNEL SYSTEM 9

Modelling of open channel systems, closed conduit systems and urban drainage systems.Environmental modelling of open channel systems.Gravity friction models: (pumped flow models, ship models, surge tank models); Friction dominatedmodels

UNIT IV RIVER MODELS 9

River models with fixed and mobile bed; Basin and reservoir models; Tidal models with fixed and mobile bed; estuarine models; harbor and breakwater models, models of offshore structures Modelling of estuaries, coastal processes, nearshore structures, and hydraulics structures.

UNIT V HYBRID MODELS 9

Hybrid and Analogue models; Scope and limitations of hydraulic modelling, complementary aspects of numerical and hydraulic modeling.

TEXT BOOKS

1. Pavel Novak, Vincent Guinot, Alan Jeffrey, and Dominic. E. Reeve, Hydraulic Modelling – An Introduction, Spon Press.2010
2. James. J. Sharp, Hydraulic Modelling, Butterworths2007.
3. Helmut Kobus and Gerrit Abraham, Hydraulic Modelling, Parey.1980

REFERENCES

1. S. N. Ghosh, Tidal Hydraulic Engineering, Oxford and IBH Pub. Co. Pvt. Ltd. 1986
2. VedatBatu, Applied Flow and Solute Transport Modeling in Aquifers, Taylor and Franics.2006
3. James. L. Martin and Steven. C. McCutcheon, Hydrodynamics and Transport for Water Quality Modeling, Lewis Pub.1998.
4. https://johndfenton.com/Lectures/Hydraulics/Hydraulics.pdf
5. https://www.fhwa.dot.gov/engineering/hydraulics/pubs/hif12018.pdf

Course Coordinator **HOD**

U18PECE075	**WATER RESOURCE FIELD METHODS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Physico-Chemical Processes for Water and Wastewater Treatment				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To understand the basic chemistry of water, standards stream flow net analysis and the principles of ground water flow.To learn the aquifer parameters, discharge measuring structures, dilution techniques etc.Study the concept of catchment, run-off estimation, water conservation and reservoir sedimentation.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To learn about the basics of Water quality standards.	R
CO2	To learn about the Discharge and draw down for various condition of groundwater	R
CO3	To have a clear understanding about Locating hydro geological boundaries – Image well theory – Determination	U
CO4	To study the basics of Discharge Measuring Structures -	U & R

CO5	To study about various models affecting Runoff – Hydrograph – Unit Hydrograph – Synthetic Hydrograph –Runoff estimation	U & E
CO6	To evaluate well loss parameters.	E

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1		2	1			1	2			3				3
	CO2	2							1			3			
	CO3		2		2			2		3	2		2	3	2
	CO4		2	1			1	2			3				3
	CO5	2							2				3		2
	CO6		2			2					2			2	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT WATER QUALITY 9

Chemical composition of water - Hydrological processes and water quality – Suspended and dissolved loads - Sediments and their composition – Eutrophication and its impacts - – Water quality standards. Sources and Types of water pollution – Organic and inorganic pollutants -- BOD – DO relationships — NPS pollution – Waste water treatment - TMDL Concepts – Water quality models.

UNIT II GROUNDWATER HYDRAULICS 9

Groundwater Movement - Darcy"s law and its limitations - Stream lines and flow net analysis – Potential flow theory – Discharge and draw down for various condition of groundwater flow - Principles of groundwater flow and its equation – Dupuit – Forchheimer assumptions – Influent and Effluent streams - Evaluation of well loss parameters – Partial penetration of wells – Interference of wells

UNIT III PUMPING TEST ANALYSIS 9

Determining aquifer parameters for unconfined, leaky and non-leaky aquifers – steady and transient conditions - Slug test – Locating hydro geological boundaries – Image well theory – Determination

UNIT IV STREAMFLOW MEASUREMENT 9

Stage and Velocity Measurement – Gauges – Current meter and Doppler flow velocity meter - Discharge measurement – Area Velocity method - Area Slope method – Discharge Measuring Structures - Dilution Technique – Stage Discharge relationship – Selection of a Stream Gauging Site. **.**

UNIT V RUNOFF AND WATER CONSERVATION 9

Concept of catchment – Linear, Areal and Relief Aspects – Detailed study of Runoff process – Factors affecting Runoff – Hydrograph – Unit Hydrograph – Synthetic Hydrograph –Runoff estimation - Strange and SCS methods – Water Conservation – Rain water and Runoff Harvesting in Rural and Urban Areas - Reservoir Sedimentation.

