SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

An Autonomous Institution affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade

Kuniamuthur, Coimbatore - 641 008

DEPARTMENT OF CIVIL ENGINEERING

BE CIVIL ENGINEERING

CURRICULUM AND SYLLABI

REGULATION 2015

CHOICE BASED CREDIT SYSTEM

SRI KRISHNA COLLEGE OF ENGNEERING AND TECHNOLOGY

An Autonomous Institution Affiliated to Anna University

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VISION AND MISSION OF THE DEPARTMENT

Vision

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

Mission

To accomplish our vision, we are committed to

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

Program Outcomes (POs):-

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

PO 1. **Engineering knowledge:** Apply the knowledge of mathematics, science and engineering fundamentals for the solution of complex Civil Engineering problems.

PO 2. **Problem analysis:** Identify, formulate and analyse complex Civil Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO 3. **Design/development of solutions:** Design solutions for complex Civil Engineering problems and design system components with appropriate consideration for public health & safety, cultural, societal and environmental considerations.

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs):-

At the end of the program, Graduate should have attained

PSO1: The ability to analyse, design and interpret by applying the concepts of mathematics and physical sciences in the core areas of Civil Engineering.

PSO2: The propensity to excel in portfolio of waste management, sanitation, housing and construction management for the sustainable environment.

PSO3: The ability to acquire and update knowledge continuously and offer engineering solutions to meet the environmental and societal needs.

B.E. CIVIL ENGINEERING

I – VIII SEMESTER CURRICULUM AND SYLLABI

REGULATION: 2015

SEMESTER I							
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/wk.**	**Credits**	**Ext/Int.**	**Cat.**
THEORY							
1.	15UH101	Communication Skills - I	2/0/2	4	3	60/40	HS
2.	15UH202	Engineering Physics	3/0/0	3	3	60/40	BS
3.	15UH203	Engineering Chemistry	3/0/0	3	3	60/40	BS
4.	15UH201	Mathematics – I	2/2/0	4	3	60/40	BS
5.	15UA301	Engineering Drawing	0/1/3	4	2	60/40	ES
6.	15UC301	Fundamentals of Computing and C Programming	3/0/0	3	3	60/40	ES
PRACTICAL							
7.	15UH251	Physical Science Laboratory	0/0/4	4	2	60/40	BS
8.	15UC351	Fundamentals of Computing & C Programming Lab.	0/0/3	3	2	60/40	ES
9.	15UA355	Engineering Practices Laboratory	0/0/3	3	2	60/40	ES
		Total	**13/3/15**	**31**	**23**	**900**	

SEMESTER II							
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/wk.**	**Credits**	**Ext/Int.**	**Cat.**
THEORY							
1.	15UH102	Communication Skills - II	2/0/2	4	3	60/40	HS
2.	15UH204	Mathematics – II	2/2/0	4	3	60/40	BS
3.	15UH213	Environmental Science	3/0/0	3	3	60/40	HS
4.	15UF307	Basics of Electrical and Mechanical Engineering	3/0/0	3	3	60/40	ES
5.	15UA302	Engineering Mechanics	2/2/0	4	3	60/40	ES
6.	15UG301	Construction Materials	3/0/0	3	3	60/40	ES
PRACTICAL							
7.	15UC354	Advanced C Programming Laboratory	0/0/3	3	2	60/40	ES
8.	15UA353	Computer Aided Drafting and Modelling Laboratory	0/1/3	4	2	60/40	ES
9.	15UG351	Construction Materials Testing Laboratory	0/0/3	3	2	60/40	PC
		Total	**15/5/11**	**31**	**24**	**900**	

SEMESTER III							
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/wk.**	**Credits**	**Ext/Int.**	**Cat.**
THEORY							
1.	15MA132	Fourier Analysis and Statistical Quality Control	3/1/0	4	4	60/40	BS
2.	15CE304	Mechanics of Solids – I	3/0/0	3	3	60/40	ES
3.	15CE305	Mechanics of Fluids	3/0/0	3	3	60/40	ES
4.	15CE306	Surveying – I	3/0/0	3	3	60/40	PC
5.	15CS206	Object Oriented Programming	3/0/3	6	5	40/60	ES
6.	15CE40X	Professional Soft Core – I	3/0/0	3	3	60/40	PSC
PRACTICAL							
7.	15CE307	Strength of Materials Laboratory	0/0/3	3	2	40/60	PC
8.	15CE308	Survey Practical – I	0/0/3	3	2	40/60	PC
9.	15MC80X	Mandatory Course	2/0/0	2	1	0/100	MC
		Total	**20/1/9**	**30**	**26**	**900**	

SEMESTER IV								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/wk.**	**Credits**	**O**	**Ext/Int.**	**Cat.**
THEORY								
1.	15MA106	Computational Methods for Civil Engineers	3/2/0	5	4	-	60/40	BS
2.	15CE309	Theory of Structures	3/1/0	4	3	-	60/40	PC
3.	15CE310	Surveying – II	3/0/0	3	3	2	60/40	PC
4.	15CE311	Soil Mechanics	3/1/0	4	3	2	60/40	PC
5.	15CE40X	Professional Soft Core – II	3/0/0	3	3	-	60/40	PSC
THEORY CUM PRACTICAL								
6.	15CE312	Hydraulics and Hydraulic Machinery	3/0/3	6	4	-	40/60	PC
PRACTICAL / PROJECT WORK								
7.	15CE313	Soil Mechanics Laboratory	0/0/3	3	2	-	40/60	PC
8.	15CE314	Engineering Survey Laboratory	0/0/3	3	2	-	40/60	PC
9.	15CE701	Mini Project – I	0/0/0	-	1	-	0/100	PW
10.	15MC804	Human Values and Professional Ethics	2/0/0	2	1	-	0/100	MC
		Total	**20/4/9**	**33**	**26**	**4**	**1000**	

SEMESTER V								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/wk.**	**Credits**	**O**	**Ext/Int.**	**Cat.**
THEORY								
1.	15CE315	Structural Analysis Classical Methods	3/1/0	4	4	-	60/40	PC
2.	15CE316	Construction Management	3/0/0	3	3	-	60/40	PC
3.	15CE317	Environmental Engineering	3/0/0	3	3	2	60/40	PC
4	15CE318	Design of Steel Structures	4/0/0	4	4	2	60/40	PC
5	15CE319	Foundation Engineering	3/1/0	4	3	-	60/40	PC
PRACTICAL								
6.	15CE320	Environmental Engineering Laboratory	0/0/3	3	2	-	40/60	PC
7.	15CE321	Computer Aided Building Drawing Laboratory	0/0/3	3	2	-	40/60	PC
8.	15CE322	Concrete Laboratory	0/0/3	3	2	-	40/60	PC
EMPLOYABILITY ENHANCEMENT SKILLS								
9.	15CE1001	Internship / In-plant Training	0/0/0	-	1	-	0/100	EES
		Total	**16/2/9**	**27**	**24**	**4**	**900**	

SEMESTER VI								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/wk.**	**Credits**	**O**	**Ext/Int.**	**Cat.**
THEORY								
1.	15CE323	Structural Analysis : Modern Methods	3/1/0	4	4	-	60/40	PC
2.	15CE324	Design of R C Elements	4/0/0	4	4	2	60/40	PC
3.	15CE4XX	Professional Elective – I	3/0/0	3	3	2	60/40	PE
4.	15CE4XX	Professional Elective – II	3/0/0	3	3	-	60/40	PE
5.	15YY6XX	Open Elective	3/0/0	3	3	-	60/40	OE
THEORY CUM PRACTICAL								
6.	15CE325	Estimation and Quantity Surveying	3/0/3	6	4	-	40/60	PC
PRACTICAL / PROJECT WORK								
7.	15CE326	Structural Analysis, Design and Detailing Laboratory	1/0/3	4	2	-	40/60	PC
8.	15CE702	Mini Project – II	0/0/0	-	1	-	0/100	PW
EMPLOYABILITY ENHANCEMENT SKILLS								
9.	15CE1002	Internship/In-plant Training	0/0/0	-	1	-	0/100	EES
		Total	**20/1/6**	**27**	**25**	**4**	**900**	

SEMESTER VII								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/wk.**	**Credits**	**O**	**Ext/Int.**	**Cat.**
THEORY								
1.	15CE327	Building Services	3/ 1/0	4	4	2	60/40	PC
2.	15CE5XX	Professional Elective – III	3/0/0	3	3	2	60/40	PE
3.	15CE5XX	Professional Elective – IV	3/0/0	3	3	-	60/40	PE
4.	15CE5XX	Professional Elective – V	3/0/0	3	3	-	60/40	PE
5.	15CE5XX	Professional Elective – VI	3/0/0	3	3	-	60/40	PE
THEORY CUM PRACTICAL								
5.	15CE328	Design and detailing of R C Structures	3/0/3	6	4	-	40/60	PC
PROJECT WORK / OPEN ELECTIVE								
6.	15CE703	Design Comprehension Project	0/0/8	8	4	-	40/60	PW
		Total	**18/1/11**	**30**	**24**	**4**	**700**	

SEMESTER VIII								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs./wk.**	**C**	**O**	**Ext./Int.**	**Cat.**
PROJECT WORK								
1.	15CE704	Project Work	0/0/24	24	12	-	40/60	PW
		Total	**0/0/24**	**24**	**12**	-	**100**	

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

SL. No.	**Stream**	**Credits/Semester**								**C**	**%**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**		
1.	Humanities (HS)	3	6	-	-	-	-	-	-	**9**	4.95
2.	Basic Sciences (BS)	11	3	4	4	-	-	-	-	**22**	12.08
3.	Engineering Sciences (ES)	9	13	11	-	-	-	-	-	**33**	18.13
4.	Professional Core (PC)	-	2	7	17	23	14	8	-	**71**	39.01
5.	Professional Soft Core (PSC)	-	-	3	3	-	-	-	-	**6**	3.3
6.	Professional Electives (PE)	-	-	-	-	-	6	12	-	**18**	9.89
7.	Open Electives (OE)	-	-	-	-	-	3	-	-	**3**	1.65
8.	Project Work (PW)	-	-	-	1	-	1	4	12	**18**	9.89
9.	Employability Enhancement Skills (EES)	-	-	-	-	1	1	-	-	**2**	1.1
	Sub Total	23	24	25	25	24	25	24	12	**182**	100
10.	Mandatory Course (MC)	-	-	1	1	-	-	-	-	**2**	
	Total	**23**	**24**	**26**	**26**	**24**	**25**	**24**	**12**	**184**	

HUMANITIES SCIENCES (9 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	15UH101	Communication Skills - I	2/0/2	4	3	HS
2.	15UH102	Communication Skills - II	2/0/2	4	3	HS
3.	15UH213	Environmental Science	3/0/0	3	3	HS

BASIC SCIENCES (22 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	15UH202	Engineering Physics	3/0/0	3	3	BS
2.	15UH203	Engineering Chemistry	3/0/0	3	3	BS
3.	15UH201	Mathematics – I	2/2/0	4	3	BS
4.	15UH251	Physical Science Laboratory	0/0/4	4	2	BS
5.	15UH204	Mathematics – II	2/2/0	4	3	BS
6.	15MA107	Fourier Analysis and Statistical Quality Control	3/2/0	5	4	BS
7.	15MA108	Computational Methods for Civil Engineers	3/2/0	5	4	BS

ENGINEERING SCIENCES (33 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./wk.	C	Cat.
1.	15UA301	Engineering Drawing	0/1/3	4	2	ES
2.	15UC301	Fundamentals of Computing and C Programming	3/0/0	3	3	ES
3.	15UC351	Fundamentals of Computing & C Programming Lab.	0/0/3	3	2	ES
4.	15UA355	Engineering Practices Laboratory	0/0/3	3	2	ES
5.	15UF307	Basics of Electrical and Mechanical Engineering	3/0/0	3	3	ES
6.	15UC354	Advanced C Programming Laboratory	0/0/3	3	2	ES
7.	15UA353	Computer Aided Drafting and Modelling Laboratory	0/1/3	4	2	ES
8.	15CS206	Object Oriented Programming	3/0/3	6	5	ES
9.	15UA302	Engineering Mechanics	2/2/0	4	3	ES
10.	15UG301	Construction Materials	3/0/0	3	3	ES
11.	15CE304	Mechanics of Solids – I	3/0/0	3	3	ES
12.	15CE305	Mechanics of Fluids	3/0/0	3	3	ES

PROFESSIONAL CORE (71 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	15UG351	Construction Materials Testing Laboratory	0/0/3	3	2	PC
2.	15CE306	Surveying – I	3/0/0	3	3	PC
3.	15CE307	Strength of Materials Laboratory	0/0/3	3	2	PC
4.	15CE308	Survey Practical – I	0/0/3	3	2	PC
5.	15CE309	Theory of Structures	3/1/0	4	3	PC
6.	15CE310	Surveying – II	3/0/0	3	3	PC
7.	15CE311	Soil Mechanics	3/1/0	4	3	PC
8.	15CE312	Hydraulics and Hydraulic Machinery	3/0/3	6	4	PC
9.	15CE313	Soil Mechanics Laboratory	0/0/3	3	2	PC
10.	15CE314	Engineering Survey Practical	0/0/3	3	2	PC
11.	15CE315	Structural Analysis Classical Methods	3/1/0	4	4	PC
12.	15CE316	Construction Management	3/0/0	3	3	PC
13.	15CE317	Environmental Engineering	3/0/0	3	3	PC
14.	15CE318	Design of Steel Structures	4/0/0	4	4	PC
15.	15CE319	Foundation Engineering	3/1/0	4	3	PC
16.	15CE320	Environmental Engineering Laboratory	0/0/3	3	2	PC
17.	15CE321	Computer Aided Building Drawing Laboratory	0/0/3	3	2	PC
18.	15CE322	Concrete Laboratory	0/0/3	3	2	PC
19.	15CE323	Structural Analysis : Modern Methods	3/1/0	4	4	PC
20.	15CE324	Design of R C Elements	4/0/0	4	4	PC
21.	15CE325	Estimation and Quantity Surveying	3/0/3	6	4	PC
22.	15CE326	Structural Analysis, Design and Detailing Laboratory	1/0/3	4	2	PC
23.	15CE327	Building Services	3/1/0	4	4	PC
24.	15CE328	Design and detailing of R C Structures	3/0/3	6	4	PC

PROFESSIONAL SOFTCORE (6 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	15CE401	Highway Engineering	3/0/0	3	3	PSC
2.	15CE402	Concrete Technology	3/0/0	3	3	PSC
3.	15CE403	Irrigation Engineering	3/0/0	3	3	PSC
4.	15CE404	Principles of Architecture	3/0/0	3	3	PSC

PROFESSIONAL ELECTIVE COURSES (18 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
Elective Stream I : Structural Engineering						
1.	15CE501	Maintenance and Rehabilitation of Structures	3/0/0	3	3	PE
2.	15CE502	Green Building Technology	3/0/0	3	3	PE
3.	15CE503	Prefabricated Structures	3/0/0	3	3	PE
4.	15CE504	Earthquake Resistant Structures	3/0/0	3	3	PE
5.	15CE505	Prestressed Concrete Structures	3/0/0	3	3	PE
6.	15CE506	Pre Engineered and Industrial Structures	3/0/0	3	3	PE
7.	15CE507	Finite Element Techniques	3/0/0	3	3	PE
8.	15CE508	Tall buildings	3/0/0	3	3	PE
9.	15CE509	Ground Improvement Techniques	3/0/0	3	3	PE
Elective Stream II : Environmental Engineering						
1.	15CE510	Environmental Impact Assessment and Risk Management	3/0/0	3	3	PE
2.	15CE511	Renewable Sources of energy	3/0/0	3	3	PE
3.	15CE512	Industrial Waste Water Management	3/0/0	3	3	PE
4.	15CE513	Solid and Hazardous Waste Management	3/0/0	3	3	PE
5.	15CE514	Irrigation Water Management	3/0/0	3	3	PE
6.	15CE515	Applied Hydrology	3/0/0	3	3	PE
7.	15CE516	Air and water quality modelling	3/0/0	3	3	PE
8.	15CE517	Remote Sensing and GIS applications	3/0/0	3	3	PE
9.	15CE518	Subsurface contaminant remediation	3/0/0	3	3	PE
Elective Stream III : Transportation and Construction Engineering						
1.	15CE519	Railway , Airport, Docks and Harbour Engineering	3/0/0	3	3	PE
2.	15CE520	Traffic Engineering and Management	3/0/0	3	3	PE
3.	15CE521	Urban and Town Planning	3/0/0	3	3	PE
4.	15CE522	Construction Safety Management	3/0/0	3	3	PE
5.	15CE523	Contract Laws and Regulations	3/0/0	3	3	PE
6.	15CE524	Formwork Systems	3/0/0	3	3	PE
7.	15CE525	Quantitative Techniques in Construction Management	3/0/0	3	3	PE
8.	15CE526	Design of Substructures	3/0/0	3	3	PE
9.	15CE527	Pavement Engineering	3/0/0	3	3	PE

OPEN ELECTIVES (3 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	15CE601	Disaster Management	3/0/0	3	3	OE
2.	15CE602	Engineering Risk Benefit Analysis	3/0/0	3	3	OE
3.	15CE603	Geographic Information System	3/0/0	3	3	OE

PROJECT WORK (18 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	15CE701	Mini Project – I	0/0/0	-	1	PW
2.	15CE702	Mini Project – II	0/0/0	-	1	PW
3.	15CE703	Design Comprehension Project	0/0/8	8	4	PW
4.	15CE704	Project Work	0/0/24	24	12	PW

MANDATORY COURSES (2 Credits)

SL. No.	Course Code	Course Title	C	Cat.
1.	15EN801	Business English- I	1	MC
2.	15EN802	Business English- II	1	MC
3.	15CE801	Human Values and Professional Ethics	1	MC

ONE CREDIT COURSES (Additional Credits)

SL. No.	Course Code	Course Title	Credits
1.	15CE901	Auto CADD Certification Course	1
2.	15CE902	Building Functional Layout Planning	1
3.	15CE903	Building By Laws	1
4.	15CE904	ETABS Certification Course	1
5.	15CE905	Global Initiative of Academic Networks (GIAN)	1
6.	15CE906	M S Project Certification Course	1
7.	15CE907	MOOC Certification Courses	1
8.	15CE908	Non Destructive Testing of Existing Civil Engineering Structures	1
9.	15CE909	Primavera Certification Course	1
10.	15CE910	Professional Delivery Systems in Construction Industry	1
11.	15CE911	Rivet Architecture Certification Course	1
12.	15CE912	Safety Engineering in Building Construction	1

13.	15CE913	STADD. Pro Certification Course	1
14.	15CE914	Surveying by Total Station and GPS	1
15.	15CE915	Valuation of Immovable Properties	1
16.	15CE916	NPTEL Courses/ Spoken Tutorial	1

EMPLOYABILITY ENHANCEMENT SKILLS (2 Credits)

SL. No.	Course Code	Course Title	Duration	C	Cat.
1.	15CE1001	Internship / In-plant Training	2 weeks	1	EES
2.	15CE1002	Internship / In-plant Training	2 weeks	1	EES

SEMESTER WISE CREDIT DISTRIBUTION:-

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	**23**	**24**	**26**	**26**	**24**	**25**	**24**	**12**	**184**

Total Credits: 184

L: Lecture T: Tutorial P: Practical C: Credit O: Outside Class hours Cat.: Category

HS: Humanities Sciences BS: Basic Sciences ES: Engineering Sciences
PC: Professional Core PE: Professional Elective PSC: Professional Soft Core
OE: Open Elective PW: Project Work MC: Mandatory Course
EES: Employability Enhancement Skills

SEMESTER I

15UH101	COMMUNICATION SKILLS- I (Common to all branches of B.E / B. Tech courses)	2/0/2/3

COURSE OBJECTIVES

1. To emphasis and develop language skills to satisfy the needs of work environment
2. To inculcate reading and listening habits and thereby improvising speaking and writing skills.
3. To familiarize students with business terms through BEC Preliminary examination

COURSE OUTCOMES

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

C101.1 Understand and intensely focus on improving and increasing LSRW Skills.
C101.2 Apply a good command over basic writing and reading skills.
C101.3 Remember language skills for business related situations.
C101.4 Analyze and use vocabulary in corporate work environment

UNIT I		9

Getting to know people- Introduction- Talking about job (Present simple)- Talking about working conditions(Adverb of frequency)- Talking about company history and structure (Past simple, Prepositions of time)- Talking about company activities (Connectors of addition and contrast, Present Continuous)- Focus on language -Parts of Speech- Gerunds and Infinitives- Instructions

UNIT II		9

Vocabulary practice- Telephoning Leaving and taking messages)- Requests and obligation- Describing trends (Adjectives and adverbs)- Talking about company performance (Present perfect and past simple, Reasons and consequences)- Reading Test Practice- Describing products Dimensions, (Comparatives and superlatives, Question formation)- Talking about product development (Sequencing words, Present continuous and going to)- Articles- Prepositions- Synonyms-Antonyms- Recommendations

UNIT III		9

Talking about business equipment (Giving Instruction)- Letter Phrases- Writing Test Practice- Talking about hotel facilities (Asking for and giving direction)- Talking about traffic and transport (making predictions)- Tenses- Present-Past-Future-Forms of verbs- Word techniques-Formation-Prefixes-Suffixes

UNIT IV		9

Talking about conference arrangement (Checking and confirming)- Talking about a conference before, after, when, until, etc.- Listening Test Practice- Talking about production processes- passive- Talking about quality control Conditional 1 (real) (Making suggestions)- Itinerary- Jumbled Sentences

UNIT V		9

Talking about call centers, insurance and changes in working practices(Future possibility/ Probability- Talking about banking- Speaking Test Practice- Talking about delivery services (prepositions of time)- Talking about trading (Tense review)- Talking about recruitment Conditional 2 (hypothetical)- Talking about job applications (Indirect questions)- Reading, Writing and Listening Test- Job Application Letter and Resume Writing-Permission Letters.

TOTAL LECTURE HOURS: 45

TEXT BOOKS:

1. Wood, Ian, Anne Williams with Anna Cowper Pass Cambridge BEC Preliminary, Cengage learning. Second Edition. 2013
2. Dr Sumanth S, English for Engineers, Vijay Nicole Imprints Private Limited, 2005

REFERENCE BOOKS:

1. Whitby, Norman. Cambridge University Press- Students Book. 2013.
2. Jawahar, Jewelcy, Rathna P, English Work book, VRB Publications Pvt Ltd,2016.
3. E. Gunasekaran S, 'A Text and Workbook of Technical English I", United Global Publishers, June 2010.

15UH202	ENGINEERING PHYSICS (Common to all branches of B.E / B. Tech courses)	3/0/0/3

PREREQUISITES: Nil

COURSE OBJECTIVES

1. To impart the fundamental knowledge on acoustics
2. To understand the advanced technology of laser and optical fiber in the field of Engineering
3. To exposure the behaviour of heat

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to

C202.1 Present a technical overview of architectural acoustics

C202.2 Understand modern device and technology based on laser

C202.3 Understand modern device and technology based on optical fiber

C202.4 Design the heat engine having greater efficiency

UNIT 1	ACOUSTICS	9

Characteristics of musical sound – Loudness - Weber-Fechner law – decibel – absorption coefficient – reverberation time – Sabine's formula – Acoustics of buildings – Ultrasonics: Production of ultrasonics using piezoelectric method, magnetostriction method – Applications of ultrasonics: Sonogram, SONAR

UNIT 2	LASER	9

Introduction, Principle – Spontaneous emission, Stimulated emission, Population Inversion, Pumping - Types of Laser –Nd-YAG, CO_2 Laser, Semiconductor Laser. Applications – Lasers in Microelectronics: Thermal Effect Drilling, Welding, Cutting, Medical Field and Holography

UNIT 3	FIBER OPTICS	9

Principle, Modes of Propagation, Numerical aperture, Acceptance angle and Fractional Index change of an optical fiber - Classification based on Materials, Refractive Index Profile and Modes - Fabrication Techniques: Rod & Tube method, Crucible-Crucible Technique - Splicing, Losses in Optical fiber. Light Sources for fiber Optics – Detectors: PIN, Avalanche Photo diode – Application: Fiber Optical Communication links and endoscope.

UNIT 4	HEAT AND THERMODYNAMICS	9

Thermal conductivity – Forbe's and Lees disc methods - Radial flow of heat: Thermal conductivity of rubber and glass - Laws of thermodynamics - Concepts of entropy - Carnot cycle as heat engine and refrigerator, Carnot theorem, ideal Otto and diesel engines

UNIT 5	QUANTUM PHYSICS	9

Inadequacy of classical mechanics, Black body radiation, photoelectric effect – Dual nature, de-Broglie concept of matte waves – Electron diffraction, Davisson–Germer experiment – Heisenberg's uncertainty principle, applications – Schrodinger wave equation, time dependent and time independent, applications (particle in one dimensional box). Electron microscopy- SEM and TEM

TOTAL:45

REFERENCE BOOKS:

1. R.K. Gaur and SL Gupta "Engineering Physics" Dhanpat Rai Publications 2014
2. Rajendran "Engineering Physics" Tata McGraw-Hill Education, New Delhi – 2011
3. Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2010
4. M.N. Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2005
5. Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2013

15UH203	ENGINEERING CHEMISTRY (Common to all branches of B.E / B. Tech courses)	3/0/0/3

PREREQUISITES: Nil

COURSE OBJECTIVES

1. To impart knowledge on the role of chemistry in everyday life along with the basic nature, types, preparation and uses of polymers.
2. To demonstrate the principle and working of electrochemistry, corrosion science and to impart knowledge on various analytical techniques used in the field of basic sciences.

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to

C203.1 Upon successful completion of this course, the student will be able to:

C203.2 Understand and remember the concept of ecology and environment and importance of Natural resources.

C203.3 To understand the various environmental issues prevailing.

C203.4 Executing the gained knowledge to prevent pollution.

UNIT 1	CHEMISTRY IN EVERYDAY LIFE	9

Chemicals in medicines-analgesics, antiseptics, antacids, disinfectants-chemicals in food preservatives-artificial sweetening agents Characteristics of water-hardness-types and estimation by EDTA method. Problems based on EDTA method Domestic water treatment-disinfection methods (chlorination,ozonation,UV treatment)- demineralisation process-desalination-reverse osmosis

UNIT 2	CHEMISTRY FOR ENGINEERING PLASTICS	9

Introduction-monomers and polymers-classification of polymers Polymerisation--mechanism of addition polymerization(free radical mechanism) Plastics- classification -preparation, properties and uses of PVC,Teflon, Nylon 6,6, moulding methods Rubber-vulcanisation of rubber-synthetic rubber (Butyl rubber and SBR

UNIT 3	NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES	9

Nuclear energy-fission and fusion reaction Light water nuclear reactor for power generation (block diagram only)- breeder reactor Solar energy conversion-solar cells-wind energy Fuel cells-hydrogen oxygen fuel cells Batteries-alkaline batteries-lead acid,nickel cadmium and lithium batteries

UNIT 4	ELECTROCHEMISTRY AND CORROSION SCIENCES	9

Electrochemical cells-single electrode potential-measurement of emf Reference electrode-SHE-calomel electrode-glass electrode and measurement of pH. Ion selective electrode Corrosion-chemical corrosion-electrochemical corrosion-galvanic corrosion-differential corrosion Protective coatings-electroplating of gold-electroless plating of Nickel.

UNIT 5	ANALYTICAL TECHNIQUES	9

Laws of absorption-Principles Colorimetry-Estimation of Iron by colorimetry Instrumentation and applications-UV-Visible spectroscopy-IR spectroscopy Flame photometry-Estimation of sodium by flame photometry Atomic absorption spectroscopy-Estimation of Nickel by atomic absorption spectroscopy.

TOTAL:45

TEXT BOOKS:

1. P.C.Jain and Monica Jain, “Engineering Chemistry”, 16th Edition, DhanpatRai.
2. Ravikrishnan, A., Engineering Chemistry – I Sri Krishna Hitech Publishing Company, 2012
3. Ravikrishnan, A., Engineering Chemistry – II, Sri Krishna Hitech Publishing Company, 2012.

REFERENCE BOOKS:

1. Sunita Rattan, A Text Book of Engineering Chemistry,SK Kataria Publishers, 2010.
2. Uppal & Bhatia, Engineering Chemistry, Khanna Publishers, 2010

15UH201	MATHEMATICS I	2/2/0/3

(common to all branches)

PREREQUISITES : Basic concepts on Matrices, Differential and Integral Calculus

COURSE OBJECTIVES

1. To have a well founded knowledge on Eigen values and Eigen vectors to handle problems that arises in Engineering and Scientific fields.
2. To emphasize the applications of Differential and Integral calculus for solving different kinds of Mathematical modelling problems
3. To give adequate exposure in applying numerical methods in predicting missing data.

COURSE OUTCOMES

At the end of this course student would be able to

C201.1 Apply the concepts of Eigen values and vectors in the field of theory of vibration, Robotic Engineering, Image Processing etc

C201.2 To apply differentiation and integration techniques to solve engineering problems

C201.3 To apply numerical methods to evaluate single and double integrals

C201.4 To apply the numerical methods to interpolation of numerical data.

UNIT 1	MATRICES	12

Characteristic Equation – Eigen values and Eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic forms

UNIT 2	INTERPOLATION AND APPROXIMATION	12

Difference Operators: Forward and Backward difference operators – Interpolation with equal intervals of arguments : Newton's forward and backward interpolation – central interpolation using Bessel formula – Divided differences – Newton's divided difference formula – Lagrangian Polynomials

UNIT 3	APPLICATIONS OF DIFFERENTIAL CALCULUS	12

Limits and Continuity – Differentiation of standard functions (concepts only) - Curvature in Cartesian co-ordinates – Centre of curvature – Radius of curvature – Circle of curvature - Evolutes of standard curves – Envelopes of curves in one and two parameters.

UNIT 4	DEFINITE INTEGRALS	12

Definite Integrals – Even and Odd functions – Properties of the definite integrals – simple problems – Integration by parts and Extension

Numerical Integration : Trapezoidal rule – Simpson's 1/3 and 3/8 rules - Two and Three point Gaussian Quadrature formulae (derivations not included)

UNIT 5	MULTIPLE INTEGRALS	12

Double integration – Cartesian and Polar coordinates – Change the order of integration – Triple integration in Cartesian coordinates – Area as double integral – Volume as triple integral (cartesian co-ordinates) – Double integrals using Trapezoidal and Simpson's rules.

TOTAL : 60

TEXT BOOKS:

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2011.
2. Jain, M.K., Iyengar, S.R.K and Jain R.K., 'Numerical Methods for Scientific and Engineering Computation',New Age international Publishers, New Delhi, 2012.

REFERENCE BOOKS:

1. Grewal, B. S., Higher Engineering Mathematics,42nd Edition, Khanna Publishers, New Delhi, 2014
2. Veerarajan. T, "Engineering Mathematics for first year", 3rd edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.
3. Bali.N.P and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, New Delhi, 2011.

15UA301	ENGINEERING DRAWING	0/1/3/2

COURSE OBJECTIVES

1. To develop graphic skills for communication of concepts, ideas and design of engineering products.
2. To expose them to existing national standards related to technical drawings.

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to

C301.1 To know the conventions and the methods of engineering drawing

C301.2 Construct basic and intermediate geometry.

