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

B.E - CIVIL ENGINEERING
CURRICULUM AND SYLLABI
REGULATION 2017

SRI KRISHNA COLLEGE OF ENGNEERING AND TECHNOLOGY

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VISION AND MISSION OF THE DEPARTMENT

VISION

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

MISSION

To offer world class graduate education for entry level positions in Civil Engineering profession through high quality technical education, research, imparting social ethics and leadership qualities..

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):-

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

i. Graduates will emerge as competitive professionals in collaboration with renowned builders and set a benchmark in the field of construction.

ii. Graduates will adapt to the latest technological development and continue to be a competitive Civil Engineer / Entrepreneur.

iii. Graduates will apply logical reasoning and analytical thinking to analyse, interpret, solve multifaceted problems in the field of Civil Engineering and identify advanced tools to satisfy the demands of society.

PROGRAMME OUTCOMES (POs):-

Students in the Civil Engineering Programme should possess the following at the time of their graduation

a. An ability to apply the knowledge of mathematics and science to anticipate the challenges in the field of Civil Engineering.

b. An ability to analyse structural elements as per the codal provisions with practical knowledge to interpret and validate with their outcome.

c. An ability to be competent in planning, designing and executing different types of civil engineering projects

d. An ability to incorporate in-depth knowledge of structural systems in professional practices to fulfil the requirements within realistic constraints.

e. An ability to use the modern Civil Engineering software packages and tools.

f. An ability to identify a new paradigm for analysis, design of disaster resistant infrastructure and to function in multi-disciplinary teams to emerge as a productive Civil Engineer.

g. An ability to understand the effect of civil engineering solutions on environment and to demonstrate the need for sustainable development

h. An ability to balance professional and ethical responsibilities including Contemporary issues

i. An ability to manage the conducive working environment qualities through effective leadership and teamwork skills that allow professionals to become visionary and inspirational leaders.

j. An ability to generate techno economic viability reports and communicate the same through written, oral and graphical methods.

k. An ability to understand the principles of project management and to communicate with construction stakeholders for the effective management of projects.

l. An ability to adopt latest technological development with innovation through life-long learning process.

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY
B.E. CIVIL ENGINEERING
I – VIII SEMESTER CURRICULUM AND SYLLABI
REGULATION 2017

SEMESTER I								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs./wk**	**C**	**O**	**Ext./Int.**	**Cat.**
THEORY								
1.	17EN001	Technical Communication Skills- I	3/0/2	5	4	-	40/60	HS
2.	17MA101	Linear Algebra and Differential Calculus	3/2/0	5	4	-	60/40	BS
3.	17CE201	Construction Materials	3/0/0	3	3	2	60/40	ES
4.	17ME201	Engineering Mechanics	4/0/0	4	4	-	60/40	ES
THEORY CUM PRACTICAL								
5.	17CS211	Problem Solving Using C Programming	3/0/2	5	4	-	40/60	ES
6.	17CH103	Engineering Chemistry	3/0/2	5	4	-	40/60	BS
PRACTICAL								
7.	17ME205	Engineering Graphics	0/0/3	3	2	-	40/60	ES
MANDATORY COURSE								
8.	17CE701	Mandatory Course I	2/0/0	2	1	-	0/100	MC
		Total	**21/2/9**	**32**	**26**	**2**	**800**	

SEMESTER II								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs./wk**	**C**	**O**	**Ext./Int.**	**Cat.**
	THEORY							
1.	17EN002	Technical Communication Skills-II	3/0/2	5	4	-	40/60	HS
2.	17MA104	Integral Calculus and Laplace Transform	3/2/0	5	4	-	60/40	BS
3.	17CE301	Construction Techniques and Practices	3/0/0	3	3	2	60/40	PC
4.	17CE302	Architecture and Planning	3/0/0	3	3	2	60/40	PC
THEORY CUM PRACTICAL								
5.	17CS212	Linux and Programming in C++	3/0/2	5	4	-	40/60	ES
6.	17PH102	Engineering Physics	3/0/2	5	4	-	40/60	BS
PRACTICAL								
7.	17ME204	Engineering Practices Laboratory	0/0/3	3	2	-	40/60	ES
MANDATORY COURSE								
8.	17CH701	Mandatory Course II	2/0/0	2	1	-	0/100	MC
		Total	**20/2/9**	**31**	**25**	**4**	**800**	

SEMESTER III								
SL. No.	**Course Code**	**Course**	**L/T/P**	**hrs./wk**	**C**	**O**	**Ext./Int.**	**Cat.**
	THEORY							
1.	17MA105	Fourier Analysis and Partial Differential Equations	3/2/0	5	4	-	60/40	BS
2.	17CE202	Solid Mechanics	3/1/0	4	3	-	60/40	ES
3.	17CE203	Fluid Mechanics	3/1/0	4	3	2	60/40	ES
4.	17CE303	Engineering Survey – I	3/0/0	3	3	2	60/40	PC
THEORY CUM PRACTICAL								
5.	17CE304	Concrete Technology	3/0/3	6	4	-	40/60	PC
PRACTICAL								
6.	17CE305	Strength of Materials Laboratory	0/0/3	3	2	-	40/60	PC
7.	17CE306	CABD Laboratory	1/0/3	4	2	-	40/60	PC
MANDATORY COURSE								
8.	17CE702	Mandatory Course III	2/0/0	2	1	-	0/100	MC
		Total	**18/4/9**	**31**	**22**	**4**	**800**	

SEMESTER IV								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Hrs./wk.**	**C**	**O**	**Ext./Int.**	**Cat.**
	THEORY							
1.	17MA108	Statistical Inference and Computational Methods	3/2/0	5	4	-	60/40	BS
2.	17CE307	Theory of Structures	3/1/0	4	3	-	60/40	PC
3.	17CE308	Engineering Survey – II	3/0/0	3	3	2	60/40	PC
4.	17CE309	Soil Mechanics	3/1/0	4	3	2	60/40	PC
THEORY CUM PRACTICAL								
5.	17CE310	Hydraulics and Hydraulic Machinery	3/0/3	6	4	-	40/60	PC
PRACTICAL / PROJECT WORK								
6.	17CE311	Soil Mechanics Laboratory	0/0/3	3	2	-	40/60	PC
7.	17CE312	Engineering Survey Laboratory	0/0/3	3	2	-	40/60	PC
8.	17CE601	Mini Project – I	0/0/0	-	1	-	0/100	PW
MANDATORY COURSE								
9.	17CE703	Mandatory Course IV	2/0/0	2	1	-	0/100	MC
		Total	**17/4/9**	**30**	**23**	**4**	**900**	

SEMESTER V								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Hrs./wk**	**C**	**O**	**Ext./Int.**	**Cat.**
	THEORY							
1.	17CE313	Structural Analysis - Classical Methods	3/1/0	4	4	-	60/40	PC
2.	17CE314	Construction Management	3/0/0	3	3	-	60/40	PC
3.	17CE315	Environmental Engineering	3/0/0	3	3	2	60/40	PC
4	17CE317	Design of Steel Structures	4/0/0	4	4	2	60/40	PC
5	17CE317	Foundation Engineering	3/1/0	4	3	-	60/40	PC
	THEORY CUM PRACTICAL							
6.	17CE318	Highway Engineering	3/0/3	6	4	-	40/60	PC
	PRACTICAL / Employability Enhancement Skills							
7.	17CE319	Environmental Engineering Laboratory	0/0/3	3	2	-	40/60	PC
8.	17CE801	Internship / In-plant Training	0/0/0	-	1	-	0/100	EES
		Total	**19/2/6**	**27**	**24**	**4**	**800**	

SEMESTER VI								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Hrs./wk**	**C**	**O**	**Ext./Int.**	**Cat.**
	THEORY							
1.	17CE320	Structural Analysis - Modern Methods	3/1/0	4	4	-	60/40	PC
2.	17CE321	Design of R C Elements	4/0/0	4	4	2	60/40	PC
3.	17CE4XX	Professional Elective – I	3/0/0	3	3	2	60/40	PE
4.	17CE4XX	Professional Elective – II	3/0/0	3	3	-	60/40	PE
5.	17YY5XX	Open Elective	3/0/0	3	3	-	60/40	OE
THEORY CUM PRACTICAL								
6.	17CE322	Estimation and Quantity Surveying	3/0/3	6	4	-	40/60	PC
PRACTICAL								
7.	17CE323	Structural Analysis, Design and Detailing Laboratory	1/0/3	4	2	-	40/60	PC
PROJECT WORK / Employability Enhancement Skills								
8.	17CE602	Mini Project – II	0/0/0	-	1	-	0/100	PW
9.	17CE802	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**	**C**	**O**	**Ext./Int.**	**Cat.**
	THEORY							
1.	17CE324	Building Services	3/1/0	4	3	2	60/40	PC
2.	17CE4XX	Professional Elective – III	3/0/0	3	3	2	60/40	PE
3.	17CE4XX	Professional Elective – IV	3/0/0	3	3	-	60/40	PE
4.	17CE4XX	Professional Elective – V	3/0/0	3	3	-	60/40	PE
5.	17CE4XX	Professional Elective – VI	3/0/0	3	3	-	60/40	PE
	THEORY CUM PRACTICAL							
6.	17CE325	Design and detailing of R C Structures	3/0/3	6	4	-	40/60	PC
	PROJECT WORK / OPEN ELECTIVE							
7.	17CE603	Design Comprehension Project	0/0/8	8	4	-	40/60	PW
		Total	**18/1/11**	**30**	**23**	**4**	**700**	

SEMESTER VIII								
SL. No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs./wk.**	**C**	**O**	**Ext./Int.**	**Cat.**
PROJECT WORK								
1.	17CE604	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)	4	4	-	-	-	-	-	-	**8**	4.55
2.	Basic Sciences (BS)	8	8	4	4	-	-	-	-	**24**	13.64
3.	Engineering Sciences (ES)	13	6	6	-	-	-	-	-	**25**	14.20
4.	Professional Core (PC)	-	6	11	17	23	14	7	-	**78**	44.32
5.	Professional Electives (PE)	-	-	-	-	-	6	12	-	**18**	10.23
6.	Open Electives (OE)	-	-	-	-	-	3	-	-	**3**	1.70
7.	Project Work (PW)	-	-	-	1	-	1	4	12	**18**	10.23
8.	Employability Enhancement Skills (EES)	-	-	-	-	1	1	-	-	**2**	1.13
	Sub Total	**25**	**24**	**21**	**22**	**24**	**25**	**23**	**12**	**176**	**100**
9.	Mandatory Course (MC)	1	1	1	1	-	-	-	-	**4**	
	Total	**26**	**25**	**22**	**23**	**24**	**25**	**23**	**12**	**180**	

HUMANITIES SCIENCES (8 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	17EN001	Technical Communication Skills -I	3/0/2	5	4	HS
2.	17EN002	Technical Communication Skills -II	3/0/2	5	4	HS

BASIC SCIENCES (24 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	17MA101	Linear Algebra and Differential Calculus	3/2/0	5	4	BS
2.	17MA104	Integral Calculus and Laplace Transform	3/2/0	5	4	BS
3.	17MA105	Fourier Analysis and Partial Differential Equations	3/2/0	5	4	BS
4.	17MA108	Statistical Inference and Computational Methods	3/2/0	5	4	BS
5.	17CH103	Engineering Chemistry	3/0/2	5	4	BS
6.	17PH102	Engineering Physics	3/0/2	5	4	BS

ENGINEERING SCIENCES (26 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	17CE201	Construction Materials	3/0/0	3	3	ES
2.	17ME201	Engineering Mechanics	4/0/0	4	4	ES
3.	17CS211	Problem Solving using C Programming	3/0/2	5	4	ES
4.	17ME205	Engineering Graphics Laboratory	0/0/3	3	2	ES
5.	17CS212	Linux and Programming in C++	3/0/2	5	4	ES
6.	17ME204	Engineering Practices Lab.	0/0/3	3	2	ES
7.	17CE202	Solid Mechanics	3/1/0	4	4	ES
8.	17CE203	Fluid Mechanics	3/1/0	4	3	ES