TEXT BOOKS

1. Patra.K.C, "Hydrology and Water Resources Engineering", Narosa Publications, 2008, 2nd Edition, New Delhi. 4. Jeya Rami Reddy.P, "Hydrology, Laximi Publications, New Delhi, 2004.
2. Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology", McGraw Hill Publications, New York, 1995.

REFERENCES

1. Subramanya K., "Hydrology,Tata McGraw Hill Co., New Delhi, 1994.
2.https://easyengineering.net/water-resources-hydrology-irrigation/
3.http://dl.watereng.ir/doc/Larry%20W.%20Mays%20%20Water%20Resources%20Engineering%20_2010,%20Wiley_.pdf

Course Coordinator **HOD**

U18PECE076	**BRIDGE ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Design of Steel Structures				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To develop an understanding of appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location, functionality on various types of bridges like pre-stressed concrete bridges, steel bridges, plate girder bridge, truss bridge, suspension cable bridge, and cable stayed bridge.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	To study about the various classification of bridges their geometric and hydraulic design consideration	An
CO2	To know the analyse and design of prestressed bridges	An & C
CO3	To understand the design procedure of different types of bridges.	U & C
CO4	To study about the design concepts of substructure, seismic design considerations	C
CO5	To impart the students about the concept of stability consideration, inspection and maintenance	U
CO6	To learn Aerodynamic stability considerations.	U

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3				3					3			1	3
	CO2		3						3				3		
	CO3	2		2			2			2		2			2
	CO4	3			3			1			3		1	2	

	CO5	3				2				3		2		3	
	CO6		2				1	2			3				3
3	Category	Humanities & Social Sciences including Management Courses (HS)		Basic Sciences (BS)		Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)		Employment Enhancement Courses (EEC)		Mandatory Courses (MC)	
4	Approval	Meeting of Academic Council, May 2018													

UNIT I INTRODUCTION **9**

General - classification of bridges- site selection- geometric and hydraulic design consideration,- Loading standards for highway - railway bridge

UNIT II DESIGN OF RC AND PSC BRIDGES **9**

General design consideration; optimum spans- Concrete bridges culverts- Slab- T-beam - Pre-stressed Concrete bridges

UNIT III TYPES OF BRIDGES **9**

Box girder bridges- balanced cantilever bridge - cable stayed bridge - extrados bridges - arch bridge - Special requirements for Steel bridges- plate Girder Bridge - truss bridge – Introduction to suspension Cable Bridge - cable stayed bridge

UNIT IV BRIDGE COMPONENTS

Substructures - design of piers and abutments - pile and well foundations -Bearings and expansion joints- special wearing coats - seismic design considerations

UNIT V STABILITY CONSIDERATIONS **9**

Aerodynamic stability considerations- special durability measures -provisions for inspection – maintenance.

TEXTBOOKS:

1.Design of Bridges by N.Krishnam Raju, Oxford & IBH, Publishing Company Pvt.ltd., Delhi.
2.Johnson Victor D., “Essentials of Bridge Engineering”,
3.Jagadeesh .T.R. and Jayaram.M.A., "Design of Bridge Structures".