C301.3 To improve their visualization skills so that they can apply these skills in developing new products.

C301.4 To improve their technical communication skill in the form of communicative drawings.

UNIT 1	CONCEPTS AND CONVENTIONS	6

Use of drafting instruments, BIS conventions and specifications – size, layout and folding of drawing sheets, Lettering and dimensioning. General principles of orthographic projection, First angle projection – Layout of views.

UNIT II	PROJECTION OF POINTS, SRAIGHT LINES AND PLANES	10

Orthographic projection system - First angle projection, Projection of points, straight lines located in the first quadrant– Determination of true lengths and true inclinations, Projection of planes- parallel to any one reference plane, perpendicular to any one reference plane, inclined to any one reference plane and inclined to both reference planes

UNIT III	PROJECTION OF SOLIDS	10

Projection of simple solids-prisms, pyramids, cylinder and cone- change of position method, Axis parallel to any one reference plane-by change of position method, Axis perpendicular to any one reference plane and inclined to any one reference plane-by change of position method

UNIT IV	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	10

Sectioning of solids-prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one any one reference plane – Obtaining the true shape of section, Development of lateral surfaces of simple solids, Development of lateral surfaces of truncated solids and frustums.

UNIT V	PICTORIAL PROJECTIONS	14

Isometric view and projection, Conversion of isometric/pictorial to orthographic views, Principles of isometric projection – isometric scale, Isometric projections of simple solids, pyramids, cylinders and cones, Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

TOTAL LECTURE HOURS: 60

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
2. B. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.

REFERENCE BOOKS:

1. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. Shah M.B. and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.
3. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

15UC301	FUNDAMENTALS OF COMPUTING AND C PROGRAMMING	3/0/0/3

COURSE OBJECTIVES

1. Extrapolate the basics about Computer and Computational Thinking.
2. Applying Systematic approach for problem solving with emphasis for Design skills
3. Understand the basics and features of Structured Programming
4. Understand the Syntax and Usage of Arrays, Strings, Functions, Pointers, Structures and unions in C.

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to

C301.1 Apply the knowledge and skills acquired in computing Environment.

C301.2 Demonstrate problem solving and design skills including the ability to formulate Problems and their solutions.

C301.3 Select appropriate data types and control structures for solving a given problem.

C301.4 Illustrate the representation of arrays, strings and usage of string operations

UNIT 1	COMPUTATIONAL THINKING AND PROBLEM SOLVING	9

Computational Thinking: Introduction to Computational Thinking - History of Computation and Computational Thinking – Computer Systems – Computing Environments. How Real World Information Becomes Computational Data: Information and data Converting Information into Data - Data Capacity – Data Types and Data Encoding. Solving Problems: Problem Definition – Logical Reasoning. System /Software Development Life Cycle: Program Development – Analysis – Design: (Algorithm - Flow Chart - Pseudo Code) – Coding – Testing – Documentation. Case Study: Raptor and Scratch Tools – Installation – Programming Environment.

UNIT II	INTRODUCTION TO C PROGRAMMING	9

Computer Languages – Overview of C – Creating and Running Programs. Character Set

C Tokens: (Keywords -Identifiers – Constants – Strings - Operators – Special Symbols) – Data Types. Expression – Precedence and Associativity– Evaluating Expression – Type Conversion.

Input and Output: Unformatted Input and Output – Formatted Input and Output.

UNIT III	CONTROL FLOW CONSTRUCTIONS	9

Decision Making and Branching: Simple if – if else – Nested if – if else if – Conditional Expression – Switch case. Programming Examples

Decision Making and Looping: for – while – do while – Nested Loop Programming Examples

Jumps in Loops: goto – Continue – break - Programming Examples

UNIT IV	ARRAYS AND STRINGS	9

Arrays: Introduction – Declaration and Initialization of Single Dimensional Arrays – Array Application - Declaration and Initialization of Two Dimensional Arrays – Multidimensional Arrays Programming Examples

Character Arrays and Strings: Declaring and Initialing Strings – Reading and Writing Strings – String Manipulation Functions – Array of Strings Programming Examples

UNIT V	POINTERS AND FUNCTIONS	9

Pointers – Introduction – Pointer Constants – Pointer Values – Pointer Variables – Accessing Variables through Pointers – Pointer Declaration and Definition – Declaration Versus Redirection – Initialization of Pointer Variables

Functions – Introduction – Needs of Function – Elements of Function – Category of Function - Recursion

Structures – Introduction – Declaring and Defining Structure Variables – Accessing Structure Members – Structure Initialization – Array of structure – Unions.

TOTAL LECTURE HOURS: 45

TEXT BOOKS:

1. David Riley and Kenny Hunt, “Computational Thinking for the Modern Problem Solver”, Chapman & Hall/CRC, 2014.
2. E Balagurusamy, “Programming in ANSI C”, 6E, TMH, 2012.

REFERENCE BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg, “A Structured Programming Approach Using C”, 3E, Cengage Learning, 2008.
2. Ashok N. Kamthane, “Programming in C”, 2E, Pearson Education, 2012.
3. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

15UH251	PHYSICAL SCIENCE LABORATORY (Common to all B.E./B.Tech.)	0/0/4/2

PREREQUISITES: Nil

COURSE OBJECTIVES

1. To provide exposure to the students with hands-on experience on scientific equipments.
2. Enhancement of student in developing analytical skills through instrumental analysis.

COURSE OUTCOMES

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

C251.1 Handle physics instrument like diode laser and its parameters

C251.2 Handle physics instruments like spectrometer, travelling microscope and solar cell

C251.3 Conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

C251.4 Conversant with hands on knowledge in the chemical analysis of acid, spectrophotometer.

PHYSICS LABORATORY

EXP NO.	NAME OF EXPERIMENT	LAB HOURS
1.	Determination of laser parameters – Wavelength and angle of divergence	3
2.	Particle size determination using diode laser.	3
3.	Determination of acceptance angle in an optical fiber	3
4.	Determination of Band gap of a Semi conducting material.	3
5.	Determination wavelength of mercury spectrum – spectrometer	3
6.	Determination of thermal conductivity of a bad conductor – Lee's disc method.	3
7.	Determination of coefficient of viscosity of liquid – Poiseuille's Method	3
8.	Determination of Young's modulus by cantilever method	3
9.	Determination the specific resistance of the given coil – Carey Foster Bridge.	3
10.	Determination of efficiency of a solar cell.	3
11.	Determination of Young's modulus of the materials – Uniform bending	3
12.	Determination of lattice constant X-ray powder photograph.	3

CHEMISTRY LABORATORY

1.	Determination of strength of given acid by pH meter.	3
2.	Conductometric titration of strong acid with strong base.	3
3.	Determination of strength of acids in a mixture(HCl&CH_3COOH)using conductivity	3
4.	Potentiometric titration of Ferrous ion using Potassium dichromate.	3
5.	Determination of Single Electrode Potential of an electrode.	3
6.	Estimation of Iron (II) content by Spectrophotometer**.**	3
7.	Determination of hardness of water by EDTA method	3
8.	Estimation of Calcium ions and Magnesium ions by EDTA method.	3
9.	Estimation of alkalinity of water sample.	3
10.	Determination of Chloride in water by Argent metric method.	3
11.	Determination of Dissolved Oxygen in waste water using Winkler's titrimetry method.	3
12.	Estimation of Copper content of the given solution by EDTA method.	3

REFERENCES:

1. Dr. G. Senthilkumar "Physics Laboratory Manual I and II (2008 & 2013)" VRB publishers Pvt Ltd.,2013
2. Dr. V. Veeraiyan "Chemistry Laboratory manual I and II (2011) VRB publishers Pvt Ltd.,
3. Dr. Magudeswaran, PN Dr. R. Ramachandran "Engineering chemistry laboratory Manual" 2004
4. R.K. Shukla, Anchal Srivastava Practical Physics, New age international (2011)
5. C.L Arora, B.Sc. Practical Physics, S. Chand &Co. (2012)

15UC351	FUNDAMENTALS OF COMPUTING AND C PROGRAMMING LABORATORY	0/0/3/2

PREREQUISITES: NIL

COURSE OBJECTIVES

1. Be exposed to problem solving techniques and to generate flow charts using Raptor Tool.
2. Be exposed to Animation, gaming and application creation using Scratch Tool
3. Be Familiar with Programming in C
4. To apply the various features of C

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to

C351.1 Demonstrate problem solving and design skills including the ability to formulate Problems and their solutions.
C351.2 Select appropriate data types and control structures for solving a given problem.
C351.3 Apply and practice logical ability to solve simple problems.
C351.4 Demonstrate 'C' programs using arrays, strings.
C351.5 Illustrate the representation of Pointers, Functions and Structure.

COURSE CONTENTS

EXP NO.	NAME OF EXPERIMENT	LAB HOURS
1.	Draw Flowchart using Raptor Tool o Simple Flow Chart o Using Decision Making o Using Pre Test Loop o Using Post Test Loop	3
2.	Create Animation / Gaming /Application using Scratch Tool	3
3.	Program to process Data types, formatting inputs and outputs.	3
4.	Program using Operators and Expression Evaluation	3
5.	Program using Decision Making	3
6.	Program using Looping Statements	3
7.	Program using Single and Two Dimensional Arrays	3
8.	Program for String manipulation	3
9.	Program using Call by Value and Call by Reference.	3
10.	Program using Recursive Function.	3
11.	Program using Array of Structures	3

15ME127	ENGINEERING PRACTICES LABORATORY	0/0/3/2

PREREQUISITES: Nil

COURSE OBJECTIVES

1. To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
2. To provide fundamental knowledge and hands on experience to the students on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to

C127.1 Fabricate carpentry components and pipe connections including plumbing works.
C127.2 Use welding equipments to join the structures.
C127.3 Fabricate electrical circuits.
C127.4 Fabricate electronics circuits.

Group A (Mechanical & Civil)

1. Forming of simple objects using sheet metal.
2. Making simple welding joints.
3. Making carpentry joints by using power tools
4. Making a connection of basic pipe lines, using PVC pipes, that includes valves and taps.
5. Studying basic construction tool.

Group B (Electrical and Electronics)

Electrical Engineering Practice

1. Identification of meters and electrical components and Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring and Stair case wiring
3. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
4. Measurement of energy using single phase energy meter.
5. Measurement of earth resistance.

Electronics Engineering Practice

1. Study of Electronic components using multimeter.
2. Measurement of AC signals parameters using CRO.
3. Study of logic gates.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Half wave rectifier and Full Wave Rectifier

SEMESTER II

15UH102	COMMUNICATION SKILLS - II (Common to all B.E./B.Tech. and I MCA)	2/0/2/3

COURSE OBJECTIVES

1. To develop the prominence of listening and reading practices using authentic business vocabulary.
2. To instil analytical thinking and logical reasoning using LSRW skills in Business related situations.
3. To urge the need of effective communication in corporate sector enhancing Business English.

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to
C102.1 Understand and gain proficiency with business vocabulary.
C102.2 Apply Task- Based activity to enhance an effective communication.
C102.3 Remember LSRW skills and employ cross-cultural communication in business related situations.
C102.4 Analyze and apply Business English in working environment.

UNIT I		9

Introduction- Talking about teamwork- Making Arrangements- Improving Communication in spoken Language- Taking and Leaving Voice mail messages (Present Tenses, Past Tense and Present Perfect)-Talking about Business Hotel (Speaking Activity)- Talking about Corporate Hospitality – Formal and Informal Language- Making accepting and declining invitations (Auxiliary Verbs, Countable or Uncountable Nouns)- Focus on language –Definitions-Extended Definitions

UNIT II		9

Talking about orders – Clarity in Written Language- Phone and Letter Phrases- Talking about Company Finances- Conditional 1 and 2- Managing Cash Flow (Intention and arrangements Conditional 1 and 2)- Talking about Brands and Marketing – Ethical Banking- Talking about Public Relations – Organizing a PR Event- Describing Duties and Responsibilities (Future Tense and Articles)- Reported speech-Modal verbs- Active and Passive, impersonal passive voice

UNIT III		9

Talking about relocation- Report Phrases- Talking about Similarity and Difference- Giving Directions – Asking for Information and Making Suggestions- Talking about Location(Comparatives and Superlatives, Participles)- Talking about Company Performance- Describing Trends- Describing Cause and Effect- Talking about Environmental Impact- Discussing Green Issues- Language of Presentations (Adjectives and Adverbs, Determiners)- Homophones- Homonyms- Acronyms- Abbreviations- British and American words

UNIT IV		9

Talking About Health and Safety- Expressing Obligation- Discussing Regulations- Talking about personnel Problems- Passives- Talking about Problem at Work (Modal Verbs , Passives)-Talking about Expenses Claims- Talking about Air Travel (Relative Pronouns , Indirect Questions)- Transcoding

UNIT V		9

Talking about Staff Benefits- Talking about Appraisal Systems (Gerunds and Infinitives , Reported Speech)- Talking about Marketing Disasters- Expressing hypothetical Situations- Talking about entering Foreign Markets(Conditional 3 , Grammar review)- Letter for calling quotations, Replying for quotations- Placing an order and complaint

TOTAL LECTURE HOURS: 45

TEXT BOOKS:

1. Wood, Ian,Paul Sanderson, Anne Williams with Marjorie Rosenberg, Pass Cambridge BECVantage, Cengage learning. Second Edition. 2014.

2. Dr Sumanth S, English for Engineers, Vijay Nicole Imprints Private Limited, 2005.

REFERENCE BOOKS:

1. Whitby, Norman. Cambridge University Press- Students Book. 2013.
2. Jawahar, Jewelcy, Rathna P, English Work book, VRB Publications Pvt Ltd,2016.
3. Gunasekaran S, 'A Text and Workbook of Technical English I", United Global Publishers, June 2010.

15UH204	MATHEMATICS - II (Common to all B.E./B.Tech.)	2/2/0/3

PREREQUISITES: Vector Algebra, Complex Numbers, Differential and Integral Calculus

COURSE OBJECTIVES

1. To understand the concept of Differential and Integral calculus for Vector valued and Complex valued functions and its applications.
2. To understand Laplace transforms techniques.
3. To understand various Numerical techniques for solving Transcendental and Algebraic equations.

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

C204.1 Solve Ordinary Differential Equations analytically and numerically, which are very useful in wave and heat equations, fluid flow problems in Engineering.

C204.2 Apply the concept of Green's and Gauss theorems which arise in Fluid mechanics, Thermal Engineering and Aerodynamics.

C204.3 Apply the concept of Stokes's theorems which arise in Fluid mechanics, Thermal Engineering and Aerodynamics.

C204.4 Apply problem solving techniques in differential calculus, which come across in wide range of Engineering and Scientific problems.

UNIT 1	ORDINARY DIFFERENTIAL EQUATIONS	12

Higher order linear differential equations with constant coefficients – Cauchy's and Legendre's linear equations – Finite difference solution of second order ordinary differential equations by Euler and Modified Euler's methods – fourth order Runge -Kutta methods for solving first order differential equations

UNIT 2	VECTOR CALCULUS	12

Gradient of a scalar point function – Angle between the surfaces – Directional derivatives – Divergence and Curl of a vector point functions – Irrotational and Solenoidal vector fields – Vector integration: Green's theorem in a plane – Gauss divergence theorem – Stokes' theorem(excluding proofs) – Simple Applications involving cubes and rectangular parallelepiped

UNIT 3	COMPLEX VARIABLES	12

Functions of complex variable – Analytic functions – Necessary and sufficient conditions – Harmonic Function – construction of Analytic functions by Mile – Thomson method – Laruent's Series and Singularities – Cauchy's theorem – Cauchy's integral formula (Concept only) – residues – Calculus of Residues – Cauchy residue theorem.

UNIT 4	LAPLACE TRANSFORM	12

Laplace transform – Conditions for existence – Transform of elementary functions – First shifting theorem – Laplace transforms of $tf(t)$ and $\frac{f(t)}{t}$ - Transform of derivatives and integrals – Inverse Laplace transforms by Method of Partial fractions – Inverse Laplace transforms by Convolution Method – Laplace transforms of Periodic functions.

UNIT 5	NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS	12

Solution of non linear equations by Regula-Falsi Method – Newton-Raphson method – solution of linear systems of equations by direct methods – gauss Elimination and Gauss-Jordan Methods – Indirect method – Gauss-Seidel Method – Eigen values by Power Method – Jacobi Method

TOTAL: 60

TEXT BOOKS:

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2011.
2. N.P.Bali,Dr.Manish Goyal, 'Engineering Mathematics' Eighth Edition, Laxmi Publications (P) Ltd,2011

REFERENCE BOOKS:

1. Grewal, B. S., ' Higher Engineering Mathematics',39th Edition, Khanna Publishers, New Delhi, 2006.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2006.
3. Jain, M.K., Iyengar, S.R.K and Jain R.K., 'Numerical Methods for Scientific and Engineering Computation', New Age international Publishers, New Delhi, 2012.

15UH213	ENVIRONMENTAL SCIENCE (Common to B.E. Civil, ECE, EEE, CSE and B.Tech. IT)	3/0/0/3

PREREQUISITES: Basics of environmental sciences

COURSE OBJECTIVES

1. To impart knowledge on the role of chemistry in everyday life along with the basic nature, types, preparation and uses of polymers.
2. To demonstrate the principle and working of electrochemistry, corrosion science and to impart knowledge on various analytical techniques used in the field of basic sciences.

COURSE OUTCOMES

After the completion of this course, students will be able to

C213.1 Analyse the different materials, its properties and importance in everyday life

C213.2 Enlist different types of polymers, properties, preparation and its uses.

C213.3 Examine the properties and use of electrochemicals and corrosive agents.

C213.4 Apply the principal, working of different types of analytical techniques

UNIT 1	ENVIRONMENT & ECOSYSTEM	9

Introduction-Components of the environment-People, society and environment-Need for public awareness-Scope and importance Environmental problems and sustainable development Ecosystem –Concept-Ecosystem degradation - Structure and functions of an ecosystem-producers, consumers and decomposers -Energy flow in the ecosystem Water cycle-Carbon cycle, Oxygen cycle-Nitrogen cycle Types of ecosystem-Forest and Grassland Desert and Aquatic ecosystem-Case studies in current scenario

UNIT 2	BIODIVERSITY & NATURAL RESOURCES	9

Biodiversity-introduction-Ecosystem diversity, Species & Genetic diversity-Biogeographical classification of India Values of biodiversity-Hot spots of biodiversity Threats to biodiversity – Conservation of biodiversity Resources-introduction-Renewable & Non-renewable resources Forest resource-deforestation-timber extraction Water resources-Flood-Drought-Dam-Conflict over water
Food resource-changes & effects by modern agricultural practices-Overgrazing Land resource-landslide-Biomass-Some non-renewable sources Mineral resources-Alternate energy sources-Case studies in current scenario

UNIT 3	POLLUTION	9

Pollution-Classification of pollutants-Cause, Source, Effect and Control measures of Air pollution- Water pollution- Thermal pollution-Radioactive pollution-Marine pollution - Noise pollution Pesticidal pollution-Ground water pollution- Land pollution- Solid waste-Methods of solid waste disposal-Soil degradation Solid waste management-Recovery and conservation methods An introduction to E-waste management - Case studies in current scenario

UNIT 4	LEGAL ACTS & MAJOR ENVIRONMENTAL CONCERNS	9

Environmental legislations-Acts-Water act-Air act-Environment act Land act-Wildlife protection act Forest acts-Functions of CPCB & SPCB Water conservation-Rain water harvesting-Reducing water demand-Watershed management Disaster-Tsunami-Bhopal gas disaster-Minamata tragedy Nuclear accident-Flood, Earthquake, Cyclone and Landslide Major issues in environment-Climate change, Global warming Acid rain and Ozone layer depletion-Case studies in current scenario

UNIT 5	HUMAN POPULATION & ENVIRONMENT	9

Population-Population explosion-Effects of population growth on resources Urbanization-Family welfare Programme Environment and human health-Climate & health Infectious & water related diseases, Cancer & environment Human rights-Equity-Nutrition, health and human rights HIV/AIDS-Women and child

welfare Role of information technology in protecting the environment Role of individual in the prevention of pollution Role of NGO in protecting the environment-Case Studies in current scenario
TOTAL: 45
TEXT BOOKS: 1. AnubhaKaushik and C P Kaushik 'Perspectives in Environmental Studies"4th Edition, New Age International (P) Limited, Publisher Reprint 2014. New Delhi 2. Aloka Debi, "Environmental Science and Engineering", Universities Press, 2010.
REFERENCE BOOKS: 1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2009. (UNIT – 4: Major issues in environment) 2. 2. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', Second Edition, Pearson Education, 2004. 3. 3. Tyler Miller, Jr., 'Environmental Science, Brooks/Cole a part of Cengage Learning, 2010.
WEB REFERENCES: 1. http://nptel.ac.in/courses/104103020/20 2. http://nptel.ac.in/courses/120108002 3. http://nptel.ac.in/courses/122106030 4. http://nptel.ac.in/courses/120108004/ 5. http://nptel.ac.in/courses/122102006/20

15UF307	BASICS OF ELECTRICAL AND MECHANICAL ENGINEERING	3/0/0/3

PREREQUISITES: NIL

COURSE OBJECTIVES

1. To expose the rudiments of Electric Circuits
2. To know various types and working of Measuring Equipments and Transducers
3. To familiarize with the constructional details of different types of Electrical Machines, working principle and their performances.
4. To know about the working of basic Thermal Systems.
5. To learn the working principle of IC Engines and basic manufacturing process.

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

C307.1 Calculate current flow through any branch of the circuit, voltage across the device and power dissipation across the resistors and they can find average and RMS values of AC voltage and current.

C307.2 Indentify and understand the principle of operation of various measuring instruments and Transducers.

C307.3 Understand the Principle of operation of Electrical Machines and their applications.

C307.4 To understand the basic working of thermal systems.

C307.5 To Know the manufacturing of basic engineering components.

UNIT 1	BASICS OF CIRCUIT ANALYSIS	9

Introduction- Ohm's Law - Kirchhoff's laws – Source transformation- Resistors in Series and Parallel- Voltage and Current division- Introduction to AC Circuits – RMS value – Average value- Power and Power Factor

UNIT 2	MEASURING INSTRUMENTS AND TRANSDUCERS	9

Basic principles of Indicating instruments- Classification of Indicating instruments- Operating Principle- Ammeter and Voltmeter- Dynamometer type Watt meters- Energy meters- Megger- Transducers- Thermistor- Thermocouple – Piezo and Photo Electric transducer.

UNIT 3	ELECTRICAL MACHINES	9

Construction -Principle of Operation of DC Generator- Basic Equations and applications of DC Generator- Construction -Principle of Operation of DC Motor- Basic Equations and applications of DC Motor- Single phase transformer- Three phase induction motors- Single phase Induction Motors

UNIT 4	MECHANICAL ENGINEERING- BASIC THERMAL SYSTEMS	9

Introduction, Classification of Power Plants – Working principle of Steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits- Boilers – Classification - Operation of Simple Vertical Boiler- Terminology of Refrigeration and Air Conditioning, Layout of typical domestic Refrigerator – Principle of Window and Split type Room Air Conditioner – Central Air conditioner.

UNIT 5	I.C ENGINES & BASIC MANUFACTURING TECHNOLOGY	9

Internal Combustion Engines- Components – Working principle of Petrol and Diesel Engines- Sand Casting — Sand Moulds - Type of Patterns – Pattern Materials–Pressure Die Casting, Sand Casting defects – Inspection methods- Sheet Metal characteristics - Typical Sheet Metal operations.- CNC Machines – Classification – Working Principle – Merits & Demerits.

TOTAL: 45

TEXT BOOKS:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical and Electronics", Tata McGraw Hill, Fourth Edition, 2010.
2. Venugopal K and Prabhu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, Reprint (2010).

REFERENCE BOOKS:

1. Sudhakar.A and Shyam mohan.S Palli “Circuits and Networks: Analysis & Synthesis” 4th Edition, Tata Mc Graw Hill. 2010
2. Ravish Singh, “Electrical Networks”, Tata Mc Graw Hill, New Delhi, 2008
3. Hajra Choudhury, “Elements of Workshop Technology, Vol. I and II”, Media Promotors Pvt Ltd., Mumbai, Reprint (2012)

15UA302	ENGINEERING MECHANICS	2/2/0/3

PREREQUISITES: Fundamentals of Basic mathematics and Physics

COURSE OBJECTIVES

1. To make the students to understand the vectorial and scalar representation of forces and Moments and the static equilibrium of particles and rigid bodies, effect of friction on equilibrium, laws of motion, kinematics of motion and the interrelationship.
2. To make the students to understand the on properties of surfaces and solids, prediction of behaviour of particles and rigid bodies under motion.

COURSE OUTCOMES

After the completion of this course, students will be able to

C302.1 Define the Law of mechanics and various theorems
C302.2 Understand the centroid or Centre of Gravity and Moment of Inertia
C302.3 Apply the equilibrium concepts to force systems of particle or solids in 2D and 3D and kinematics and kinetics of particles
C302.4 Analyze the practical problems using free body diagrams

UNIT 1	BASICS AND EQUILIBRIUM OF PARTICLES	12

Introduction - Units and Dimensions - Laws of Mechanics – Parallelogram Law of forces - principle of transmissibility, Resolution and Composition of forces, Coplanar Forces -Equilibrium of a particle, Vectorial representation of forces - Forces in space - Equilibrium of a particle in space

UNIT 2	EQUILIBRIUM OF RIGID BODIES & FRICTIONAL FORCE	12

Moment of a force – Varignon's theorem – Equivalent system of forces – Reduction of system of forces into single force and couple. Types of beams, simple and compound beams, type of supports and reaction– Equilibrium of rigid bodies in two dimensions, Simple Trusses, Types-Method of joints, Method of sections- Virtual work. Laws of Coulomb friction – Angle of friction – Cone of friction , Equilibrium of bodies on inclined plane- Ladder friction- Wedge Friction

UNIT 3	PROPERTIES OF SURFACES AND SOLIDS	12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section , Hollow section by using Standard formula, Second moments of plane area – Rectangle, triangle, circle from integration T section, I section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia. Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia

UNIT 4	DYNAMICS OF PARTICLES	12

Displacements, Velocity and acceleration, their relationship —.Newton's laws of motion, Relative motion, Curvilinear motion - Cartesian and polar coordinate, Motion of projectile, Newton's laws of motion- DÁlemberts Principle, Work Energy Equation– Impulse and Momentum, Impact of elastic bodies- Conservation of momentum, Direct central impact and coefficient of restitution

UNIT 5	DYNAMICS OF RIGID BODIES	12

Kinematics of rigid bodies – Translation and Rotation of Rigid Bodies – Fixed axis rotation- Velocity and acceleration. General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere

TOTAL: 60

TEXT BOOKS:

1. F.P. Beer, and Jr. E.R Johnston, Vector Mechanics for Engineers – Statics and Dynamics, Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. Irving H. Shames, Engineering Mechanics - Statics and Dynamics, Pearson Education Asia Pvt. Ltd., 2006

REFERENCE BOOKS:

1. S. Rajasekaran and G. Sankarasubramanian, Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., New Delhi, 2005
2. J. L. Meriam and Craige , “Engineering Mechanics statics and dynamics”, John Willey and Son’s publication 8th edition.
3. Dr.D.S.Kumar , “Engineering Mechanics”, S.K.Kataria & Sons Publications-2012.

15UG301	CONSTRUCTION MATERIALS	3/0/0/3

PREREQUISITES: NIL

COURSE OBJECTIVES

1. To have a clear knowledge of construction materials and their properties.
2. To know the market forms of building materials.
3. To learn the criteria for choice of the appropriate material and the various tests for assessing the strength and quality of materials.
4. To know the relevant IS codes to be referred for various construction materials.

COURSE OUTCOMES

After the completion of this course, students will be able to

C301.1 Learn and identify the relevant physical and mechanical properties of construction materials.
C301.2 Understand the typical and potential applications of these materials.
C301.3 Understand the importance of experimental verification of material properties.
C301.4 Know the relevant IS codes to be referred for various construction materials.

UNIT 1	STONES & BRICKS	9

Stone as building material - Selection - tests - Deterioration and Preservation of Stones - Bricks - Classification – specification - Tests - Bricks for special use - Refractory bricks - Code Practices

UNIT 2	CEMENT & AGGREGATES	9

Cement - Cement Ingredients - Properties - grades - types - Hydration - Manufacturing process - Cement mortar - Tests on Cements: Compressive strength - Tensile strength - Soundness and consistency - Setting time - Aggregates - Bulking of Sand - Natural stone aggregates - Grading - Test on Coarse aggregates: Crushing strength - Impact strength - Flakiness - Abrasion Resistance - Code Practices

UNIT 3	CONCRETE	9

Ingredients - Mix proportion and grade - Ready Mix Concrete - Batching plants - Properties of fresh concrete - Properties of hardened concrete - Code Practices

UNIT 4	TIMBER & OTHER MATERIALS	9

Timber - Market forms - Industrial timber - Plywood - Veneer - Thermocole - Panels of laminates - Steel - Market forms - Aluminum - UPVC - Fibre glass reinforced plastic - Types - Water proofing materials - Code Practices

UNIT 5	FLOORING & FINISHING MATERIALS	9

Types of Flooring - Tiles: Roof & Wall tiles - Glass - Sanitary wares - Sealants for joints - Cladding - uses - Paints - Varnishes - Emulsion - Coverage

TOTAL: 45

TEXT BOOKS:

1. Varghese.P.C, “Building Materials”, PHI Learning Pvt. Ltd, New Delhi, 2012.
2. Rangwala.S.C, “Engineering Materials”, Charotar Publishing House, New Delhi 2014.

REFERENCE BOOKS:

1. Shetty M. S., Concrete Technology (Theory and Practice), S. Chand & Company Ltd., 2013.
2. Rajput.R.K, “Engineering Materials”, S. Chand & Company Ltd., 2011.
3. Duggal.S.K, “Building Materials”, New Age International (P) Ltd., Publishers

15UC354	ADVANCED C PROGRAMMING LABORATORY	0/0/3/2

PREREQUISITES: Fundamentals of Computing and C Programming Lab

COURSE OBJECTIVES

1. To Enable Students to Solve Problems using C Programming
2. To apply various C Features.

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to

C354.1 Design programs involving decision making, loops, arrays and functions.

C354.2 Implement Pointers, Dynamic Memory Allocation techniques and files in 'C' language.

C354.3 Construct programs using advanced features like preprocessor, macros, Command Line Arguments and Variable Length Argument List.

C354.4 Apply Structured Programming Concepts to Solve Real Time Application.

EXP NO.	NAME OF EXPERIMENT
1.	Program using Decision Making and Looping
2.	Program using Arrays and Strings
3.	Program using Pointer arithmetic
4.	Program using Pointer on Single and Two dimensional Arrays
5.	Program using Dynamic Memory Allocation
6.	Program using Array of Pointer and Function Pointer
7.	Program using Array of Structure using Structure passing to Function
8.	Program on basic File operation
9.	Program using Binary file
10.	Program using Random File Access
11.	Program using Preprocessor directive, Command Line Arguments and Variable Length Argument List
12.	Develop a mini project implementation using the concepts from 1 to 11.