PROFESSIONAL CORE (78 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	17CE301	Construction Techniques and Practices	3/0/0	3	3	PC
2.	17CE302	Architecture and Planning	3/0/0	3	3	PC
3.	17CE303	Engineering Surveying – I	3/0/0	3	3	PC
4.	17CE304	Concrete Technology	3/0/3	6	4	PC
5.	17CE305	Strength of Materials Laboratory	0/0/3	3	2	PC
6.	17CE306	CABD Laboratory	1/0/3	4	2	PC
7.	17CE307	Theory of Structures	3/1/0	4	3	PC
8.	17CE308	Engineering Surveying – II	3/0/0	3	3	PC
9.	17CE309	Soil Mechanics	3/1/0	4	3	PC
10.	17CE310	Hydraulics and Hydraulic Machinery	3/0/3	6	4	PC

11.	17CE311	Soil Mechanics Laboratory	0/0/3	3	2	PC
12.	17CE312	Engineering Survey Laboratory	0/0/3	3	2	PC
13.	17CE313	Structural Analysis: Classical Methods	3/1/0	4	4	PC
14.	17CE314	Construction Management	3/0/0	3	3	PC
15.	17CE315	Environmental Engineering	3/0/0	3	3	PC
17.	17CE317	Design of Steel Structures	4/0/0	4	4	PC
17.	17CE317	Foundation Engineering	3/1/0	4	3	PC
18.	17CE318	Highway Engineering	3/0/3	6	4	PC
19.	17CE319	Environmental Engineering Laboratory	0/0/3	3	2	PC
20.	17CE320	Structural Analysis: Modern Methods	3/1/0	4	4	PC
21.	17CE321	Design of R C Elements	4/0/0	4	4	PC
22.	17CE322	Estimation and Quantity Surveying	3/0/3	6	4	PC
23.	17CE323	Structural Analysis, Design and Detailing Laboratory	1/0/3	4	2	PC
24.	17CE324	Building Services	3/1/0	4	3	PC
25.	17CE325	Design and detailing of R C Structures	3/0/3	6	4	PC

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.	17CE401	Maintenance and Rehabilitation of Structures	3/0/0	3	3	PE
2.	17CE402	Green Building Technology	3/0/0	3	3	PE
3.	17CE403	Prefabricated Structures	3/0/0	3	3	PE
4.	17CE404	Earthquake Resistant Structures	3/0/0	3	3	PE
5.	17CE405	Prestressed Concrete Structures	3/0/0	3	3	PE
6.	17CE406	Pre Engineered and Industrial Structures	3/0/0	3	3	PE
7.	17CE407	Finite Element Techniques	3/0/0	3	3	PE
8.	17CE408	Tall buildings	3/0/0	3	3	PE
9.	17CE409	Ground Improvement Techniques	3/0/0	3	3	PE
	Elective Stream II : Environmental Engineering					
1.	17CE410	Environmental Impact Assessment and Risk Management	3/0/0	3	3	PE
2.	17CE411	Renewable Sources of energy	3/0/0	3	3	PE
3.	17CE412	Industrial Waste Water Management	3/0/0	3	3	PE
4.	17CE413	Solid and Hazardous Waste Management	3/0/0	3	3	PE
5.	17CE414	Irrigation Water Management	3/0/0	3	3	PE
6.	17CE415	Applied Hydrology	3/0/0	3	3	PE
7.	17CE417	Air and water quality modelling	3/0/0	3	3	PE
8.	17CE417	Remote Sensing and GIS applications	3/0/0	3	3	PE
9.	17CE418	Subsurface contaminant remediation	3/0/0	3	3	PE

	Elective Stream III : Transportation and Construction Engineering					
1.	17CE419	Railway , Airport, Docks and Harbour Engineering	3/0/0	3	3	PE
2.	17CE420	Traffic Engineering and Management	3/0/0	3	3	PE
3.	17CE421	Urban and Town Planning	3/0/0	3	3	PE
4.	17CE422	Construction Safety Management	3/0/0	3	3	PE
5.	17CE423	Contract Laws and Regulations	3/0/0	3	3	PE
6.	17CE424	Formwork Systems	3/0/0	3	3	PE
7.	17CE425	Quantitative Techniques in Construction Management	3/0/0	3	3	PE
8.	17CE426	Design of Substructures	3/0/0	3	3	PE
9.	17CE427	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.	17CE501	Disaster Management	3/0/0	3	3	OE
2.	17CE502	Engineering Risk Benefit Analysis	3/0/0	3	3	OE
3.	17CE503	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.	17CE601	Mini Project – I	0/0/0	-	1	PW
2.	17CE602	Mini Project – II	0/0/0	-	1	PW
3.	17CE603	Design Comprehension Project	0/0/8	8	4	PW
4.	17CE604	Project Work	0/0/24	24	12	PW

MANDATORY COURSES (4 Credits)

SL. No.	Course Code	Course Title	C	Cat.
1.	17CE701	Spoken Hindi / Foreign Language	1	MC
2.	17CH701	Environmental Science	1	MC
3.	17CE702	Life Skills	1	MC
4.	17CE703	Human Values and Professional Ethics	1	MC

EMPLOYABILITY ENHANCEMENT SKILLS (2 Credits)

SL. No.	Course Code	Course Title	Duration	C	Cat.
1.	17CE801	Internship / In-plant Training	2 weeks	1	EES
2.	17CE802	Internship / In-plant Training	2 weeks	1	EES

ONE CREDIT COURSES (Additional Credits)

SL. No.	Course Code	Course Title	Credits
1.	17CE901	Auto CADD Certification Course	1
2.	17CE902	Building Functional Layout Planning	1
3.	17CE903	Building Bye Laws and Approval	1
4.	17CE904	ETABS Certification Course	1
5.	17CE905	Global Initiative of Academic Networks (GIAN)	1
6.	17CE906	M S Project Certification Course	1
7.	17CE907	MOOC /NPTEL Online Certification /IITB Spoken Tutorial Courses	1
8.	17CE908	Non Destructive Testing of Structures	1
9.	17CE909	Primavera Certification Course	1
10.	17CE910	Professional Delivery Systems in Construction Industry	1
11.	17CE911	Rivet Architecture Certification Course	1
12.	17CE912	Safety Engineering in Building Construction	1
13.	17CE913	STADD. Pro Certification Course	1
14.	17CE914	Surveying by Total Station and GPS	1
15.	17CE915	Valuation of Immovable Properties	1

SEMESTER WISE CREDIT DISTRIBUTION:-

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	**26**	**25**	**22**	**23**	**24**	**25**	**23**	**12**	**180**

Total Credits: 180

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
OE: Open Elective
PW: Project Work
EES: Employability Enhancement Skills
MC: Mandatory Course

CATEGORY / SEMESTER WISE: COURSES / CREDIT DISTRIBUTION:-

SL. No.	Category	Sem.	No. of Courses	Total Courses	Credits	Total Credits	%	AICTE Range of Credits (%)
1.	Humanities Sciences (HS)	I	1	2	4	8	4.55	5 - 10
		II	1		4			
2.	Basic Sciences (BS)	I	2	6	8	24	13.64	15 - 20
		II	2		8			
		III	1		4			
		IV	1		4			
3.	Engineering Sciences (ES)	I	4	8	13	26	14.2	15 - 20
		II	2		6			
		III	2		7			
4.	Professional Core (PC)	I	-	25	-	78	44.32	30 - 40
		II	2		6			
		III	4		11			
		IV	6		17			
		V	7		23			
		VI	4		14			
		VII	2		7			
		VIII	-		-			
5.	Professional Electives (PE)	VI	3	6	6	18	10.23	10 -15
		VII	3		12			
6.	Open Electives (OE)	VI	1	1	3	3	1.70	5 - 10
7.	Project Work (PW)	IV	1	4	1	18	10.23	10 - 15
		VI	1		1			
		VII	1		4			
		VIII	1		12			
8.	Employability Enhancement Skills (EES)	V	1	2	1	2	1.13	-
		VI	1		1			
9.	Mandatory Course (MC)	I	1	4	1	4	100	100
		II	1		1		4 Units	8 units
		III	1		1			
		IV	1		1			
		Total	58	58	180	180		

SEMESTER I

17EN001	TECHNICAL COMMUNICATION SKILLS I (COMMON TO ALL BRANCHES)	3/0/2/4

Nature of Course	Theory
Pre requisites	Basics of English Language

Course Objectives:

1	To equip the students with the LSRW skills.
2	To develop communication skills and soft skills.
3	To facilitate the students to use the Language in practical mode.
4	To prepare the students for all competitive program like BEC/ IELTS/ TOEFL.

Course Outcomes:

Upon completion of the course, students shall have ability to

C001.1	Remember language skills for business related situations.	[R]
C001.2	Understand and intensely focus on improving and increasing LSRW skills	[U]
C001.3	Apply a good command over basic writing and reading skills.	[AP]
C001.4	Analyze and use vocabulary in corporate work environment.	[U]

Course Contents:

INTRODUCTION Basics of English language- History of English language- Etymology of scientific terms - Importance of LSRW skills – Getting to know people- How to talk about personality types- Self introduction-Introducing others.

LISTENING Importance of listening skills -Listening to short conversations or monologues- Seeking and supplying information -Listening for specific information- Active listening- Telephonic Conversation and Etiquette -Talking and conveying messages (over the phone)- Listening to speeches / talks- Giving directions / instruction.

SPEAKING Importance of Speaking skills-Grammar and Vocabulary- Pronunciation - Business topics- Talk about preferences-Agree and disagree- Giving opinions- Listening and responding- Sense of persuasion- Situational approaches- Reasons and Consequences -Making Predictions- Short presentation -Interactive communication-Discourse markers and management.

READING Importance of reading skills - Reading short texts such as notices, advertisements, memos, emails- Skimming and scanning -Identifying relationship between characters, facts and ideas-Comparing facts and figures-Reading and understanding specific meaning in a text - Cloze reading- Identifying relevant information- Identifying reasons and consequences through reading practices -Vocabulary practice.

WRITING Importance of writing skills- Brevity of communication -Notes- Memo- Email - Formal and informal – Letter writing- Job application Letter - Resume Writing - Itinerary- Paragraph Writing - Essay Writing- Check list- -Requests and Obligation- Letter Phrases –Instructions- Recommendations- Jumbled sentences.

PARTS OF SPEECH Present simple- Simple past- Connectors of addition and contrast- Present Continuous- Gerunds and Infinitives- Vocabulary development through prefixes-suffixes and word roots- Synonyms-Antonyms **-**Auxiliary Verbs - Countable and Uncountable Nouns -

Present perfect -Future possibility/ Probability - Question formation-Sequencing words- Prepositions- If- Conditionals.		
Lab Component		
1	Listening Comprehension	[E]
2	Writing Emails and Letters	[E]
3	Mini Presentation	[E]
4	Telephonic Conversation	[E]
5	Reading Comprehension	[E]
	Total Hours:	**60**

Text Books:	
1	Whitby, Norman. Cambridge University Press- Students Book. 2013
2	Rizvi Ashraf M , "Effective Technical Communication", McGraw Hill Education (India) Private Limited , 2016
3	Sumanth S, English for Engineers, Vijay Nicole Imprints Private Limited 2015.
Reference Books:	
1	Wood, Ian,Paul Sanderson, Anne Williams with Marjorie Rosenberg, Pass Cambridge BEC Preliminary, Cengage learning. Second Edition. 2014.
2	Sharma R.C ,Mohan Krishna, Business Correspondence and Report Writing, McGraw Hill Education (India) Private Limited, 2016.
3	Lewis, Norman, Word Power Made Easy, Pocket Books, New York,1979.
Web References:	
1	http://www.cambridgeindia.org
2	http://www.cambridgeenglish.org/exams/business-certificates/business
3	*https://**steptest**.in*
Online Resources:	
1	https://www.coursera.org/specializations/business-english
2	http://www.academiccourses.com/Courses/English/Business-English

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

Summative assessment based on Continuous and End Semester Examination

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

17MA101	LINEAR ALGEBRA AND DIFFERENTIAL CALCULUS (COMMON TO ALL BRANCHES)	3/2/0/4

Nature of Course	Analytical
Pre requisites	Basics of differentiation

Course Objectives:

1	To develop the skill to use matrix algebra techniques that are needed by engineers for practical applications.
2	To familiarize with functions of several variables applicable in many branches of engineering
3	To find the solution of ordinary differential equations as most of the engineering problems are characterized in this form.
4	To acquire sound knowledge of techniques in solving ordinary differential equations using numerical methods

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

C101.1	Recall the concepts of matrices, ordinary and partial derivatives	[R]
C101.2	Express a square matrix in the diagonal form	[U]
C101.3	Evaluate the extreme values of the given function	[AP]
C101.4	Apply the knowledge of differential equation to solve the engineering problems	[AP]
C101.5	Apply numerical method techniques to find the solution of ordinary differential equations	[AP]

Course Contents:

Matrices-Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties and Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a real symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation-**Functions of several variables**- Total derivatives – Differentiation of implicit functions – Jacobians – Taylorseries expansion – Maxima and Minima – Method of Lagrangian multipliers-**Ordinary differential equations**-Second andHigher order linear differential equations with constant coefficients –Cauchy's and Legendre's linear differential equations- Method of variation of parameters -**Applications of second order differential equations**- Free and forced oscillations – Undamped and Damped system - Solution of specified differential equations connected with electric circuits and bending of beams (Differential equations and associated conditions need to be given)-**Numerical solution to first order ordinary differential equations**- Single step methods: Taylor series method - Euler's Method -Modified Euler's Method – Runge - Kutta Method of fourth order - Multistep method - Milne's Predictor- Corrector Method-Adam-Bashforth Predictor- Corrector Method.