REFERENCES:

1. Bowles .J.E., “Foundation Analysis and Design”, McGraw Hill Publishing co., New York,
2. Swamy Saran, Analysis and Design of substructures, Oxford and IBH Publishing Ltd.
3. R.Rajagopalan, "Bridge Superstructure", Tata Mcgraw- Hills Publishing Company Limited.
4. https://easyengineering.net/bridge-engineering-books/
5. http://civilcafe.weebly.com/uploads/2/8/9/8/28985467/bridge_engineering_handbook_seismic_design_second_edition.pdf

Course Coordinator **HOD**

U18PECE077	**STRUCTURAL GEOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Engineering Geology				

	Course Coordinator Name & Department:

COURSE OBJECTIVES: To study of the application of deforming forces to earth materials and the structures resulting from that deformation.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Acquire knowledge on the geometry and type of structures present in earth	Ap
CO2	Understand the micro and macro scale deformation mechanisms	U
CO3	Understand geometrical and genetic classification of folds	U
CO4	Understand the origin of foliations and lineation	U
CO5	Understand geometrical and genetic classification of fractures and faults	U
CO6	To learn Strain ellipses of different types and their geological significance.	U & An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	2							1			3			
	CO2		2		2			2		3	2		2	3	2
	CO3	3													
	CO4	3				3					3			1	3
	CO5		3						3				3		
	CO6	2		2			2			2		2			2

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I STRUCTURE AND TOPOGRAPHY **9**

Description, classification, and origin of earth structures, Ways in which the continental crust can deform; Effects of topography on structural features, Topographic and structural maps; Importance representativefactors of the map; link scales of structure from the field, hand specimen,

UNIT II STRESS AND STRAIN IN ROCKS **9**

Concept of rock deformation: Stress and Strain in rocks, Strain ellipses of different types and theirgeological significance, Planar and linear structures;Theoretical and meso to microscale analysis of structures developed through a linked series of lectures and practicals; Concept of dip and strike; Outcrop patterns of different structures. practical 2D strain analysis; 3D strain concepts; incremental strain,kinematics and polyphase deformations;

UNIT III FOLDS **9**

Fold morphology; fold construction and classes; Geometric and genetic classification of folds; Introduction to the mechanics of folding: Buckling, Bending, Flexural slip and flow folding

UNIT IV FOLIATION AND LINEATION **9**

Description and origin of foliations: axial plane cleavage and its tectonic significance Description and origin of lineation and relationship with the major structures; current concepts in plate tectonics

UNIT V FRACTURES AND FAULTS **9**

Geometric and genetic classification of fractures and faults; Effects of faulting on the outcropsGeologic/geomorphic criteria for recognition of faults and fault plane solutions;fault evolution and section balancing; fault rock microstructures; fault and fold mechanics

TEXT BOOKS

1. Ghosh, S.K., Structural Geology: Fundamentals and Modern Developments, Elsevier; First edition

REFERENCES

1. Davis, G. R. (1984) Structural Geology of Rocks and Region. John Wiley
2. Billings, M. P. (1987) Structural Geology, 4th edition, Prentice-Hall.
3. Park, R. G. (2004) Foundations of Structural Geology.Chapman & Hall.
4. Pollard, D. D. (2005) Fundamental of Structural Geology. Cambridge University Press.
5. Ragan, D. M. (2009) Structural Geology: an introduction to geometrical techniques (4th Ed).Cambridge University Press (For Practical)
6. Lahee F. H. (1962) Field Geology. McGraw Hill
7.http://www.geosci.usyd.edu.au/users/prey/Patrice_Intro_to_SG.pdf
8.http://www.geology.cz/projekt681900/vyukovematerialy/Krystof_Verner_Applied_structural_geology_and_tectonics.pdf

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Course Coordinator **HOD**

U18PECE078	**ECOLOGICAL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	**3**	**0**	**0**	**3**
	Prerequisite: Environmental Sciences				
	Course Coordinator Name & Department:				

COURSE OBJECTIVES: To educate the students on the principles of ecology as applied to environmental engineering and also to understand the relationship between biotic and abiotic components.

COURSE OUTCOMES (COs):		**Revised Bloom's Taxonomy**
CO1	Acquire knowledge on the geometry and type of structures present in earth	Ap
CO2	Understand the micro and macro scale deformation mechanisms	U
CO3	Understand geometrical and genetic classification of folds	U
CO4	Understand the origin of foliations and lineation	U
CO5	Understand geometrical and genetic classification of fractures and faults	U
CO6	To carry out Case studies on Integrated Ecological Engineering Systems.	An

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/POs	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
2	CO1	3	2		2				3			2			3