15UA353	COMPUTER AIDED DRAFTING AND MODELING LABORATORY	0/0/3/2

PREREQUISITES: Nil

COURSE OBJECTIVES

1. To provide fundamental knowledge and hands on experience to the students on various basic skills in Civil, and Mechanical Engineering drafting and modelling using software.

COURSE OUTCOMES

After the completion of this course, students will be able to

C353.1 Describe the basic concepts of Engineering Graphics.

C353.2 Sketch isometric, orthographic projections and projection of lines and planes.

C353.3 Develop section of solids including cylinders, cones, prisms and pyramids.

C353.4 Construct projections of lines, planes, solids, isometric projections and sections of solids using AutoCAD.

COURSE CONTENTS

EXP NO.	NAME OF EXPERIMENT
1.	Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2.	Drawing of a Title Block with necessary text and projection symbol.
3.	Drawing of curves like parabola, spiral, involutes using B- spline or cubic spline.
4.	Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5.	Drawing front view, top view and side view of objects from the given pictorial views
6.	(eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
7.	Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
8.	Drawing of a simple steel truss.
9.	Drawing sectional views of prism, pyramid, cylinder, cone, etc,
10.	Drawing isometric projection of simple objects.
11.	Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.
	TOTAL HOURS:45

15UG351	CONSTRUCTION MATERIALS TESTING LABORATORY	0/0/3/2

PREREQUISITES: NIL

COURSE OBJECTIVES

1. To learn and understand various properties of Building Materials.
2. To be exposed to various field test on building materials.
3. To make the students to determine experimentally the fundamental properties of Construction materials.
4. To make the students to know the significance of the various building materials

COURSE OUTCOMES

After the completion of this course, students will be able to

C351.1 Describe the various building materials and their properties.
C352.2 Demonstrate the various laboratory and field test on building materials
C352.3 Demonstrate on the various testing procedure on Cement
C352.4 Demonstrate on the various testing procedure on Aggregate & Bricks

LIST OF EXPERIMENTS

Test on Bricks

i. Water absorption
ii. Compressive strength test
iii. Field Test on bricks

Test on Cement

iv. Specific gravity test
v. Fineness test
vi. Soundness test
vii. Consistency and Setting time
viii. Compressive strength test
ix. Field test on cement

Test on Fine Aggregate

x. Specific gravity test
xi. Fineness Modulus
xii. Bulking of Sand

Test on Coarse Aggregate

xiii. Specific gravity test
xiv. Fineness Modulus

SEMESTER III

15MA134	FOURIER ANALYSIS AND STATISTICAL QUALITY CONTROL (COMMON TO CIVIL AND MECHANICAL BRANCHES)	3/2/0/ 4

PREREQUISITES: 15MA102- Integral Calculus and Transform Techniques

COURSE OBJECTIVES

1. To study the concept of mathematical formation of certain practical problems in terms of partial differential equations and solving for physical interpretation.
2. To understand the concept of Fourier series and also the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
3. To understand the concepts of Fourier transforms and its inverse, their properties and the possible special cases with attention to their applications.
4. To study the concept of boundary value problems which is necessary for the effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory.
5. To learn the methods of finding the solution of numerically for partial differential equations as most of the engineering problems are characterized in the form of nonlinear partial differential equations.

COURSE OUTCOMES.

After the completion of this course, students will be able to

C134.1 Recall basic integration concepts and partial derivatives

C134.2 Interpret Fourier series solutions to the engineering problems

C134.3 Use the concepts of control charts for quality assessments and to improve the quality of the manufacturing products

C134.4 To study the concept of fitting a curve of best fit to the given numerical data

C134.5 To calculate the deviation of the expected value from the observed value using curve fitting.

UNIT I	PARTIAL DIFFERENTIAL EQUATIONS	12

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions- Lagrange's linear equations –Linear homogeneous partial differential equations of second and higher order with constant coefficients.

UNIT II	FOURIER SERIES	12

Introduction with Applications - Dirichlet's conditions- General Fourier Series – Odd and Even Functions- Half range sine series- Half range cosine series – Change of Interval – Parseval's Identity- Harmonic analysis.

UNIT III	BOUNDARY VALUE PROBLEMS	12

Method of separation of variables - Solution of one dimensional wave equation – one dimensional heat equation – steady state solutions of two dimensional heat equations (excluding insulated edges) – Fourier series solution in Cartesian coordinates.

UNIT IV	FOURIER TRANSFORMS	12

Introduction with Applications - complex form of Fourier Transform -Fourier sine and cosine transforms- Properties-Transforms of simple functions-Convolution theorem and Parseval's Identity (without proof) – Evaluation of integrals using Parseval's Identity.

UNIT V	NUMERICAL METHODS TO SOLVE PARTIAL DIFFERENTIAL EQUATIONS	12

Finite difference solutions of one dimensional heat equation – Bender – Schmidt's method – Crank Nicolson's method - One dimensional wave equation- Two dimensional Laplace Equations.

SELF STUDY: Two dimensional Poisson equations.

TOTAL : 60

TEXT BOOKS:

1. Grewal. B.S, “Higher Engineering Mathematics”, 43th Edition, Khanna Publications, Delhi, 2014.
2. Venkataraman M.K., Numerical Methods, National Publishing Company, 2000.

REFERENCE BOOKS:

1. Kreyszig. E, “Advanced Engineering Mathematics”, Eighth Edition, John Wiley and Sons (Asia) Limited, Singapore, 2011.
2. Jain M.K. Iyengar, K & Jain R.K., Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd, Publishers 2013.
3. SankaraRao. K., “Numerical Methods for Scientists and Engineers”, PHI Pvt Ltd, New Delhi, 6th Edition, 2012.

WEB RESOURCES:

1. http://nptel.ac.in/video.php?subjectId=122107037
2. http://nptel.ac.in/courses/112106064
3. http://nptel.ac.in/courses/111105042
4. http://nptel.ac.in/courses/110105039/22

15CE304	MECHANICS OF SOLIDS – I	3/0/0/3

PREREQUISITES: Engineering Mechanics

COURSE OBJECTIVES

1. To know fundamental concepts of stress, strain and deformation of solids with applications to bars and beams
2. To analyze plane truss& determine the deflection of beams
3. To draw the bending moment and shear force diagram for different types of beams

COURSE OUTCOMES

After the completion of this course, students will be able to

C304.1 Apply the fundamentals concepts of stress, strain and deformation of solids

C304.2 Analyse the behavior of beams subjected to various loading and sketch the BMD and SFD

C304.3 Anaylse the plane trusses to compute the load carrying capacity of each member.

C304.4 Apply the concept of pure bending of beams to compute deformations in beams

C304.5 Apply torsion equation to compute the deformations of shafts and springs.

UNIT 1	STRESS, STRAIN AND DEFORMATION OF SOLIDS	12

Rigid bodies and deformable solids - stability, strength, stiffness - tension, compression and shear stresses - strain, elasticity, Hooke's law, limit of proportionately, modulus of elasticity, stress-strain curve for ductile and brittle material, lateral strain - temperature stresses - deformation of simple and compound bars - shear modulus, bulk modulus, relationship between elastic constants

UNIT 2	TRANSVERSE LOADING ON BEAMS	12

Beams - types of supports - simple and fixed, types of load - concentrated, uniformly distributed, varying distributed load, combination of above loading - relationship between bending moment and shear force - bending moment, shear force diagram for cantilever beam, simply supported beam and overhanging beams.

UNIT 3	ANALYSIS OF PLANE TRUSS AND THIN CYLINDERS	12

Stability and equilibrium of plane frames - types of trusses - analysis of forces in truss members - method of joints, method of sections, method of tension coefficients - thin cylinders and shells - under internal pressure - deformation of thin cylinders.

UNIT 4	DEFLECTION OF BEAMS	12

Theory of bending - Deflection of beams – moment area method - Macaulay's method - Conjugate Beam method for computation of Slopes and deflections of cantilever and simply supported beams

UNIT 5	TORSION	12

Stresses and deformation in circular (solid and hollow shafts) - stepped shafts - shafts fixed at both ends - leaf springs - stresses in helical springs - deflection of springs

SELF STUDY: Flitched Beams, Deflection test on metal beam, Compression test on Helical Springs.

TOTAL:60

TEXT BOOKS:

1. Bansal R.K, 'Strength of Materials', Lakshmi Publications Ltd, New Delhi, 2012. (Unit I – Unit V)
2. Junarkar S.B., 'Mechanics of Structures', Vol. 1, 21st Edition, Charotar Publishing House, Anand, India, 2007. (Unit I – Unit V)
3. Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010. (Unit I – Unit V)

REFERENCE BOOKS:

1. William A. Nash, Strength of Materials, Tata McGraw-Hill Publishing Co. Ltd, New Delhi, 2010
2. Gambhir.M.L. "Fundamentals of Solid Mechanics", PHI Learning Private Ltd., New Delhi, 2010.
3. Kazimi S.M.A., "Solid Mechanics ", Tata McGraw-Hill Publishing Company, New Delhi, 2008.

WEB REFERENCES:

1. http://nptel.ac.in/course.php?disciplineId=105
2. http://web.mit.edu/emech/dontindex-build/

15CE305	MECHANICS OF FLUIDS	3/1/0/3

PREREQUISITES:

Linear Algebra, Calculus and Applications, Transform Techniques and Integral Calculus

COURSE OBJECTIVES

1. To study about the properties of fluid, principles of fluid statics, kinematics and dynamics.
2. To study about flow through pipes and pipe networks and boundary layer concepts.
3. To understand the application of similitude and model study.

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

C305.1 Analyse properties of fluids, principles of fluid statics, kinematics and dynamics.

C305.2 Analyse flow through pipes, pipe network

C305.3 Analyse boundary layer Concepts

C305.4 Use similitude and model study

UNIT 1	DEFINITIONS AND FLUID PROPERTIES	12

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Continuum concept of system and control volume

UNIT 2	FLUID STATICS & KINEMATICS	12

Pascal's Law and hydrostatic equation – Forces on plane and curved surfaces – Buoyancy – Meta centre - Pressure measurement – Fluid mass under relative equilibrium- Fluid Kinematics Stream, Streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – Flow nets.

UNIT 3	FLUID DYNAMICS	12

Euler and Bernoulli's equations – Application of Bernoulli's equation - Velocity measurement (Pitot tube, current meter, float technique) – Discharge measurement – Reynolds Experiment - Laminar flows through pipes– Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Moody diagram – Momentum principle

UNIT 4	BOUNDARY LAYER AND FLOW THROUGH PIPES	12

Definition of boundary layer – Thickness and classification – Displacement and momentum thickness – Development of laminar and turbulent flows in circular pipes – Major and minor losses of flow in pipes– Pipes in series and in parallel – Pipe network.

UNIT 5	DIMENSIONAL ANALYSIS	12

Dimensional Analysis – Rayleigh's method, Buckingham Pi-theorem – Similitude and models – Scale effect and distorted models.

SELF STUDY: Hot wire anemometry, flow visualization techniques, velocity measurements

TOTAL: 60

TEXT BOOKS:

1. Jain A.K., "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, 2010. (Unit I – Unit V)

2. Modi P.N & Seth S.M, “Hydraulics & Fluid Mechanics”, Standard book house, New Delhi, 2009. (Unit I – Unit V)
3. Bansal R K, “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications, New Delhi, 2007.(Unit I – Unit V)

REFERENCE BOOKS:

1. Rajput, R K, “A text book of Fluid Mechanics", S Chand & Co., New Delhi, 2007.
2. Streeter, Victor L. and Wylie B.E., “Fluid Mechanics”, McGraw Hill Ltd., 2010.
3. Robert W and Macdonald, Alan, T, “Introduction to Fluid Mechanics”, John Wiley & Sons, 2009.

WEB REFERENCES:

1. http://nptel.ac.in/courses/105101082
2. http://nptel.ac.in/courses/105103095

15CE306	SURVEYING - I	3/0/0/3

PREREQUISITES: NIL

COURSE OBJECTIVES

1. To understand basic principle and concepts of different surveying methods.
2. To study the different surveying equipments in the field of civil engineering.
3. To enhance the ability to calculate surveying quantities.
4. To enable the suitability of surveying instruments and method to a given problem.

COURSE OUTCOMES

After the completion of this course, students will be able to

C306.1 Operate the various instruments in surveying

C306.2 Analyze the working principle of the advanced surveying instruments

C306.3 Measure the horizontal and vertical distances by using various methods

C306.4 Analyze contour maps and calculate the volume of earth work

UNIT 1	INTRODUCTION AND CHAIN SURVEYING	9

Definition - Principles - Classification - Conventional signs - Chain survey – Instruments-tape corrections - Uses of cross staff and optical square - Chaining and ranging- Field book - Plotting – Errors in chain survey- Obstacles in chaining - Chaining on Sloping ground - Calculation of area by trapezoidal and Simpson's rule

UNIT 2	COMPASS AND PLANE TABLE SURVEYING	9

Prismatic compass – Surveyor's compass - Bearing - Systems and conversions - Local attraction - Magnetic declination - Dip - Traversing - Plotting - Adjustment of errors - Plane table instruments and accessories - Merits and demerits - Methods - Radiation - Intersection - Resection -Traversing.

UNIT 3	LEVELLING	9

Levels and Staves – Sensitiveness of bubble - Bench marks - Temporary and permanent adjustments -Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Sources of Errors in levelling- Precise levelling - Types of instruments - Adjustments - Field procedure

UNIT 4	LEVELLING APPLICATIONS	9

Longitudinal and Cross-section-Plotting - Contouring - Methods - Characteristics and uses of contours – Plotting – Methods of interpolating contours – Computations of cross sectional areas and volumes - Earthwork calculations - Capacity of reservoirs - Mass haul diagrams.

UNIT 5	THEODOLITE SURVEYING	9

Theodolite - Description and uses - Temporary and permanent adjustments of vernier transit - Measurement of horizontal angles and vertical angles - Traversing - Closing error and distribution -Gale's tables – Total station- Omitted measurements.

SELF STUDY: Modern equipments for surveying

TOTAL:45

TEXT BOOKS:

1. Punmia B C, "Surveying", Vol. I and II, Laxmi Publications (P) Ltd., New Delhi, 2005. (Unit I – Unit V)

2. Kanetkar T.P., Surveying and Levelling, Vols. I and II, Standard Publishers Distributors, New Delhi 2008. (Unit I – Unit V)

REFERENCE BOOKS:

1. Duggal R K, "Surveying", Vol I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2013.
2. Bannister A and Raymond S, "Surveying", Addison WeSley Longman ltd, England, 2006.
3. Basak. N.N. Tata McGraw Hill Publishing Company Ltd., New Delhi, 2001.

WEB REFERENCES:

1. http://www.nptel.ac.in/courses/105107122/home.htm
2. http://www.nptel.ac.in/courses/105104101
3. http://www.textofvideo.nptel.iitm.ac.in/105107121/lec3.pd

15CS206	OBJECT ORIENTED PROGRAMMING	3/0/3/5

PREREQUISITES: 15CS201Problem Solving Techniques and C Programming

COURSE OBJECTIVES

1. To understand Object Oriented programming concepts like data abstraction, encapsulation
2. To analyze different kinds of constructor, Inheritance and polymorphism
3. To understand and apply streams and File concepts
4. To implement collection frame work and strings in solving real world problems

COURSE OUTCOMES

Upon successful completion of the course, students shall have ability to:
C206.1 Evaluate the concepts of friend function and virtual functions
C206.2 Create C++ programs using Object Oriented concepts
C206.3 Design, write and debug Package, multithreading and interface concepts using java programs
C206.4 Implement I/O functionality to read and write files.

UNIT I	INTRODUCTION	9

Introduction: Object Oriented Programming features - Merits and demerits of object oriented methodology- An overview of C++ - Data types- variables –Constants -operators –expressions -selection statements – Iteration statements –Jump statements –Functions – Function Arguments – Recursion – Function prototype Arrays – single dimensional arrays –Passing single dimensional arrays to functions –Two dimensional arrays –Multidimensional arrays- pointers – pointer variables – pointer expressions

UNIT II	PROGRAMMING IN C++	9

Classes and objects –Friend Functions –Friend class - constructor –Default constructor-parameterized constructor –copy constructor – destructors.-operator overloading –unary-Binary – Operator overloading using friend function-Inheritance –single-multilevel-multiple-hierarchical – Virtual base class - virtual functions- pure virtual functions – Abstract classes.

UNIT III	C++ STREAMS AND FILE HANDLING	9

C++ Streams – Stream classes – Formatted I/O -File –File classes - Opening and Closing of files-Reading and writing a Text file -Unformatted and Binary I/O –Characters vs Bytes –put() and get() –read() and write()-getline() –Detecting EOF –Random Access File- File pointers

UNIT IV	JAVA PROGRAMMING	9

The Byte code – Java Features –Simple java program –Java Keywords -Data types, variables, Literals and arrays- operators- control statements -classes-objects-methods –constructor – overloaded constructor-Object as Arguments –Returning objects-Inheritance-Basics – Super keyword-Method overriding

UNIT V	PACKAGES, INTERFACE ,COLLECTION FRAMEWORK	9

Packages – Defining a package – Access protection –importing a packages – Interfaces-Defining an interface-implementing interface - applying an interface - Extending an interface -. Multithreaded programming – Java Thread Model – creating a thread – implementing a thread – extending thread-Collection framework - collection –List -Set –Queue-Dequeue.

SELF- STUDY: String- String Buffer- operations

TOTAL LECTURE HOURS:45

LABORATORY EXPERIMENTS

C++

1. Simple C++ Programs to Implement Various Control Structures.
   a. If statement
   b. Switch case statement and do while loop
   c. For loop

d. While loop

2. Program to understand Inline Functions & Function overloading
3. Programs to implement Constructors & Destructors.
4. Programs to Implement Inheritance and Function Overriding.
   a. Multiple inheritance –Access Specifiers
   b. Hierarchical inheritance – Function Overriding/Virtual Function
5. Programs to Overload Unary & Binary Operators as Member Function & Non Member Function.
   a. Unary operator as member function
   b. Binary operator as non member function
6. Programs to Understand Friend Function & Friend Class.
   a. Friend Function
   b. Friend class

JAVA

7. Simple Java applications using
   a. Data types
   b. Class & object
   c. Constructor
8. Implementation of Inheritance concepts
   a. Single inheritance using super keyword
   b. Multilevel inheritance
9. Creation of simple package and access
10. Developing user-defined interfaces and implementation

TEXT BOOKS:

1. Herbert Schildt." *The* Complete Reference C++", *Fourth* Edition, MH, 2016 .(Unit –I Chapter 2,3,4,5,6 Unit –II Chapters 12,14,15,16,17 Unit III Chapters 20,21)
2. Herbert Schildt, "Java : The Complete Reference", Ninth edition, MH, 2014.Unit –IV Chapter 1-8), Unit –V Chapter 9,11,16,17)

REFERENCE BOOKS:

1. K.R.Venugopal, RajkumarBuyya, T.Ravishankar, "Mastering C++", MH, 2003
2. BjarneStroustrup, "The C++ programming language" Addison Wesley, fourth edition 2000
3. John R.Hubbard, "Progranning with C++", Schaums outline series, MH, Third Edition 2003
4. H.M.Deitel, P.J.Deitel, "Java : How to program", Ninth edition, PHI private limited. 2000

WEB REFERENCES:

1. http://www.nptel.ac.in
2. http://www.javaworld.com
3. http://www.ocw.mit.edu

15CE307	STRENGTH OF MATERIALS LABORATORY	0/0/3/2

PREREQUISITES: Mechanics of Solids

COURSE OBJECTIVES

1. To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.
2. To make measurements of loads, displacements and strains relating these quantities.
3. To make the students to know the strength and stiffness properties of structural elements

COURSE OUTCOMES

After the completion of this course, students will be able to

C307.1 Examine the behaviour of different materials under the action of shear and torsion.

C307.2 Test the strength and stiffness properties of structural elements.

C307.3 Test the hardness properties of structural elements.

C307.4 Analyse elements such as bars, beams subjected to tension and compression.

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Double shear test on metal
3. Torsion test on mild steel rod
4. Compression test on wood
5. Izod Impact test on metal specimens
6. Charpy Impact test on metal specimens
7. Rockwell Hardness test on metal Specimens
8. Brinell Hardness test on metal Specimens
9. Deflection test on metal beam
10. Test on open coiled helical springs
11. Test on closed coiled helical springs.
12. **Self Learning:** Study on the uses of deflectometer, extensometer, and compressometer and strain gauges.

REFERENCES:

1. Laboratory Manual prepared by the Department of Civil Engineering.
2. IS1786-2008, Specification for cold worked steel high strength deformed bars for concrete reinforcement, 2008

15CE308	SURVEY PRACTICAL – I	0/0/3/2

PREREQUISITES: NIL

COURSE OBJECTIVES

1. Gain the ability to use various surveying equipments
2. To make measurements of distances, area, elevations, differences in elevation and to plot contour maps
3. To measure horizontal and vertical angles by adopting the principles of Theodolite

COURSE OUTCOMES

After the completion of this course, students will be able to

C308.1 Measure distance and area by various surveying equipment

C308.2 evaluate the difference in elevations

C308.3 prepare the contour maps

C308.4 prepare a map for the plot and calculate the area

C308.5 measure the angles and height of the object using theodolite

LIST OF EXPERIMENTS

1. Study of Chain and its accessories
2. Aligning, Ranging and Chain traversing – Measurement of distance and setting the perpendiculars
3. Compass traversing – Determination of area of closed traverse
4. Plane Table Surveying – Radiation Method and Intersection Method
5. Plane Table Surveying: Resection – Solving Two point problem and Three point problem
6. Plane Table Surveying: Resection – Solving Three point problem
7. Study of levels and levelling staff
8. Fly levelling using Dumpy Level
9. Check levelling
10. Levelling - LS and CS – Plotting longitudinal section and cross section of proposed roadway
11. Contouring – Preparation of Block contour map and calculate the area enclosed by contours
12. Determination of horizontal and vertical angle by using Theodolite.
13. **Self Learning:** Study of Total Station and GPS

REFERENCES:

1. Laboratory Manual prepared by the Department of Civil Engineering.
2. Punmia B C, "Surveying", Vol. I and II, Laxmi Publications (P) Ltd., New Delhi, 2005.

SEMETER IV

15MA106	COMPUTATIONAL METHODS FOR CIVIL ENGINEERS (CIVIL)	3/2/0/4

Nature of Course	Problem analytical
Pre requisites	15UH101-Mathematics I 15UH204-Mathematics II

Course Objectives:

1	To solve boundary value problems encountered in engineering practices using Fourier series.
2	To find numerical solution for partial differential equations
3	To acquire the knowledge in handling functional derivatives dependent on one or more independent variables.
4	To learn the concept of testing hypothesis using statistical analysis
5	To analyze data, interpret results and write technical reports
6	To control the quality of the goods while they are in the process

Course Outcomes:

Upon completion of the course, students shall have ability to

C106.1	Recall the concepts of measures of central tendency	[R]
C106.2	Solve partial differential equations both analytical and numerical techniques	[U]
C106.3	Apply analytical and numerical methods to solve wave and heat equation with boundary conditions	[AP]
C106.4	Use testing of hypothesis to derive the inference for engineering problems	[AP]
C106.5	Design and conduct an experiment	[AP]
C106.6	Use the concepts of control charts for quality assessments and to improve the quality of the manufacturing products	[AP]

Course Contents:

Boundary Value Problems - One dimensional wave equation – One dimensional equation of heat conduction –Fourier series solutions in Cartesian coordinates-**Numerical Solution to PDE-**Finite difference techniques –Laplace equation–Liebmann's Iteration Process-Parabolic Equation –Bender-Schmidt's Difference Equation - Crank-Nicholson's Difference Equation –Hyperbolic Equation - **Calculus Of Variations -** Variation and its properties – Euler's equation - Functional dependent on first and higher order derivatives - **Testing of Hypothesis** –Large sample - Z test-Test of significance - Proportions- Mean - Standard deviation- Small sample test – t test and F test for single mean– difference of means and variance - Chi-square test for goodness of fit and independence of attributes- **Design of Experiments**- Analysis of variance - One way and two way classifications -Completely randomized design -Randomized block design.

Total Hours:	**60**

Text Books:

1	Grewal B.S., Numerical methods in Engineering and Science. 10th edition, Khanna Publishers, 2014.
2	Gelfand.I.M. and S.V.Fomin, Calculus of Variations, Dover Publications, New York, 2012.
3	Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand &

	sons, 2000,Reprint 2014.
Reference Books:	
1	Jain M.K. Iyengar, K & Jain R.K., Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd, Publishers 2013.
2	Sankara Rao. K., "Numerical Methods for Scientists and Engineers", PHI Pvt Ltd, New Delhi, 6th Edition, 2012.
3	"Probability, Statistics and Random Processes" T Veerarajan, Second Edition, Tata McGraw Hill Education Private Limited,2003 .
Web References:	
1	http://nptel.ac.in/video.php?subjectId=122107037
2	http://nptel.ac.in/courses/112106064
3	http://nptel.ac.in/courses/111105042
4	http://nptel.ac.in/courses/110105039/22
5	http://freevideolectures.com/Course/3028/Econometric-Modelling/22
Online Resources:	
1	https://www.mooc-list.com/course/numerical-methods-engineers-saylororg
2	https://www.canvas.net/browse/usflorida/courses/numerical-methods
3	www.edx.org/ statistics
4	www.online.colostate.edu

15CE309	THEORY OF STRUCTURES	3/1/0/3
Nature of Course	Problem analytical	
Pre requisites	15UA302 - Engineering Mechanics, 15CE304 – Mechanics of Solid-I.	
Course Objectives:		
1.	To determine the deflection of beams and trusses using strain energy	
2.	To draw the bending moment and shear force diagram for indeterminate beams	
3.	To evaluate safe load and design the columns.	
4.	To understand various theories of failure and state of stress in three dimensions.	
5.	To determine two dimensional principal stresses and stresses in thick cylinders	
Course Outcomes: **After the completion of this course, students will be able to**		
C309.1	Apply the basic concepts of energy principles	
C309.2	Analyse Indeterminate beams	
C309.3	Analyse the behaviour of columns with different end conditions	
C309.4	Apply the various failure theories for design of members.	
C309.5	Compute normal and shear stress in thick and compound Cylinder	
Course Contents:		
Energy principles: Strain energy and strain energy density – strain energy in tension, shear in flexure and torsion – Castigliano's theorems – application of energy theorems for computing deflections in beams and trusses. **Indeterminate beams** : Propped cantilever and fixed beams – fixed end moments and reactions for concentrated load, uniformly distributed load, uniformly varying load and combined load – analysis of continuous beams – theorem of three moments - shear force and bending moment diagrams. **Columns:** Euler's theory of long columns – critical loads for prismatic columns with different end conditions – Rankine – Gordon formula for eccentrically loaded columns – eccentrically loaded short columns – middle third and middle fourth rule – core section. **Theories of failure** : Theories of failure – principal stress – principal strain – shear stress – strain energy and distortion energy theories – application in analysis of stress, load carrying capacity and design of members. **Two dimensional state of stress** : Two dimensional state of stress at a point – Normal and shear stresses on any plane – Principal planes and principal stresses – Maximum shear stress –thick cylinders – compound cylinders.		
Total Hours:		**60**
Text Books:		
1	Rajput.R.K, "Strength of Materials", S. Chand & Company Ltd., New Delhi 2014.	
2	Vazirani, V.N, V.N. and Ratwani, N.M. Strength of Materials, Vol. I, Khanna Publishers, 2015.	
3	Punmia B. C, Ashok Jain and Arun Jain "Strength of Materials and Theory of Structures" - Vol.1, Laxmi Publications, New Delhi, 2015.	
Reference Books:		
1	JEgor P. Popov, "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2009.	
2	Hearn E. J., "Mechanics of Materials" Vol. I, Butterworth-Heinemann. Oxford, 2001.	
3	Bedi D. S., "Strength of Materials", Khanna book publishing Co. Ltd., New Delhi, 2008	
Web References:		
1	http://nptel.ac.in/course.php?disciplineId=105	
2	http://web.mit.edu/emech/dontindex-build/	
Online Resources:		
1	https://ocw.mit.edu/courses/materials-science	

15CE310	SURVEYING - II	3/0/0/3

Nature of Course	Theory application
Pre requisites	:15CE306- Surveying - I

Course Objectives:

1	To understand the concepts involved in Tachometric Surveying
2	To know about the curves, contouring and setting out works for construction Purposes.
3	To study the concepts of control survey, survey adjustments and hydrographic survey
4	To study the Advance Surveying Instruments like EDM, Total Station and GPS
5	To study the co-ordinate measurements by GPS and traversing by Total station.

Course Outcomes:

After the completion of this course, students will be able to

C310.1	Explain the basic concepts of surveying
C310.2	Measure the distance and heights of objects using Tacheometric principle.
C310.3	Distinguish the advantages of electronic surveying over conventional surveying Methods.
C310.4	Determine the working principles of various Modern Surveying Equipment, its Components, and signal structure and error sources.
C310.5	Classify the types of curves and its importance
C310.6	Apply the concepts of Setting out of curves.
C310.7	Construct various methods for control surveying and Trigonometric Levelling.
C310.8	Solve various methods for survey adjustments and hydro graphic survey.

Course Contents:

Tacheometric Surveying: Tachometric systems - Tangential, stadia and subtense methods - Stadia systems - inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants. **Setting out of Curves**: Simple curves - Setting with chain and tapes, tangential angles by Theodolite, double Theodolite. Compound curve – Setting out - Transition curves - Functions and requirements - Calculation of length of transition curve - Super elevation - Setting out by offsets and angles vertical curves – Types- Setting out of vertical curve - Sight distances. **Control Surveying:** Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Baseline - Instruments and accessories - Satellite station - Reduction to centre –Trilateration - Trigonometric levelling - Single and reciprocal observations. **Survey Adjustments**: Errors - Sources, precautions and corrections - Classification of errors - True and most probable values -Weighted observations - Principle of least squares - Normal equation - Correlates - Level nets. **Hydrographic Surveying and Modern Methods of Surveying:** Hydrographic Surveying - Tides -MSL - Sounding methods - Location of soundings and methods. Electronic Distance Measurement (EDM), Global Positioning System (GPS), Total station And its application**.**

Total Hours:	**45**

Text Books:

1	Kanetkar T.P, Kulkarni S V.," Surveying and Levelling", Vols. I and II, Standard Publishers Distributors, New Delhi 2015.
2	Punmia B.C., "Surveying", Vols. I, II and III, Laxmi Publications, 2016.

Reference Books:

1	Duggal R K, "Surveying", Vol I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2013.
2	Chandra A M, "Higher Surveying", New Age International Pvt Ltd., New Delhi, 2015.
3	Burnside.C.D, "Electromagnetic Distance Measurement," BeekmanPublishers, 1971.