Total Hours: 60

Text Books:

1	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2014.
2	Grewal. B.S, "Higher Engineering Mathematics", 43rd edition, Khanna Publications, Delhi, 2014.
3	Bali N.P and ManishGoyal,"A Text book of Engineering Mathematics" 8thedition,Laxmi publications ltd, 2011.

Reference Books:

1	Veerarajan. T, "Engineering Mathematics for first year", 3rdedition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.
2	Glyn James, —Advanced Modern Engineering Mathematics, Pearson Education, 4th edition, 2012.

3	Jain M.K. Iyengar, K & Jain R.K., Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd, Publishers 2013.
Web References:	
1	http://www.nptel.ac.in/courses/111105035
2	http://www.nptel.ac.in/courses/122104017
3	http://nptel.ac.in/courses/122102009
4	http://nptel.ac.in/courses/111107063
Online Resources:	
1	https://www.coursera.org/learn/linearalgebra2
2	https://www.coursera.org/learn/differentiation-calculus
3	https://www.coursera.org/learn/single-variable-calculus
4	https://alison.com/courses/Algebra-Functions-Expressions-and-Equations

TentativeAssessment Methods & Levels (based on Blooms'Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C101.1	Remember	Classroom or Online Quiz	2
C101.2	Understand	Class Presentation/Power point presentation	4
C101.3	Apply	Group Assignment	6
C101.4& C101.5	Apply	Group activities	8

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	Term End Assessment	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CE201	CONSTRUCTION MATERIALS	3/0/0/3

Nature of Course: Theory and Application

Pre Requisites:NIL

Course Objectives:

1. To have a clear knowledge of construction materials and their properties.
2. To know the market forms of building materials.
3. To learn 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

C201.1 Learn and identify the relevant physical and mechanical properties of construction materials .	[U]
C201.2 Understand the typical and potential applications of these materials	[U]
C201.3 Understand the importance of experimental verification of material properties.	[U]
C201.4 Know the relevant IS codes to be referred for various construction materials.	[U]
C201.5 To produce concrete as per the requirement .	[AP]
C201.6 Possess the knowledge on modern materials	[U]

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

Stones – Bricks – Concrete Blocks: Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Bricks for special use – Refractory bricks – Code Practices. weather and water proof – roof finishes**.. Lime – Cement** – Aggregates – Mortar : Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration**.** Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – Industrial by-products – Fly ash – Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading – Sand Bulking – Code Practices. **Concrete**: Ingredients - Mix proportion and grade - Ready Mix Concrete - Batching plants - Properties of fresh concrete - Properties of hardened concrete - Code Practices. **Timber & Other Materials**: Timber – Market forms – Industrial timber– Plywood – Veneer – Thermocole – Panels of laminates – Steel – Aluminium– UPVC - Water proofing materials- Paints – Varnishes – Distempers – Bitumen's– Code Practices**Modern Materials**: Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles. Geomembranes and Geotextiles for earth reinforcement**.**

Total Hours	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.
3. Sahu G.C, Jayagopal Jena, " Building Materials and Construction", McGraw Hill Education (india) Pvt. Ltd, New Delhi, 2015 .

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

Web References:

1. http://www.constructionmaterials-ct.com

TentativeAssessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C201.1	Understand	Outside Class Hours Technical Report I	**10**
C201.2			
C201.3			
C201.4			
C201.5	Understand & Apply	Outside Class Hours Technical Report II	**10**
C201.6			

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	70	60	60	70
Apply	30	40	40	30
Analyse	-		-	-
Evaluate	-	-	-	-
Create	-		-	-

17CE202	ENGINEERING MECHANICS	4/0/0/4

Nature of Course	Concepts and Analytical
Pre requisites	NIL

Course Objectives:

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

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

C201.1	Define and illustrate the basic concepts of force system	[U]
C202.2	Identify the resultant force, moment and geometrical properties of 2D, 3D objects	[AP]
C202.3	.Examine the resistance force of particles and objects for Impending Motion	[AN]
C202.4	Determine the Displacement, velocity and acceleration of particles and objects.	[E]

Course Contents:

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

Basics and Equilibrium of Particles: System of forces-Laws of Mechanics, Parallelogram Law of forces -principle of transmissibility- Resolution and Resultant of Coplanar concurrent Forces - Equilibrium of a particle in two dimensions- Free Body Diagram- Lami's Theorem -Forces In Space- Resultant and Equilibrium of particles in space (vector approach. **Statics of Rigid Bodies:** Moment of a force-Varignon's theorem- Equivalent system of forces-Reduction of system of forces into single force and couple- Free body diagram and type of supports and reaction- Equilibrium of rigid bodies in two dimensions

Properties of Surfaces and Solids: Centroid of Common Shapes of Area-Centroid And Area Moment of Inertia of Composite Areas (Rectangle, triangle, circle, quarter and semicircle) by using Standard formula- Centre of gravity of 3D composite bodies by using standard formula -Parallel axis theorem and perpendicular axis theorem- Polar moment of inertia –Principal Moment of Inertia of an area. **Friction:** Types of Friction- Coulombs Law of Dry Friction - Impending motion- Angle of repose -Simple contact friction.

Dynamics of Particles: Displacements-Velocity and acceleration of uniform and uniformly accelerated rectilinear motion of particles Motion of particles under Gravity -Relative motion analysis -Curvilinear motion-Tangential and normal components of acceleration -Newton's laws of motion- D'Alembert's Principle -Work Energy Equation-Impulse and Momentum -Impact of elastic bodies-Direct central impact. **Kinematics of rigid bodies** -Translation and Rotation of Rigid Bodies - Fixed axis rotation-Velocity -General Plane motion -absolute and relative velocity.

Total Hours:	**60**

Text Books:

1	Beer F.P, and Johnston ER, Vector Mechanics for Engineers – Statics and

	Dynamics, McGraw Hill Education, New Delhi, 2025.
2	Dhiman A.K, Dhiman P, Kulshreshtha D.C, Engineering Mechanics-Statics and Dynamics, McGraw Hill Education, 2025
Reference Books:	
1	Kottiswaran N, Engineering Mechanics - Statics and Dynamics, Sri Balaji Publications- 2013.
2	RajasekaranS and Sankarasubramanian G, Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., New Delhi, 2009.
3	Meriam JL and Craige, "Engineering Mechanics statics and dynamics", John Willey and Son's publication 8th edition.2011
4	Kumar DS, "Engineering Mechanics", S.K.Kataria& Sons Publications-2012.
5	Irving H. Shames, Engineering Mechanics - Statics and Dynamics, Pearson Education Asia Pvt. Ltd., 2011.
6	Timoshenko.S, "Engineering Mechanics", McGraw Hill Education, 2008.
Web References:	
1	http://nptel.ac.in/courses/122104015/
2	http://nptel.ac.in/courses/112103109/
Online Resources:	
1	https://ocw.mit.edu/courses

TentativeAssessment Methods & Levels (based on Blooms'Taxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C201.1	Understand	Objective type Quiz	**5**
C201.2 C201.4	Apply Evaluate	Group Assignment	**10**
C201.3	Analyze	Tutorial	**5**

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	Term End Assessment	
Remember	-	-	-	-
Understand	60	50	50	50
Apply	40	40	30	30
Analyse	0	10	10	10
Evaluate	0	0	10	10
Create	-	-	-	-

17CS211	PROBLEM SOLVING USINGC PROGRAMMING (Common to Civil/Mechanical/ECE/EEE)	3/0/2/4

Nature of Course	Programming
Pre requisites	NIL

Course Objectives:

1	To understand problem solving concepts.
2	To gain knowledge about the control structures in C
3	To write C programs using arrays and pointers
4	To write functions&Structures inC

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

C211.1	Recall syntax of various C constructs	[R]
C211.2	Select techniques to solve real world problems	[U]
C211.3	Solve problems using C constructs	[AP]
C211.4	Use pointers and arrays in programs	[AP]
C211.5	Write functions and structures in C	[AP]
C211.6	Develop applications using C	[C]

Course Contents:

Problem Solving Techniques: Algorithm, Pseudo-code and Flowchart Problem Solving with Sequential Logic Structure - Decisions – Loops. **Case Study:** Raptor and Scratch Tools - **C Fundamental Constructs** : C Character Set – Identifiers and Keywords– Data Types- Constants - Variables and Arrays-Declarations-Operators and Expressions- Data input and output-Preparing and running a Complete C Program- **Control Structures** Branching: if-else- Looping: while-do while-for- Nested control structures -switch-break-continue-comma-goto. **Arrays:** Defining an array- Processing an array- Multi dimensional arrays - **Strings**: Defining a string-Null character-initialization of strings – reading and writing a string- processing the string- **Pointers**: fundamentals – Pointer Declaration& Usage –Dynamic Memory Allocation. **Functions:**Defining a Function – Accessing a function – Function Prototype Functions - Pointer to Function - Functions Returning Pointers.- Pointers and Strings -Passing arguments to a function – Recursion. **Structures and Unions**: The Type Definition (typedef) –Enumerated types– Structure - Type Definition – Initialization – Accessing Structures.-Structures and Functions – passing Whole Structure –Self -Referential Structure-Unions. **Case Study** : GDB: The GNU Project Debugger

List of Experiments:

1. Office Automation – Resume preparation , Spreadsheet processing [U]
2. Draw Flowchart using Raptor Tool [AP]
   a. Simple Flow Chart
   b. Decision Making
   c. Looping[Pre test&Post test]
3. Create Animation / Gaming /Application using Scratch Tool [C]
4. Program to process data types, format input and output and to evaluate an expression [AP]
5. Program using decision making statements [AP]

6.	Program using looping statements	[AP]
7.	Program using single and two dimensional arrays	[AP]
8.	Program with Strings	[AP]
9.	Program using Pointers.	[AP]
10.	Program using Recursion	[AP]
11.	Program using structures	[AP]
12.	Debugging with GDB	[AP]

Total Hours: 60

Text Books:

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

Reference Books:

1	Herbert Schildt, "The Complete Reference C", 4th edition ,TMH,2015
2	ThamaraiSelvi S and Murugesan R, "Programming in ANSI C", 6E, TMH, 2012.
3	VenugopalKR and SudeepR.Prasad , "Mastering C", TMH ,Second edition , 2015

Web References:

1	http://nptel.ac.in/courses/106105085/
2	http://nptel.ac.in/courses/106106127/
3	http://raptor.martincarlisle.com/
4	https://scratch.mit.edu/

Online Resources:

1	https://ocw.mit.edu/courses

Assessment Method & Levels (based on Blooms'Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	Term End Assessment	
Remember	30	30	20	-
Understand	70	50	30	-
Apply	-	20	50	70
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	30

17CH103	ENGINEERING CHEMISTRY	3 /0 /2 /4

Nature of Course	: Theory skill based
Pre requisites	: NIL

Course Objectives:

1	To make the students conversant with boiler feed water requirements, water treatment techniques, the principles and applications of electrochemistry.
2	To understand the working principles of electrodes and the significances of various component analyzer.
3	To learn the effect of corrosion in materials and the methods for prevention of corrosion.
	To acquire knowledge in applications of plastics and rubber in engineering field.
4	To understand the concepts of photo physical and photochemical processes in
5	spectroscopy
6	To gain knowledge about non conventional the energy sources, fuel cells and storage Devices.