	CO2													
	CO3	3		3			2			2	1			2	
	CO4		2					3							3
	CO5										3				
	CO6	3				3							1	2	

3	Category	Humanities & Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Engg. Sciences (ES)	Professional Core (PC)	**Professional Core Elective (PE)**	Open Elective (OE)	Massive Open Online Course(MOOC)	Employment Enhancement Courses (EEC)	Mandatory Courses (MC)
4	Approval	Meeting of Academic Council, May 2018								

UNIT I ECOLOGY&ENVIRONMENT 9

Aim, scope and applications of ecology - Development and evolution of ecosystems -Energy flow and material cycling in ecosystems - productivity in ecosystems, classification of systems - Structural and functional interactions of environmental systems - Environmental systems as energy systems

UNIT IIECOLOGICALENGINEERING. 9

Characteristics of rivers and lakes which affect the management of domestic and industrial wastewaters. chemical hazards assessment, surveillance and biomonitoring, and review of regulations governing effluents Modelling and ecotechnology - Elements of modeling - Modeling procedure - Classification of ecological models - Applications of models in ecotechnology - Ecological economics.

UNIT III STREAM ECOLOGY 9

Description of physical, chemical, and biological characteristics in streamsand rivers including an integrated treatment of the environmental factors affecting the composition and distribution of biota; emphasizes the application of ecological engineering Principles in aquatic ecosystem protection

UNIT IV APPLICATION OFECOLOGICALENGINEERING 9

Ecosanitation - Principles and operation of soil infiltration systems - Wetlands and ponds - Source separation systems - Aquacultural systems - Detritus based treatment for solid wastes - Applications of ecological engineering for marine systems.

UNIT V CASE STUDIES INECOLOGICALENGINEERING 9

Case studies of Integrated Ecological Engineering Systems and their commercial prospects.

TEXT BOOKS:

1. S.V.S.Rana Essentials of Ecology and Environmental science. PHI Learning Pvt ltd. Delhi 2013.
2. Kangas, P.C. and Kangas, P., *"Ecological Engineering: Principles andPractice",*Lewis Publishers, New York. 2003
3. William J Mitsch, Ecological Engineering and Ecosystem Restoration John Wiley & Sons, Inc.2015

REFERENCES

1. Etnier, C. and Guterstam, B., “Ecological Engineering for Wastewater Treatment”, Lewis Publishers, New York.2007.
2. White, I.D., Mottershed, D.N. and Harrison, S.J., “Environmental Systems - An Introductory Text”, Chapman Hall, London.2004.
3. Mitsch, J.W. and Jorgensen, S.E., “Ecological Engineering - An Introduction to Ecotechnology”, John Wiley & Sons, New York.2009.
4. https://docs.google.com/document/d/149uEpqkQjENU8Ow4UyzoOpxvdLG3Hzf4jV1PgxCWFq0/edit
5. https://www.researchgate.net/publication/222565367_Design_principles_for_ecological_engineering

Course Coordinator **HOD**

OPEN ELECTIVE FROM CIVIL

U18OECE001	**METRO SYSTEMS AND ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Any course in Engineering				
	Course Designed by – Dept of Civil Engineering				
	Category – OPEN ELECTIVE (OE)				
	Approval - Meeting of Academic Council, May 2018				

OBJECTIVES: To know about the urban transport problems, planning, construction and operation.

UNIT I INTRODUCTION **15**

Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations

UNIT II MASS TRANSIT SYSTEMS **15**

Mass Transit concepts- Trip interchanges and assignments ; Urban transportation problems, Modes of masstransit- their planning, construction and operation, Case studies of existing mass transit systems ; Technical andeconomic evaluation of mass transit projects

UNIT III TRAFFIC INTEGRATION **15**

Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management

TEXTBOOKS:

1. C. S. Papacostas, P. D. Prevedouros, Transportation Engineering and Planning, PHI Publication, 3rd edition,2002
2. S. Grava, Urban Transportation Systems, Mc. Graw Hill Professional, 1st Ed. 2002.