Web References:

1	http://www.nptel.ac.in/courses/105104101
2	http://www.textofvideo.nptel.iitm.ac.in/105107121/lec3.pd
Online Resources:	
1	http://www.nptel.ac.in/courses/105107122/home.htm

Assessment Methods & Levels (based on Blooms'Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C307.1	Remember	Quiz	2
C307.2	Understand	Writing Skills	2
C307.3	Understand	Technical Presentation	2
C307.4	Understand	Quiz	3
C307.5	Understand	Group Discussion	3
C307.6	Apply	Group Assignment	2
C307.7	Apply	Test	3
C307.8	Apply	Tutorial	3

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	20	20	15	15
Understand	80	40	45	45
Apply	-	40	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE311	SOIL MECHANICS	3/1/0/3
Nature of Course	Theory analytical	
Pre requisites	: NIL	
Course Objectives:		
1	To study the concepts and fundamentals of soil mechanics.	
2	To identify and describe the physical properties of soil	
3	To study the engineering behaviour of soil such as permeability, compaction, consolidation and shear strength.	
4	To study the various methods of slope stability analysis	
Course Outcomes: **After the completion of this course, students will be able to**		
1	Illustrate the phase system and evaluate the different properties of soil.	
2	Analyse stresses developed in soil under various load conditions.	
3	Differentiate and explain the concepts of shear strength, behavior and performance of soil under the influence of water.	
4	Correlate the concepts, principles of compaction and consolidation and different failure modes of slopes and different methods of slope Stability analysis.	
5	Perform field and lab tests wherever and whenever it is required.	
Course Contents:		
Introduction to Soil Formation, Properties and Classification of Soil: Soil formation and soil types - Civil engineering problems related to soils - Nature of soil - Simple definitions - Phase relationships - Determination of properties of soils – Classification - IS classification system. **Soil Water and Stress Distribution**: Principles of water flow - Darcy's law – Permeability - Laboratory Methods - Field - measurement of permeability - Effective stress concept - Dry and saturated soils - Stress distribution in soil media - Boussinesq's Analysis - Westergard's Analysis - Intensity of vertical stress using influence charts. **Consolidation and Compaction Characteristics of Soils:** Consolidation - measurement of compressibility - e-log p curves - Terzaghi's one dimensional consolidation theory - Determination of coefficient of consolidation, Compaction, Factors affecting compaction, Laboratory and field compaction methods. **Shear Strength:** Shear at a point - Mechanism of shear resistance - Mohr– Coulomb failure criterion - Measurement of shear strength - Direct shear test - Triaxial shear test - Unconfined compression test - Vane shear test - Shear strength of clay and sand. **Stability of Slopes:** Types of slopes - Stability of infinite slope - Stability of Finite slope - Total stress Analysis – Friction circle method - Swedish circle method - Use of Taylor's stability number - Slope failure mechanism - Effect of Tension cracks – Methods of Improving slope stability.		
	Total Hours:	**60**
Text Books:		
1	GopalRanjan and Rao, ASR, "Basic and Applied Soil Mechanics" New Age International (P) Limited Publication, New Delhi, Second Edition, 2010.	
2	Venkataramaiah, "Geotechnical Engineering", New Age International Ltd., New Delhi Third Edition, 2012.	
3	Punmia , B.C, "Soil Mechanics and Foundation Engineering", Laxmi Publications, New Delhi, Sixteenth Edition, 2016.	
Reference Books:		
1	Alam Singh, "Modern Geotechnical Engineering", IBS Publications, New Delhi, 2010.	
2	Muni Budhu, "Soil Mechanics and Foundation Engineering", Wiley India publication, New Delhi, Second Edition, 2010.	
3	Shashi K.Gulhati and Manoj Dutta, " Geo technical Engineering", Tata McGraw Hill publishing company Ltd, NewDelhi, 2009.	
Web References:		
1	http://nptel.ac.in/courses/105101084/	

Online Resources:	
1	http://nptel.ac.in/courses/105101084/

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C309.1	Remember, Understand, Apply	Technical Presentation, Report I	10
C309.2			
C309.3			
C309.4			
C309.5	Remember, Understand, Apply	Technical Presentation, Report I	10
C309.6			
C309.7			
C309.8			

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	20	20	10	10
Understand	80	30	20	20
Apply	-	30	35	35
Analyse	-	10	25	25
Evaluate	-	10	10	10
Create	-	-	-	-

15CE312	HYDRAULICS AND HYDRAULIC MACHINERY	3/0/3/4

Nature of Course	Theory, analytical and practical application
Pre requisites	: 15CE305 Mechanics of Fluids

Course Objectives:

1	To remember the concept of open channel flow characteristics.
2	To understand the concept of hydraulic jumps and surges.
3	To study the concepts of hydraulic machines viz. flow through turbines and pumps including their performance characteristics and design aspects.

Course Outcomes:
Upon completion of the course, students shall have ability to

C310.1	Understand the concepts of open channel flow.	[U]
C310.2	Remember the concepts of flow measurement.	[R]
C310.3	Understand the concept of impact of jet on vanes.	[U]
C310.4	Understand the design of pumps.	[U]
C310.5	Understand the design of turbines.	[U]
C310.6	Apply the properties of varied flow.	[AP]
C310.7	Analyse the performance and characteristics of pumps and turbines.	[AN]
C310.8	Evaluate the performance and characteristics of pumps and turbines.	[E]

Course Contents:

Open channel flow: Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel –Uniform flow – Manning's and Chezy's formula – Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections – Non-erodible channels. **Gradually varied flow**: Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions-Specific energy – Critical flow and its computation. **Rapidly varied flow**: Hydraulic jump – Types – Energy dissipation – Surges – Surge channel transitions - **Impact of jet on vanes:** Application of momentum principle – impact of jets on plane and curved plates. **Pumps:** Roto dynamic pump **-** Centrifugal pump – Minimum speed to start the pump – Multistage Pumps – cavitations – specific speed – characteristics curves – Jet and submersible pumps – rotary pumps. Positive displacement pumps – reciprocating pump – negative Slip – flow separation conditions – air vessels –indicator diagram and its variation – savings in work done. **Turbines**: Turbines – Classification – Radial flow turbines – Axial flow turbines – Impulse and Reaction turbines – Draft tube and cavitations – Performance of turbines.

Lab Component

1	Orifice	[E]
2	Notches	[E]
3	Venturimeter	[E]
4	Orifice Meter	[E]
5	Impact of Jet on Flat Plate	[E]
6	Friction and Minor losses	[E]
7	Centrifugal pump	[E]
8	Submersible Pump	[E]
9	Reciprocating Pump	[E]
10	Pelton Wheel Turbine	[E]
11	Francis Turbine	[E]
12	Kaplan Turbine	

Total Hours:	75

Text Books:	
1	Modi P.N. & Seth S.M, “Hydraulics & Fluid Mechanics”, Standard book house, New Delhi, 2009.
2	Jain A.K., “Fluid Mechanics including Hydraulic Machines”, Khanna Publishers, 2010
3	Bansal R K, “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications, New Delhi, 2007.
Reference Books:	
1	Subramanya K, “Flow in open channels”, Tata McGraw Hill publishing company 3rd Edition, 2008.
2	Mohanty A K, “Fluid Mechanics" Second Edition, Prentice Hall of India Private Limited, New Delhi, 2007.
3	Rajput, R K, “A text book of Fluid Mechanics”, S Chand & Co., New Delhi, 2007.
4	Kumar K L, “Engineering Fluid Mechanics”, S Chand & Co., New Delhi, 2009
Web References:	
1	http://nptel.ac.in/courses/105103021
2	http://nptel.ac.in/courses/105107059

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

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	Rubric based CIA [40 Marks]	
Remember	20	20	10	10	10
Understand	80	20	20	20	20
Apply	-	30	30	20	20
Analyse	-	30	40	30	20
Evaluate	-	-	-	20	30
Create	-	-	-	-	-

15CE313	SOIL MECHANICS LABORATORY	0/0/3/2

Nature of Course	Practical application
Co requisites	: 15CE311 Soil Mechanics

Course Objectives:	
1	To learn the methods of determining various soil properties.

Course Outcomes: **Upon completion of the course, students shall have ability to**	
C313.1	Calculate the index properties of soil
C313.2	Analyse the relationship between Maximum dry density and Optimum Moisture Content
C313.3	Determine the permeability and seepage of the soil.
C313.4	Compute the Shear Strength parameters and California Bearing ratio of soil

Course Contents:

1) Determination of Moisture content
2) Determination of Particle size distribution of soil by sieve analysis
3) To Find out the Specific gravity of soil
4)Find out the Relative density of cohesion less soil
5) Find out the Atterberg limits
6) Determination of Moisture - Density relationship
7) Finding out the Field Density of soil
8)Determination of Permeability of soil
9) Finding out Shear parameters.
10) Calculation of California Bearing Ratio of soil.

Total Hours:	**30**

Reference Books:	
1	Punmia, B.C, "Soil Mechanics and Foundation Engineering", Laxmi Publications, New Delhi, Sixteenth Edition, 2005.
2	Muni Budhu,"Soil Mechanics and Foundation Engineering", Wiley India Publication, New Delhi, Second Edition, 2010.

Online Resources:	
1	http://eerc02-iiith.virtual-labs.ac.in/

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

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Rubric based Continuous Assessment [60 marks] (in %)	End Semester Examination [40 marks] (in %)
Remember	20	20
Understand	30	30
Apply	50	50
Analyse	-	-
Evaluate	-	-
Create	-	-

15CE314	ENGINEERING SURVEY LABORATORY	0/0/3/2

Nature of Course	Practical application
Pre requisites	: 15CE306 -SURVEYING– I

Course Objectives:

Gain the ability to use various surveying equipment.

To make measurements of distances, area, elevations, differences in elevation and to plot contour maps.

To measure horizontal and vertical angles by various surveying equipment.

Course Outcomes:

After the completion of this course, students will be able to

C314.1	Study the fundamentals of different method of surveying
C314.2	Locate the field position on the plan or vice versa.
C315.3	Locate the elevation of the given point with respect to a given datum.
C315.4	Measure distance and area by various surveying equipment
C315.5	Measure elevations, differences in elevation and plot contour maps.
C315.6	Set out simple and transition curve by linear and angular methods
C315.7	Measure the height of an object by measuring the angles by modern Surveying Equipment

Course Contents

1	Determination of point in field using Fly levelling, Check levelling using Dumpy Level
2	Levelling – LS, CS – Plotting longitudinal section, cross section of proposed roadway
3	Determination of horizontal angle by Repetition and Reiteration methods using Theodolite.
4	Determination of vertical angle by using Theodolite.
5	Contouring – Preparation of Block contour map and calculate the area enclosed by contours
6	Determination of Heights and distances - Triangulation - Single plane method
7	Determination of Heights and distances - Triangulation - Double plane method.
8	Study of Tangential system - Stadia system - Subtense system.
9	Setting out of Simple curve (right/left-handed) - (Angular and Linear methods).
10	Setting out of Transition curve.
11	Traverse using Total Station.
12	Construction stake out using Total Station.

Total Hours: 30

Reference Books:

1. Punmia B C, "Surveying", Vol. I and II, Laxmi Publications (P) Ltd., New Delhi, 2016.
2. Punmia B C, "Higher Surveying", Vol. III, Laxmi Publications (P) Ltd., New Delhi, 2016
3. Kanetkar T.P., Surveying and Levelling, Vols. I and II, Standard Publishers Distributors, New Delhi 2015.
4. Duggal R K, "Surveying", Vol I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2013.
5. Basak. N.N," Surveying and Levelling" Tata McGraw Hill Publishing Company Ltd., New Delhi, 2014.

Web References:

http://www.textofvideo.nptel.iitm.ac.in/105107121/lec3.pd

Online Resources:

http://www.nptel.ac.in/courses/105107122/home.htm
http://www.nptel.ac.in/courses/105104101

Assessment Methods & Levels (based on Bloom's Taxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	30	20
Understand	30	40
Apply	40	40
Analyse	-	-
Evaluate	-	-
Create	-	-

15CE701	MINI PROJECT – I	0/0/0/1
Nature of Course	: Project	
Course Objectives:		
1	To expanding his / her knowledge base and also provide opportunity to utilize the creative ability and inference capability	
Course Outcome: **After the completion of this course, students will be able to**		
C701.1	Analyse a compelling and viable problem as project topic.	
C701.2	Apply their skill to create practical solutions to identified problem	
C701.3	Develop the software model and other artifacts appropriate for problem	
C701.4	Apply the approprite tools required for the project	
C701.5	Categorize the work systemmatically towards completion of a project work	
C701.6	Compose the work & explain their work in front of an evaluation panel	

Students could join (maximum 3) together, form a small team and execute a simple project in the area relevant to Civil Engineering under the guidance of a faculty.

The mini project shall be submitted in a report form and should be presented before a committee constituted by the Head of the Institution, which shall evaluate the project work done for 100 marks.

The committee will consist of head of the department, the supervisor of the mini project and two senior faculty member of the department.

SEMESTER- V

15CE315	STRUCTURAL ANALYSIS CLASSICAL METHODS	3/1/0/4

Nature of Course	Concepts and analytical
Pre requisites	:15CE304 Mechanics of Solids – I, 15CE309 Theory of Structures

Course Objectives:

1	To learn the different types of force and displacement method of analysis.
2	To study the concepts of arches its types and its application.
3	To study the concepts of indeterminate beams and frames.
4	To study the concepts of moving loads.

Course Outcomes:

After the completion of this course, students will be able to

C315.1	Analyse continuous beams and frames by slope deflection method
C315.2	Analyse continuous beams and frames by moment deflection method
C315.3	Classify the types of arches with its settlement and temperature effects.
C315.4	Analyse the two hinged,three hinged, circular and parabolic arches.
C315.5	Analyse the statically indeterminate beams and frames
C315.6	Explain the concept of moving loads for statically determinate and indeterminate structures

Course Contents:

Slope Deflection Methods: Continuous beams and rigid frames(with and without sway) – Symmetry and antisymmetry – Simplification for hinged end – Support displacements. **Moment Distribution Method:** Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without frames. **Arches:** Arches as structural forms – Examples of arch structures – types of arches – Analysis of three hinged and two hinged, parabolic and circular arches – Settlement and temperature effects. **Consistent Deformation Method:** introduction – Statically indeterminate beams – Propped cantilever,Fixed and Continous beams – Analysis of frames – Analysis of pin connected indeterminate frames –**Moving Loads and Influence Lines:** Introduction to moving loads – Concepts of influence lines – Influence lines for reaction, shear force and bending moment for simply supported beams – Analysis for different types of moving loads – Single concentrated loads – Several concentrated loads – Uniformly distributed load shorter and longer than the span.

Total Hours:	**60**

Text Books:

1	Vaidyanadhan,R and Perumal,P,"Comprehensive Structural Analysis – Vol. I & Vol. II", Laxmi Publications, New Delhi, 2010
2	Punmia B.C, Ashok kumar Jain and ArunkumarJain,"Theory of Structures" –II, Laxmi Publication Pvt. Ltd, 2012.
3	Bhavikatti S.S Structural Analysis -I, Vikas publishing House private Ltd, NewDelhi 11014

Reference Books:

1	Rajasekaran S and Sankarasubramanian G, "Computational Structural Mechanics", Prentice Hall of India Pvt.Ltd,Delhi,2011
2	Reddy.C.S "Basic Structural Analysis" Tata McGraw – Hill Publishing Company Ltd, New Delhi, 2011

Web References:

1	http://www.nptel.ac.in/courses/105104101

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C315.1	Apply, Analyse	Test	**3**
C315.2	Apply, Analyse	Tutorial	**3**
C315.3	Remember, Understand	Quiz	**3**
C315.4	Analyse	Group Assignment	**4**
C315.5	Analyse	Group Assignment	**4**
C315.6	Understand , Apply	Tutorial	**3**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	-	10	10	15
Understand	-	10	10	45
Apply	40	40	20	40
Analyse	60	40	60	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE316	CONSTRUCTION MANAGEMENT	3/0/0/3

Nature of Course	Theory and Analytical
Pre requisites	Nil

Course Objectives:

1	To understand the basic concepts in construction planning and scheduling
2	To study about benefits in project crashing and cost control in a project
3	To learn about the importance of safety and quality in construction field
4	To study the entire management system

Course Outcomes:
Upon completion of the course, students shall have ability to

C316.1	Learn and identify the relevant physical and mechanical properties of construction materials
C316.2	Understand the typical and potential applications of these materials.
C316.3	Understand the importance of experimental verification of material properties.
C316.4	Know the relevant IS codes to be referred for various construction materials.

Course Contents:

Introduction to Management-need, importance & purpose: Construction Management basics: Nature of Construction Industry, Role of Architect and Engineer, Special Characteristics of construction activity, their influence on Construction Management, Scope of Construction Management ,Management Planning, Importance of Planning. Project Manager: Qualities of Project Manager, Organizing: Organizing as a management process, Principles of Organization, different structures of organizations ,Characteristics, Features, their merits and limitations, Ownerships of organization: Sole proprietorship, partnership, Private Ltd., Public Ltd., Formal and informal organizations **Construction Planning :**Basic concepts in the development of construction plans–Choice of technology and construction method– Work tasks– Definition– Precedence relationships among activities–Estimating activity durations–Estimating resource requirements for work activities- Coding **Scheduling Procedures and Techniques:** Relevance of construction schedules–Bar charts – The critical path method–Calculations for critical path scheduling– Activity float and schedules–Presenting project schedules–Critical path scheduling for Activity–on–node and with leads, lags and windows– Resource oriented scheduling–Scheduling with resource constraints and precedence –Scheduling with uncertain durations–Crashing and time/cost trade-offs –Improving the scheduling process –application of management software- Scheduling a residential building using MS project **Cost Control Monitoring and Accounting:** The cost control problem–The project budget– Forecasting for activity cost control – Financial accounting systems and cost accounts–Control of project cash flows–Schedule control–Schedule and budget updates–Relating cost and schedule information **Introduction to Construction Safety Management:** Construction accidents - Construction Safety Management: Importance - causes of accident, safety measures- Environmental issues in construction- Construction industry related laws. Human factors in safety – legal and financial aspects of accidents in construction – occupational and safety hazard assessment

Total Hours:	**45**

Text Books:

1	Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997
2	Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw–Hill Publishing Co., New Delhi, 2012
3	Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
4	S.Seetharaman, “Construction Engineering and Management, Umesh Publishers, New

	Delhi, 2000.
5	Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001
Reference Books:	
1	Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001
2	Hand Book on Construction Safety Practices, SP:70, BIS, 2001.
3	Halpin,D.W., "Financial and cost concepts for construction Management", John Wiley and Sons, New York,2005.
4	Jimmie W.Hinze, "Construction Planning and Scheduling", Prentice Hall Publication,4thedition,2011
Web References:	
1	http://nptel.ac.in/courses/120108005/
2	https://onlinecourses.nptel.ac.in/noc17_ch05/course
Online References:	
1	http://www.nptel.ac.in/courses/105107122/home.htm

Assessment Methods & Levels (based on Blooms'Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C316.1	Remember, Understand	Quiz	5
C316.2	Apply	Tutorial	5
C316.3	Analyse	Group Assignment	5
C316.4	Analyse	Test	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	20	20	20	10
Understand	60	40	30	40
Apply	20	20	30	30
Analyse	-	20	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

15CE317	ENVIRONMENTAL ENGINEERING	3/0/0/3

Nature of Course	Concepts and Theory
Pre requisites	Nil

Course Objectives:

1	To study the principles and concepts of unit operations and processes involved in water and wastewater treatment.
2	To evaluate the performance of water and wastewater treatment plants
3	To enable the students in designing water and waste water treatment plants for a community.
4	To study the various techniques for sludge disposal and disposal into land or water bodies.

Course Outcomes:
After the completion of this course, students will be able to

C317.1	Interpret the type of unit operations and processes involved in water and wastewater treatment plants
C317.2	Choose the appropriate unit operations and processes required for satisfactory treatment of water and wastewater
C317.3	Design individual unit operation or processes
C317.4	Create the layout of water and wastewater treatment plants

Course Contents:

Water treatment: Population forecast and water demand – Water treatment Objectives – Unit operations and processes in domestic water treatment – Principles, functions and design of flash mixers, flocculators, sedimentation tanks and sand filters – Aeration – iron and manganese removal, Defluoridation and demineralization – water softening- Disinfection, water distribution system. **Primary Waste Water Treatment:** Characteristics of sewage, Quantity and flow variation, Principles, functions and design of screen, grit chambers and primary sedimentation tanks. **Secondary Treatment of Waste Water:** Activated Sludge Process and Trickling filter; Other treatment methods – Stabilisation Ponds and Septic tanks – Advances in Sewage Treatment, waste water reuse and recycling. **Sludge treatment and disposal:** Sources and characteristics of sludge, Sludge Thickening – Sludge digestion – Biogas recovery - Drying beds – Conditioning and Dewatering – Sludge disposal and treatment – Typical layouts. **Waste Water Disposal Methods**: Dilution – Self purification of surface water bodies – Oxygen sag curve – disposal to lakes and sea, Land disposal – Sewage farming – Deep well injection – Soil dispersion system.

Total Hours: 45

Text Books:

1	Garg S.K., (2001), Environmental Engineering, Vols. I and II, 12th Edition, Khanna Publishers, New Delhi.
2	Droste R.L., (1997)., Theory and Practice of water wastewater treatment, John Wiley & sons
3	Peavy H.S.,.Rowe D.R and George Tchobanoglous (2001), Environmental Engineering, McGraw-Hill Company, New Delhi

Reference Books:

1	Metcalf and Eddy (2003), Wastewater Engineering, Treatment and reuse, Tata McGraw-Hill Edition, Fourth edition
2	Rangwala (1999), Water supply & Sanitary Engineering, Charotar Publishing House, Anand-16th Edition

Web References:

1	http://nptel.ac.in/courses/105106119/

Online Resources:

1	http://nptel.ac.in/courses/105104102/

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C317.1	Remember	Outside Class Hours Technical Report I	10
C317.2	Understand		
C317.3	Evaluate	Outside Class Hours Technical Report II	10
C317.4	Understand		

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	20	20	20	20
Understand	80	30	40	30
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	50	40	50
Create	-	-	-	-

15CE318	DESIGN OF STEEL STRUCTURES	4/0/0/4
Nature of Course	Analysis and Design	
Pre requisites	15UA302- Engineering Mechanics, 15CE311–Mechanics of Solids- I	
Course Objectives:		
1	To study the design of connections.	
2	To study the design of axial members.	
3	To study design of compression members.	
4	To understand the design of roof truss	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C318.1	Explain the force transferring mechanism, design and detail the connections as bolted and welded connections.	
C318.2	Design and detail of steel tension members.	
C318.3	Design and detail of steel compression members	
C318.4	Design and detail of steel flexure members.	
C318.5	Classify the structural steel connections in industrial building	
C318.6	Design and detail column base.	
Course Contents:		
Design Philosophy of steel structures: – Limit state method – IS 800:2007 related provisions. **Bolted and Welded connection in steel structures:** Connection types – Design-Type of welds, joints - strength of welds - Design –**Steel tension members:** Behaviour - Design – Rods – Plate – Single and double angle. **Steel compression members:** Type of Column sections - Design - rolled steel section -built up section - laced and battened columns - Angle struts- Design of column bases – Gusseted base. **Steel flexure members:**Behaviour - Design - simple and compound beams - Laterally restrained – Laterally unrestrained - Factors affecting lateral stability - built-up beams. **Design of Industrial Roof Truss** and Gantry Girder.		
	Total Hours	**60**
Text Books:		
1	Duggal S.K., “Limit state design of steel structures” McGraw Hill Co., New Delhi, 2014.	
2	Arya.A.S & Ajmani.J.L.”Design of Steel Structures”, New Chand & Bros.Roorkee.	
3	Subramanian, N., (2008), Design of Steel Structures, oxford university press,	
Reference Books:		
1	Teaching Resource for Structural Steel Design, Vol. 1,2,3 (2000), INSDAG- Institute for Steel Development and Growth, Kolkatta.	
2	Negi L.S. “Design of steel structures” McGraw Hill Co., New Delhi, 2014	
3	Bhavikatti S.S.,”Design of Steel Structures (By limit state method as per IS 800:2007)” I K International Publiishing house pvt ltd, 2010.	
4	IS 800-2007, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi.	
Web References:		
1	www.nptel.ac.in	
Online Resources:		
1	http://nptel.ac.in/courses/105103094/	

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C318.1	Apply	Outside Class Hours Technical Report I	**10**
C318.2			
C318.3			
C318.4	Apply & Create	Outside Class Hours Technical Report II	**10**
C318.5			
C318.6			

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	25	30	30
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	75	75	70	70

15CE319	FOUNDATION ENGINEERING	3/1/0/3
Nature of Course	Theory and analytical	
Pre requisites	15CE311 Soil Mechanics	
Course Objectives:		
1	To learn site investigation and soil exploration methods	
2	To understand bearing capacity of soil and to estimate the same	
3	To design a suitable foundation (shallow and deep) system	
4	To estimate the capacity of pile and pile group and to understand the efficiency of pile group in clay and sand	
5	To understand types of earth pressure; pressure distribution behind retaining wall	
Course Outcomes: **After the completion of this course, students will be able to**		
C319.1	Carry out soil investigation for civil engineering construction.	
C319.2	Estimate bearing capacity of soil and select a suitable foundation.	
C319.3	Design a suitable shallow or deep foundation.	
C319.4	Estimate the load carrying capacity of pile and pile group and pressure distribution behind retaining walls	
Course Contents:		
Site Investigation and Sub- Soil Exploration: Necessity- stages- methods of exploration- depth and lateral extent of exploration-types of samples- Field tests- penetration tests (SPT, CPT&DCPT), Geophysical Investigations- in-situ vane shear test- plate load test- sub soil investigation report – Marine Exploration and sampling techniques. **Bearing Capacity and Shallow Foundations:** Introduction- types, choice of foundations- Location and depth of foundation; Bearing capacity-basic definitions- types of shear failure-Terzaghi's bearing capacity theory- effect of water table- I S Code method- Bearing capacity from SPT and plate load test-Proportioning of shallow foundation (no structural design); Settlement- Components of settlement-allowable settlement as per I S Code- differential settlement**. Pile Foundation**- Classification and selection- Load carrying capacity-static, dynamic formulae (Engineering News and Hileys)- pile load test- design of pile groups- efficiency-Feld's rule, Converse Labarre formula; Settlement of pile grou- negative skin friction- Under reamed piles. **Earth Pressure and Retaining Wall:** Definitions-Rankine's earth pressure theory for active and passive states for horizontal and inclined surfaces-Coulomb`s earth pressure theory (no derivation)- types of retaining wall. **Well Foundation:** Types – Different shapes of wells – Components of wells – forces acting- Sinking of wells – Tilts and shifts.		
	Total Hours:	**45**
Text Books:		
1	Gopal Ranjan and Rao, ASR, "Basic and Applied Soil Mechanics" New Age International (P) Limited Publication, New Delhi, Second Edition, 2010.	
2	Varghese,P.C., "Foundation Engineering", Prentice Hall of India., 2007	
3	Arora, K. R. "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors New Delhi. (Reprint 2015).	
Reference Books:		
1	S. K.Gulhati&ManojDatta, "Geotechnical Engineering", Tata McGraw Hill Publishing Company, 2005	
2	Teng,W.C, "Foundation Design" , Prentice Hall, 1984	

3	Swami Saran, “Analysis and Design of Substructures”, Oxford and IBH Publishing Company Pvt Ltd, 2008.
Web References:	
1	http://nptel.ac.in/courses/105104137/
Online Resources:	
1	http://nptel.ac.in/courses/105107120/

Assessment Methods & Levels (based on Blooms’Taxonomy)

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
C319.1	Apply	Quiz	**5**
C319.2	Evaluate	Test	**5**
C319.3	Apply	Quiz	**5**
C319.4	Analyze	Assignment	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	-	-	-	-
Understand	-	-	-	-
Apply	80	25	40	50
Analyse		75	30	20
Evaluate	20	-	30	30
Create	-	-	-	

15CE320	ENVIRONMENTAL ENGINEERING LABORATORY	0/0/3/2

Nature of Course	Practical application
Pre requisites	Physical Science Laboratory

Course Objectives:

1. To understand the physico-chemical analysis of water and waste water.
2. To interpret the results and draw conclusions about the quality of water for intended usage.
3. To learn the principles of analysis of common air pollutant.

Course Outcomes:

C320.1 Learn the sampling and preservation techniques for water quality analysis
C320.2 Estimate the parameters for water quality
C320.3 Perform field tests of water samples.
C320.4 Estimate the strength and characteristics of effluent samples.
C320.5 Perform bacteriological examination of water quality.
C320.6 Measure a criteria air pollutant in the surrounding environment

Course Contents

1	Sampling and preservation methods of water and waste water	[U]
2	Determination of pH, Turbidity and conductivity	[AN]
3	Determination of Hardness	[AN]
4	Determination of Chlorides.	[AN]
5	Determination of Sulphates	[AN]
6	Determination of DO and BOD	[AN]
7	Determination of COD	[AN]
8	Determination of Optimum Coagulant Dosage	[AN]
9	Determination of Residual Chlorine and available chlorine in bleaching powder	[AN]
10	Determination of Iron and Fluoride	[AN]
11	Bacteriological examination of water and waste water	[AP]
12	Determination of an air pollutant	[AP]
13	Study of settling characteristics	[AP]
	Total Hours:	**30**

Reference Books:

1. Standard Methods for examination of Water and Wastewater, APHA, AWWA and WPCF, 20th Edition.
2. KVSG Muralikrishna (1997), Chemical analysis of water and soil - a laboratory manual, Environmental Protection Society
3. CPHEEO Manual on sewage and sewerage treatment and water supply and Distribution.

Web References:

http://nptel.ac.in/courses/105106119/

Online Resources:

http://nptel.ac.in/courses/105104102/

Assessment Methods & Levels (based on Bloom's Taxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	-	-
Understand	30	20
Apply	40	40
Analyse	30	40
Evaluate	-	-
Create	-	-

15CE321	COMPUTER AIDED BUILDING DESIGN LABORATORY	0/0/3/2

Nature of Course	Practical application
Pre requisites	15UA301- Engineering Drawing

Course Objectives:

1. To understand the regulations as per National Building Code.
2. To identify the functional requirements and building rules.
3. To understand the sketches and working drawings
4. To draft on computer building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the following:

Course Outcomes:

Upon completion of the course, students shall have ability to

C321.1 Familiarize with the standard symbols and sign conventions suitably.
C321.2 Understand the different views of the components of a building.
C321.3 Implement the regulations for layout planning and preparation of drawings.
C321.4 Draft the elevation and sectional views of the buildings using computer software.

Course Contents:

1) Introduction [R]
   a. Selection of site
   b. Orientation
   c. location of buildings
2) Terminology and Objectives of building bye-laws [U]
3) Classification of buildings [U]
   a. Floor area ratio (FAR)
   b. Floor space Index (FSI)
4) Principles underlying building bye-laws [AP]
5) classification of bye buildings [AP]
   a. Open space requirements
   b. built up area limitations
6) Height of Buildings, Wall thickness, lighting and ventilation requirement [AP]
7) Introduction to National Building Code Provisions. [R]
8) Minimum standards for various parts of buildings – requirements of different rooms and their grouping. [AP]

Total Hours:	**30**

Reference Books:

1. Construction Planning, Equipment and methods by R.L. Peurifoyetal. – Tata Mc. Graw Hill Publications.
2. Civil Engg. Drawing & House Planning – Varma B.P., Khanna publishers, Delhi.
3. Building drawing & detailing – Balagopal& T.S. Prabhu, Spades Publishers, Calicut.
4. Building by laws bye state and Central Governments and Municipal corporations.
5. Building drawing – Shah.M.G., Tata McGraw-Hill,1992.
6. Building planning & Drawing –Kumaraswamy N., KameswaraRao A., Charotar Publishing.
7. Shah, Kale and Patki, Building Drawing with integrated approach to built environment, Tata McGraw-Hill.