Course Outcomes:

Upon completion of the course, students shall have ability to

C103.1	Recall the requirements of boiler feed water, water treatment procedures for industries.	[R]
C103.2	Understand the working principle of Ion Selective Electrodes, pH electrodes and conductivity meters as an analyzer.	[U]
C103.3	Apply the various corrosion control techniques in real time industrial environments.	[A]
C103.4	Use the knowledge of polymers, various energy sources and storagedevices in engineering field.	[U]
C103.5	Understand the principle and working of certain analytical techniques	[U]
C103.6	Solve theoretical problems based on the concepts acquired from the module in various engineering field.	[A]

Course Contents:

Water Treatment-Boiler feed water–Requirements-disadvantages of hard water - demineralization process– desalination-reverse osmosis. Applied electrochemistry: Electrochemical cells – electrolytic cell-reversible and irreversible cells -electrode potential - single, standard - oxidation and reduction potentials - emf of a cell - emf series–significances-pH measurement, glass electrodes, hydrogen electrodes, reference electrodes. Corrosion and its control: Mechanism - types–galvanic corrosion–differential aeration–pitting corrosion – factors-Corrosion control–cathodic protection– corrosion inhibitors-protective coatings– electroplating -electroless plating. Engineering polymers: Polymerisation -free radical mechanism-Plastics- types-preparation, properties and uses of PTFE-Polyurethane - Poly Carbonate -Nylon 6,6 and Nylon 6 - Rubber-Vulcanization of rubber-synthetic rubber -Butyl rubber and SBR Spectrophotometry: Beer-Lambert law – UV Visible – IR Spectrophotometers – Flame emission photometers - Atomic absorption spectrophotometers. Energy Sources: Nuclear energy- reactor-breeder reactor- Photovoltaic cells-Wind energy -Fuel cells. Storage Devices: Batteries- alkaline -Lead acid, nickel cadmium and lithium-TiS_2batteries.

Lab Component

1	Water hardness	[E]
2	Alkalinity	[E]

3	Chloride content	[E]
4	Dissolved oxygen in water	[E]
5	pH meter	[E]
6	Conductivity meter	[E]
7	Potentiometer	[E]
8	Spectrophotometer	[E]
9	Electroplating of Nickel	[E]
10	Corrosion rate of a metal	[E]
	Total Hours:	**60**

Text Books:	
1	Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2013.
2	Krishna murthyN,VallinayagamD.,"Engineering Chemistry" PHI Learning Pvt Ltd.,2014
3	Gadag R.V, Nithyananda Shetty A "Engineering Chemistry" 3rd edition PHI Learning Pvt Ltd.,2014
Reference Books:	
1	Shikha Agarwal., "Engineering Chemistry and Applications", Cambridge University press, 2016.
2	Liliya.,Bazylak.I.,Gennady.E.,Zaikov.,Haghvi.A.K.,"Polymersand Polymeric Composites" CRC Press,2014.
3	Lefrou.,Christine.,Fabry.,Pierre.,Poignet.,Jean-claude.,"Electrochemistry - The Basics, with examples" 2012 ., Springer.
4	Zaki Ahmad, Digby Macdonald, "Principles of Corrosion Engineering and Corrosion Control", Elsevier Science, 2nd Edition 2012.
5	Perez, Nestor,"Electrochemistry and Corrosion Science", Springer, 2016.
6	Ghazi A.Karim. "Fuels, Energy and the Environment", CRC Press, Taylor and Francis group, 2012.
Web References:	
1	http://www.analyticalinstruments.in/home/index.html
2	www.springer.com › Home › Chemistry › Electrochemistry
3	https://www.kth.se/…/electrochem/welcome-to-the-division-of-applied-electrochemistry
4	www.edx.org/
5	https://www.ntnu.edu/studies/courses
6	www.corrosionsource.com/
Online Resources:	
1 2 3 4 5 6	nptel.ac.in/courses/105104102/hardness.htm https://ocw.mit.edu/courses/chemistry nptel.ac.in/courses/105106112/1_introduction/5_corrosion.pdf https://alison.com - Spectroscopic technique, Colorimetry https://ocw.mit.edu/courses/chemistry nptel.ac.in/courses/113108051

Assessment Method& Levels (based on Blooms' Taxonomy)					
Summative assessment based on Continuous and End Semester Examination					
Bloom's Level	**Continuous Assessment**				**End Semester Examination (Theory) [40 marks]**
	Theory			**Practical**	
	CIA-I [6 marks]	**CIA-II [6 marks]**	**Term End Examination [8 marks]**	**Rubric based CIA [40 Marks]**	
Remember	30	30	30	10	20
Understand	60	50	40	20	50
Apply	10	20	30	40	30
Analyse	-	-	-	30	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17ME205	ENGINEERING GRAPHICS	0/0/3/2
Nature of Course	Practical application	
Co requisites	Basic drawing and Computer Knowledge	
Course Objectives:		
1.	To know the method of constructing the conic curves used in Engineering Applications.	
2.	To develop an understanding of Isometric to Orthographic Views and vice versa.	
3.	To learn the basic projection of straight lines and plane surfaces.	
4.	To develop the imagination of solids inclined to one reference planes.	
5.	To know the sectioning of solids and development of surfaces used in various fields.	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C205.1	Recall the basic concepts of engineering drawing.	[R]
C205.2	Recall the basic syntax and commands of CAD software.	[R]
C205.3	Interpret the parameters of engineering drawing.	[U]
C205.4	Sketch the 2D geometries in the drafting software.	[AP]
C205.5	Examine the isometric projection and convert it into orthographic projection (Vice versa).	[A]
Course Contents:		
1. Construction of Conic Curves (Ellipse, Parabola and Hyperbola) 2. Construction of Special Curves (Cycloid and Involutes) 3. Isometric to Orthographic projections – Manual sketches 4. Isometric to Orthographic projections – Software sketches 5. Projection of lines - Inclined to both HP and VP 6. Projection of Plane surfaces (Hexagon, Pentagon and circle) – Inclined to both HP and VP 7. Projection of Solids (Prism and Pyramid) – Inclined to HP 8. Projection of Solids (Cone and Cylinder) – Inclined to VP 9. Sectioning of Solids (Prism and Pyramid) with Section plane Inclined to HP 10. Sectioning of Solids (Cone and Cylinder) with Section plane Inclined to VP 11. Development of Surfaces (Prism,Pyramid,Cone and Cylinder) 12. Introduction to Perspective projection		
	Total Hours:	**30**
Reference Books:		
1.	Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2014.	
2.	Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2011.	
3.	Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2013.	
Web References:		
1.	http://nptel.ac.in/courses/112102101/	
2.	www.solidworks.com	

Assessment Method & Levels (based on Bloom'sTaxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [60 marks]**	**End Semester Examination [40 marks]**
Remember	30	30
Understand	30	30
Apply	20	20
Analyse	20	20
Evaluate	0	0
Create	0	0

SEMESTER II

17EN002	TECHNICAL COMMUNICATION SKILLS II (COMMON TO ALL BRANCHES)	3/0/2/4

Nature of Course	Theory
Pre requisites	Technical Communication Skills I

Course Objectives:

1	To develop the prominence of listening and reading practices using authentic business vocabulary.
2	To instil analytical thinking and logical reasoning to enhance LSRW skills in Business related situations.
3	To urge the need of effective communication in corporate sector with Business English.
4	To prepare students for competitive program like BEC, IELTS, TOEFL

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

C002.1	Remember LSRW skills and employ cross-cultural communication in business related situations.	[R]
C002.2	Understand and gain proficiency with business vocabulary	[U]
C002.3	Apply Task- Based activity to enhance an effective communication.	[AP]
C002.4	Analyse and apply Business English in working environment	[AP]

Course Contents:

LISTENINGTaking and Leaving Voice mail messages –Identifying the information before listening-Inferring ideas- Listening to short monologues -Longer listening tasks -Recognise functions.

SPEAKING Expressing hypothetical Situations – Expressing obligation -Aspects of business – Giving examples- Giving reasons- Giving extra information- Presentation at a business meeting- Connecting ideas- Collaborative task – Short talk on a business topics- Film Reviews

READING Science texts- Terms related about science and scientists - Scanning for specific information- Understanding cohesive features - Skimming the reading comprehensions - Interpret opinions and ideas expressed – Collocations - Identifying dependent preposition - Identifying the extra words.

WRITING Definitions, Extended Definitions -Letter writing (accepting and declining invitations)- Internal communication (notes/memo/E-mail writing to the head of the department, colleague, assistant , staff in the department etc) Report writing- Business proposal- circular- agenda and minutes- Appropriate linking words- Report Phrases - Asking for Information and Making Suggestions- Transcoding (Bar Chart, Flow Chart)- Letter for calling quotations, Replying for quotations- Placing an order and complaint letter.

PARTS OF SPEECH Tenses - Adjectives - Adverbs - Articles- Modal verbs, Active and Passive, Impersonal Passive voice, Homophones- Homonyms- Acronyms- Abbreviations- British and American words- Comparatives and Superlatives- Gerunds- infinitives – Participles - Modal Verbs - Relative Pronouns- Reported Speech - Indirect Questions- Spotting errors.

Lab Component		
1	Mini Presentation	[E]
2	Logical reasoning and Ethics in a given situation	[E]
3	Technical Presentation	[E]
4	Group Discussion	[E]
	Total Hours:	**60**

Text Books:	
1	Whitby, Norman. Cambridge University Press- Students Book. 2013.
2	Rizvi Ashraf M , "Effective Technical Communication", McGraw Hill Education (India) Private Limited , 2016
3	Sumanth S, English for Engineers, Vijay Nicole Imprints Private Limited 2015.
Reference Books:	
1	Wood, Ian, Paul Sanderson, Anne Williams with Marjorie Rosenberg, Pass Cambridge BEC Vantage, Cengage learning. Second Edition. 2014.
2	Gunasekaran S, 'A Text and Workbook of Technical English II", United Global Publishers, June 2010.
3	Lewis, Norman, Word Power Made Easy, Pocket Books, New York, 1979
Web References:	
1	http://www.cambridgeindia.org
2	http://www.cambridgeenglish.org/exams/business-certificates/business-vantage
3	https://**steptest**.in
Online Resources:	
1	https://www.coursera.org/specializations/business-english
2	http://www.academiccourses.com/Courses/English/Business-English

Assessment Method & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment				End Semester Examination (Theory) [40 marks]
	Theory			Practical	
	CIA-I [6 marks]	CIA-II [6 marks]	Term End Examination [8 marks]	Rubric based CIA [40 Marks]	
Remember	30	20	20	20	20
Understand	30	30	30	30	30
Apply	40	50	50	50	50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17MA104	INTEGRAL CALCULUS AND LAPLACE TRANSFORM (COMMON TO ALL BRANCHES)	3/2/0/4

Nature of Course	Analytical
Pre requisites	Basics of integration

Course Objectives:

1	To gain knowledge in improper integrals, Gamma and Beta functions which are needed in engineering applications
2	To develop logical thinking and analytical skills in evaluating multiple integrals
3	To acquaint with the concepts of vector calculus needed for problems in all engineering disciplines
4	To apply numerical methods to evaluate integrals when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information
5	Solve the differential equations using Laplace transform technique

Course Outcomes:

Upon completion of the course, students shall have ability to

C104.1	Recall basic integration formulae, scalar and vector point function concepts	[R]
C104.2	Differentiate and integrate vector point functions	[U]
C104.3	Evaluate integrals using Beta and Gamma functions	[AP]
C104.4	Evaluate double integral and triple integral to compute area, volume for two dimensional and three dimensional solid structure	[AP]
C104.5	Find the gradient, divergence and curl of vector point functions and related theorems useful for evaluation of engineering problems	[AP]
C104.6	Apply the Laplace transform technique to solve ordinary differential equations	[AP]

Course Contents:

Definite integrals-Evaluation of definite integrals using Bernoulli's formula-Beta and Gamma Integrals- Relation between Beta and Gamma Functions-Evaluation of Integrals using Beta and Gamma Functions-**Multiple integrals** - Double integration in Cartesian coordinates –Area as double integral –Change the order of integration-Triple integration in Cartesian co-ordinates – Volume as triple integral-**Vector calculus** - Vector differential operator- Gradient of a scalar point function - Directional derivatives –Divergence and Curl of a vector point function – Irrotational and solenoidal vector fields –Simple problems– Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem(statements)– Simple applications involving cubes and rectangular parallelopipeds-**Numerical integration -** Trapezoidal rule – Simpson's 1/3 and 3/8 rules – Two and three point Gaussian Quadrature formulae –Trapezoidal rule and Simpson's rule to evaluate double integrals-**Laplace transform** –Conditions for existence – Transform of elementary functions – Basic properties (without proof) – Derivatives and integrals of Laplace transform -Transforms of derivatives and integrals - Periodic functions - **Inverse Laplace transform**-Partial fraction method - convolution theorem , Initial and Final value theorems (statements)– Problems - Solution of second order differential equations with constant coefficients.