REFERENCES:

1. J.D. Fricker, & R.K. Whitford, Fundamentals of Transportation Engineering, Pearson, PH, 2004
2. V.R. Vuchic, Urban Transit Systems and Technology, John Wiley & Sons, February 2007
3. C.A. O'Flaherty, Transport Planning and Traffic Engineering, Arnold, 1997
4. J. E. Anderson, Transit Systems Theory, Lexinton Books, USA

U18OECE002	**POLLUTION REGULATIONS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Any course in Engineering				
	Course Designed by – Dept of Civil Engineering				
	Category – OPEN ELECTIVE (OE)				
	Approval - Meeting of Academic Council, May 2018				

OBJECTIVES: To know about various Act of pollution and control of pollution Acts for water, air and in general environmental protection.

UNIT I: INTRODUCTION **10**

Introduction - Introduction - Functions - Constitution - Organisational set up - Environmental Legislations - Monitoring of Industries - Procedure for Issue of Consent - Address of the Offices and Laboratories.

UNIT II: WATER (P&CP) ACT **10**

The Water (Prevention and Control of Pollution) Act, as amended in 1978 and 1988 - Standards for Discharge of Trade Effluent - Standards for Discharge of Sewage - Drinking Water – Specification (IS 10500:1991) - Tolerance Limits for Inland Surface - Waters subject to Pollution IS : 2296 – 1982 - Consent Fee Applicable under the Water (P&CP) Act - Parameters to be analyzed for the Industrial Effluent Samples - Rate of Cess on the Basis of Water Consumption - Cess Return Format

UNIT III: AIR (P&CP) ACT, **10**

The Air (Prevention and Control of Pollution) Act, as Amended in 1987 - Consent Fee applicable under the Air (P&CP) Act – National Ambient Air Quality Standards - Standards for Chlorine Emission.

UNIT IV:ENVIRONMENT (PROTECTION) ACT **15**

The Environment (Protection) Act, 1986 (No. 29 of 1986) - The Environment (Protection) Rules - Standard Prescribed under Environment (Protection) Rules,
Waste Water Generation Standards - Environmental Statement - The Bio-Medical Waste Management Rules, 2016

TEXTBOOK

1. Tamilnadu Pollution Control Board, January 2017.

U18OECE003	**ROAD SAFETY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Any course in Engineering				
	Course Designed by – Dept of Civil Engineering				
	Category – OPEN ELECTIVE (OE)				
	Approval - Meeting of Academic Council, May 2018				

OBJECTIVES: To learn about nature of road safety, management, uses of crash data, countermeasure selection and evaluation.

UNIT I: NATURE OF ROAD SAFETY **9**

Defining Road Safety - Road Safety – a Complex Field - Science-based Road Safety Research - Road Safety Demographics - Crash Contributing Factors and Interactions - Road User Decisions - Intervention Tools and Countermeasures

UNIT II: INSTITUTIONAL SETTINGS OF ROAD SAFETY MANAGEMENT **9**

The Foundation for Road Safety Management Policy - Safety Management Roles and Responsibilities - The Influence of Interest Groups - Road Safety Education Opportunities - Road Safety and Other Transportation Priorities

UNIT III: ORIGINS, CHARACTERISTICS AND USES OF CRASH DATA 9

Using Data to Identify Safety Problem - State and Local Data Systems - Crash Data Collection - National Road Safety Databases

UNIT IV: CONTRIBUTING CRASH FACTORS, COUNTERMEASURE SELECTION, AND EVALUATION 9

Problem Identification Using Scientific Methods - High Risk Entities - Countermeasure Identification - Countermeasure Identification - Diversity Analysis - Cost Effectiveness of Alternative Countermeasures.

UNIT V: ROAD SAFETY PROGRAM MANAGEMENT 9

The Importance of Scientific Management Techniques - Strategies for Integrating and Amplifying Safety in the - Transportation Planning Processes - Organizational Leadership and Support Needs - Effective Multidisciplinary - Collaborative Relationships - Coalition Building Communications Strategies - Current Research Supporting Road Safety Management - Stimulating Change - Funding Sources and Requirements -Leveraging Resources - Outreach and Public Involvement

U18OECE004	**INFRASTRUCTURE DEVELOPMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Any course in Engineering				
	Course Designed by – Dept of Civil Engineering				
	Category – OPEN ELECTIVE (OE)				
	Approval - Meeting of Academic Council, May 2018				

OBJECTIVES: To know about infrastructure development related to sanitation, storm water, municipal wastes, power and fire.