Web References:

1. http://blogs.autodesk.com/autocad/autocad-online-resources-autodesk-app-store-for-autocad/
2. http://www.mycadsite.com/tutorials/index.htm
3. http://www.cadtutor.net/

Online Resources:

1. http://tutorial45.com/autocad-tutorial/
2. http://www.computeraideddesignguide.com/autocad-tutorial/

Assessment Methods & Levels (based on Bloom's Taxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Category	**Rubric based Continuous Assessment [60 marks] (in %)**	**End Semester Examination [40 marks] (in %)**
Remember	20	20
Understand	40	30
Apply	40	50
Analyse	-	-
Evaluate	-	-
Create	-	-

15CE322	CONCRETE LABORATORY	0/0/3/2

Nature of Course	Practical application
Pre requisites	15UG301 Construction Materials

Course Objectives:

1. To understand the properties of Materials used in concrete
2. To understand the Mechanical properties of Concrete.

Course Outcomes:

After the completion of this course, students will be able to

C322.1 Assess the properties of materials in Concrete
C322.2 Formulate the mix design for Concrete
C322.3 Assess the properties of Fresh Concrete
C322.4 Assess the properties of Hardened Concrete

Course Contents

1. Concrete Mix Design – IS Method	(AP)
2. Slump test	(AN)
3. Compaction factor test	(AN)
4. Vee – Bee test	(AN)
5. Compressive strength test	(AN)
6. Split tensile test	(AN)
7. Flexural strength test	(AN)
8. Non - destructive tests	(AN)
Total Hours:	**30**

Text Books:

1. Shetty M.S., Concrete Technology, S.Chand and Company Ltd., New Delhi, 2009 Santhakumar, A.R., Concrete Technology, Oxford University Press, New Delhi, 2010

Reference Books:

1. Neville, A.M., Properties of Concrete, Pearson, 2012.
2. Gambir, M.L. “Concrete Technology”, Tata McGraw Hill, Publishing Co, Ltd, New Delhi, 2004.
3. IS: 10262, “Recommended Guidelines for Concrete Mix Design”, 2009, BIS, New Delhi.

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

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Rubric based Continuous Assessment [60 marks] (in %)	End Semester Examination [40 marks] (in %)
Remember	-	-
Understand	-	-
Apply	30	30
Analyse	70	70
Evaluate	-	-
Create	-	-

SEMESTER VI

15CE323	STRUCTURAL ANALYSIS : MODERN METHODS	3/1/0/4
Nature of Course	Concepts & analytical	
Pre requisites	: 15CE315 STRUCTURAL ANALYSIS - CLASSICAL METHODS	
Course Objectives:		
1 2 3	To understand the behavior of indeterminate structures To know the concepts of elastic analysis and plastic analysis To understand the concepts of matrix analysis of structures.	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C323.1	Apply the concepts and applications of elastic analysis and plastic analysis	
C323.2	Analyse cables, suspension bridges and space frames	
C323.3	Apply various methods for analyse the framed structures	
C323.4	Apply the concepts of matrix analysis of structures.	
Course Contents:		
Plastic Analysis plastic moment of resistance - shape factor, collapse load - analysis of continuous beams and portals – limiting conditions for applications. **Cables, Suspension bridges and Space frames: Approximate methods for multistoried frames** Substitute frame method - portal method - cantilever method and Kani's method.**Flexibility Matrix method** Concept of flexibility matrix - analysis of continuous beams - plane frames and pin jointed plane trusses. **Stiffness Matrix method** Stiffness matrix for beam element - analysis of continuous beams - plane frames & pin jointed plane trusses.		
	Total Hours:	**60**
Text Books:		
1	Vaidyanadhan,R and Perumal,P,"Comprehensive Structural Analysis – Vol. I & Vol. II", Laxmi Publications, New Delhi, 2010	
2	Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 12th Edition, 2004.	
Reference Books:		
1	R.L.Jindal (1996), Indeterminate Structures, Tata McGraw Hill Publishing House.	
2	Negi.L.S (2002), Theory & Problems in Structural Analysis, Tata McGraw Hill publishing House.	
3	G.S.Pandit& Gupta S.P (1998), Structural Analysis (A matrix approach), Tata McGraw Hill Publishing Ltd.	
Web References:		
1	http://nptel.ac.in/courses/105101086/	
Online Resources:		
1	http://nptel.ac.in/courses/105101086/	

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C323.1	ANALYSE	Tutorial	**6**
C323.2	APPLY	Quiz	**5**
C323.3	ANALYSE	Surprise test	**4**
C323.4	ANALYSE	Group Assignment	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	-	-	-	-
Understand	-	-	-	-
Apply	20	30	25	25
Analyse	80	70	75	75
Evaluate	-	-	-	-
Create	-	-	-	-

15CE324	DESIGN OF RC ELEMENTS	4/0/0/4

Nature of Course	Analysis and design
Pre requisites	: 15CE315 STRUCTURAL ANALYSIS - CLASSICAL METHODS

Course Objectives:

1	To understand the fundamental principles and procedures of Reinforced Concrete Design.
2	To study the Principles of Reinforced Concrete Design to real world problems

Course Outcomes:
After the completion of this course, students will be able to

C324.1 Study the various properties of Materials

C324.2 Analyse and Design of Slab and Beam

C324.3 Analyse and Design of Beam

C324.4 Design for Bond, Anchorage, Shear &Torsion

C324.5 Analyse and Design of Columns and Stair Cases

C324.6 Design of Footing and Detail the reinforcements

Course Contents:

MATERIALS: Stress strain curve for concrete – Standard concrete mixes for RCC works – Types of reinforcements – Plain and deformed bars – Stress- strain curve for reinforcing steel. **Design Concepts:** Concept of elastic method, ultimate load method and limit state method – Advantages of limit state method over other methods – Design codes and specification – Limit state philosophy as detailed in IS code – Durability limit state – Deflection cracking – Modification factor. **Design For Flexure:** analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects – Analysis and design of singly and doubly reinforced rectangular and flanged beams. **Design For Bond, Anchorage Shear & Torsion.** Behaviour of RC members in bond and anchorage - Design requirements as per current code – Behaviour of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion. **Design Of Columns And Stair Cases:** Types of columns – Braced and unbraced columns – Design of short column for axial, uniaxial and biaxial bending – Design of long columns- Design of staircases (ordinary and doglegged).**Design Of Footing and Reinforcement Detailing:** design of wall footing – Design of axially and eccentrically loaded rectangular footing – Design of combined rectangular footing for two columns only – Standard method of detailing RC beams, slabs and columns – Special requirements of detailing in Earthquake resistant building.

Total Hours:	**60**

Text Books:

1	Gambhir,M.L., “Fundamental of Reinforced concrete Design”,PHI learning , Pvt.Ltd.2009
2	Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., New Delhi, 2013

Reference Books:

1	Punmia .B.C, Ashok kumarjain and Arunkumarjain “Reinforced Concrete Structure”, Laxmi publications New Delhi, 2000.
2	UnnikrishnaPillai and DevdassMenon - Reinforced Concrete Design – Tata McGraw Hill PublishingCompany Ltd. 2008.
3	Purushothaman, P. Reinforced Concrete Structural Elements – Tata McGraw Hill Publishing Co. Ltd.2007.
4	Sinha, S.N. Reinforced Concrete Design – Tata McGraw Hill Publishing Company Ltd.

	2008.
5	Jain, A K, “Limit State Design of RC structures”, Nemchand Publications, Roorkee, 2007.
6	SP 16: 1980 Design Aids for Reinforced Concrete to IS 456: 1978, BIS, New Delhi
7	SP 34: 1987 Handbook on Concrete Reinforcement and Detailing, BIS, New Delhi
8	IS 456: 2000 Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi.
9	IS 875 : 1987 Code of practice for design loads (other than earthquake)for buildings and structures, Part 1: Dead loads - Unit weights of building material and stored materials, BIS, New Delhi Part 2:Imposed loads, Part 3: Wind Loads, Part 4 Snow loads, Part 5 Special loads and load Combinations. , BIS, New Delhi
10	National Building Code 2005, BIS, New Delhi.

Web References:

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

Assessment Methods & Levels (based on Blooms’ Taxonomy)

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
C324.1	Remember & Understand	Outside Class Hours Technical Report I	**10**
C324.2			
C324.3			
C324.4	Apply	Outside Class Hours Technical Report II	**10**
C324.5			
C324.6			

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	40	-	-	-
Understand	40	30	25	25
Apply	20	70	75	75
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE325	ESTIMATION AND QUANTITY SURVEYING	3/0/3/4

Nature of Course: C (Theory concept), M (Practical Application)

Pre Requisites: 17CE306– Computer Aided Building Drawing Laboratory

Course Objectives:

1. To estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents.
2. To prepare value estimates.
3. To acquire knowledge in various types of building materials such as stones, bricks, concrete blocks, cements and its types.
4. To know about the construction materials and their importance in Civil Engineering.

Course Outcomes:

After the completion of this course, students will be able to

C325.1 Describe the fundamentals of specification.

C325.2 Discuss the basic concepts behind estimation

C325.3 Formulate material quantities for simple structure like foundation steps and boundary walls.

C325.4 Formulate the estimation of buildings

C325.5 Prepare estimation of other structures

C325.6 Compose rate analysis and value estimates

Course Contents:

Introduction: General - Units of measurements – Types of estimation - Methods of estimates – Advantages. Simple problems – Estimation of different foundations, steps and boundary walls. **Estimate of Buildings:**Load bearing structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat roof. Reinforcement bar bending and bar requirement schedules.(beam,slab&column)**Estimate of other Structures:** Estimating of septic tank, soak pit– tube well – open well. Estimate of bituminous and cement concrete roads. Estimate of retaining walls.**Specification and Rate Analysis:**Object of specifications – General and Detailed specifications for various items of work –earth work excavation – lime mortar - cement concrete – damp proof course – form work– brick and stone masonry - Flooring – painting and wood work. Purpose – requirements - Schedule of rates and Data book – procedure of rate analysis –Requirement of labour and materials for different works – Obtaining rate for different works namely cement mortar – cement concrete – RCC – RR masonry – Brick masonry –DPC – Plastering – flooring – weathering course – pointing – painting.**Valuation:** Objects of valuation - definition of various terms such as free and lease hold property – Market value – Book value – Assessed value – Mortgage Value - Replacement Value –Gross and Net Income – Capital cost – Cost Escalation - sinking fund – Depreciation –Methods – Fixation of Rent – calculation of standard rent of Government Building – Principles of Report preparation.

Lab Component

1. Estimation of Different types of Foundations (AP)
2. Estimation for stairs (AP)
3. Valuation of residential buildings (AP)
4. Estimation of Load Bearing Structures (AP)
5. Estimation of Septic Tanks and Soak Pit (AP)
6. Estimation of Open Well and Tube Well (AP)
7. Estimation of Flexible and Rigid Pavement (AP)
8. Estimation of retaining walls (AP)
9. Rate Analysis for different types of works (AP)
10. Reinforcement bar bending and bar requirement schedules.(beam, slab &column)(AP)

Total Hours :	**60**

Text Books:

1. Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., 2016.
2. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand& Company Ltd., 2012.
3. Vazirani, V.N and Chandola, S.P., “Civil Engineering Estimation ,costing and Valuation)”,Khanna Publications., 2015.
4. A.K.Upadhyay, “Civil Estimation and Costing” S.K. Kataria and Sons, New Delhi, 2015

Reference Books:

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD.
2. Tamil Nadu Transparencies in Tenders Act, 1998.
3. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003.
4. B.S.Patil, ‘Civil Engineering Contracts and Estimates’, University Press, 2013.
5. D.N. Banerjee, ‘Principles and Practices of Valuation’, V Edition, Estern Law House, 2015.
6. Dr.S. SEETHARAMAN, ‘Estimation and Quantity Surveying’, Anuradha Publications, 2015.

Web References:

1. http://nptel.ac.in/courses/105103093/1

Online References:

1. https://www.youtube.com/watch?v=D04uxZpgp6M
2. https://www.youtube.com/watch?v=vurarO8Fcg4

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

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	Rubric based CIA [40 Marks]	
Remember	5	-	5	-	-
Understand	30	20	25	20	20
Apply	65	80	70	80	80
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

15CE326	STRUCTURAL ANALYSIS DESIGN AND DETAILING LABORATORY	1/0/3/2

Nature of Course	: M (Practical application)
Pre requisites	: 15CE324– Design of R C Elements and 15CE318 Design of Steel Structures

Course Objectives:

1. To design and detail the Various Reinforced Concrete slab and beam
2. To design and detail the Reinforced Concrete footings
3. To design and detail the Steel column and beam
4. To design and detail the Steel roof truss

Course Outcomes:

After the completion of this course, students will be able to

C326.1 To understand the basic principles of Retaining walls, Concrete Walls &Tank

C326.2 To understand the basic theory behind Yield Line Theory.

C326.3 To understand the basic principles of Bridge and Flat Slab.

C326.4 To have a comprehensive design knowledge in Retaining Walls and Reinforced Walls

C326.5 To have comprehensive design knowledge in Water Retaining Structures, Staging and foundations of elevated water tanks and domes.

C326.6 To understand and design of solid slab bridge and for IRC loadings and Flat Slab

Course Contents

1. Analysis and Design of 2-D RC frame using an analysis software considering gravity loads.
2. Analysis and Design of 2-D RC frame using an analysis software considering gravity loads and wind load.
3. Analysis and Design of 2-D RC frame using an analysis software considering gravity loads and seismic load.
4. Analysis and Design of 3-D RC frame using an analysis software considering gravity loads.
5. Analysis and Design of 3-D RC frame using an analysis software considering gravity loads and wind load.
6. Analysis and Design of 3-D RC frame using an analysis software considering gravity loads and seismic load.
7. Analysis and Design of Roof truss using an analysis software considering gravity loads.
8. Analysis and Design of Roof truss using an analysis software considering gravity loads and wind load.
9. Analysis and Design of Roof truss using an analysis software considering gravity loads and seismic load.
10. Analysis and Design of workshop shed using an analysis software considering gravity loads.
11. Analysis and Design of workshop shed using an analysis software considering gravity loads and wind load.
12. Analysis and Design of workshop shed using an analysis software considering gravity loads and seismic load.

Total Hours: 30

Reference Books:

1. Krishna R.Pranesh.R.N ," Design of Reinforced Concrete Structures ",3rd Edition , Newage International (P),Ltd, 2010.
2. Punmia.B.C, Ashok Kumar Jain , Arun Kumar Jain , "Limit State Design Reinforced Concrete", As per IS 456:2000, Laxmi Publications(P), Ltd,2007
3. Subramanian.N, "Design of Steel Structures", Oxford University press, 2008.
4. Duggal, "Limit state design of Steel structures", Tata McGraw Hill, New Delhi, 2010.
5. Nevile, "Properties of Concrete", Longman Publishers, 2004.

6. IS: 456 : 2000, Plain and Reinforced concrete – code of practice
7. IS: 10262 : 2009, Recommended guidelines for Concrete Mix Design
8. IS 800 -2007, Indian Standard Code of practice for General Construction in Steel.
9. SP 6: Part 1: 1964 Handbook for structural engineers - Structural steel sections.

Web References:

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

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ce10

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

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Rubric based Continuous Assessment [60 marks] (in %)	End Semester Examination [40 marks] (in %)
Remember	10	10
Understand	20	30
Apply	60	50
Analyse	10	10
Evaluate	-	-
Create	-	-

15CE327	BUILDING SERVICES	3/1/0/4

Nature of Course	:G (Theory Application)
Pre requisites	: NIL

Course Objectives:

1	To study the essential services for the building
2	To create awareness about the importance of electrical and mechanical services in Buildings
3	To study the air conditioning and safety measures for the building

Course Outcomes:

After the completion of this course, students will be able to

C327.1 Understand the plan for essential services for the building
C327.2 Choose the appropriate equipment for buildings
C327.3 Implement wiring systems & Prepare the plan for electrical wiring for buildings
C327.4 Plan for Lighting facilities for the building
C327.5 Choose suitable air conditioning system for buildings
C327.6 Understand fire safety for various types of buildings Uncertainty

Course Contents:

Machineries: Lifts and Escalators, Special features required for physically handicapped and elderly people, Conveyors, Vibrators, Concrete mixers, AC/DC motors, Generators, Laboratory services, Gas, Water, Air and Electricity. **Electrical Systems in Buildings:** Basics of electricity, Single/Three phase supply, Protective devices in electrical installations, Earthing for safety, Types of earthing, ISI Specifications, Types of wires, wiring systems and their choice, Planning electrical wiring for buildings, Main and distribution boards, layout of substations. **Principles of Illumination and Design**: Design of modern lighting, lighting for stores, offices, schools, hospitals and house lighting, Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types. Sanitary fixtures and plumbing: Principles of design of water supply in buildings -House service connection -Fixtures and fittings -Systems of plumbing and drawings of types of plumbing. **Fire and Safety Installation:** Causes of fire in buildings, Safety regulations, NBC, Planning considerations in building like non-combustible materials, staircases and lift lobbies, fire escapes and AC systems.

Total Hours:	**60**

Text Books:

1	Ambrose ER, “Heat pumps and Electric heating”, John and Wiley Sons, Inc., New York, 2000.
2	Hopkinson RG and Kay JD, “The lighting of Buildings”, Faber and Faber, London, 2000.
3	Sherratt AFC, “Air Conditioning and Energy Conservation”, The Architectural Press, London, 1997.
4	Derek Phillips, “Lighting in Architectural Design”, McGraw-Hill, New York, 2000.

Reference Books:

1	National Building Code of India, BIS 2005.
2	Handbook of Building Engineers in Metric Systems, NBC, New Delhi, 2001.
3	Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2005.

Web References:

1	http://www.handbook.curtin.edu.au/units/31/318930.html
2	https://www.ljmu.ac.uk/study/courses/undergraduates/2017/building-services-engineering

Online Resources:

1	http://www.cibse.org/building-services

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C327.1	Understand	Assignment	**3**
C327.2	Analyse	Technical Quiz	**4**
C327.3	Apply	Assignment	**3**
C327.4	Remember	Technical Presentation	**4**
C327.5	Analyse	Case study	**4**
C327.6	Understand	Test	**2**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	10	30	20	20
Understand	10	10	20	20
Apply	30	50	10	10
Analyse	50	10	50	50
Evaluate	-	-	-	-
Create	-	-	-	-

15CE328	DESIGN AND DETAILING OF R.C STRUCTURES	3/0/3/4

Nature of Course: Problem analytical-J

Pre Requisites: 15CE324– Design of R.C Elements

Course Objectives:

1. To acquire knowledge in retaining wall, Concrete Walls,water tanks, Yield Line, flat slabs and principles of design pertaining to Staging , Foundations and bridges.
2. To have comprehensive design knowledge related to structures, systems that are likely to be encountered in professional practice.

Course Outcomes:

After the completion of this course, students will be able to

C328.1 Apply the basic principles of Retaining Walls, Concrete Walls and Tanks
C328.2 Utilize the basic theory behind Yield Line Theory
C328.3 Employ the basic principle of Bridges and Reinforced Concrete Walls
C328.4 Design the Retaining Walls and Reinforced Concrete Walls
C328.5 Design the water retaining structures, staging and foundations of elevated water tanks and domes.
C328.6 Design a Solid Slab Bridge with IRC loadings and Flat Slab

Course Contents:

RETAINING WALLS: Design of cantilever and counter fort retaining walls **WATER TANKS**: Underground rectangular tanks – Domes – Overhead circular tank – Design of staging and foundations. **YIELD LINE THEORY**: Application of virtual work method to Square, Rectangular, Circular, Hexagonal and triangular slabs (only Problems no derivations). **FLAT SLABS and CONCRETE WALLS:** Types, Components of flat slab, Design of flat slabs - Design of reinforced concrete walls **BRIDGES**: – Bridges-Introduction-Classification of bridges-IRC loadings- Effective width of load Dispersion-Design of solid slab bridge.

Lab Component

1. Design and Detailing of Cantilever Retaining Wall
2. Design and Detailing of Counterfort Retaining Wall
3. Design and Detailing of Dome
4. Design and Detailing of Under Ground Water Tank
5. Design and Detailing of Elevated Circular Water tank
6. Design and Detailing of Hexagonal Slab
7. Design and Detailing of Circular Slab
8. Design and Detailing of Triangular Slab
9. Design and Detailing of Flat Slab
10. Design and Detailing of Solid Slab Bridge

Total Hours : 60

Text Books:

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

Reference Books:

1. Sinha N C and Roy S K, "Fundamentals of Reinforced Concrete", S Chand & Co, Ltd., New Delhi, 2015.
2. Varghese P C, "Limit State Design of Reinforced Concrete", Prentice Hall of India Ltd, New Delhi, 2015.
3. IS 456:2000 “Code of practice for plain and reinforced concrete (fourth revision)”, BIS,New Delhi.

4. IS 3370(Part 1):2009 “Code of practice for concrete structures for the storage of liquids: Part 1 General requirements”, BIS, New Delhi.
5. IS 3370(Part 2):2009 “Code of practice for concrete structures for the storage of liquids: Part 2 Reinforced concrete structures”, BIS, New Delhi.
6. IS 3370(Part 4):1967 “Code of practice for concrete structures for the storage of liquids: Part 4 Design tables”, BIS, New Delhi.
7. IRC:6-2010, Standard Specifications and Code of Practice for Road Bridges, Section II – Loads and Stresses (Fourth Revision), Indian Road Congress, New Delhi.
8. SP 16(S&T): 1980 Design aids for reinforced concrete to IS 456:1978, BIS, New Delhi.
9. SP 34(S&T): 1987 Handbook on concrete reinforcement and detailing, BIS, New Delhi.

Web References:

1. http://nptel.ac.in/courses.php?disciplineId=105

Online References:

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

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

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	Rubric based CIA [40 Marks]	
Remember	-	-	-	-	-
Understand	20	20	20	20	20
Apply	-	-	-	-	-
Analyse	80	80	80	80	80
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

SEMESTER- VIII

15CE704	PROJECT WORK	0/0/24/12

Nature of Course	: Project
Course Objectives:	
1	To expanding his / her knowledge base and also provide opportunity to utilize the creative ability and inference capability
2	To simulate real life situations related to civil engineering and impart adequate training to face and tackle any problem in the field

Course Outcomes:

After the completion of this course, students will be able to

C704.1 Identify a relevant problem affecting the society.
C704.2 Collect suitable literature for the problem statement.
C704.3 Generate the methodology of work.
C704.4 Conduct experiments to analyse and develop solutions
C704.5 Recall the learned skills to specific audience in oral form.

Students could join (maximum 3) together, form a small team and execute a project in the area relevant to Civil Engineering under the guidance of a faculty.

Alternately, a student is encouraged to take an industrial project with civil engineering organizations. The project will be guided by the faculty member and the concerned officer in the industry

The project work shall be submitted in a report form and should be presented before a committee constituted by the Head of the Institution, which shall evaluate the project work done for 100 marks. The progress of the project will be evaluated based on a minimum of three reviews

The committee will consist of head of the department, the supervisor of the project and two senior faculty member of the department and an external member.

PROFESSIONAL SOFT CORE

15CE401	HIGHWAY ENGINEERING	3/0/0/3

COURSE OBJECTIVES

1. To exposure the students in highway planning, engineering surveys for highway alignment.
2. To design Geometric Elements of Highways and Urban roads.
3. To design Rigid and Flexible pavements.
4. To know about the desirable properties of highway materials and various practices adopted for construction.

COURSE OUTCOMES

After the completion of this course, students will be able to

C401.1 Discuss the various cross sectional elements.

C401.2 Describe various phases of highway planning and road construction

C401.3 Assess the material properties for highway design

C401.4 Design the various geometric elements of highways

C401.5 Design flexible and rigid pavements

C401.6 Evaluate the pavement condition and to decide appropriate measures

UNIT 1	HIGHWAY PLANNING & FINANCING	9

Importance of Highway Transportation – Classification of Highways – Scope,advantage and important highway plans – Highway financings – calculation of Annual cost – Economic analysis – methods – Highway location and surveys

UNIT 2	GEOMETRIC DESIGN OF HILL ROADS	9

Design of Horizontal Alignments – Super Elevation, widening of Pavements on Horizontal Curves – Transition Curves, Gradients, Summit and Valley Curves, Sight Distances – Stopping Sight Distance(SSD), Overtaking Sight Distance (OSD), Sight Distances at Intersections, Intermediate Sight Distance and Illumination Sight Distance. Geometric Design of Hill Roads[IRC Standards Only]

UNIT 3	DESIGN OF RIGID AND FLEXIBLE PAVEMENTS	9

Rigid and Flexible Pavements – Components and their Functions, Design Principles of Flexible and Rigid pavements, Factors affecting the Design of Pavements. Design Practice for flexible Pavements [CBR method, IRC method]. Design Practice for Rigid Pavements- [IRC Recommendations – Problems], Joints

UNIT 4	HIGHWAY MATERIALS	9

Desirable Properties and Testing of Highway Materials: - Soil – California Bearing Ratio Test, Field Density Test. Aggregate – Crushing, Abrasion, Impact Tests, Water Absorption, Flakiness and Elongation Indices and Stone Polishing Value Test. Bitumen – Penetration, Ductility, Viscosity, Binder Content and Softening Point Tests.

UNIT 5	HIGHWAY MAINTANENCE	9

Types of defects in Flexible Pavements – Surface defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. Failures in Rigid Pavements – Scaling, Shrinkage, Wraping, Structural Cracks, Spalling of Joints and Mud Pumping and Special Repairs.

Pavements Evaluation – Pavements Surface Conditions and Structural Evaluation, Overlay design by Benkleman Beam Method(Procedure only)

SELF STUDY: Evaluation of Pavements Failure and Strengthening

TOTAL:45

TEXT BOOKS:

1. Kadiyali L R, Principles and Practices of Highway Engineering, Khanna Technical Publications, Delhi, 2003 (Unit I – Unit V)
2. Khanna S.K and Justo C E G, Highway Engineering, Nem Chand & Bros, Roorkee, 2001. (Unit I – Unit V)

REFERENCE BOOKS:

1. Sharma S.K, "Principles Practices& Design of Highway Engineering" S. Chand & Co,2001
2. Guidelines for the design of Flexible pavements IRC 37 -2001, Indian Road Congress, New Delhi.
3. Guidelines for the design of Rigid pavements Irc 58-2002, Indian Road Congress, New Delhi.
4. Design and specifications of Rural roads(manual)Ministry of rural roads, Government of India, New Delhi 2001.

WEB REFERENCES:

1. http://nptel.ac.in/courses/105101087

15CE402	CONCRETE TECHNOLOGY	3/0/0/3

PREREQUISITES: NIL

COURSE OBJECTIVES

1. To understand the properties of concrete
2. To know about the concepts of mix design
3. To acquire knowledge in special concretes, durability of concrete, concreting under special circumstances

COURSE OUTCOMES

Upon successful completion of the course, students

C402.1 Estimate the mix design for making concrete

C402.2 Relate the fresh and hardened properties of concrete

C402.3 Explain the durability aspects of concrete

C402.4 Explain the various types of concrete

C402.5 Apply the various special concrete in the required scenario

UNIT 1	MIX DESIGN AND ADMIXTURES	9

Mix design: Introduction, concept of mix design – various mix design methods – batching of ingredients: volume batching, weigh batching – IS method of mix proportioning- Mix proportioning of concrete using admixtures. Properties, advantages, dosage and application. Admixtures - Plasticizers – super-plasticizers – Retarders – Accelerators – Air entraining admixtures –water proofing admixtures.

UNIT 2	STUDIES ON FRESH CONCRETE	9

Workability: Definition, factor affecting workability, measurement of workability: Slump test, compacting factor test – segregation – bleeding – steps of manufacture of concrete: batching, mixing, transporting, placing, compacting – curing of concrete - Factors affecting strength of concrete: water / cement ratio, maturity of concrete, micro –shrinkage of concrete and factors affecting it.

UNIT 3	STUDIES ON HARDENED CONCRETE	9

Testing on hardened concrete: Compression test, flexural strength of concrete, indirect tension test methods – factors influencing strength results – Accelerated strength tests –determination of modulus of elasticity – in situ strength determination – variation in test results – Non-destructive strength tests: ultrasonic pulse velocity tests, rebound hammer test.

UNIT 4	DURABILITY OF CONCRETE	9

Durability : Definition, significance – permeability – chemical attack, sulphate attack – methods of controlling – thermal properties of concrete – chloride attack – concrete in sea water – resistance to abrasion and cavitations – acoustic properties – corrosion of steel

UNIT 5	SPECIAL CONCRETES	9

Lightweight concrete - High strength concrete- High Performance Concrete – Fibre reinforced concrete– Ferro cement – Polymer Concrete- Ready mix concrete – Self compacting concrete – Vacuum dewatering Concrete – Mass Concrete - Sulphur Concrete –Waste material based Concrete. Special Concreting methods

SELF STUDY: Cold Weather concreting, hot weather concreting

TOTAL:45

TEXT BOOKS:

1. Shetty M.S., Concrete Technology, S.Chand and Company Ltd., New Delhi,2009 (Unit I-Unit V)
2. Santhakumar, A.R., Concrete Technology, Oxford University Press, New Delhi,2010 (Unit I–Unit V)

REFERENCE BOOKS:

1. Neville, A.M., Properties of Concrete, Pearson, 2012.
2. Gambir, M.L. “Concrete Technology”, Tata McGraw Hill, Publishing Co, Ltd, New Delhi, 2004
3. IS: 10262, “Recommended Guidelines for Concrete Mix Design”, 2009, BIS, New Delhi 1988

WEB REFERENCES:

1. http://nptel.ac.in/courses/105102012/

15CE403	IRRIGATION ENGINEERING	3/0/0/3

PREREQUISITES:NIL

COURSE OBJECTIVES

1. To understand the need and mode of irrigation.
2. To study about minimizing water losses and on farm development works.
3. To learn the concepts involved in elementary hydraulic design of different structures and its maintenance.

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

C403.1 Know about the methods and types of irrigation

C403.2 Plan irrigation projects.

C403.3 Understand the design of hydraulic structures.

C403.4 Understand the concepts of irrigation water management

UNIT 1	INTRODUCTION	9

Irrigation – Need and mode of irrigation – Advantages and types of irrigation – Crop and crop seasons – consumptive use of water – Root zone depth – Duty and delta –Relationship – Factors affecting duty – Irrigation efficiencies – Planning and development of irrigation projects.

UNIT 2	IRRIGATION METHODS	9

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits –Sprinkler irrigation – Drip irrigation.

UNIT 3	DIVERSION AND IMPOUNDING STRUCTURES	9

Functions of diversion head works – Types – Weirs – Causes of failure of weirs and their remedies – Weirs on pervious foundations - Types of impounding structures - Tanks, Sluices and weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams

UNIT 4	CANAL IRRIGATION	9

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops –

Cross drainage works – Hydraulic design of cross drainage works – Canal head works – Canal regulators– River training works.

UNIT 5	IRRIGATION WATER MANAGEMENT	9

Need for optimization of water use – Minimizing irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

SELF STUDY: Improving the energy efficiency of pumping systems, irrigation scheduling techniques.