Total Hours:	**60**

Text Books:	
1	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2014
2	Grewal. B.S, "Higher Engineering Mathematics", 43rd edition, Khanna Publications, Delhi, 2014
3	Bali NP and Manish Goyal,"A Text book of Engineering Mathematics" 8th edition Laxmi publications ltd, 2011
Reference Books:	
1	Veerarajan. T, "Engineering Mathematics for first year", 3rdedition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011
2	Glyn James, —Advanced Modern Engineering Mathematics, Pearson Education, 4th edition, 2012
3	Jain M.K. Iyengar, K & Jain R.K., Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd, Publishers 2013
Web References:	
1	http://nptel.ac.in/video.php?subjectId=122107037
2	http://nptel.ac.in/courses/122107036/
3	http://nptel.ac.in/video.php?subjectId=117102060
Online Resources:	
1	https://www.coursera.org/learn/pre-calculus
2	https://www.coursera.org/learn/linearalgebra1
3	https://alison.com/courses/Advanced-Mathematics-1
4	https://www.edx.org/course/algebra-lineal-mexicox-acf-0903-1x.
5	https://www.edx.org/course?search_query=laplace+transform

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C104.1	Remember	Classroom or Online Quiz	2
C104.2	Understand	Class Presentation/Power point presentation	4
C104.3, C104.4	Apply	Group Assignment	7
C104.5,C104.6	Apply	Group activities	7

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	Term End Assessment	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CE301	CONSTRUCTION TECHNIQUES AND PRACTICES	3/0/0/3

Nature of Course	Theory and Application
Pre requisites	17CE201– Construction Materials

Course Objectives:

1	To know the various construction techniques and practices
2	To get an overview of the equipment needed for different types of construction activities
3	To acquire knowledge for building demolition in safe manner
4	To make students aware of various construction and demolition techniques.

Course Outcomes:

Upon completion of the course, students shall have ability to

C301.1	Have a sound knowledge on various Construction Practices	[R]
C301.2	Select the specific construction equipment for the construction purpose.	[U]
C301.3	Apply the advanced construction techniques in Substructure constructions	[AP]
C301.4	Apply the advanced construction techniques in Superstructure constructions	[AP]
C301.5	Implement the various demolition techniques in safe manner	[AP]
C301.6	Apply advanced demolition sequence	[AP]

Course Contents:

Construction Practices : Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Brick masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – Building foundations – basements – centering and shuttering – de-shuttering forms–Slip forms – scaffoldings – Fabrication and erection of steel trusses – frames – braced domes – weather and water proof – roof finishes. **Sub Structure** Construction: Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.**Super Structure** Construction: Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures -Erection of articulated structures, braced domes and space decks. **Construction Equipment:** Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling .**Demolition Techniques** :Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques

Total Hours: 45

Text Books:

1	Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, 2010.
2	Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 2012.

Reference Books:	
1	Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 2011.
2	Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi,2012
3	Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi, 2012
Web References:	
1	http://www.nptel.ac.in 112103121
Online Resources:	
1	https://www.youtube.com/watch?v=bA3OsOsrRgc
2	https://www.youtube.com/watch?v=j04CtMzo_0Y

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

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
C301.1, C301.2, C301.3	Remember, Understand, Apply	Outside Class Hours Technical Report I	**10**
C301.4, C301.5, C301.6	Apply	Outside Class Hours Technical Report II	**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	20	20	20	20
Understand	20	40	30	20
Apply	60	40	50	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CE302	ARCHITECTURE AND PLANNING	3/0/0/3

Nature of Course	Concepts and Theory
Pre requisites	Nil

Course Objectives:

1. To introduce the various facets of architecture and planning for a holistic understanding of the disciplines.
2. To understand the elements and principles of architecture.
3. To understand the design approach of various building types with specific reference to site and climate.
4. To understand the planning aspects of a building.

Course Outcomes:

Upon completion of the course, students shall have ability to

C302.1	Understand and appreciate architecture and planning	[U]
C302.2	Understand the climate responsive architecture and design.	[U]
C302.3	Understand and apply the elements and principles of Architecture	[AP]
C302.4	Understand and apply various rules and regulations of planning and development authorities.	[AP]
C302.5	Plan any civil engineering project by incorporating various aspect of environment and climate of the project area	[AP]
C302.6	Incorporate new technologies in planning.	[AP]

Course Contents:

Introduction to architecture- Definitions of Architecture – architecture as a discipline – context for architecture as satisfying human needs: functional, aesthetic and psychological- outline of components and aspects of architectural form. Building typologies: Residential, institutional, commercial and Industrial types – Anthropometry and space standards- Functional relationships – **Elements of architecture-** Understanding fundamental elements such as point, line, plane, form and space, shape, pattern, light, colour, surface and texture. Understanding perceptual effects of geometric forms such as sphere, cube, pyramid, cylinder and cone. Understanding perceptual effects of configuration of architectural spaces – Spatial relationship and its types, Spatial organization and its types – built form and open space relationships. **Principles of architecture-** Understanding fundamental principles such as proportion, scale, balance, symmetry/asymmetry, rhythm, axis, hierarchy, datum, unity, harmony, dominance, and climax. Movement with reference to the architectural form and space – relationship between architectural form and circulation – Types of circulation. **Site analysis and climate responsive design -** Site Surveys - Site analysis of natural, cultural and aesthetic factors – topography, hydrology, soils, vegetation, macro/micro climate, surface drainage, accessibility, size and shape, infrastructures available - Site level planning and organization of open, semi-open and built spaces. Man, Climate and Shelter - Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls - Simple passive design considerations. **Introduction to planning -** Planning – Definition, concepts, standards and processes- Development Control Rules - Building bye-laws and zoning regulations - Scope and content of master plan - Planning of new towns and satellite areas - Performance standards for Urban Housing - Principles of Urban Landscape - Smart City Concepts.-Green buildings, Smart materials and nano-technology, Energy Conservation Building Code.

Total Hours:	**45**

Text Books:	
1	Pramar. V.S. “Design fundamental in Architecture”, Somaiya Publications Pvt. Ltd., New Delhi, 1997. (Unit I – Unit III)
2	Koenigsberger OH and Others, “Manual of Tropical Housing and Building” – Part I - Climate design, Orient Longman, Madras, India, 2010. (Unit IV)
3	Rangwala. S.C. “Town Planning” Charotar Publishing House. Anand, 2005. (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. Francis D.K. Ching, “Architecture-Form, Space and Order”, Van Nostrand Reinhold Company, New York, 2007.
3. 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
4. Kevin Lynch, “Site planning”, MIT Press, Cambridge, MA, 1984.
5. 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
Online Resources:	
1	http://char.txa.cornell.edu/language/principl/principl.htm

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

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

Course Outcome	Bloom’s Level	Assessment Component	Marks
C302.1, C302.2, C302.3	Remember, Understand, Apply	Outside Class Hours Technical Report I	**10**
C302.4, C302.5, C302.6	Remember, Understand, Apply	Outside Class Hours Technical Report II	**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	20	20	20	20
Understand	80	40	30	20
Apply	-	40	50	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CS212	LINUX AND PROGRAMMING IN C++	3/0/2/4
	(Common to Civil/Mechanical/ECE/EEE)	

Nature of Course	Theory and Programming
Pre requisites	17CS211-Problem Solving Using C Programming

Course Objectives:

1	To introduce basic Linux concepts.
2	To understand Object Oriented Programming concepts like data abstraction and encapsulation.
3	To analyse different kinds of constructors, inheritance and polymorphism.
4	To understand and apply streams and file concepts.

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

C212.1	Remember the basic commands of Linux.	[R]
C212.2	Understand the basic Linux Commands and file system hierarchy	[U]
C212.3	Construct and apply C++ program to solve the given problems using basic programming constructs.	[AP]
C212.4	Apply the concepts of friend function and virtual functions.	[AP]
C212.5	Apply the concepts of polymorphism.	[AP]
C212.6	Make use of I/O functionality to code basic file operations and experiment with templates.	[AP]

Course Contents:

Introduction to Linux-Linux basic Commands- File System Hierarchy-Users, groups and permissions. Programming paradigms - Basic concepts and benefits of Object Oriented Programming, An overview of C++, datatypes, Selection statements, Functions, Arrays, Function overloading . Classes and objects, Default constructor, operator overloading, Friend functions - virtual functions. Templates, Exception handling. Derived classes- Inheritance, Virtual Base Class, Abstract class, Polymorphism and Virtual Functions-Virtual Base class. Console Input /output operation, File Handling. Error handling.

Lab Component

1	Linux Commands	[E]
2	Shell Programming	[E]
3	Simple Classes for understanding objects, member functions and constructors	[E]
4	Compile time polymorphism	[E]
5	Run time polymorphism	[E]
	Total Hours:	**60**

Text Books:

1	Christopher Negus, Christine Bresnahan, “Linux Bible”, Willey Publishing Inc., 2012.
2	Herbert Shildt , “ The Complete Reference C++” , Fourth Edition, TMH, 2003.

Reference Books:

1	K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, “Mastering C++”, TMH, 2003.
2	Bjarne Stroustrup, "The C++ programming language" Addison Wesley, fourth edition.
3	Richard Blum, Christine , “ Linux Command Line and Shell Scripting Bible” , 2nd Edition, Wiley Publishing Inc. 2011.

Web References:	
1	http://nptel.ac.in/courses/117106113/
2	http://nptel.ac.in/syllabus/syllabus.php?subjectId=106106111
Online Resources:	
1	www.edx.org/course/introduction-linux-linuxfoundationx-lfs101x-0
2	https://www.coursera.org/learn/c-plus-plus-a

Assessment Method & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

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

17PH102	ENGINEERING PHYSICS	3/0/2/4

Nature of Course	Theory and Skill based
Pre requisites	Nil

Course Objectives:

1	To learn the basic concepts of physics needed for all branches of engineering
2	To understand the concepts and working principles of laser, fibre optics, quantum physics and crystal physics.
3	To identify suitable materials to be used in the engineering field.
4	To implement and visualize theoretical aspects in the laboratory
5	To familiarize the students to handle various instruments and equipment

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

C102.1	Recall the basic concepts of laser, fibre optics and quantum physics used in various engineering applications	[R]
C102.2	Understand the crystal structure of the various materials	[U]
C102.3	Understand the fundamental concepts of electrical and magnetic properties of materials.	[U]
C102.4	Interpret the behaviour of nanomaterials and shape memory alloys	[U]
C102.5	Apply the gained knowledge to solve the problems related to their field of study	[AP]

Course Contents:

Laser: Principle of absorption and emission - Types of laser: CO_2, Nd-YAG, semiconductor laser - Industrial applications - Holography. Fiber optics: Principle and propagation–numerical aperture and acceptance angle – classification of optical fibers - splicing - fiber optic communication system - light source - PIN detector. Fiber optic sensors: temperature and displacement. Quantum mechanics: Matter waves, de-Broglie wavelength, uncertainty principle – Schrödinger's wave equation – time independent and time dependent - physical significance - particle in a one dimensional potential box. Conducting materials: Classical free electron theory of metals - Electrical and thermal conductivity- Wiedemann-Franz law - Band theory of solids- Fermi distribution function –Effect of temperature on Fermi function. Semiconducting materials: Intrinsic and extrinsic semiconductors – carrier concentration derivation – Fermi level – variation of Fermi level with temperature in intrinsic – electrical conductivity for intrinsic semiconductor – Band gap determination – Hall effect. Magnetic materials: Origin of magnetic moment –ferro magnetic material – domain theory – hysteresis – soft and hard magnetic materials – Ferrites. Dielectric materials: properties- Electronic and ionic polarisation – frequency and temperature dependence – internal field-Claussius-Mosotti relation-dielectric loss –dielectric breakdown mechanisms - ferro electric materials – piezo electric materials - insulating materials - applications. Crystallography: Atomic packing factor for SC, BCC, FCC and HCP structures – miller indices. Advanced materials: Shape memory alloys-characteristics - properties of Ni-Ti alloy. Characterisation techniques: SEM, TEM and X-ray diffraction. Nanomaterials: Properties – synthesis techniques: ball milling, chemical vapour deposition and sol-gel method. Carbon nanotubes: structure - properties and applications.