UNIT I: ROLE OF INFRASTRUCTURE IN DEVELOPMENT 10

Elements of Infrastructure (physical, social, utilities and services); Basic definitions, concepts, significance and importance; Data required for provision and planning of urban networks and services; Resource analysis, provision of infrastructure, and land requirements; Principles of resource distribution in space; Types, hierarchical distribution of facilities, Access to facilities, provision and location criteria, Norms and standards.

UNIT II: PLANNING AND MANAGEMENT OF WATER, SANITATION AND STORM WATER 10

Water – sources of water, treatment and storage, transportation and distribution, quality, networks, distribution losses, water harvesting, recycling and reuse, norms and standards of provision, institutional arrangements, planning provisions and management issues; Sanitation – points of generation, collection, treatment, disposal, norms and standards, grey water disposal, DEWATS, institutional arrangements, planning provisions and management issues. Storm water – rainfall data interpretation, points of water stagnation, system of natural drains, surface topography and soil characteristics, ground water replenishment, storm water

collection and disposal, norms and standards, institutional arrangements, planning provisions and management issues;

UNIT III: PLANNING AND MANAGEMENT OF MUNICIPAL WASTES, POWER AND FIRE **10**

Municipal and other wastes – generation, typology, quantity, collection, storage, transportation, treatment, disposal, recycling and reuse, wealth from waste, norms and standards, institutional arrangements, planning provisions and management issues. Power – Sources of power procurement, distribution networks, demand assessment, norms and standards, planning provisions and management issues. Fire – History of fire hazards, vulnerable locations, methods of fire fighting, norms and standards, planning provisions and management issues.

UNIT IV: TRANSPORT INFRASTRUCTURE PLANNING, MANAGEMENT AND DESIGN **15**

Role of transport, types of transport systems, evolution of transport modes, transport problems and mobility issues**;** Urban form and Transport patterns, land use – transport cycle, concept of accessibility; Hierarchy, capacity and geometric design elements of roads and intersections**;** Basic principles of Transport infrastructure design; Traffic and transportation surveys and studies, traffic and travel characteristics; Urban transport planning process – stages, study area, zoning, data base, concept of trip generation Transport, environment and safety issues; principles and approaches of traffic management, transport system management.

TEXTBOOKS:

1. Crisis in road transport Konark Publishers Pvt. Ltd. , Mohinder Sing and L.R. Kadiyali, New Delhi, 1989
2. Traffic engineering and transportation planning, L. R. Kadiyali, Khanna Publishers, New Delhi, 2007.

REFERENCES:

1. Environmental scenario inIndia, Mukerjee S. and Chakraborty D. (Eds), Routledge, London, 2012.
2. Infrastructure and Governance , Sameer Kochhar, Deepak B. Phatak, H. Krishnamurthy, Gursharan Dhanjal, (eds), Academic Foundation, New Delhi, 2008.

	PROJECT SAFETY MANAGEMENT	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Any course in Engineering				
U18OECE005	Course Designed by – Dept of Civil Engineering				
	Category – OPEN ELECTIVE (OE)				
	Approval - Meeting of Academic Council, May 2018				

OBJECTIVES: To study relationship between Projects and Planning at various Levels. To study Management, Implementation and Evaluation of Projects.

UNIT I:PROJECT PLANNING **10**

Introduction to Projects; Nature of planning projects; Project Life Cycle; Identification of projects

UNIT II: PROJECT FORMULATION AND APPRAISAL 10

Relationship between projects and planning issues including sectoral policy at: Local, State and National levels Project appraisal: Market analysis – Macro environment survey, survey methods, market characterization, demand forecasting; Technical Analysis – Magnitude, processes, materials, equipment, factors of production availability, implementation schedule; suitability of the plans, layout and design, location of the project; location analysis; supporting infrastructurerequirements- Capital Budgeting – Estimation of costing of components; developing over project cost; Social cost benefit analysis – UNIDO, Merles, ZOPP/GOPP, etc.