TOTAL: 45

TEXT BOOKS:

1. Santhosh Kumar Garg, "Irrigation and Hydraulic Structures", Khanna Publishers, New Delhi, 2011. (Unit I – Unit V)
2. Punmia BC and Pande B BLal, “Irrigation and Water Power Engineering”, Laxmi Publications Pvt.Ltd., New Delhi, 2009.(Unit I – Unit V)

REFERENCE BOOKS:

1. SahasraBudhe S R, "Irrigation and Hydraulic Structures", Katson Publishing House, Ludhiana, 1996.
2. Asawa G L,"Irrigation Engineering", New Age International Publishers, New Delhi 2009.

WEB REFERENCES:

1. http://nptel.ac.in/courses/105105040

15CE404	PRINCIPLES OF ARCHITECTURE	3/0/0/3

PREREQUISITES: NIL

COURSE OBJECTIVES

1. To give an idea on Architectural aspects of a building.
2. To provide the basic knowledge on the principles and functional design of buildings relating to the environment and climate.

COURSE OUTCOMES

Upon successful completion of this course, the student will be able to:

C404.1 Plan any civil engineering project by incorporating various aspect of environment and climate of the project area

C404.2 Know the different qualities of architecture

C404.3 Know the Architecture that can enhance the building in terms of appearance and utility

C404.4 Incorporate various rules and regulation of town planning and development authorities.

UNIT 1	ARCHITECTURAL DESIGN	9

Architectural Design – an analysis – integration of function and aesthetics – Introduction to basic elements and principles of design.

UNIT 2	SITE PLANNING	9

Surveys – Site analysis – Development Control – Layout regulations- Layout design concepts.

UNIT 3	BUILDING TYPES	9

Residential, institutional, commercial and Industrial – Application of anthropometry and space standards- Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior design.

UNIT 4	CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN	9

Man and environment interaction- Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls

UNIT 5	TOWN PLANNING	9

Planning – Definition, concepts and processes- Urban planning standards and zoning regulations- Urban renewal – Conservation – Principles of Landscape design

SELF STUDY: Green building concept in Architecture

TOTAL:45

TEXT BOOKS:

1. Pramar. V.S. “Design fundamental in Architecture”, Somaiya Publications Pvt. Ltd., New Delhi, 1997. (Unit I – Unit V)
2. MuthuShobaMohan.G.”Principles of Architecture”, Oxford University Press. New Delhi, 2006. (Unit I – Unit V)
3. Rangwala. S.C. “Town Planning” Charotar Publishing House. Anand, 2005. (Unit I – Unit V)

REFERENCE BOOKS:

1. De Chiara.J., Michael. J. Crosbie.,"Time Saver Standards for Building Types", McGraw Hill Publishing Company, New York, 2001.
2. Arvind Krishnan, Nick Baker, SimosYannas, Szokolay.S.V., "Climate Responsive Architecture"., A Design Hand Book for Energy Efficient Building, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2007.
3. National Building Code of India, SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2005.

WEB REFERENCES:

1. http://www.civilengineeringx.com/building-design-and-construction-handbook

ELECTIVE STREAM I
STRUCTURAL ENGINEERING

15CE501	MAINTENANCE AND REHABILITATION OF STRUCTURES	3/0/0/3

Nature of Course: Theory & Concept

Pre Requisites: 15CE402 Concrete Technology

Course Objectives:

1. To understand the Maintenance and Repair Strategies for damaged structures
2. To understand the quality assurance and durability of concrete.
3. To understand the different types of special concretes and techniques for repair.
4. To understand the Retrofitting and Rehabilitation techniques for structural members
5. To study the concept used in various demolition techniques and case studies.

Course Outcomes

After the completion of this course, students will be able to

C501.1 Explain the different repair and maintenance strategies
C501.2 Predict the concept of serviceability and durability of concrete
C501.3 Explain the special materials for Repair
C501.4 Describe the retrofitting methods of structures
C501.5 Report the different techniques for repair and Demolition

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

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.**Serviceability and Durability of Concrete:**Quality assurance for concrete construction concrete properties- strength, permeability, thermal properties and cracking. - Effects due to climate, temperature, chemicals, corrosion - Design and construction errors - Effects of cover thickness and cracking.**Special Materials for Repair :**Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, expansive cement, polymer concrete, sulphur infiltrated concrete, ferrocement, fibre reinforced concrete**. Repairs, Rehabilitation and Retrofitting of structures :** Repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure. Recent development of seismic retrofit methods – reasons and methods. **Techniques for Repair and Demolition :**Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack,vacuum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatingsand cathodic protection. engineered demolition techniques for Dilapidated structures

Total Hours	45

Text Books:

1. Recent development of seismic retrofit methods – reasons and methods

Reference Books:

1. Shetty. M.S, Concrete Technology - Theory and Practice, S.Chand and Company, New Delhi, 2009.
2. Vidivelli,B., Rehabilitation of Concrete Strucutres", Standard Publishers Distributors,2007.
3. Santhakumar, A.R., Training Course notes on Damage Assessment and repair in Low Cost Housing ,
"RHDC-NBO" Anna University, July 1992.
4. Raikar, R.N., Learning from failures - Deficiencies in Design, Construction and Service - R&D Centre
(SDCPL), RaikarBhavan, Bombay, 1987.
5. N. Lakshmipathy, M. Senthil.R, Lecture Notes of "Workshop on Repairs and Rehabilitation of Structures", October 1999

Web References:

1. nptel.ac.in/courses/105107123
2. Nptel.ac.in/courses/114106025

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C501.1	Remember	Quiz	**3**
C501.2	Understand	Surprise Test	**3**
C501.3	Understand	Group Assignment	**4**
C501.4	Understand	Technical Presentation	**5**
C501.5	Apply	Mini project	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	60	40	-	20
Understand	40	40	60	40
Apply	-	20	40	40
Analyse	-	-	-	
Evaluate	-	-	-	-
Create	-	-	-	-

15CE502	GREEN BUILDING TECHNOLOGY	3/0/0/3

Nature of Course	: Theory & Concept
Pre requisites	:Nil

Course Objectives:

1	To understand the concepts of sustainability , energy and environment
2	To select materials to decrease environmental impacts
3	To Know ways to decrease water consumption inside the buildings
4	To identify green building rating system and their contributions

Course Outcomes:
After the completion of this course, students will be able to

C502.1	Describe various components which makes the building energy efficient such as lighting, space conditioning, heat control and energy efficient.
C502.2	Discuss the various green building rating systems along with its implementation for conventional buildings
C502.3	Appraise suitable construction strategies and to introduce the concept of Green buildings
C502.4	Outline smart buildings and Energy management systems

Course Contents:

Introduction : Historical Perspective Buildings. Conventional versus Green Buildings – Comparison. Minor and major aspects of Green Buildings – The Integrated Design Process. Green Building Documentation Requirements. Conventional, Contemporary and Future Ecological Design – Green Design to Regenerative Design. **Green building systems** :Sustainable sites and landscaping – Enhancing ecosystems. Building envelop – selection of green materials, products and applications. Passive design strategies. Internal load reduction – Indoor environment quality. Building water and waste water management. Use of LEED / IGBC standards .**Green Building Implementation** :Site Planning, Health and Safety Planning, Construction and Demolition. Waste Management – Reducing the Footprint of Construction Operations – Maximizing the Value of Building Commissioning. HVAC Systems, Lighting and cleaning systems for green buildings. Costs and Benefits of Building Commissioning – use of LEED / IGBC standards. **Green building assessment:**International Building Assessment Systems – The USGBC/ LEED Building Assessment Standard – The LEED Certification Process – The Green Globes Building Assessment Protocol- Example of a Platinum / Gold / Silver Building. Comparison of present Building Rating Systems – Code compilation requirements – LeedGriha**Economics of Green Buildings :**Economic aspects of Green Buildings – Quantifying Green Building Benefits – Managing Costs and Barriers. Short & long term environment benefits. Some typical case studies of Green Buildings

Total Hours:	**45**

Text Books:

1	Jerry Yudelson, “Green Buildings A to Z”, Understanding the buildings, www. newsociety.com, 2008
2	“Green building guidelines: Meeting the demand for low-energy, resource-efficient homes”, Sustainable Buildings Industry Council, 2004.

Reference Books:

1	Charles J. Kibert, “Sustainable Construction: Green Building Design and Delivery”, 2nd Edition, Wiley, 2007
2	Jerry Yudelson, “Green Buildings through Integrated Design”, Tata McGraw Hill, 2008

Web References:

1	http://nptel.ac.in/courses/120108004/

Online Resources:

1	http://nptel.ac.in/courses/120108004/

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C502.1	Understand	Quiz	**5**
C502.2	Understand	Group Assignment	**5**
C502.3	Understand , Analyse	Mini Project	**5**
C502.4	Remember , Understand	Technical Presentation	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	40	40	30	20
Understand	60	60	40	60
Apply	-	-	-	-
Analyse	-	-	30	20
Evaluate	-	-	-	-
Create	-	-	-	-

15CE503	PREFABRICATED STRUCTURES	3/0/0/3

Nature of Course: C (Theory Concept)

Pre Requisites:-NIL

Course Objectives:

1. To understand the different types of prefabricated elements and the technologies used for fabrication and erection.
2. To study the concepts of modular construction and industrialized construction
3. To Use the different types of prefabricated elements and the technologies used for fabrication and erection in field.

Course Outcomes

After the completion of this course, students will be able to

1 -Apply the principles, systems, production methods and modular coordination of prefabrication.

2 -Apply the various construction procedures of prefabricated components and shear wall.

3- Apply the design principles in prefabricated joints and identify the probems and its solution in joints of prefabricated structures

4 - Apply the codal provisions in design of prefabricated elements to avoid progressive collapse

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

Introduction to Prefabricated Structures Need for prefabrication – Principles – Materials – Comparison with monolithic construction Types of prefabrication – Site and plant prefabrication - Economy of prefabrication- Modular coordination –Standardization – Systems – Production – Transportation – Erection.**Prefabricated Components** Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs-Ribbed floor panels – Wall panels – Columns – Shear walls- Footings- Storage of precast elements –Dimensional tolerances.**Design Principles** Disuniting of structures- Design of cross section based on efficiency of material used – Problems in designbecause of joint flexibility – Allowance for joint deformation.**Joint in Structural Members**Joints for different structural connections – Dimensions and detailing- Effective sealing of joints for waterproofing – Provisions for non-structural fastenings – Design of expansion joints.**Design for Abnormal Loads and its Applications**Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse-Designing and detailing of precast unit for factory structures – Purlins, roof trusses, lattice girders, gable frames

Total Hours	45

Text Books:

1. Gerald Staib, “Components and Systems: Modular Construction - Design, Structure, New Technologies”, BirkhauserVerlag AG, 1st edition, August 2008
2. Ryan E. Smith, “Prefab Architecture: A Guide to Modular Design and Construction”, John Wiley & Sons, January 2011.

Reference Books:

1. Mark Anderson, “Prefab Prototypes: Site-Specific Design for Offsite Construction”, Princeton Architectural Press, January 2007.
2. Alejandro Bahamon, “PreFab-Prefabricated and Movable Architecture”, HarperCollins Design International, November 2002.
3. Michael Stacey, “Component Design (New Technology)”, Architectural Press,1st edition, November 2001

Web References:

1. civildigital.com/prefabricated-structures-prefabrication-concept-components-advantage
2. www.metcolleges.ac.in/Notes/CIVIL/FinalYear/CE2045/CE2045.docx
3. www.annauniverzity.com Civil Engineering

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C503.1	Remember	Quiz	**3**
C503.2	Understand	Assignment	**2**
C503.3	Understand	Surprise Test	**2**
C503.4	Understand	Group Assignment	**3**
C503.5	Apply	Technical Presentation	**5**
C503.6	Apply	Mini project	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	40	30	30	30
Understand	40	30	40	40
Apply	20	40	30	30
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE504	EARTHQUAKE RESISTANT STRUCTURES	3/0/0/3

Nature of Course: Theory Analytical

Pre Requisites: Basics of Civil Engineering

Course Objectives:

1. To understand the concept of vibrations and damping forces.
2. To understand the types degree of freedom systems.
3. To study the various causes of earthquakes.
4. To learn about the responses of structures to various types of earthquakes.
5. To understand the earthquake resistant design concepts.

Course Outcomes:

Upon completion of the course, students shall have ability to

C504.1 Remember the Concept of static and dynamic forces	(R)
C504.2 Remember the various types of damping forces on system	(R)
C504.3 Understand the concept of degree of freedom system.	(U)
C504.4 Learn the various natural and artificial sources of earthquakes	(U)
C504.5 Apply the concept of Liquefaction for earthquake resistant design	(AP)
C504.6 Apply the various ductility concepts into RC Structures	(AP)
C504.7 Design and analyse earthquake resistant structures as per codal provisions.	(AN)
C504.8 Analyse the structures provided with vibration control measures.	(AN)

Course Contents:

Theory of Vibrations: Concept of inertia and damping ,Types of Damping , Difference between static forces and dynamic excitation, Degrees of freedom, SDOF idealisation, Equations of motion of SDOF system for mass as well as base excitation, Free vibration of SDOF system, Response to harmonic excitation, Impulse and response to unit 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, Mode superposition Method (Concepts only).**Elements of Seismology:** Causes of Earthquake, Geological faults, Tectonic plate theory, Elastic rebound, Epicentre, Hypocentre, Primary, shear and Raleigh waves Seismogram, Magnitude and intensity of earthquakes, Magnitude and Intensity scales, Spectral Acceleration, Information on some disastrous earthquakes. **Response of Structures to Earthquake:** Response and design spectra, concept of peak acceleration, Effect of soil properties and damping, Liquefaction of soils, Importance of ductility, 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, Important points in mitigating effects of earthquake on structures.

Total Hours : 45

Text Books:

1. Damodaraswamy SR & S.Kavitha, Basics of Dynamics and Aseismic Design, PHI Learning ,2009.
2.Pankaj Agarwal & shrikhande , Earth quake resistant Design of Structures, PHI Learning ,2009.
3. Chopra A.K., “Dynamics of Structures - Theory and Applications to Earthquake Engineering”, Second Edition, Pearson Education, 2007.

Reference Books:

1. Dowrick D.J., “Earthquake Resistant Design & Risk Reduction”, John Wiley & Sons, London , 2009.
2. Paz, M., “Structural Dynamics - Theory & Computation”, CBS Publishers & Distributors, Shahdara, Delhi, 2010.
3. IS 1893-2002, Criteria for Earth Quake resistant design of structures part - I, BIS, New Delhi.

Web References:

1. http://nptel.ac.in/courses/105101004/

Online References:

1. https://onlinecourses.nptel.ac.in/noc 1_ch08/course

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C504.1	Remember	Quiz	2
C504.2	Remember	Quiz	2
C504.3	Understand	Technical Presentation	2
C504.4	Understand	Power Point Presentation	2
C504.5	Apply	Surprise Test	2
C504.6	Apply	Surprise Test	2
C504.7	Analyse	Group Assignment	4
C504.8	Analyse	Group Assignment	4

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Continuous Assessment Tests			Semester End Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term Examination (8 Marks)	
Remember	40	20	20	20
Understand	60	60	40	20
Apply	-	20	40	40
Analyse	-	-	-	20
Evaluate	-	-	-	-
Create	-	-	-	-

15CE505	PRESTRESSED CONCRETE STRUCTURES	3/0/0/3

Nature of Course	: Theory analytical
Pre requisites	: 15CE328 Design and detailing of R C Structures

Course Objectives:

1	To understand the principle of prestressing and design of prestressed elements.

Course Outcomes:
After the completion of this course, students will be able to

C505.1	Understand the different methods of prestressing.
C505.2	Estimate the effective prestress including the short and long term losses.
C505.3	Analyze and design prestressed concrete beams under flexure and shear.
C505.4	Understand the methods of achieving continuity in prestressed concrete
C505.5	Analyze and design circular prestressed concrete structures

Course Contents:

Introduction: Principles of prestressing -methods of prestressing - materials - Anchorage systems - Pretensioning and post - tensioning - Losses of prestress **Working Stress Approach:** Definition of Type I, Type II and type III structures- Design and choice of sections of Post - tensioned beams based on working stress approach - check for limit state of collapse - Layout of cables in post-tensioned beams short term and long term defections –codal requirements **Shear Design:** Shear and principal stresses - Limit state shearing resistance of cracked and uncracked sections - Design of shear reinforcement - Transmission of prestressing force by bond in pretensioned members -check for transmission length - Design of anchorage zone of post-tensioned beams by I.S.Code method and Guyon"s method. **Composite Construction:** Types of composite construction involving precast prestressed units and cast-in-situ concrete -Analysis - Analysis for stresses - Design for flexure and shear - Effect of differential shrinkage Concordant Cable -Methods of achieving continuity in prestressed concrete continuous beams - Assumptions in elastic analysis - primary and secondary moments -Pressure line- concordant cable and linear transformations - Design Principle. **Circular Prestressing:** Circular prestressing in liquid retaining tanks - Analysis for stresses - Design of tank wall incorporating the recommendations of I.S: 3370 part III and IV codes - Types of prestressed concrete tension members and poles.

Total Hours:	**45**

Text Books:

1	Krishna Raju N., " Prestressed Concrete", Tata McGraw Hill Publishing Company, Delhi, 1995
2	Rajagopalan N., " Prestressed Concrete", Narosa Publishing House, New Delhi, 2002

Reference Books:

1	Sinha N. C. and Roy S. K., "Fundamentals of Prestressed Concrete", S Chand & Co, 1985
2	Lin T. Y. and Ned H. Burns, "Design of Prestressed Concrete Structures", John Wiley Sons, New York, 1982.Nilson A H, "Design of Prestressed Concrete", John Wiley Sons, New York, 1978

Web References:

1	http://www.nptel.ac.in/courses/105106118/

Online Resources:

1	http://www.nptel.ac.in/courses/105106118/

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C505.1	Remember	Quiz	**3**
C505.2	Understand	Class Presentation	**3**
C505.3	Analyse	Assigning Case studies	**4**
C505.4	Analyse	Assignment	**5**
C505.5	Analyse	Class Presentation	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	20	50	25	25
Understand	80	50	25	25
Apply	-	-	-	-
Analyse	-	-	50	50
Evaluate	-	-	-	-
Create	-	-	-	-

15CE506	PRE ENGINEERED INDUSTRIAL STRUCTURES	3/0/0/3

Nature of Course	:Theory analytical
Pre requisites	: 15CE324Design of RC Elements

Course Objectives:

1	To understand the functional planning of Pre-engineered industrial structures.
2	To design different components of industrial structures.
3	To evaluate the performance of the Pre- engineered buildings.

Course Outcomes:
Upon completion of the course, students shall have ability to

C506.1	Understand the classification of the industries and site layout of industries	[U]
C506.2	Analyse the industrial buildings.	[AN]
C506.3	Analyse the gantry columns along with the connections.	[AN]
C506.4	Analyse the transmission line towers.	[AN]
C506.5	Understand the concepts of cold formed sections	[U]

Course Contents:

Introduction: Classification of Industries and Industrial structures – Pre Engineered Structures- Site layout. **Analysis of industrial buildings:** Analysis of industrial building for Gravity and Wind load. Analysis and design of gable frames **Analysis of gantry column:** Analysis and design of gantry column (stepped column / column with bracket), girts, bracings. **Analysis of transmission lines towers:** Analysis of transmission line towers for wind load and design of towers including all connections. **Cold Formed compression sections:** Forms of light gauge sections**-** Effective width computation of unstiffened, stiffened, multiple stiffened compression elements of cold formed light gauge sections.

Total Hours: 45

Text Books:

1	Subramanian N - “Design of Steel Structure” oxford University Press
2	Punmia B.C.,. Jain A.K “Design of Steel Structures”, Laxmi Publications, New Delhi**.**

Reference Books:

1	Bureau of Indian Standards, IS800-2007, IS875-1987, IS-801-1975. Steel Tables, SP 6 (1) – 1984
2	Ramchandra and VirendraGehlot “ Design of Steel Structures “ Vol 1 and Vol.2, Scientific Publishers, Jodhpur
3	Duggal “Limit State Design of Steel Structures” TMH

Web References:

1	http://nptel.ac.in/courses/

Online Resources:

1	http://nptel.ac.in/courses/

Assessment Methods & Levels (based on Blooms’Taxonomy)

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
C506.1	Remember	Quiz	**4**
C506.2	Analyse	Tutorial	**4**
C506.3	Understand	Assignment	**2**
C506.4	Understand	Class Presentation	**5**
C506.5	Analyse	Tutorial	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	-	-	-	-
Understand	50	40	40	35
Apply	-	-	-	-
Analyse	50	60	60	65
Evaluate	-	-	-	-
Create	-	-	-	-

15CE507	FINITE ELEMENT TECHNIQUES	3/0/0/3

Nature of Course	: Problem analytical
Pre requisites	: 15UA302- Engineering Mechanics, 15CE304– Mechanics of Solids – I

Course Objectives:

1	To understand the basic concept of finite element for one, two, and three dimensional finite elements
2	To study the various finite element procedures and solution techniques for linear and nonlinear structures
3	Derive constitutive relations and solve structural engineering problems with appropriate mathematical models.

Course Outcomes:
Upon completion of the course, students shall have ability to

C507.1	Remember the concept of finite element	[R]
C507.2	Understand the concept of shape function	[U]
C507.3	Apply the numerical integration technique to solve problems	[AP]
C507.4	Analyze the discrete and continuum problems using finite element method.	[AN]

Course Contents:

Concept of finite element - variational and weighted residual methods - convergence and compatibility requirements - elements for trusses - beams and frames - stress and strain analysis of two dimensional planar problems - **concept of shape functions** - triangular elements - rectangular elements - iso-parametric elements stress analysis (three dimensional elements): **numerical integration techniques** plate and shell elements - finite strip method nonlinear - vibration and thermal problems, meshing and solution problems - auto and adaptive mesh generation techniques .

45

Text Books:

1	Robert D.Cook, e tal, " Concepts and Applications of Finite Element Analysis", John Wiley & Sons, Inc. Singapore, 2007
2	Bathe. K.J., "Finite Element Procedure", Prentice Hall of India, New Delhi, 2006.
3	Tirupathi, R.Chandrupatla and Ashok, D. Belegundu., "Introduction to Finite Elements in Engineering", Prentice Hall of India Private Limited., New Delhi, 2004.

Reference Books:

1	Rajasekaran, S., "Finite Element Methods in Engineering Design", S.Chand& Co Ltd., NewDelhi, 2003.
2	Mukhopadhyay, M., "Matrix, Finite Element Computer and Structural Analysis", Oxford & IBH publishing Co., Pvt. Ltd. New Delhi, 1993

Web References:

1	www.nptel.ac.in

Online Resources:

1	http://nptel.ac.in/courses/105105041/#

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C507.1	Remember	Quiz	**5**
C507.2	Understand	Quiz	**5**
C507.3	Apply	Announced Test	**5**
C507.4	Analyse	Tutorial	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	10	10	10	10
Understand	30	20	20	20
Apply	25	30	30	30
Analyse	35	40	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

15CE508	TALL BUILDINGS	3/0/0/3

Nature of Course	:Theory
Pre requisites	: NIL

Course Objectives:

1	To know the materials used in Tall building construction
2	To study the analysis and design aspects of Tall Buildings
3	To understand the behaviour of structural systems
4	To know the stability calculations of Tall buildings

Course Outcomes:

Upon completion of the course, students shall have ability to

C508.1	Understand the materials used in Tall Building construction	[U][R]
C508.2	Evaluate the loading acting in the buildings	[AN]
C508.3	Understand the behaviour of structural systems	[U]
C508.4	Apply the concepts for design and analysis of Tall Buildings	[A]
C508.5	Evaluate the stability of Tall Buildings	[AN]

Course Contents:

Design Criteria and Materials: Development of High Rise Structures – General Planning Considerations – Design philosophies – Materials used for Construction. **Loading:** Gravity Loading – Dead Load – Live Load – Live load reduction technique – Impact Load – Construction Load – Sequential Loading, Lateral Loading – Wind load – Earthquake Load. Combination of Loads. **Behavior of Various Structural Systems:** Factors affecting growth, Height and Structural form. High rise behavior of Various structural systems – Rigid frames, braced frames, In filled frames, shear walls, coupled shear walls, wall-frames, tubular structures, cores, outrigger – braced and hybrid mega systems. **Analysis and Design:** Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerized general three dimensional analysis. **Stability of Tall Buildings:** Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsion instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

Total Hours:	**45**

Text Books:

1	Bryan Stafford Smith, Alex coull, “Tall Building Structures, Analysis and Design”, John Wiley and Sons, Inc., 1991.
2	Taranath B.S., “Structural Analysis and Design of Tall Buildings”, McGraw Hill, 2011.

Reference Books:

1	Lin.T.Y, StotesBurry.D, “Structural Concepts and systems for Architects and Engineers”, John Wiley, 1988.
2	Lynn S.Beedle, “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi, 1986.
3	Wolfgang Schueller “High Rise Building Structures”, John Wiley and Sons, New York 1977.

Web References:

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

Online Resources:

1	https://skyscrapercenter.com/

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C508.1	Understand & Remember	Assignment	**3**
C508.2	Analyse	Technical Quiz	**5**
C508.3	Understand	Assignment	**3**
C508.4	Apply	Technical Presentation	**4**
C508.5	Analyse	Case Study	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	20	20	20	20
Understand	20	30	20	20
Apply	-	-	10	10
Analyse	60	50	50	50
Evaluate	-	-	-	-
Create	-	-	-	-

15CE509	GROUND IMPROVEMENT TECHNIQUES	3/0/0/3

Nature of Course	:G (Theory)
Pre requisites	:17ES207 Soil Mechanics

Course Objectives:

1	To identify basic deficiencies of various soil deposits.
2	To study the various ways and means of improving the soil characteristics
3	To study the In-situ treatment methods in cohesion and cohesion less soils

Course Outcomes:
After the completion of this course, students will be able to

C509.1	Decide the appropriate improvement in different soils
C509.2	Describe the role of ground improvement in foundation engineering
C509.3	Use drainage and dewatering techniques to improve soil stability
C509.4	Apply the In-situ treatment for cohesionless and cohesive soil
C509.5	Use the concept of earth reinforcement
C509.6	Apply grouting techniques for soil stability

Course Contents:

Introduction: Role of ground improvement in foundation engineering-
methods of ground improvement- Geotechnical problems in alluvial, laterite and black cotton soils- selection of suitable ground improvement techniques based on soil condition. **Drainage and dewatering-** Drainage techniques- Well points- Vacuum and electro osmotic methods- Seepage analysis for two dimensional flow- fully and partially penetrating slots in homogenous deposits (Simple cases only).**In- situ treatment of cohesionless and cohesive soils –** In-situ densification of cohesionless and consolidation of cohesive soils- Dynamic compaction and consolidation- Vibrofloation - Sand pile compaction- Preloading with sand drains and fabric drains – Stone columns- lime piles (Installation techniques only)-relative merits of various methods and their limitations. **Earth reinforcement:** Concept of reinforcement -Types of reinforcement material- applications of reinforced earth- use of Geotextiles for filtration, drainage and separation in road and other works. **Grouting Techniques:** Types of grouts -Grouting equipment and machinery- Injection methods- grout monitoring- Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils.

Total Hours:	**45**

Text Books:

1	Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering" ,McGraw-Hill, 1994.
2	Purushothama Raj, P. "Ground Improvement Techniques", Tata McGraw-Hill PublishingCompany, New Delhi, 1995

Reference Books:

1	Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman an dHall, Glassgow, 1993
2	Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995
3	Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jerse y,

Web References:

1	http://nptel.ac.in/courses/105101084/

Online Resources:

1	http://nptel.ac.in/courses/105101084/

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C509.1	Remember, Understand, Apply	Technical Presentation, Report I	**10**
C509.2			
C509.3			
C509.4			
C509.5	Remember, Understand, Apply	Technical Presentation, Report I	**10**
C509.6			

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	20	20	20	30
Understand	80	40	45	35
Apply	-	40	35	35
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

ELECTIVE STREAM- II
ENVIRONMENTAL ENGINEERING

15CE510	ENVIRONMENTAL IMPACT ASSESSMENT AND RISK MANAGEMENT	3/0/0/3
Nature of Course	Theory & Concept	
Pre requisites	Nil	
Course Objectives:		
1 2 3	To deal with the various impacts of infrastructure projects on the components of environment To acquire knowledge regarding the methods of assessing the impact To know about the various impacts of development projects on environment and the mitigating measures	
Course Outcomes: **After the completion of this course, students will be able to**		
C510.1	Develop the options for estimating environmental and social impacts	
C510.2	Create the format of an EIA report (Environmental Impact Statement and Environmental statement)	
C510.3	Examine the issues that affect the quality of thr EIA report	
C510.4	Evaluate the purpose of developing follow up- procedures, and the options for designing the procedures	
C510.5	Plan the mitigation measures for the new projects	
Course Contents:		
Introduction: Impact of development projects under Civil Engineering on environment – Evolution of Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) - EIA capability and limitations – Legal provisions on EIA. **Methodologies:** Methods of EIA -Check lists - Matrices - Networks - Cost-benefit analysis - Analysis of alternatives – Case studies. **Prediction And Assessment**: Assessment of Impact on land, water and air, noise, social, cultural flora and fauna; Mathematical models; public participation - Rapid EIA. **Environmental Management Plan**: Plan for mitigation of adverse impact on environment - options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the Project Affected People - ISO 14000. Brief introduction about Environment legislation and Environmental Audit. **Case Studies: EIA** for infrastructure projects - Bridges - Stadium - Highways - Dams - Multi-storey Buildings – Water Supply and Drainage Projects.		
	Total Hours:	**45**
Text Books:		
1	Anjaneyulu. Y and Sastry.C.A “Environmental Impact Assessment Methodlogies”, BS Publications, Hydrabad, 2002.	
2	Shukla S. K. and Srivastava P.R., “Concepts in Environmental Impact Analysis”, Common Wealth Publishers, New Delhi, 2009.	
3	Environmental Impact Assessment : L. Canter	
Reference Books:		
1	Richard K. Morgan. “Environmental Impact Assessment: A Methodological Approach”, kluwer academic Publisers	
2	Judith Petts, Handbook of Environmental Impact Assessment Vol. I and II, Blackwell Science, New York, 1998	
3	Hosetti.B“Environmental Impact Assessment and Management”, Daya Publishing House	
Web References:		
1	http://www.moef.gov.in/citizen/specinfo/eia.html	
2	http://www.moef.gov.in/citizen/specinfo/emp.html	

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C510.1	Understand	Quiz	**6**
C510.2	Understand,Remember,Apply	Group Discussion	**6**
C510.3	Understand, Analyse	Group Assignment	**4**
C510.4	Apply	Test	**4**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	20	-	-	10
Understand	70	60	20	20
Apply	10	20	40	40
Analyse	-	20	40	30
Evaluate	-	-	-	-
Create	-	-	-	-

15CE511	RENEWABLE SOURCES OF ENERGY	3/0/0/3

Nature of Course: Theory concept

Pre Requisites: NIL

Course Objectives:

1. To understand the availability of renewable sources of energy.
2. To identify the new methodologies / technologies for effective utilization of renewable energy sources
3. To study the design and operation of landfills

Course Outcomes:

Upon completion of the course, students shall have ability to

C511.1 Understand the renewable sources of energy available . (U)
C511.2 Recognize the necessity of choosing alternate energy resources (U)
C511.3 Understand the concepts of biomass applications (U)
C511.4 Familiarise the applications and economics of renewable energy sources (U)

Course Contents:

Energy resources: World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Tamil nadu, India and around the World – Potentials – Achievements / Applications – Economics of renewable energy systems. **Solar energy:** Solar Radiation – Measurements of Solar Radiation – Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation – Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications. **Wind energy:** Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects. **Bio-energy:** Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration – Biomass Applications. **Other Renewable energy sources:** Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage – Fuel Cell Systems – Hybrid Systems.