Lab Component		
1	Laser and optical fiber parameters	[E]
2	Lattice constant using x-ray diffraction pattern	[E]
3	Specific resistance-Carey Foster's Bridge	[E]
4	Band gap of a semiconductor	[E]
5	Characteristics of a solar cell /Photo diode	[E]
6	Thermal conductivity of a bad conductor	[E]
7	Young's modulus	[E]
8	Rigidity modulus	[E]
9	Thickness of a thin material using air wedge	[E]
10	Coefficient of viscosity for a liquid	[E]
	Total Hours:	**60**

Text Books:	
1	Gaur RK and Gupta SG, 'Engineering Physics' Dhanpat Rai Publications (P) Ltd, New Delhi, 2014.
2	Rajendran, V 'Engineering Physics' Mc Graw Hill Publications ltd, New Delhi, 2014.

Reference Books:	
1	Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (9 th Edition) 2013.
2	Avadhanulu MN, Kshirshagar PG – A Text Book of Engineering Physics- S.Chand & Co Ltd, 2016.
3	Mittal PK – Applied Physics – I.K. International Publishing House pvt.Ltd.

Web References:	
1	http://www.nanotech-now.com/Nanomat-Preso2.pdf
2	http://nptel.ac.in/courses/108106073
3	https://www.corning.com/in/en/products/communication-networks/…/fiber.html
4	https://physics.stanford.edu/node/201
5	https://www.amazon.com/Semiconductor-Materials-Physical…References/…/0849389…
6	https://books.google.co.in/books?isbn=1482238888
7	https://www.generalplastics.com/polyurethane-foam-dielectric-materials-f…
8	https://www.asme.org/…/nanotechnology/carbon-nanotube-super-fabric
9	https://web.iit.edu/…/web/…/Academic%20Resource%20Center/…/Miller…
10	https://www.boundless.com/physics/…/the-hall-effect-559-10926/

Online Resources:	
1	https://www.coursera.org/learn/ap-physics-1
2	www.cleanroom.byu.edu › Semiconductor Properties
3	https://www.urmc.rochester.edu › … › Our Resource Laboratories
4	https://www.jic.ac.uk/microscopy/links.html
5	https://www.merlot.org/merlot/materials.htm
6	www.fiberopticsonline.com/

7	https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/

Assessment Method & Levels (based on Blooms' Taxonomy)

Summative assessment based on Continuous and End Semester Examination

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

17ME204	ENGINEERING PRACTICES LABORATORY	0/0/3/2

Nature of Course: Practical Application

Pre requisites: 17ME205 - Engineering Graphics

	Course Objectives:
1.	To learn the use of basic hand tools and to know the need for safety in work place and to gain hands on experience on Carpentry, Fitting, Sheet metal, Plumbing, welding and Foundry.
2.	To learn about basic electrical devices, meters and Electronics devices and meters and to gain knowledge about the fundamentals of various electrical and electronic gadgets, basic electronic instruments, their working and trouble shooting.
3.	To gain knowledge about the basics of computer hardware and various operating systems

	Course Outcomes Upon completion of the course, students shall have ability to	
C204.1	Make simple components like tray, cylinder, funnel etc. and to make simple lap, butt and tee joints using arc welding equipment.	[AP, C]
C204.2	Prepare simple wooden joints using wood working tools, pipe connections and sand mould	[C]
C204.3	Identify, formulates and solves the hardware engineering problem in electrical and electronic components at home	[U,AP]
C204.4	Identify various computer parts and learn to operate the various operating systems in computers.	[U,AP, E]

Course Contents

MECHANICAL ENGINEERING

Preparation of simple objects using sheet metal, preparation of joints using welding process and sand mould preparation.

CIVIL ENGINEERING

Preparation of carpentry joints by using power tools and preparation of basic pipe line connections using PVC pipes that include valves and taps.

ELECTRICAL AND ELECTRONICS

Troubleshooting of electrical and electronics components and residential wiring. Soldering practice of electronic circuits and operation of Cathode Ray Oscilloscope

COMPUTER SCIENCE AND ENGINEERING

PC Repair Fundamentals. Hard disk Partitioning and Disk Defragmentation. Installing Windows OS, Linux & Maintaining Windows OS, Linux. Upgrading Memory and Hard Drives. Securing the PC and LAN.

S.No.	List of Exercises	
1	Fabrication of rectangular tray, cylindrical container and cone	[AP]
2	Preparation of butt, lap and T joint using welding (Arc, MIG,TIG)	[AP]
3	Preparation of Cross lap joint and T joint using carpentry tools	[AP]

	4	Preparation of connection of basic pipe lines	[C]
	5	Preparation of Sand mould (Solid and Split Pattern)	[C]
	5	Troubleshooting of electrical and electronics components	[C]
	6	Preparation of Residential wiring.	[C]
	7	Soldering of electronic circuits	[AP]
	8	Operation of Cathode Ray Oscilloscope	[U]
	9	PC Repair Fundamentals	[U]
	10	Hard disk Partitioning and Disk Defragmentation	[AP]
	11	Installing Windows OS, Linux & Maintaining Windows OS, Linux.	[AP]
	12	Upgrading Memory and Hard Drives, Securing the PC and LAN.	[U]
		Total Hours	30

Reference Books:

1. Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology", Pearson Education, Inc. 2013 (Second Indian Reprint).
2. Begman, "Manufacturing Process", John Wilely & Sons, VIII Edition, 2015.
3. Suyambazhahan S, "Engineering Practices Laboratory Manual" PHI Learning, 2009
4. Sekhar Dash & K.Vijayakumar, "Electrical Engineering Practice Lab Manual". Vijay Nicole Imprints Private Ltd., First Edition, 2013
5. Scott Mueller "Upgrading and Repairing PCs", 22 nd Edition, QUE, Pearson Education, New Delhi, 2015.

Web References:

1. http://www.allaboutcircuits.com/education/
2. http://www.nptel.ac.in/courses/112107090/
3. nptel.ac.in/courses/112101005/14

Online Resources:

1. http://www.electrical4u.com/
2. http://vlab.co.in/

Assessment Methods and Levels (Based Blooms Taxonomy)		
Summative assessment based on Continuous and End Semester Examination		
Bloom's level	**Rubric based continuous Assessment [60]**	**End Semester Examination [40]**
Remember	-	-
Understand	20	20
Apply	20	20
Analyse	10	10
Evaluate	20	20
Create	30	30

SEMESTER III

17MA103	FOURIER ANALYSIS AND PARTIAL DIFFERENTIAL EQUATIONS (COMMON TO CIVIL AND MECHANICAL)	3/2/0/4

Nature of Course	Analytical
Pre requisites	17MA101- Linear Algebra and Differential Calculus 17MA102-Integral Calculus and Laplace Transform

Course Objectives:

1	To acquaint the student with Fourier transform techniques which are used in variety of engineering fields
2	To study the concept of mathematical formulation of certain practical problems in terms of partial differential equations and solving for physical interpretation
3	To understand the different possible forms of Fourier series and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data
4	To solve boundary value problems encountered in engineering practices using Fourier series
5	To find numerical solution for partial differential equations

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

C103.1	Recall basic integration concepts and partial derivatives	[R]
C103.2	Formulate and solve the partial differential equations	[U]
C103.3	Interpret Fourier series solutions to the engineering problems	[AP]
C103.4	Apply analytical and numerical methods to solve wave and heat equation with boundary conditions	[AP]
C103.5	Use Fourier transforms techniques to evaluate integrals	[AP]

Course Contents:

Fourier Transforms - Complex form of Fourier Transforms -Fourier sine and cosine transforms-Properties(excluding proof)-Transforms of simple functions-Convolution theorem and Parseval's Identity (Statement) – Evaluation of integrals using Parseval's Identity- **Partial Differential Equations -** 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-**Fourier series** - Dirichlet's conditions- General Fourier Series – Odd and Even Functions- Half range sine series and cosine series –Parseval's Identity- Harmonic analysis-**Applications of Partial Differential Equations -** 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'sDifference Equation –Hyperbolic Equation

Total Hours: 60

Text Books:

1	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2014
2	Grewal. B.S, "Higher Engineering Mathematics", 43rd edition, Khanna Publications, Delhi, 2014.

Reference Books:	
1	Veerarajan. T, "Transforms and Partial differential equations", 2nd edition, Tata McGraw-Hill Publishing Company Ltd., reprint,2015
2	Bali NP and Manish Goyal,"A Text book of Engineering Mathematics Sem-III/IV" 4th edition, Laxmi publications ltd, 2012
3	Glyn James, —Advanced Modern Engineering Mathematics, Pearson Education, 4th edition, 2012
4	Rajasekaran S., Numerical methods in Science and Engineering – A Practical Approach, 3rd edition, Wheeler Publishing, 2003
Web References:	
1	http://nptel.ac.in/video.php?subjectId=122107037
2	http://nptel.ac.in/courses/122107036/
3	http://nptel.ac.in/video.php?subjectId=117102060
Online Resources:	
1	https://www.edx.org/course/calculo-diferencial-galileox-cmath001rx
2	https://www.edx.org/course/pre-university-calculus-delftx-calc001x-1
3	https://www.edx.org/course/calculus-1a-differentiation-mitx-18-01-1x
4	https://alison.com/courses/Advanced-Mathematics-1
5	https://ocw.mit.edu/courses/…/18-335j-introduction-to-numerical-methods-fall-2010 /ocw.usu.edu › Electrical and Computer Engineering › Signals and Systems

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C103.1	Remember	Classroom or Online Quiz	2
C103.2	Understand	Class Presentation/Power point presentation	4
C103.3	Apply	Group Assignment	6
C103.4& C103.5	Apply	Group activities	8

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment			End Semester Examination
	CIA1	CIA2	Term End Assessment	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CE202	SOLID MECHANICS	3/1/0/3

Nature of Course	Concepts and Analytical
Pre requisites	17ME201 - Engineering Mechanics

1	**Course Objectives:** To know fundamental concepts of stress, strain and deformation of solids with applications to bars and beams To analyze plane truss& determine the deflection of beams To draw the bending moment and shear force diagram for different types of beams.	
	2Course Outcomes: **Upon completion of the course, students shall have ability to**	
C202.1	Study the concepts of stress ,strain and deformation of solids	[R]
C202.2	Understand the concept of stresses and deformation in shafts	[U]
C202.3	Understand the concept of stresses in spring action	[AP]
C202.4	Analyse plane truss and thin cylinders	[AN]
C202.5	Able to draw the bending moment and shear force diagram	[U]
C202.6	Analyse the deflection of beam	[AN]

Course Contents:

Stress, Strain And Deformation Of Solids: Rigid bodies and deformable solids – stability – strength- stiffness – tension-compression and shear stresses – strain- elasticity- Hooke's law-limit of proportionality - 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**Transverse Loading On Beams:** Beams - types of supports - simple and fixed - types of load - concentrated, uniformly distributed, uniformly varying 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. **Analysis Of Plane Truss And Thin Cylinders**: 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. **Deflection Of Beams** : 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 .**TORSION**: Stresses and deformation in circular shafts - stepped shafts - shafts fixed at both ends - leaf springs - stresses in helical springs - deflection of springs

Total Hours:	**45**

Text Books:

1	Bansal R.K, 'Strength of Materials', Lakshmi Publications Ltd, New Delhi, 2012.
2	Junarkar S.B., 'Mechanics of Structures', Vol. 1, 21st Edition, Charotar Publishing House, Anand, India, 2007.