UNIT III: PROJECT MANAGEMENT AND IMPLEMENTATION, AND PROJECT EVALUATION AND MONITORING 10

Project characteristics - pitfalls in management of a project; Techniques of management; Planning milestones - responsibility charts and principle responsibility, principles of activity planning; Project Implementation – methods, hurdles, facilitative factors; Project culture: line management, steering committee, role of project manager; Project Control: cost and time, quality - ISI standards and its application to Indian context; Introduction to Project Management Software (Ms Projects) and its usage. Types of evaluation - concurrent, ex-ante and ex-post. Methods of evaluation, techniques of evaluation, end results, Presentation of evaluation findings, Techniques of Monitoring of Development Works.

UNIT IV: REGULATORY FRAMEWORKS GOVERNING PROJECTS 15

National Rehabilitation and Resettlement Policy (2007) - Social Impact mitigation; National Environmental Policy (2006) – Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP).

TEXTBOOKS:

1. Projects reports, Prasanna Chandra McGraw Hill, New Delhi, 2009.
2. Brilliant Project Management, Barker, Stephenand Cole, Rob. Pearson Education Limited, UK, 2007.

	ENVIRONMENT, HEALTH AND SAFETY IN INDUSTRIES	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Any course in Engineering				
U18OECE006	Course Designed by – Dept of Civil Engineering				
	Category – OPEN ELECTIVE (OE)				
	Approval - Meeting of Academic Council, May 2018				

OBJECTIVES: To study about the factory safety norms, environmental policies, storage and import of hazardous chemical rules and other rules and regulations.

UNIT I: FACTORIES ACT – 1948 9

Stuatutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young persons – special provisions – penalties and procedures-Tamilnadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948

UNIT II ENVIRONMENT ACT – 1986 **9**

General powers of the central government, prevention, control and abatement of environmental pollution-Biomedical waste (Management and handling Rules, 1989-The noise pollution (Regulation and control) Rules, 2000-The Batteries (Management and Handling Rules) 2001- No Objection certificate from statutory authorities like pollution control board. Air Act 1981 and Water Act 1974: Central and state boards for the prevention and control of air pollution-powers and functions of boards – prevention and control of air pollution and water pollution – fund – accounts and audit, penalties and procedures.

UNIT III MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES 1989 **9**

Definitions – duties of authorities – responsibilities of occupier – notification of major accidents – information to be furnished – preparation of offsite and onsite plans – list of hazardous and toxic chemicals – safety reports – safety data sheets.

UNIT IV OTHER ACTS AND RULES **9**

Indian Boiler Act 1923, static and mobile pressure vessel rules (SMPV), motor vehicle rules, mines act 1952, workman compensation act, rules – electricity act and rules – hazardous wastes (management and handling) rules, 1989, with amendments in 2000- the building and other construction workers act 1996., Petroleum rules, Gas cyclinder rules-Explosives Act 1983-Pesticides Act.

UNIT V INTERNATIONAL ACTS AND STANDARDS **9**

Occupational Safety and Health act of USA (The Williames-Steiger Act of 1970) – Helath and safety work act (HASAWA 1974, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).

TEXTBOOKS

1. The Factories Act 1948, Madras Book Agency, Chennai, 2000
2. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt.Ltd., New Delhi.
3. Water (Prevention and control of pollution) act 1974, Commercial Law publishers (India) Pvt.Ltd., New Delhi.
4. Air (Prevention and control of pollution) act 1981, Commercial Law Publishers (India) Pvt.Ltd., New Delhi.

REFERENCES

1. The Indian boilers act 1923, Commercial Law Publishers (India) Pvt.Ltd., Allahabad.
2. The Mines Act 1952, Commercial Law Publishers (India) Pvt.Ltd., Allahabad.
3. The manufacture, storage and import of hazardous chemical rules 1989, Madras Book Agency, Chennai.
4. National seminar on hazardous waste management organized by National Safety council, Ministry of environment and forests, Government of India, United States – Asia environmental partnership, Tamilnadu pollution control board and Indian chemical manufacturers association, April 2001.