Total Hours : 45

Text Books:

1. Rai. G.D., “Non Conventional Energy Sources”, Khanna Publishers, New Delhi, 2011.
2. Twidell, J.W. & Weir, A., “Renewable Energy Sources”, EFN Spon Ltd., UK, 2006.
3. Sukhatme. S.P., “Solar Energy”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.

Reference Books:

1. Godfrey Boyle, “Renewable Energy, Power for a Sustainable Future”, Oxford University Press, U.K., 1996.
2. Tiwari. G.N., Solar Energy – “Fundamentals Design, Modelling & Applications”, Narosa Publishing House, New Delhi, 2002.
3. Freris. L.L., “Wind Energy Conversion Systems”, Prentice Hall, UK, 1990.
4. 4.. David M. Mousdale – “Introduction to Biofuels”, CRC Press, Taylor & Francis Group, USA 2010

Web References:

1. nptel.ac.in/courses/112105050/

Online References:

1. nptel.ac.in/courses/108108078/

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C511.1, C511.2	Remember	Quiz	3
C511.3, C511.4	Understand	Technical Presentation	4
C511.5	Understand	Surprise Test	3
C511.6	Analyse	Mini project	10

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Continuous Assessment Tests			Semester End Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term Examination (8 Marks)	
Remember	40	20	20	20
Understand	60	60	60	40
Apply	-	-	-	-
Analyse	-	20	20	40
Evaluate	-	-	-	-
Create	-	-	-	-

15CE512	INDUSTRIAL WASTEWATER MANAGEMENT	3/0/0/3

Nature of Course: C (Theory concept)

Pre Requisites: Nil

Course Objectives:

1. To acquire a detailed knowledge on the current practices in industrial wastewater treatment.
2. To learn the principles, objectives and basic criteria for the selection of processes for wastewater treatment and/or recycling with attention to environmental sustainability.

Course Outcomes:

After the completion of this course, students will be able to

C512.1 Understand the characteristics and composition of industrial wastewater.

C521.2 Determine appropriate strategies for treatment and management of industrial pollutants

C521.3 Analyse the quality requirements for reuse of industrial effluents

C521.4 Recommend different techniques for the safe disposal of industrial effluents

Course Contents:

Introduction to Wastewater : Effects of Industrial Wastes on Streams, Land and wastewater Treatment Plants – water quality criteria – Effluent standards – Industrial effluent – volume reduction – Strength reduction – Process Modification – Methods and Materials changes – Housekeeping – established recovery and reuse methods for by-products within the plant operations – Regularity requirements and Environmental legislations. **Industrial Effluent Treatment :** Equalization and Neutralization – separation of Solids – Physio–chemical treatment – Removal of organic and inorganic solids – combined treatment of Industrial and municipal Wastes – Individual and Common Effluent Treatment Plants. Biological treatment methods – Aerobic and Anaerobic digestion – Ultimate disposal of sludge – Cleaner Technologies and pollution prevention – Waste minimization – Management of RO rejects. **Advanced Wastewater Treatment and Residue Management:** Chemical Oxidation–Ozonation–Photocatalysis –Wet Air Oxidation – Evaporation – Ion exchange – Membrane technologies – Nutrient removal – Land treatment – Well injection. Quantification and characteristics of sludge – thickening, Digestion, Wet combustion – Conditioning, Dewatering and Disposal of Sludge. **Case Studies 1:** Industrial manufacturing process description – wastewater characteristics and effluent treatment flow sheet for Textiles– Sugar mill– distilleries–Thermal power plant–Nuclear power plant–Petroleum refineries– Fertilizers and Dairy. **Case Studies 2 :** Wastewater characteristics and effluent treatment flow sheet for Tanneries – Pulp and Paper mill – Chemical industries – Metal finishing industries – Iron and Steel industries – Meat packing industries and Poultry plant – Industrial estates and Industrial Clusters.

Total Hours :	45

Text Books:

1. NarayanaRao M and Amal K. Dutta, “Wastewater Treatment”, Oxford & IBH Publishing Co., Pvt. Ltd., New Delhi, 2001.
2. Barnes D, Buss PJ and Gould BW, “Water and Wastewater Systems”, Pitman Publishing Inc., Marshfield, 2000.

Reference Books:

1. Punmia B.C; Ashok Kumar Jain; Arun Kumar J, “Waste Water Engineering”, Lakshmi Publications.
2. Metcalf; Eddy, “Waste Water Engineering”, Tata McGraw Hill Publishing Co Ltd., New Delhi.
3. Wesley Eckenfelder Jr. W, “Industrial water pollution control”, McGraw Hill book Co, New Delhi, 2001.

Web References:

1. http://nptel.ac.in/courses/105106119/36

Online References:

1. https://onlinecourses.nptel.ac.in/noc17_ch05/course

Assessment Methods & Levels (based on Bloom's Taxonomy)
Formative assessment based on Capstone Model (Max. Marks : 20)

Course Outcome	Bloom's Level	Assessment Component	Marks
C512.1	Remember	Quiz	5
C512.2	Remember	Assignment	5
C512.3	Understand	Technical Presentation	5
C512.4	Understand	Power Point Presentation	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Continuous Assessment Tests			Semester End Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term Examination (8 Marks)	
Remember	40	20	30	30
Understand	60	80	70	70
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE513	SOLID AND HAZARDOUS WASTE MANAGEMENT	3/0/0/3

Nature of Course: Theory concept

Pre Requisites: NIL

Course Objectives:

1. To understand the necessity and importance of professional solid waste management.
2. To learn the methods and means of waste collection and transfer of solid and hazardous wastes
3. To study the different treatment approaches for MSW hazardous wastes
4. To study the design and operation of landfills

Course Outcomes:

After the completion of this course, students will be able to

C513.1. Interpret the properties and composition of solid wastes.
C513.2 .Compare the regulations relevant to solid waste handling and disposal
C513.3. Analyse the collection route and collection system
C513.4. Select suitable waste processing technologies and disposal methods
C513.5 .Design a suitable sanitary landfill for disposal of solid waste on land
C513.6. Identify the hazardous waste types and management

Course Contents:

Characteristics and Sources of Municipal Solid Wastes: Sources-Types and composition of solid wastes-Solid waste generation and estimation-Physical and chemical characteristics of municipal solid waste-Sampling protocols for MSW-Socio economic aspects of improper solid waste management- Regulatory development. **Collection, Transfer and Transportation of Solid Wastes:** Collection services-Types of collection system-Collection routes-Personnel requirements-Types of transfer stations-Transport means and methods-Location of transfer stations. **Processing of Municipal Solid Wastes:** On-site handling methods-On-site storage and segregation methods-On-site processing of solid wastes- Unit operations for processing of MSW-Size reduction, screening, density separation, Fundamentals of thermal processing-combustion, pyrolysis, gasification, incineration-Principles of aerobic and anaerobic composting-Energy recovery. **Disposal of solid wastes by Sanitary Landfill:** Landfill classifications-Siting considerations- Generation, movement and control of gases and leachates-Preliminary design and operation of sanitary landfills-Leachate collection and treatment. **Hazardous wastes:** Types and composition of Hazardous Wastes - Waste generation - Effects of improper management – Treatment of Hazardous wastes -Hazardous waste management in India.

Total Hours :	**45**

Text Books:

1. George Tchobanoglous, Hilary Theisen and Samuel Vigil. “Integrated Solid Waste Management”,
2. McGraw-Hill Publishers, 1993.
3. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. “Environmental Engineering” McGraw-Hill
4. Publishers, 2013.
5. John Pichtel. Waste management Practices Municipal, hazardous and Industrial Taylor and Francis 2005.

Reference Books:

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Environmental Engineering – A Design Approach Sincero, A.P., and Sincero, G.A., Phi Learning 2009.
3. Solid Waste Engineering – Vesilind, P. A and Worrel W.A, Cengage Learning 2011.
4.

Web References:

1. http://nptel.ac.in/courses/120108005/

Online References:

1. https://onlinecourses.nptel.ac.in/noc17_ch05/course

Assessment Methods & Levels (based on Bloom's Taxonomy)
Formative assessment based on Capstone Model (Max. Marks : 20)

Course Outcome	Bloom's Level	Assessment Component	Marks
C513.1, C513.2	Remember	Quiz	3
C513.3, C513.4	Understand	Technical Presentation	4
C513.5	Understand	Surprise Test	3
C513.6	Analyse	Mini project	10

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Continuous Assessment Tests			Semester End Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term Examination (8 Marks)	
Remember	40	20	20	20
Understand	60	60	60	40
Apply	-	-	-	-
Analyse	-	20	20	40
Evaluate	-	-	-	-
Create	-	-	-	-

15CE514	WATER RESOURCE MANAGEMENT	3/0/0/3

Nature of Course	: Theory & analytical
Pre requisites	: Nil

Course Objectives:

1. To understand the need and mode of irrigation.
2. To study about minimizing water losses and on farm development works.
3. To learn the concepts involved in elementary hydraulic design of different structures and its maintenance.

Course Outcomes:

Upon completion of the course, students shall have ability to

C514.1: Understand the irrigation and its methods	[U]
C514.2: Understand the concepts various hydraulic structures	[U]
C514.3: Analyze various hydraulic structures	[AN]
C514.4: Understand the concepts of irrigation water management	[U]
C514.5: Apply the concepts of irrigation water management	[AP]
C514.6: Design the various hydraulic structures	[C]

Course Contents:

Irrigation: Irrigation – Need and mode of irrigation – Advantages and types of irrigation – Crop and crop seasons – consumptive use of water – Root zone depth – Duty and delta –Relationship – Factors affecting duty – Irrigation efficiencies – Planning and development of irrigation projects. **Irrigation Methods:** Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits –Sprinkler irrigation – Drip irrigation. **Diversion and Impounding structures:** Functions of diversion head works – Types – Weirs – Causes of failure of weirs and their remedies – Weirs on pervious foundations – Types of impounding structures – Tanks, sluices and weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams **Canal Irrigation:** Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal head works – Canal regulators – River training works. **Irrigation Water Management:** Need for optimization of water use – Minimizing irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

Total Hours:	**45**

Text Books:

1. Santhosh Kumar Garg, “Irrigation and Hydraulic Structures”, Khanna Publishers, New Delhi, 2011.
2. Punmia BC and Pande B B Lal, “Irrigation and Water Power Engineering”, Laxmi Publications Pvt Ltd., New Delhi, 2009.

Reference Books:

1. Sahasra Budhe S R, “Irrigation and Hydraulic Structures”, Katson Publishing House, Ludhiana, 2013.
2. Asawa G L,”Irrigation Engineering”, New Age International Publishers, New Delhi 2009.

Web References:

http://nptel.ac.in/courses/105104140/

Online Resources:

http://nptel.ac.in/courses/105104103/

Assessment Methods & Levels (based on Blooms’ Taxonomy)

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
C514.1,	Understand	Quiz	**3**
C514.2	Analyse	Technical Presentation	**3**
C514.3	Apply & Analyse	Assignment	**5**
C514.4	Understand	Test	**3**
C514.5	Apply & Analyse	Test / Tutorials	**3**
C514.6	Create	Assignment	**3**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	30	20	10	10
Understand	30	30	10	10
Apply	40	30	40	40
Analyse	-	20	10	40
Evaluate	-	-	-	-
Create	-	-	-	-

15CE515	APPLIED HYDROLOGY	3/0/0/3

Nature of Course	: Theory analytical
Pre requisites	: Nil

Course Objectives:

1. To understand all the components of the hydrological cycle.
2. To study the concept of mechanics of rainfall, its spatial and temporal measurement and their applications.
3. To understand the different types of simple statistical analysis and application of probability distribution of rainfall and run off.
4. To learn the concepts of simple methods of flood routing and ground water hydrology.

Course Outcomes:

After the completion of this course, students will be able to

C515.1. Compute the precipitation, abstraction in a given watershed area
C515.2. Construct the flood hydrograph and estimate the peak discharge in the reservoir
C515.3 Estimate Flood and Flood Routing
C515.4 .Infer the concepts of groundwater hydrology

Course Contents:

Precipitation: Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation. **Abstraction from Precipitation:** Losses from precipitation – Evaporation losses – Reservoir evaporation – Infiltration losses – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall. **Hydrographs:** Factors affecting hydrograph – Base flow separation – Unit hydrograph – Derivation of unit hydrograph – S-curve hydrograph – Unit hydrograph of different deviations - Synthetic unit hydrograph. **Flood Routing:** Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's channel routing – Flood control. **Groundwater Hydrology:** Types of aquifer – Darcy's law – Dupuit's assumptions – Confined aquifer – Unconfined aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

Total Hours:	**45**

Text Books:

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2010.
2. Raghunath, H.M., "Hydrology", New Age International Publishers, 2nd edition, 2006.

Reference Books:

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000.
2. Singh, V.P., "Hydrology", McGraw-Hill Inc., Ltd., 2000.
3. Jayarami Reddi.P., "A Text book of Hydrology", Laxmi Publications, New Delhi, 1997

Web References:

http://nptel.ac.in/courses/105105110/

Online Resources:

http://nptel.ac.in/courses/105104103/

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C515.1, C515.2, C515.3, C515.4	Understand	Quiz	**4**
C515.1, C515.4	Apply	Assignment	**5**
C515.2, C515.3	Analyse	assignment	**6**
C515.2, C515.3	Analyse	Tutorial	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	30	20	10	10
Understand	30	30	20	20
Apply	40	30	40	40
Analyse	-	20	30	30
Evaluate	-	-	-	-
Create	-	-	-	-

15CE516	AIR AND WATER QUALITY MODELLING	3/0/0/3

Nature of Course: G (Theory Analytical)

Pre Requisites: Nil

Course Objectives:

1. To learn modelling of water and air quality parameters.
2. To understand the interaction of water and air quality parameters.
3. To identify appropriate modelling solutions for air and water quality problems.
4. To understand the basics of ground water modelling.

Course Outcomes:

Upon completion of the course, students shall have ability to

C516.1 Remember the ambient air quality and water quality standards. (R)

C516.2 Understand the role of mathematical models in validating air and water Quality parameters. (U)

C516.3 Understand various types of models for validating surface water quality parameters. (U)

C516.4 Understand various types of models for validating air quality parameters. (U)

C516.5 Understand various types of models for validating ground water quality parameters. (U)

C516.6 Understand computer modelling for water quality (U)

Course Contents:

Introduction to Modelling: Role of mathematical models-Systems approach-Systems and models-Kinds of mathematical models-Model development and validation-Effluent and stream standards-Ambient air quality standards. **Surface Water Quality Modelling :** Historical development of water quality models-Rivers and streams water quality modelling-River hydrology and flow-Low flow analysis-dispersion and mixing-Flow, depth and velocity-Lakes and impoundments- Water quality response to inputs-Water quality modelling process-Model sensitivity-Assessing model performance-Models for dissolved oxygen, pathogens-Streeter-Phelps models. **Air Quality Modelling :** Transport and dispersion of air pollutants-Wind velocity, wind speed and turbulence-Estimating concentrations from point sources-Gaussian equation-Determination of dispersion parameters-Atmospheric stability-Types of modelling technique-Modelling for non-reactive pollutants-Single source, short term impact, multiple sources and area sources, Fixed box models- diffusion models- Gaussian plume derivation- Modifications of Gaussian plume equation- Long term average multiple cell model- Receptor oriented and source oriented air pollution models model performance, accuracy and utilization. **Ground Water Quality Modelling:** Mass transport of solutes-Degradation of organic compounds-Application of concepts to predict groundwater contaminant movement-Seawater intrusion-Basic concepts and modelling. **Computer Models:** Exposure to computer models for surface water quality, groundwater quality and air quality.

Total Hours : 45

Text Books:

1. Steven C.Chapra, Surface Water Quality Modeling, Waveland Pr, Inc., 2008.
2. R.W.Boubel, Fundamentals of Air Pollution, Elsevier 2006

Reference Books:

1. J.L. Schnoor, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
2. Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I , Academic Press, 2006.

Web References:

1. http://nptel.ac.in/courses/105102089/10

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C516.1	Remember	Quiz	2
C516.2	Remember	Quiz	2
C516.3	Understand	Technical Presentation	4
C516.4	Understand	Power Point Presentation	4
C516.5	Understand	Surprise Test	2
C516.6	Understand	Assignment	6

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Continuous Assessment Tests			Semester End Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term Examination (8 Marks)	
Remember	30	10	20	20
Understand	70	90	80	80
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE517	REMOTE SENSING AND GIS APPLICATIONS	3/0/0/3

Nature of Course: Theory Application

Pre Requisites: Nil

Course Objectives:

1. To study the basics and concepts of Remote Sensing
2. To study the concepts optical and microwave Remote sensing
3. To study the basics of GIS
4. To study the applications of Remote sensing and GIS

Course Outcomes:

Upon completion of the course, students shall have ability to

At the end of the course the student should be able to

C517.1 Understand the concepts of remote sensing	[U]
C517.2 Understand the concepts of optical and microwave sensing	[U]
C517.3 Apply the visual interpretation techniques in remote sensing image processing	[AP]
C517.4 Understand the basic concepts of GIS	[AN]
C517.5 Analyse the remote sensing images	[AN]
C517.6 Apply the GIS techniques in various fields of Civil Engineering	[AP]

Course Contents:

Remote Sensing: Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra-Red (IR), Near IR, Middle IR , Thermal IR and Microwave – Black Body Radiation - Planck's law – Stefan-Boltzmann law. **EMR interaction with atmosphere and earth:** Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface. **Optical and Microwave Remote Sensing:** Satellites - Classification – Based on Orbits – Sun Synchronous and Geo Synchronous – Based on Purpose – Earth Resources Satellites, Communication Satellites, Weather Satellites, Spy Satellites – Satellite Sensors - Resolution – Spectral, Spatial, Radiometric and Temporal Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics. **Geographic Information System:** 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. **Miscellaneous Topics:** Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications- Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems.

Total Hours : 45

Text Books:

1. Lillesand, T.M and Kiefer R.W. Remote Sensing and Image interpretation. John Willey and sons, inc. New York, 2007.
2. Michael Hord, R. Remote sensing methods and application, John Wiley and Sons, New York, 1986.
3. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001.
4. Burrough P. A., Principle of GIS for land resource assessment, Oxford, 1990.
5. M.G. Srinivas (Edited by), Remote Sensing Applications, Narosa Publishing House, 2001.

Reference Books:

1. Steven, M.D., and Clark, J.A. Application of Remote sensing in Agriculture, Butterworths, London, 1990.
2. Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No.IRS-UP/SAC/FMDD/TN/16/90,1990.
3. Sabins, F.F.Jr. Remote sensing principles and interpretation, W.H.Freeman & Co., 2007.
4. Manual of Remote Sensing Vol. II. American Society of Photogrammetry.

Web References:

1. http://nptel.ac.in/courses/170108009

Online References:

1. https://onlinecourses.nptel.ac.in/noc17_ch05/course

Assessment Methods & Levels (based on Bloom's Taxonomy)
Formative assessment based on Capstone Model (Max. Marks : 20)

Course Outcome	Bloom's Level	Assessment Component	Marks
C517.1, **C517**.2	Understand	Quiz	5
C517.3	Apply	Surprise Test	5
C517.4, **C517**.5	Analyse	Assignment	5
C517.6	Apply	Group Assignment	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Continuous Assessment Tests			Semester End Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term Examination (8 Marks)	
Remember	20	10	10	10
Understand	60	50	30	30
Apply	20	20	40	30
Analyse	-	20	20	30
Evaluate	-	-	-	-
Create	-	-	-	-

15CE518	SUBSURFACE CONTAMINANT REMEDIATION	3/0/0/3
Nature of Course	Theory Concept	
Pre requisites	Nil	

Course Objectives:

1	To understand the concepts, terminology, and technologies used to address contaminated soil and groundwater.
2	To learn the remediation methods, remediation planning process, and the choice of technology.
3	To propose remediation methods given the nature of pollution and given the contaminated media.

Course Outcomes:
Upon completion of the course, students shall have ability to

C518.1	To do basic calculations for the analysis of contaminant fate in soil and groundwater	[U], [AP]
C518.2	To analyse the outcome of potential remediation technologies.	[R],[U],[AP]
C518.3	To understand the issues that affect the subsurface quality	[U], [AN]
C518.4	Be aware of the purpose of developing follow-up procedures, and the options for designing these procedures	[AP]

Course Contents:

Soil Pollutant Interaction: Sources of Subsurface Contamination-Hydrogeological considerations in Saturated and Unsaturated Zone-Factors governing soil-pollutant interaction-Estimation of Source Concentration. **Site and Subsurface Characterization**: Methods of Site Characterization-Geophysical Methods-Boring and Sampling-Monitoring Wells. **Fate and Transport of Contaminants:** Contaminant release-Contaminant transport mechanisms-advection-diffusion-dispersion- governing equations-Contaminant transformation – sorption - biodegradation-ion exchange-precipitation. **Treatment and Disposal Methods:** Monitored natural attenuation - Solidification and stabilization -Bioremediation – Incineration - Soil washing -Electro kinetics -Contaminant transport through landfill barriers - Landfill stability **Ground Water Remediation:** Pump and treat - Air sparging - Soil Vapor Extraction - Permeable reactive Treatment Walls - Advanced remediation technologies.

Total Hours:	**45**

Text Books:

1	LaGrega M.D., Buckingham P.L. and Evans J.C. (2001), “Hazardous Waste Management”- McGraw Hill, New York.

Reference Books:

1	Walter Z.Tang Physicochemical Treatment of Hazardous Wastes, Lewis Publishers, 20049.
2	Paul L. Bishop, ‘Pollution Prevention: - Fundamentals and Practice’, Mc-Graw Hill International, Boston, 2000.

Web References:

1	https://www.epa.gov/remedytech/remediation-technologies-cleaning-contaminated-sites
2	http://www.mfe.govt.nz/more/funding/contaminated-sites-remediation-fund

Assessment Methods & Levels (based on Blooms’Taxonomy)

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
C518.1	Understand	Quiz	**6**
C518.2	Understand, Remember, Apply	Design Project	**6**
C518.3	Understand, Analyse	Term Project (Lab Based)	**8**

Summative assessment based on Continuous and End Semester Examination

Bloom’s Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	20	-	-	10
Understand	70	60	20	20
Apply	10	20	40	40
Analyse	-	20	40	30
Evaluate	-	-	-	-
Create	-	-	-	-

ELECTIVE STREAM III
TRANSPORTATION ENGINEERING & CONSTRUCTION MANAGEMENT

15CE519	RAILWAY, AIRPORT, DOCKS AND HARBOUR ENGINEERING	3/0/0/3

Nature of Course: Theory Concept

Pre Requisites: Nil

Course Objectives:
1. To know about the basics and design of various components of railway engineering.
2. To understand the concept of urban transportation system.
3. To learn about the aircraft characteristics, planning and components of airport.
4. To study about the types and components of docks and harbours

Course Outcomes
After the completion of this course, students will be able to
- C519.1 Describe the railways and its various components
- C519.2 Demonstrate the working of runways and taxiways & generate the final layout.
- C519.3 Prepare the layout of harbour
- C519.4 Categorize the components of docks and harbours.
- C519.5 Outline the new concepts involved in airports, docks and harbours

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

Railway planning and design- Location surveys and alignment - Permanent way – Components- - Functions and requirements - Gauges -Geometric design- simple problems. **Railway track construction and maintenance operation-**Track Junctions-Points and crossings - types and functions- design and layout -Railway stations and yards- Signalling and interlocking - control systems of train movements - Track drainage- Re-laying of Track – Urban transportation system- MRTS-Metro. Airport planning and design- Airport characteristics- Airport Planning - Site Selection - Runway Design- Orientation - Cross wind component - Wind rose diagram (Problems) - Corrections for basic runway length - Geometric standards for runway - Taxiway Design – Geometric standards for taxiway - Minimum Separation Clearance - Airport Drainage - Airport Zoning - Clearance over highways and railways. Airport layouts, visual aids, and air traffic control- Airport Layouts – Apron - Terminal Building – Hangars - Motor Vehicle Parking area and circulation Pattern - Airport buildings – Primary functions - Planning concept-Visual aids – Runway and taxiway markings, Wind direction indicators, Runway and taxiway lightings, Air traffic control –Air traffic control network. **Docks and Harbours -**Types - Layout and planning principles-site selection-Terminal facilities-Port building- Transit shed- Warehouse-Mooringaccessories-breakwaters –wharves-quays –piers-fenders-Jetties- navigation aids– dry and wet docks- dredging.

Total Hours	45

Text Books:
1. Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, DhanpatRai and Sons, Delhi, 2010.
2. Khanna S. K., Arora M. G. and Jain S. S., Airport Planning and Design, Nemchand and Brothers, Roorkee, 2006.
3. Bindra S.P., A Course in Docks and Harbour Engineering, DhanpatRai and Sons, New Delhi, 2013.

Reference Books:
1. M.M. Agarwal, Railway Engineering, Prabha& Co. 2007.
2. Oza and Oza, Elements of Dock and Harbour Engineering, Charotar Publishing House, 1996.

Web References:
1. nptel.ac.in/courses/105107123
2. https://www.youtube.com/watch?v=WUq3uN4MDms
3. Nptel.ac.in/courses/114106025

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C519 .1	Remember	Quiz	**3**
C519 .2	Understand	Assignment	**2**
C519 .3	Understand	Surprise Test	**2**
C519 .4	Understand	Group Assignment	**3**
C519 .5	Apply	Technical Presentation	**5**
C519 .6	Apply	Mini project	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	40	30	30	30
Understand	40	30	40	40
Apply	20	40	30	30
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE520	**TRAFFIC ENGINEERING AND MANAGEMENT**	**3/0/0/3**

Nature of Course: Theory Concept

Course Objectives:

1. To know about the basic elementsof traffic engineering.
2. To learn about the various traffic facilities.
3. To understand the traffic control and regulations.
4. To study traffic management systems and traffic safety.

Course Outcomes

After the completion of this course, students will be able to

C520.1 Identify the basic components and elements in traffic engineering

C520.2 Distinguish the relationship between speed, density and flow

C520.3 Explain the concepts of traffic Survey to estimate travel demand analysis

C520.4 Design the links and capacity of traffic flow at rotary in at -grade intersection

C520.5 Analyze the various urban transportation system and effective use of transportation management system

Course Contents

Elements of Traffic Engineering - road user, vehicle and road way. Vehicle characteristics - IRC standards - Design speed, volume. Highway capacity and levels of service - capacity of urban and rural roads - PCU concept - **Fundamental parameters and relations of traffic flow**- speed, density, volume, travel time, headway, spacing, time-space diagram, time mean speed, space mean speed and their relation, relation between speeds, flow, density, fundamental diagrams - **Traffic studies and Facilities**- Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, Parking studies, Accident studies. Road user facilities - Parking facilities - Cycle tracks and cycleways - Pedestrian facilities. **Traffic regulation and control** - Signs and markings - Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination - Road furniture - Street lighting. **Traffic System Management** - Design of at-grade intersections – Principles of design – Channelization - Design of rotaries - Grade separated intersections -Geometric elements for divided and access controlled highways and expressways.

Total Hours	45

Text Books:

1. Kadiyali.L.R. (2000), Traffic Engineering and Transportation Planning, Khanna Publishers.
2. S.K. Sharma (1998), Principles, Practice and design of highway Engineering, S. Chand & Co Ltd, New Delhi.
3. PratabChraborthy&Animesh Das (2004), Principles of Transportation Engineering, Tata McGraw Hill Co Ltd, New Delhi

Reference Books:

1. R. J. Salter and N. B. Hounsel, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.
2. C. JotinKhisty and B. Kent Lall, Transportation Engineering, Prentice Hall of India Private Limited, New Delhi 2008.
3. ITE Hand Book, Highway Engineering Hand Book, McGraw Hill co Ltd, New Delhi.

Web References:

1. http://nptel.ac.in/courses/105101008/
2. http://nacto.org/wp-content/uploads/2012/06/ITE-2009.pdf
3. http://hcm.trb.org/?qr=1

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C520.1	Remember	Quiz	3
C520.2	Understand	Assignment	2
C520.3	Understand	Surprise Test	2
C520.4	Understand	Assignment	3

C520.5	Understand	Technical Presentation	5
C520.6	Apply	Mini project	5

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	50	40	40	40
Understand	50	50	40	40
Apply	-	10	20	20
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE521	URBAN AND TOWN PLANNING	3/0/0/3
Nature of Course	Theory Concept	
Pre requisites	-NIL	

Course Objectives:

1	To introduce various policies, strategies on issues related to urban development.
2	To study contents of Regional plan, Master plan, DCR planning and development of Industrial estates and SEZ.
3	To understand constraints of Plan implementation –Industrial, financial and Legal constraints.
4	To know principles of sustainable transportation and to know the significance of relation between urban development and environment

Course Outcomes:
After the completion of this course, students will be able to

C521.1	To describe National policies and Strategies on Urban Development.
C521.2	To disucss contents of Master plan , Detailed development plan and DCR planning
C521.3	To outline Industrial ,financial and legal constraints of plan implementation.
C521.4	To describe different principles and methods of sustainable transportation
C521.5	To appraise its implications on Environment and resources and to know economic benefits of sustainable transportation
C521.6	To critique urban development and sustainability principles and to find a balance between these two
C521.7	To discuss Involvement of Public ,Private NGO ,CBO and beneficiaries in Urban development.

Course Contents:

Urban planning and Development-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. **Development plans, formulation & Evaluation-**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. **Plan implementation and urban Management-**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. **Sustainable urban and transport principles-**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 **Urban region and environment-**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.

Total Hours:	**45**

Text Books:

1	Goel .S.L Urban, *"Development and Management*", Deep and Deep publications, New Delhi,2002.
2	Rangwala. S.C. "Town Planning" Charotar Publishing House. Anand, 2005.

Reference Books:

1	Singh .V.B, "*Revitalized Urban Administration in I*ndia", Kalpaz publication, Delhi 2001
2	Joe Ravetz, "*City Region 2020 – Integrated Planning for a Sustainable Environment"*, 2000.
3	Sustainable Transportation and TDM – Planning the balances, "*Economic, Social and Ecological objectives"*; Victoria Transport Policy Institute, 2007.
4	Kevin Lynch, "Site planning", MIT Press, Cambridge, MA, 1984.