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/
Online Resources:	
1	http://www.nesoacademy.org/civil-engineering/mechanics of solids

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C202.1	Remember	Quiz	**3**
C202.2	Understand	Quiz	**3**
C202.3	Understand	Group Assignment	**3**
C202.4	Apply	Problem solving	**4**
C202.5	Analysis	Case study	**3**
C202.6	Analysis	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	20	10	10
Understand	80	40	40	40
Apply	-	40	30	30
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

17CE203	FLUID MECHANICS	3/1/0/3

Nature of Course	Concepts and Analytical
Pre requisites	17MA101 Linear Algebra and Differential Calculus 17MA102 Integral Calculus and Laplace Transform

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 completion of the course, students shall have ability to**	
C203.1:	Understand the fluid properties and types of flows	[U]
C203.2:	Estimate the forces on immersed surfaces	[E]
C203.3	Determine the pressure difference in pipe flows	[AP]
C203.4:	Apply Bernouli's equation to determine the Velocity and Discharge	[AP]
C203.5	Analyze flow through pipes, pipe network and boundary layer concepts	[AN]
C203.6:	Analyse the dimensional and model analysis	[AN]

Course Contents:

Fluid properties: Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Continuum concept of system and control volume.**Fluid statics & kinematics:** 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. **Fluid dynamics:**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. **Boundary layer and flow through pipes:** 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. **Dimensional analysis:** Dimensional Analysis – Rayleigh's method, Buckingham Pi-theorem – Similitude and models – Scale effect and distorted models

Total Hours: 45

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", KhannaPublishers, 2010.
3. Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2007.

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:
http://nptel.ac.in/courses/105101082
Online Resources:
http://nptel.ac.in/courses/105103095
Tentative Assessment Methods & Levels (based on Blooms'Taxonomy)
Formative assessment based on Capstone Model (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
C203.1	Understand	Outside Class Hours Technical Report I	**10**
C203.2	Evaluate		
C203.3	Apply		
C203.4	Apply	Outside Class Hours Technical Report II	**10**
C203.5	Analyse		
C203.6	Analyse		

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

17CE303	ENGINEERING SURVEY – I	3/0/0/3

Nature of Course	Theory and Application
Pre requisites	NIL

Course Objectives:

1. To understand basic principle and concepts of different surveying methods.
2. To measure the land area by chaining, compass and plane table.
3. To measure the elevation of points using dumpy level.
4. To measure the height and distance by theodolite
5. To know about contouring works for construction Purposes.
6. To study the different surveying equipment in the field of civil engineering.

	Course Outcomes: **Upon completion of the course, students shall have ability to**	
C303.1	Remember the basics of surveying and different methods of surveying.	[R]
C303.2	Understand working principle of surveying instruments and the basic surveying techniques using Chain, Compass and Plane table	[U]
C303.3	Apply the surveying concepts measurement of area, volume and calculation of Earthwork for measuring the land area and preparation of map for Constructional purpose.	[AP]
C303.4	Apply the various methods for measurement of horizontal and vertical distance.	[AP]

Course Contents:

Introduction and Chain Surveying: Definition - Principles - Classification - Chain survey – Instruments - Chaining and ranging- Field book - Plotting - Obstacles in chaining - Chaining on Sloping ground - Calculation of area by trapezoidal and Simpson's rule.Compass and Plane Table Surveying: Prismatic compass – Surveyor's compass - Bearing - Systems and conversions - Local attraction - Plane table instruments and accessories - Methods - Radiation - Intersection - Resection -Traversing. Levelling: Levels and Staves –Bench marks - Temporary and permanent adjustments -Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Precise levelling - Types of instruments - Adjustments - Field procedure. Levelling Applications: 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.Theodolite Surveying: 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 –Omitted measurements.

Total Hours: 45

Text Books:

1. Punmia B C, "Surveying", Vol. I and II, Laxmi Publications (P) Ltd., New Delhi, 2016.
2. Kanetkar T.P., Surveying and Levelling, Vols. I and II, Standard Publishers Distributors, New Delhi 2015.

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," Surveying and Levelling" Tata McGraw Hill Publishing Company Ltd., New

Delhi, 2014.

Web References:

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

Online Resources:

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

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

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

Course Outcome	Blooms Taxonomy	Assessment Component	Marks
C303.1	Remember and Understand	Outside Class Hours Technical Report I	**10**
C303.2			
C303.3	Apply	Outside Class Hours Technical Report II	**10**
C303.4			

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

17CE304	CONCRETE TECHNOLOGY	3/0/3/4

Nature of Course: Theory and Practical Application

Pre Requisites: 17CE201 – Construction Materials

	Course Objectives:
1	To impart knowledge on properties and durability of concrete
2	To enable the students to understand the concept of mix design
3	To impart knowledge on the special concretes
4	To facilitate the students to know concreting under special circumstances

	Course Outcomes: Upon completion of the course, students shall have ability to	
CE304.1	Remember the properties of concrete.	(R)
CE304.2	Understand the properties and manufacturing process of fresh concrete.	(U)
CE304.3	Understand the properties of hardened concrete.	(U)
CE304.4	Understand the properties and dosage limits of admixtures.	(U)
CE304.5	Learn the effects of various chemical actions on concrete.	(U)
CE304.6	Implement various special concretes and concreting methods based on the scenario.	(AP)
CE304.7	Apply the concepts of mix design for making concrete.	(AP)
CE304.8	Analyse the characteristics and properties of concrete	(AN)

Course Contents:

Mix Design and Admixtures : 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. **Studies on Fresh concrete :** 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. **Studies on Hardened concrete :** 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. **Durability of concrete :** 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. **Special Concretes :** 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.

Lab Component

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 : 60

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:

4. Neville, A.M., Properties of Concrete, Pearson, 2012.
5. Gambir, M.L. "Concrete Technology", Tata McGraw Hill, Publishing Co, Ltd, New Delhi, 2004.
6. IS: 10262, "Recommended Guidelines for Concrete Mix Design", 2009, BIS, New Delhi.

Web References:

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

Online References:

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	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	10	20	10	10	10
Understand	50	80	40	20	40
Apply	40	-	30	20	30
Analyse	-	-	20	50	20
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

17CE305	STRENGTH OF MATERIALS LABORATORY	0/0/3/2

Nature of Course	Practical application
Co requisites	17CE202 - Solid Mechanics

Course Objectives:

1. 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 know the strength and stiffness properties of structural elements.

	Course Outcomes: **Upon completion of the course, students shall have ability to**	
C305.1	Understand the behaviour of different materials under the action of various forces.	[U]
C305.2	Analyze the strength and stiffness properties of structural elements.	[AN]
C305.3	Determine the physical properties of constituent materials of concrete.	[AN]
C305.4	Determine the behaviour of structural elements, such as bars, beams Subjected to Tension, compression, by means of experiments.	[AP]

Course Contents:

1)	Determination of tension on mild steel rod.	[AN]
2)	Determination of Double shear on metal. .	[AN]
3)	Finding out Torsional value of mild steel rod. .	[E]
4)	Determination of Compression strength on wood, bricks, tiles and mortar cubes. .	[AN]
5)	Determination of Izod and Charpy impact test on metal specimens.	[AN]
6)	Finding out the Rockwell Hardness Number on metal Specimens	[E]
7)	Finding out the Brinell Hardness test on metal Specimens.	[E]
8)	Finding out the Deflection values on metal beam on various tests.	[E]
9)	Determination of Elastic properties of open coiled and close coiled helical springs	[AN]
10)	Determination of Fatigue values on specimens.	[AN]
11)	Determination of elastic modulus of concrete.	[AN]
12)	Determination of properties of cement.	[E]

Total Hours: 30

Reference Books:

1. Bansal, R.K., "A Text Book of Strength of Materials", Laxmi Publications (P) Ltd. New Delhi 2010
2. James M. Gere and Stephen P. Timoshenko, "Mechanics of Materials" (3rd edition), McGraw Hill Book Company, Singapore, 2002.
3. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.
4. Rattan SS, Strength of Material, McGraw Hill Educational Private (India)Limited.2011

Web References:

1. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT.
2. http://em2lab.yolasite.com/

Online Resources:		
www.istl.org/02spring/internet.html		
Assessment Method & 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	-	-
Understand	-	-
Apply	10	10
Analyse	50	40
Evaluate	40	50
Create	-	-

17CE306	COMPUTER AIDED BUILDING DESIGN LABORATORY	1/0/3/2

Nature of Course	Practical Application
Pre requisites	17ME202 - ENGINEERING GRAPHICS

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. At the end of this course the student should be able 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**	
C306.1	Familiarize with the standard symbols and sign conventions suitably.	[R]
C306.2	Understand the different views of the components of a building.	[U]
C306.3	Implement the regulations for layout planning and preparation of drawings	[AP]
C306.4	Draft the elevation and sectional views of the buildings using computer software.	[AP]

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: http://blogs.autodesk.com/autocad/autocad-online-resources-autodesk-app-store-for-autocad/ **http://www.mycadsite.com/tutorials/index.htm** **http://www.cadtutor.net/**		
Online Resources:		
	http://tutorial45.com/autocad-tutorial/ http://www.computeraideddesignguide.com/autocad-tutorial/	
Assessment Method & 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	-	-

SEMESTER IV

17MA106	STATISTICAL INFERENCE AND COMPUTATIONAL METHODS	3/2/0/4

Nature of Course	Analytical
Pre requisites	17MA101- Linear Algebra and Differential Calculus 17MA102-Integral Calculus and Laplace Transform

Course Objectives:

1	To study the concept of finding the roots of nonlinear (algebraic and transcendental) equations and solutions of large system of linear equations and Eigen values of the matrix
2	To learn and construct approximate polynomial for the given numerical data and to find the intermediate missing values
3	To learn the concept of testing hypothesis using statistical analysis
4	To analyze data, interpret results and write technical reports
5	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	Remember the concepts to find the solutions of algebraic and simultaneous equations	[R]
C106.2	Fit an approximate polynomial to the given data using numerical methods	[U]
C106.3	Apply numerical methods to solve algebraic, transcendental and simultaneous equations	[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:

Numerical solution to algebraic and transcendental equations - Regula-Falsi method - Newton-Raphson method –Gauss Elimination method -Gauss Jordan method –Gauss Jacobi method - Gauss Seidel method – Inverse of a matrix by Gauss Jordan method –Eigen value of a matrix by power method-**Interpolation** -Interpolation with equal intervals –Newton's Forward and Backward difference formula - Central difference formulae - Gauss forward and backward formula-Interpolation with unequal intervals –Newton's Divided difference formula – Lagrange's interpolation formula**- 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- **Statistical Quality Control-** Quality control charts -quality variations-Variables and attributes-basics of control charts-warning limits – control charts for variables - $\overline{X} - R$ chart- control charts for attributes -np chart-p chart and c chart

Total Hours: 60

Text Books:

1	Grewal B.S., Numerical methods in Engineering and Science. 10th edition, Khanna Publishers, 2014.
2	Kandasamy.P,Thilagavathy,K,P.Gunavathy,"Numerical Methods",3rd edition , Chand and company Pvt.Ltd.,2013.
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

Tentative Assessment Methods & Levels (based on Bloom'sTaxonomy)

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C106.1	Remember	Class Quiz	2
C106.2	Understand	Group Presentation	4
C106.3 C106.4	Apply	Group Activity	7
C106.5& C106.6	Apply	Group Assignment	7

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	30	30	30	30
Apply	50	50	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CE307	THEORY OF STRUCTURES	3/1/0/3

Nature of Course	Concepts and Analytical
Pre requisites	17ME201 - Engineering Mechanics, 17CE202 - Solid Mechanics.