Web References:

1	http://nptel.ac.in/courses/105107067/

Online Resources:	
1	http://www.iitk.ac.in/3inetwork/html/reports/IIR2006/Planning_for_Urban.pdf

Assessment Methods & Levels (based on Blooms'Taxonomy)

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

Course	Bloom's Level	Assessment Component	Marks
C521.1	Remember	Quiz	**2**
C521.2	Remember	Test	**2**
C521.3	Understand	Writing Skills	**3**
C521.4	Understand	Class Presentation	**2**
C521.5	Analyse	Group Discussion	**3**
C521.6	Analyse	Group Assignment	**3**
C521.7	Understand	Test	**3**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	20	20	10	10
Understand	80	30	20	20
Apply	-	30	35	35
Analyse	-	10	25	25
Evaluate	-	10	10	10
Create	-	-	-	-

15CE522	CONSTRUCTION SAFETY MANAGEMENT	3/0/0/3

Nature of Course: Theory concept

Pre Requisites: NIL

Course Objectives:

1. To understand the concept of Construction Safety Management
2. To understand the safety practices in construction industry.
3. To understand the different safety system.
4. To study the various construction accidents and the preventive measures
5. To study the Safety Considerations In Equipment Handling:

Course Outcomes:

After the completion of this course, students will be able to

C522.1 Explain the concepts of construction safety management

C522.2 Distinguish various construction accidents, its causes and preventive measures

C522.3 Construct safety in construction contracts and different contractual obligation

C522.4 Identify different safety systems

C522.5 Analyze the concepts of risk assessment and control

C522.6 Apply the safety consideration in handling various equipments

Course Contents:

Inroduction to Construction Safety Management: Construction accidents - Construction Safety Management: Importance - causes of accident, safety measures- Environmental issues in construction-Construction industry related laws. Human factors in safety – legal and financial aspects of accidents in construction – occupational and safety hazard assessment-OSHA Act-Compliance-Roles and Responsibilities- violations-EHS-ISO standards **Saftey Induction and Practice in Site:** Safety Programmes - Construction Safety - Elements of an Effective Safety Programmes - Job-site assessment - Safety Meetings -Safety Incentives. Contractual Obligations - Safety in construction contracts- Substance Abuse - safety Record Keeping. **Safety System:** Safety Culture - Safe Workers - Safety and First Line Supervisors - Safety and Middle Managers - Top Management Practices, Company Activities and Safety - Safety Personnel - Sub-contractual Obligation - Project Coordination and Safety Procedures -Workers Compensation. **Safety Planning:** Accident prevention-cost of accidents-Safety and productivity-safety provision in the factories act-accident reporting investigation and statistics-total loss control and damage control-Safety sampling- safety audit - critical incident technique- safety equipment -planning and site preparation- safety system of storing construction materials-Excavation - blasting- timbering-scaffolding- safe use of ladders- safety in welding. **Safety Consideration in Equipment Handling:** Safety in hand tools- Safety in grinding- Hoisting apparatus and conveyors- Safety in the use of mobile cranes-Manual handling-Safety in demolition work- Trusses, girders and beams-First- aid- Fire hazards and preventing methods-Interesting experiences at the construction site against the fire accidents

Total Hours : 45

Text Books:

1. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997

Reference Books:

1. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.
2. Hand Book on Construction Safety Practices, SP:70, BIS, 2001.
3." Guidelines for the Establishment of Safety Management System at Construction Worksites,
4.Risk assessment- A Practical Guide, 1993, Institution of Occupational Safety and Health, United Kingdom
5. OSHA Standard's-1910

Web References:

1. http://nptel.ac.in/courses/120108005/

Online References:

2. https://onlinecourses.nptel.ac.in/noc17_ch05/course

Assessment Methods & Levels (based on Bloom's Taxonomy)
Formative assessment based on Capstone Model (Max. Marks : 20)

Course Outcome	Bloom's Level	Assessment Component	Marks
C522.1	Understand	Seminar	4
C522.2	Understand	Seminar	4
C522.3	Understand	Surprise Test	2
C522.4	Understand	Surprise Test	2
C522.5	Understand	Group Assignment	4
C522.6	Apply	Group Assignment	4

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Continuous Assessment Tests			Semester End Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term Examination (8 Marks)	
Remember	40	20	20	20
Understand	60	60	40	40
Apply	-	20	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE523	CONTRACT LAWS AND REGULATIONS	3/0/0/3
Nature of Course	: C Theory Concept	
Pre requisites	: Nil	

Course Objectives: Understand the basics of construction contracts and its processes

1	To understand the basic of construction contracting method on India.
2	To make the student aware about tendering methods and the method of bidding and the enable the students to make contract formation.
3	To study the various legal requirement to make contract and Arbitration procedures.
4	To aware about the labour regulations and the impact of breach of any rule and regulation.

Course Outcomes:
Upon completion of the course, students shall have ability to

C523 .1	Understand the different types of contracts in construction, arbitration and legal aspect and its provisions.
C523 .2	Identify the tendering methods, method of bidding and contract formation.
C523 .3	Understand the various legal requirements to make contract and Arbitration procedures.
C523 .4	To aware about the labour regulations and the impact of breach of any rule and regulation.

Course Contents:

Construction Contracts: Indian Contracts Act, Elements of Contracts, Types of Contracts, Features, Suitability, Design ofContract Documents, International Contract Document, Standard Contract Document.**Tenders:**Prequalification, Bidding, Accepting,Evaluation of Tender from Technical, Contractual andCommercial Points of View,Contract Formation and Interpretation, PotentialContractual Problems, World BankProcedures and Guidelines, Transparency in Tenders Act.**Arbitration:**Comparison of Actions and Laws, Agreements, Subject Matter, Violations, Appointment of Arbitrators,Conditions of Arbitration, Powers and Duties of Arbitrator, Rules of Evidence, Enforcement of Award, Costs. Conciliation-Principles-Difference between arbitration and conciliation.
Legal Requirements: Insurance and Bonding, Laws Governing Sale, Purchase and Use of Urban and Rural Land, LandRevenue Code,Tax Laws,Income Tax, Sales Tax, Excise and Custom Duties and their Influence onConstruction Costs, Legal Requirements for Planning, Property Law, Agency Law, Local GovernmentLaws for Approval, Statutory Regulations.**Labour Regulations:**Social Security, Welfare Legislation, Laws relating to Wages, Bonus and Industrial Disputes, LabourAdministration, Insurance and Safety Regulations, Workmen's Compensation Act, Indian Factory Act,Tamil Nadu Factory Act, Child Labour Act, Other Labour Laws.

Total Hours:	**45**

Text Books:

1	Gajaria G.T., Laws Relating to Building and Engineering Contracts in India,
2	Jimmie Hinze, Construction Contracts, McGraw Hill, 2001. 9
3	Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000

Reference Books:

1	Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., Fundamentals of Construction Management and Organisation, Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
2	Patil. B.S, Civil
3	Tamilnadu PWD Code, 1986

Web References:

1	http://www.nptel.ac.in/syllabus/105102013/

Online Resources:	
1	https://www.youtube.com/watch?v=9TSDLu7DzQ0

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C523 .1	Understand	Class Presentation	**5**
C523 .2	Remember	Quiz	**5**
C523 .3	Understand	Group Assignment	**5**
C523 .4	Understand	Case studies	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	20	30	20	30
Understand	80	40	60	50
Apply	-	30	20	20
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

15CE524	FORMWORK SYSTEMS	3/0/0/3

Nature of Course: D (Theory Application)

Pre Requisites: NIL

Course Objectives:

1. To know the various types of formwork
2. To get an overview of the material needed for different types of formwork
3. To acquire knowledge for designing formwork
4. To make students aware of various safety precautions in formwork

Course Outcomes

C524.1 Have a sound knowledge on various Formwork Practices [R]
C524.2 To select the different materials for formwork [U]
C524.3 Apply the advanced techniques in formwork [AP]
C524.4 To design the formwork for special structures as per considerations. [AN]

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

Introduction: Formwork-requirement-Qualities of formwork- types of formwork-formwork detail for different structural members-removal of formwork-maintenance-durability of formwork-cost. **Formwork materials:** Lumber-Plywood-Metal forms, nails and spikes-Form ties- Glass reinforced plastic-Bracing and Lacing-Timber-Steel-wood – Aluminium formwork technology- Mivan formwork- Advantages over conventional systems **Formwork for Super Structure:** Girders, bridge decks, off shore platforms, special forms for shells - Erection of articulated structures, braced domes and space decks. **Formwork Design:** Design considerations-Measurements of formwork-Column, beam, Slab and wall-Formwork for unsymmetrical structure-Quality requirement estimation-Cost analysis. **Formwork for special structures:** High rise buildings-Tunnel construction-Bridge construction-nuclear reactor-marine structure-Folded plate-Thin shells- chimney- Pier-Composite structures-Long span roof structures-Underground structures-safety.

Total Hours	45

Text Books:

1. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, DhanpatRai and Sons, 2010.
2. Kumar neerajjha “Formwork for Concrete structures”, 2013
3. Awad.s.Hanna.,"Concrete formwork systems", Marcel Dekker .Inc,1998

Reference Books:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 2011.
2. Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi, 2012.
3. PurushothamaRaj. P.,"Construction techniques equipment &practices",SixthEdition,Sri Krishna Hitech publishing company Pvt . Ltd,2016

Web References:

http://nptel.ac.in/courses/105102088/

Online Resources:

https://www.youtube.com/watch?v=EIDXE28_8eQ&list=PL8BA090E69BF01BC2

Assessment Methods & Levels (based on Blooms’ Taxonomy)

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
CE524.1	Remember	Quiz	**5**
CE524.2	Understand	Surprise Test	**5**
CE524.3	Apply	Test	**5**
CE524.4	Analyse	Group Assignment	**5**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	30	20	10	10
Understand	40	30	20	15
Apply	30	35	40	40
Analyse	-	15	30	35
Evaluate	-	-	-	-
Create	-	-	-	-

15CE525	QUANTITATIVE TECHNIQUES IN CONSTRUCTION MANAGEMENT	3/0/0/3

Nature of Course	:D (Theory application)
Pre requisites	:NIL

Course Objectives:

1	Summarize the concepts of Operations Research
2	Analyze Linear Programming problems using Graphical and Simplex Methods,
3	Transportation and Assignment Problems Explain Decision Theory , devise Decision Rules for Decision making under conditions of certainty, risk and Uncertainty and generate Decision trees

Course Outcomes:

Upon completion of the course, students shall have ability to

C525.1	Summarize the concepts of Operations Research	[UN,AP]
C525.2	Analyze Linear Programming problems using Graphical and Simplex Methods, Transportation and Assignment Problems	[AN,AP]
C525.3	Explain Decision Theory , devise Decision Rules for Decision making under conditions of certainty	[R,U]
C525.4	Explain risk and Uncertainity and generate Decision trees	[R]

Course Contents:

Operation Research : Introduction to Operations Research - Linear Programming – Graphical and Simplex Methods, **Production Management :** Equipment Replacement Theory –- Material Transportation and Work Assignment Problems, **Scheduling Techniques :** Scheduling techniques - PERT and CPM- Break-even analysis, **Decision Theory :** Deterministic Inventory Models- Decision Theory – Decision Rules- Decision making under conditions of certainty, risk and uncertainty- Decision trees **, Managerial Economics :** Pricing Techniques –Game theory Applications

Total Hours: 45

Text Books:

1	Vohra, Nd.,"" Quantitative Techniques in Management", Tata McGraw-Hill Company Ltd, 2007.
2	Hamdy A.Taha, ""Operations Research: An Introduction", Prentice Hall, 2010.
3	S.L.Tang, Irtishad U.Ahmad, Syed M.Ahmed, Ming Lu," Quantitative Technique for Decision making in Construction", Hongkong University Press, HKU, 2004.

Reference Books:

1	Frank Harrison, E., The Managerial Decision Making Process, Houghton Mifflin Co., Boston, 1999.
2	S.L.Tang, Irtishad U.Ahmad, Syed M.Ahmed, Ming Lu, Quantitative Technique for Decision making in Construction, Hongkong University Press, HKU, 2004.
3	Schroeder, R.G, Operations Management, McGraw Hill, 2009.

Assessment Methods & Levels (based on Blooms'Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C525.1	Apply, Analyse	Group Assignment	5
C525.2	Apply, Analyse	Tutorial	5
C525.3 & C352.4	Apply, Analyse	Test, Tutorial	10

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	-	-	-	-
Understand	20	-	-	20
Apply	40	50	60	40
Analyse	40	50	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

15CE526	DESIGN OF SUB-STRUCTURES	3/0/0/3
Nature of Course	: G (Theory analytical)	
Pre requisites	: NIL	

Course Objectives:

1	To gain familiarity with different types of foundation.
2	To explore the students to the design of shallow foundations and deep foundations.
3	To understand the concept of designing well and machine foundation
4	To understand the design concept of special foundations.

Course Outcomes:
Upon completion of the course, students shall have ability to

C526.1	Select appropriate foundations type based on available soil conditions.	[R,U]
C526.2	Select appropriate foundations type based on available soil conditions..	[AP]
C526.3	Determine the load carrying capacity of each type of foundation.	[A]
C526.4	Design of reinforced concrete shallow foundations, pile foundations, well foundations, and machine foundations.	[AP]

Course Contents:

Shallow foundations: Soil investigation – Basic requirements of foundation – Types and selection of foundations. Bearing capacity of soil - plate load test – Design of reinforced concrete isolated, strip, combined footing. **Pile foundations**: Introduction – Types of pile foundations –Pile Driving Equipments- piles cap -load carrying capacity - pile load test. **Well foundations:** Types of well foundation – Grip length – load carrying capacity – construction of wells – Failures and Remedies – Design of well foundation. **Machine foundations:** Introduction – Types of machine foundation – Basic principles of design of machine foundation –Dynamic properties of soil – vibration analysis of machine foundation – Design of foundation for Reciprocating machines and Impact machines –vibration isolation. **Special foundations:** Foundation on expansive soils – choice of foundation – under-reamed pile foundation. Foundation for concrete Towers, chimneys – Reinforced earth retailing walls.

Total Hours:	**45**

Text Books:

1	Swamy Saran, Analysis and Design of substructures, Oxford and IBH Publishing Co. Pvt. Ltd.,2006.
2	P.C. Varghese, “Foundation Engineering”, Prentice-Hall of India, New Delhi, 2005
3	Nainan P Kurian “Design of Foundation Systems”, Narosa Publishing House, 1992

Reference Books:

1	Bowles .J.E., “Foundation Analysis and Design”, McGraw Hill Publishing co., New York, 1986.
2	Tomlinson.M.J, “Foundation Design and Construction”, Longman, Sixth Edition, New Delhi.

Web References:

1	http://nptel.ac.in/courses/105101084/

Online Resources:

1	http://nptel.ac.in/courses/105101084/

Assessment Methods & Levels (based on Blooms’ Taxonomy)

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
C526.1	Remember, Understand	Quiz	5
C526.2	Apply	Assignment	5
C526.3	Analyze	Tutorial	10
C526.4	Apply		

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	20	-	20	20
Understand	40	-	30	30
Apply	40	50	30	30
Analyse	-	50	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

15CE527	PAVEMENT ENGINEERING	3/0/0/3

Nature of Course	:D (Theory application)

Course Objectives:

1	To understand various analysis and design procedures of pavement
2	To identify different methods of maintenance and evaluation of pavement
3	To know the different methods of rehabilitation of highway pavements.

Course Outcomes:
After the completion of this course, students will be able to

C527.1	Categorize the factors governing the design.
C527.2	Examine and Implement different methods of strengthening the pavement.
C527.3	Analyse and design flexible and rigid pavements
C527.4	Implement maintenance and evaluation procedure of the pavement

Course Contents:

Pavement types and factors affecting design: Types and component parts of pavements - factors affecting design and performance of pavements - comparison between highway and airport pavements. **Stress analysis and design of flexible pavements-** stresses and deflections in homogeneous masses – Boussinesq's Theory- Burmister theory- wheel load stresses – ESWL- methods of flexible pavement design- group index, CBR, triaxial, mcleod and IRC method. **Stress analysis and design of rigid pavements-** Westergaard's analysis– wheel load stress, warping stress, frictional stress and combination of stresses – types of joints – Design of slab and joints – IRC method. **Pavement Evaluation**- Structural evaluation of flexible and rigid pavements - Evaluation by deflection measurements- PSI- strengthening of pavements –overlays. **Stabilization-** choice of stabilizers – Geo synthetics – Types - Use of Geo synthetics in roads.

Total Hours:	**45**

Text Books:

1	S.K. Khanna& E.G. Justo (1998), Highway Engineering, Nemchand Brothers, Roorkee
2	PratabChraborthy&Animesh Das. (2004), Principles of Transportation Engineering, Tata McGraw Hill Co.
3	E.J.Yoder and M.W.Witczak, Principles of Pavement Design, John Wiley, New York

Reference Books:

1	S.K. Sharma (1998), Principles, Practice and design of highway Engineering, S. Chand & Co Ltd, New Delhi
2	Y. H. Huang, Pavement Analysis and Design, Pearson Education, Delhi
3	Guidelines for the Design of flexible Pavements, Indian Road Congress, IRC 37-2001.
4	Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, Indian Roads Congress, IRC 58-2002.

Web References:

1	http://nptel.ac.in/courses/105105107/
2	http://nptel.ac.in/courses/105101087/

Assessment Methods & Levels (based on Blooms'Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C527.1	Understand	Quiz	5
C527.2	Apply, Analyse	Tutorial	10
C527.3	Analyse, Evaluate		
C527.4	Apply	Assignment	5

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	10	20	10	10
Understand	20	20	20	20
Apply	20	20	30	30
Analyse	50	20	30	30
Evaluate	-	20	10	10
Create	-	-	-	-

OPEN ELECTIVES

15CE601	DISASTER MANAGEMENT	3/0/0/3

Nature of Course: C (Theory Concept)

Pre Requisites: NIL

Course Objectives:

1. To understand the knowledge of the disaster phenomenon, its different contextual aspects, impacts and public health consequences.
2. To learn the skills and ability to design, implement and evaluate research on disasters

Course Outcomes

Upon completion of the course, students shall have ability

C601 .1To remember the principles and components of disaster management [R]

C601 .2 To remember different disaster management schemes. [R]

C601 .3 To analyse the potential effects of disasters and methods to deliver public health response to avert these effects [U]

C601 .4Tounderstand recent trends in disaster management [U]

C601 .5To apply disaster management in Forecasting and warning of disasters [AP]

C601 .6 To apply the disaster management technique in Statistical seismology [AP]

C601 .7 To analyse the risk and vulnerability in disaster management [AN]

Course Contents

Introduction to Disaster Management: Dimensions of natural & anthropogenic disasters – Principles /components of disaster management, Organizational structure for disaster management,–Disaster management schemes– Natural disasters and mitigation efforts – Flood control – Drought management – Cyclones – Land use planning, NBC threat and safety measures – Forest fires – Oil fires – Crisis in power Sector – Accidents in coal mines**. Disaster Management:** Operations Management (OM) – Risk assessment and disaster response – Antifriction techniques – NGO management –SWOT analysis based on design &formulation strategies – Insurance & risk management, Institution awareness and safety programmes **Recent Trends in Disaster Management :**Psychological and social dimensions in disasters – Trauma and stress – Emotional intelligence –Electronic warning systems – Recent trends in disaster information provider – Geo Informatics **Applications:** Applications in disaster management – Statistical seismology– Quick reconstruction technologies – Role of media in disasters – Management of epidemics – Bio-Terrorism– Forecasting and Management of casualties. **Disaster Management in India:** Disaster preparedness– Disaster mitigation – Forecasting and warning of disasters – Assessing risk and vulnerability – Disaster management in India – Role of news media in Disaster management – Rehabilitation of victims.

Total Hours	45

Text Books:

1. Singh.R.B, Disaster Management, Rawat publications, 3rd edition 2000
2. Pardeep Sahni, Alka Dhameja, Uma Madury, PHI learning Pvt Ltd, 2013

Reference Books:

1. Sundar.I., Disaster Management , Sarup& Sons, 3rd edition 2007,New Delhi
2. Sathish Modh, Introduction to Disaster Management, Macmillan publishers, 2nd edition,2009, New Delhi

Web References:

1. nptel.ac.in/courses/105107123
2. nptel.ac.in/courses/114106025

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C601 .1	Remember	Quiz	**3**
C601 .2	Remember	Quiz	**2**
C601 .3	Understand	Surprise Test	**2**
C601 .4	Understand	Group Assignment	**3**
C601 .5	Apply	Technical Presentation	**3**
C601 .6	Apply	Mini project	**4**
C601 .7	Analyse	Group Assignment	**3**

Summative assessment based on Continuous and End Semester Examination				
Bloom's Level	**Continuous Assessment**			**End Semester Examination [60 marks]**
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	
Remember	40	30	30	30
Understand	40	30	20	20
Apply	20	40	30	30
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

15CE602	ENGINEERING RISK – BENEFIT ANALYSIS	3/0/0/3

Nature of Course	: C (Theory concept)
Pre requisites	: Nil

Course Objectives:

1	Effectively apply project management processes
2	Acquire a foundation of Agile, Constraints, project risk management
3	Interact with Customers and Stakeholders
4	Understand Total Quality Management and Risk

Course Outcomes:
Upon completion of the course,

C602.1	Graduates can Identify information sources and risks for engineering projects	[U]
C602.2	Graduate understands the theory and concepts of aspect of Cost Benefit Analysis.	[U]
C602.3	Graduate will be able to perform Cost Benefit Analysis if required.	[A]
C602.4	Graduates will be able to sense and analyse the various possible uncertainties that may occur.	[A]
C602.5	Graduates will be able to analyse decision making problems decision analysis approaches.	[A]
C602.6	Graduates will be able to perform evaluation of present values.	[E]

Course Contents:

Risk Analysis: Certainty - Risk and Uncertainty-forms of risk and risk identification; project risk analysis – cost risk analysis and schedule risk analysis; the sociological implications of acceptable risk; approaches to risk management, monitoring for compliance, risk perception and design implications – case studies. **Decision Analysis:** the multi stage decision model – the value of perfect information – the axioms of rational behaviour – introduction to utility – risk aversion – multi attribute utility theory – decision analysis and risk management **Introduction to Cost Benefit Analysis:** Cost benefit analysis – explanation – objectives; types of evaluation; programme evaluation and CBA; CBA in practise – need for undertaking CBA – when to use CBA **Cost benefit analysis process:** Determining scope and objective – assessing constrains – considering alternatives – identification, quantification and valuation – evaluation of net present value – sensitivity analysis – equity and distributional implications – results – recommendation and report generation; case study.

Total Hours:	**45**

Reference Books

1	Vose, David Risk Analysis: A Quantitative Guide 3rd Edition, John Wiley & Sons Ltd 2008
2	M. Modarres, M. Kaminskiy, V. Krivtsov *Reliability Engineering and Risk Analysis: A Practical Guide*, 2nd Edition, CRC Press, Taylor & Francis Group 2010

Web References:

1	https://ocw.mit.edu/courses/engineering-systems-division/esd-72-engineering-risk-benefit-analysis-spring-2007/index.htm
2	https://www.finance.gov.au/sites/default/files/Intro_to_CB_analysis.pdf

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks

C602.1	Understand	Quiz	3
C602.2	Understand	Quiz	3
C602.3	Analyse	Assignment	3
C602.4	Analyse	Assignment	3
C602.5	Analyse	Assignment	4
C602.6	Evaluate	Assignment	4

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	-	-	-	-
Understand	50	40	40	40
Apply	-	-	-	-
Analyse	50	40	40	40
Evaluate	-	20	20	20
Create	-	-	-	-

17CE503	**GEOGRAPHICAL INFORMATION SYSTEMS**	**3/0/0/3**

Nature of Course: D (Theory Application)

Pre Requisites:

Course Objectives:

1. To possess knowledge about GIS techniques and its application in the field of Civil Engineering.
2. To possess knowledge on GIS application

Course Outcomes:

Upon completion of the course, students shall have ability to

C503.1 Understand the concepts of GIS [U]
C503.2 Understand the spatial analysis involved in GIS [U]
C503.3 Analyse the networks [AN]
C503.4 Understand the advanced applications of GIS [U]
C503.5 Applying various concepts of GIS [AP]

Course Contents:

Gis Technique and Data Input: MAP – Types of Maps – Development of GIS – Components of GIS – Hardware, software, organisation – Types of data – Spatial and non-spatial data – Print, Line and Polygon – Vector and Raster data – Database structures – Files – Vector and Raster data structures. **Data analysis and Modelling:** Data Retrieval – Query – Simple Analysis – Spatial Analysis – Overlay – Vector Data Analysis – Raster Data Analysis – Modelling using GIS – Digital Elevation Model – Cost and path analysis – Expert Systems – Artificial Intelligence – Integration with GIS. **Data output and error analysis**: Data Output – Types – Devices used – Raster and Vector Display Devices – Printers – Plotters – Photo write Devices – Sources of Errors – Types of Errors – Elimination – Accuracies. **GIS applications in resource management:** Fields of Applications – Natural Resources – Agriculture – Soil – Water Resources – Wasteland Management - Social Resources - Cadastral Records – LIS. **Advanced GIS Applications:** AM/FM – Utility Network Management – Integration with Remote Sensing – Knowledge based techniques – Multi-criteria Techniques – Introduction to Object Oriented Data base Models.

Total Hours : 45

Text Books:

1. Burrough P A, Principles of GIS for Land Resources Assessment, Oxford Publication, 2000.
2. Michael N Demers, Fundamentals of Geographical Information Systems, Third Edition, John Wiley Publications, 2008.
3. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001.

Reference Books:

1. Paul A Longley, Michael F Good child ,Geographical Information Systems Volume I and II, Second Edition, John Wiley Publications, 2010.

Web References:

1. www.esri.com – online lessons, tutorials, assignments
2. www.nptel.ac.in – civil engineering - GIS

Online References:

1. https://onlinecourses.nptel.ac.in/noc17_ch05/course

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C503.1	Understand	Quiz	5
C503.2	Understand	Surprise Test	5
C503.4	Apply	Assignment	5
C503.5	Analyse	Group Assignment	5

Summative assessment based on Continuous and End Semester Examination

Bloom's Category	Continuous Assessment Tests			Semester End Examination (60 Marks)
	CIA1 (6 Marks)	CIA2 (6 Marks)	Term Examination (8 Marks)	
Remember	20	10	10	10
Understand	60	50	30	30
Apply	20	20	40	30
Analyse	-	20	20	30
Evaluate	-	-	-	-
Create	-	-	-	-

MANDATORY COURSES

15EN801	BUSINESS ENGLISH- I	2/0/0/1
Pre requisites	: Nil	

Course Contents:

S.NO	TOPICS	Hours
1.	Introduction to BEC Preliminary	1
2.	Vocabulary Practice	2
3.	Reading short text- Reading Part 1	1
4.	Business related situation- Reading Part 2	2
5.	Graphs and Charts - Reading Part 3	1
6.	Making Predictions- Reading Part 4	2
7.	Read for specific information – Reading Part 5	2
8.	Gap filling (collocation and linking words)- Reading Part 6	1
9.	Streamline the appropriate information -Reading part 7	1
10.	Correspondence (memo, e-mail, notes)- Writing part 1	2
11.	Internal communication (Email, formal letter) Writing part 2	2
12	Interview - talking about preferences Speaking Part 1	2
13.	Mini Presentation- Speaking Part 2	2
14	Discourse Management Speaking Part 3	2
15.	Conversation , Monologue - Listening Part 1	1
16.	Telephone conversation Listening part 2	2
17.	Listening for specific information -listening part 3	2
18.	Listening for gist , understanding opinion- Listening Part 4	2
	Total Hours:	**30**

15EN802	BUSINESS ENGLISH-II	2/0/0/1

Pre requisites	: 15EN801 Business English- I

Course Contents:

S.NO	TOPICS	Hours
1.	Introduction to Vantage	1
2.	Functions	2
3.	Underlining key words and identifying statements- Reading Part 1	2
4.	Identifying the linkers and gap filling- Reading Part 2	2
5.	Identifying the writers purpose- Reading Part 3	2
6.	Looking for the different meanings in the context- Reading Part 4	2
7.	Identifying the Correct Errors- Reading Part 5	2
8.	Writing References	2
9.	Levels of Formality- Writing part 1	1
10.	Business Correspondence- Writing part 2	2
11.	Answering General Questions- Speaking part 1	2
12	Giving a Presentation- Speaking part 2	2
13.	Telephonic Conversation- Listening Part 1	2
14	Recognize Functions- Listening part 2	2
15.	Multiple Choice Questions- Listening Part 3	2
16.	Taking turns to Speak- Speaking Part 3	2
	Total Hours:	**30**

15CE801	HUMAN VALUES AND PROFESSIONAL ETHICS	2/0/0/1

Nature of Course	: C (Theory concept)
Pre requisites	: Nil

Course Objectives:

1	To create an awareness on professional ethics amongst the engineering students. To instill Moral values, Social Values and Loyalty amongst the students.
2	To impart knowledge about human relations
3	To impart the habit of respecting the rights of others.

Course Outcomes:
After the completion of this course, students will be able to

C801.1	Understand the basic Human values and ethics
C801.2	Understands the significance and relevance of values in management.
C801.3	Understand his roles, rights and responsibilities as an engineer
C801.4	Understand the importance of patens and copyrights
C801.5	Understand s the aspects of safety and risk.
C801.6	Understand the importance and need for proper human relations in the workforce management.
C801.7	Understand the importance and process of wistle blowing
C801.8	Understand the different themes in human relations.

Course Contents:

Human Values: Meaning and significance of values - Formation of values and human values - Relevance of values in management - Personal values and organizational commitment - Need for values in global change - Personal Values Influence Ethical Choices - Learn to distinguish right and wrong - Positive steps toward preventing corporate crime - Develop support for whistle blowing. **Engineering Ethics:** Ethics – various disciplines – Engineering ethics - Senses of Engineering Ethics - variety of moral issues - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory –ethical theories and their uses. **Engineering As Social Experimentation:** Engineering as experimentation - engineers as responsible experimenters - codes of ethics - Safety and risk- Assessment - Collegiality and loyalty - respect for authority - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights. Case studies - challenger case study - The three mile island - Chernobyl case studies. **Human relations and Forces influencing behaviour at work:** The Nature, Purpose of Human Relations - Importance of Human Relations - Human relations defined – Forces influencing Behaviour at work – Captain Singh case study. **Major themes in Human Relations:** Communication Process -Functions - filters and barriers – self-awareness – self acceptance - motivation – process – trust - self disclosure - Conflict management and resolution.

Total Hours:	**30**

Text Books:

1	R. Nandagopal and AjithSankar R. N., Indian Ethos and Values in Management, Tata McGraw-Hill Publications, 2010.
2	Barry L. Reece and Rhonda Brandt, Effective Human Relations 9th Edition, Cengage Publications, 2010
3	V.Jayakumar, Professional Ethics and Human Values, Lakshmi Publications, 8th edition, 2008.

Reference Books:

1	Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)
2	A.N Tripathi, Human Values, 2nd Edition New Age International Publication 2010.
3	Human Values Dr. Rajan Misra, Laxmi Publications, 2009.
Web References:	
1	http://nptel.ac.in/courses/109104068/30
Online Resources:	
1	http://nptel.ac.in/courses/109104068/30

Assessment Methods & Levels (based on Blooms' Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C801.1	Remember	Surprise Test	4
C801.2	Remember	Surprise Test	4
C801.3	Understand	Quiz	2
C801.4	Understand	Quiz	2
C801.5	Understand	Quiz	2
C801.6	Understand	Quiz	2
C801.7	Understand	Quiz	2
C801.8	Apply	Group assignment	2

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination [60 marks]
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	
Remember	30	30	30	30
Understand	60	60	50	50
Apply	10	10	20	20
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-