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.
	To determine two dimensional principal stresses and stresses in thick cylinders

Course Outcomes:

Upon completion of the course, students shall have ability to

C307.1	Remember the basic concepts of energy principles	[R]
C307.2	Understand the concepts of normal and shear stress in thick and compound Cylinder and behaviour of columns with different end conditions.	[U]
C307.3	Compute principal stresses and strains.	[AP]
C307.4	Analyse beams, frames and trusses by strain energy method	[AN]
C307.5	Analyse continuous beams using theorem of three moments	[AN]
C307.6	Analyse various types of failures.	[AN]

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:	**45**

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	Egor 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

Tentative 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	Announced Test	**2**
C307.3	Apply	Tutorial	**3**
C307.4	Analyse	Group Assignment	**4**
C307.5	Analyse	Surprise Test	**5**
C307.6	Analyse	Technical Presentation	**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	10	10	10	10
Understand	30	20	20	20
Apply	25	25	30	30
Analyse	35	45	40	40
Evaluate	-	-	-	-
Create	-	-	-	-

17CE308	ENGINEERING SURVEY - II	3/0/0/3

Nature of Course	Theory and Application
Pre requisites	17CE303 - Engineering Survey - 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 advanced Surveying Instruments like EDM, Total Station and GPS To study the co-ordinate measurements by GPS and traversing by Total station.

Course Outcomes:

Upon completion of the course, students shall have ability to

C308.1	Remember the basic concepts of surveying	[R]
C308.2	Understand the measurement of distance and heights of objects using Tacheometric principle.	[U]
C308.3	Understand the advantages of electronic surveying over conventional surveying Methods, working principles of various Modern Surveying Equipment, its Components, and signal structure and error sources.	[U]
C308.4	Apply the concepts of Setting out of curves.	[AP]
C308.5	Use various methods for control surveying and Trigonometric Levelling.	[AP]
C308.6	Use various methods for survey adjustments and hydro graphic survey.	[AP]

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", Vol. I and II, Standard Publishers Distributors, New Delhi 2015.
2	Punmia B.C., "Surveying", Vol. 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," Beekman Publishers, 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

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C308.1 C308.2 C308.3	Remember & Understand	Outside Class Hours Technical Report I	**10**
C308.4 C308.6 C308.5	Apply	Outside Class Hours Technical Report II	**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	20	-		20
Understand	80	50	40	20
Apply	-	50	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CE309	SOIL MECHANICS	3/1/0/3

Nature of Course	Concepts and 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:

Upon completion of the course, students shall have ability to

C309.1	Remember the phase system in soil	[R]
C309.2	Understand the concepts of shear strength, behaviour and performance of soil under the influence of water.	[U]
C309.3	Understand the concepts, principles of compaction and consolidation and different failure modes of slopes and different methods of slope stability analysis.	[U]
C309.4	Perform field and lab tests wherever and whenever it is required.	[AP]
C309.5	Analyse stresses developed in soil under various load conditions.	[AN]
C309.6	Evaluate various properties of soil.	[E]

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: 45

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/

Tentative 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 C309.2 C309.3	Remember Understand	Outside Class Hours Technical Report I	**10**
C309.4 C309.6 C309.5	Apply,Analyse & Evaluate	Outside Class Hours Technical Report II	**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	20	20	10	10
Understand	80	30	20	20
Apply	-	30	35	35
Analyse	-	10	25	25
Evaluate	-	10	10	10
Create	-	-	-	-

17CE310	HYDRAULICS AND HYDRAULIC MACHINERY	3/0/3/4

Nature of Course	Theory, Analytical and Practical Application
Pre requisites	17CE203 Fluid Mechanics

Course Objectives:

1	To remember the concept of open channel flow characteristics.
2	To understand the concept of hydraulic jumps and surges.
3	To study the concepts of hydraulic machines viz. flow through turbines and pumps 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 and turbines	[U]
C310.5	Apply the properties of varied flow.	[AP]
C310.6	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	Determination of discharge through an Orifice	[E]
2	Determination of discharge through Notches	[E]
3	Determination of coefficient of discharge through Venturimeter	[E]
4	Determination of coefficient of discharge through Orifice Meter	[E]
5	Determination of Impact of Jet on Flat Plate	[E]
6	Determination of Friction and Minor losses	[E]
7	Evaluation of performance characteristics of Centrifugal pump	[E]

8	Evaluation of performance characteristics of Submersible Pump	[E]
9	Evaluation of performance characteristics of Reciprocating Pump	[E]
10	Determination of Efficiency of Pelton Wheel Turbine	[E]
11	Determination of Efficiency of Francis Turbine	[E]
12	Determination of Efficiency of Kaplan Turbine	[E]
	Total Hours:	60

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	30	30
Analyse	-	-	-	-	-
Evaluate	-	30	40	40	40
Create	-	-	-	-	-

17CE311	SOIL MECHANICS LABORATORY	0/0/3/2

Nature of Course	Practical application
Co requisites	17CE309 Soil Mechanics

Course Objectives:

1	To learn the methods of determining various physical properties of soil.
2	To learn the methods of determining various mechanical properties of soil.

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

C311.1	Remember the Classifications of the soil according to standards.	[R]
C311.2	Understand the index properties of soil	[U]
C311.3	Determine the engineering properties of soil	[AP]
C311.4	Determine the permeability and seepage of the soil.	[AP]

Course Contents:

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

17CE312	ENGINEERING SURVEY LABORATORY	0/0/3/2
Nature of Course	Practical application	
Pre requisites	17CE303 - ENGINEERING SURVEY– I	

Course Objectives:

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

Course Outcomes:

C312.1	Study the fundamentals of different method of surveying	[R]
C312.2	Locate the field position on the plan or vice versa and the elevation of a given point with respect to a given datum	[U] [AP]
C312.3	Measure distance and area by various surveying equipment	[AP]
C312.4	Measure elevations, differences in elevation and plot contour maps	[AP]
C312.5	Set out simple and transition curve by linear and angular methods	[AP]
C312.6	Measure the height of an object by measuring the angles by modern Surveying	

Course Contents :

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

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

Assessment Method & 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	-	-

17CE601	MINI PROJECT-I	0/0/0/1

Nature of Course	Practical
Pre requisites	NIL

Course Objectives:

1	To estimate the ability of the student in transforming the theoretical knowledge studied so far into application software.
2	For enabling the students to gain experience in organization and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year
3	To understand and gain the knowledge of software engineering practices, so as to participate and manage large software engineering projects in future

Course Outcomes:

Upon completion of the course, students shall have ability to

C601.1	Define a compelling and viable problem as project topic.	[U]
C601.2	Develop skill to create practical solutions to identified problem.	[AP]
C601.3	Ability to use software model and other artifacts appropriate for problem	[AN]
C601.4	Identify and master tools required for the project	[AP]
C601.5	To plan and work systematically towards completion of a project work	[E], [C]
C601.6	To develop the ability to explain and defend their work in front of an evaluation panel	[AP]
	Total Hours:	**15**

Syllabus

In this practical course, each group consisting of two/three members (four in special cases) is expected to design and develop practical solutions to real life problems related to industry, institutions and Civil Engineering research. Software usage should be followed during the development. The theoretical knowledge, principles and practices gained from various subjects should be applied to develop effective solutions to various computing problems. The knowledge gained during various practical subjects to work with various Designing tools should be utilized in various stages of development. Modeling Techniques, Design and Testing strategies should be documented properly.

A committee consisting of Head of the department, the Supervisor of the mini project and two senior faculty members of the department will perform the internal assessment of the mini project. A report on mini project should be submitted for evaluation and project work should be presented and demonstrated before the panel of examiners .

Assessment Method & Levels (based on Blooms'Taxonomy)

Summative assessment based on Continuous and Viva Voce Examination

Bloom's Level	Continuous Assessment [40 marks]			Project Book [20 marks]	Viva Voce Examination [40 marks]
	Review –I [10 marks]	Review –II [10 marks]	Review –III [20 marks]		
Remember	-	-	-	-	-
Understand	-	-	-	-	-
Apply	80	20	10	10	10
Analyse	20	20	20	20	20
Evaluate	-	40	20	20	20
Create	-	20	50	50	50

SEMESTER V

17CE313	STRUCTURAL ANALYSIS CLASSICAL METHODS	3/1/0/4

Nature of Course	Concepts and Analytical
Pre requisites	17CE202 Solid Mechanics , 17CE307 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:

Upon completion of the course, students shall have ability to

C313.1	Classify the types of arches with its settlement and temperature effects.	[R,U]
C313.2	Explain the concept of moving loads for statically determinate and indeterminate structures	[U,AP]
C313.3	Analyse continuous beams and frames by slope deflection method.	[AP,AN]
C313.4	Analyse continuous beams and frames by moment deflection method	[AP,AN]
C313.5	Analyse the two hinged,three hinged, circular and parabolic arches.	[AN]
C313.6	Analyse the statically indeterminate beams and frames..	[AN]

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

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C313.1	Analyse	Test	**3**
C313.2	Analyse	Tutorial	**3**
C313.3	Understand	Quiz	**3**
C313.4	Analyse	Group Assignment	**4**
C313.5	Analyse	Group Assignment	**4**
C313.6	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	-	-	-	-
Understand	-	20	20	20
Apply	40	40	20	30
Analyse	60	40	60	50
Evaluate	-	-	-	-
Create	-	-	-	-

17CE314	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

C314.1	Understand the basic fundamentals , theory on project planning in construction projects and concepts of scheduling procedures and technique	[U]
C314.2	Apply the mathematical skills to solve the construction problems	[AP]
C314.3	Analyze the optimal use of resources using MS project software	[AN]
C314.4	Analyse the skill on resource management, quality management and cost management with respect to the project schedule	(AN)

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 pathscheduling–Activity float and schedules–Presenting project schedules–Critical path scheduling forActivity–on–node and with leads, lags and windows– Resource oriented scheduling–Scheduling withresource constraints and precedences –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 – Financialaccounting systems and cost accounts–Control of project cash flows–Schedule control–Schedule andbudget 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	Seetharaman S, "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 Resources:	
1	http://www.nptel.ac.in/courses/105107122/home.htm

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
CE314.1	Understand	Quiz	5
CE314.2	Apply	Tutorial	5
CE314.3	Apply	Group Assignment	5
CE314.4	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	-	-	-	-

17CE315	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:
Upon completion of the course, students shall have ability to

C315.1	Understand the type of unit operations and processes involved in water and wastewater treatment plants	[R]
C315.2	Demonstrate an ability to choose the appropriate unit operations and processes required for satisfactory treatment of water and wastewater	[U]
C315.3	Design individual unit operation or processes	[E]
C315.4	Prepare the layout of water and wastewater treatment plants	[U]

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	PeavyH.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/

Tentative 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	Remember	Outside Class Hours Technical Report I	**10**
C315.2	Understand		
C315.3	Evaluate	Outside Class Hours Technical Report I	**10**
C315.4	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	-	-	-	-

17CE316	DESIGN OF STEEL STRUCTURES	4/0/0/4
Nature of Course	Analysis and Design	
Pre requisites	17ME201 - Engineering Mechanics, 17CE202–Solid Mechanics	
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**		
C316.1	Explain the force transferring mechanism, design and detail the connections as bolted and welded connections.	[AP]
C316.2	Design and detail of steel tension members.	[AP]
C316.3	Design and detail of steel compression members.	[AP]
C316.4	Design and detail of steel flexure members.	[AP]
C316.5	Classify the structural steel connections in industrial building	[AP]
C316.6	Design and detail column base.	[C]
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.		
		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	BhavikattiS.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
C316.1	Apply	Outside Class Hours Technical Report I	**10**
C316.2			
C316.3			
C316.4	Apply & Create	Outside Class Hours Technical Report I	**10**
C316.5			
C316.6			

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

17CE317	FOUNDATION ENGINEERING	3/1/0/3

Nature of Course	Theory and analytical
Pre requisites	17CE309 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:

Upon completion of the course, students shall have ability to

C317.1	Carry out soil investigation for civil engineering construction.	[AP]
C317.2	Estimate bearing capacity of soil and select a suitable foundation.	[E]
C317.3	Design a suitable shallow or deep foundation.	[C]
C317.4	Estimate the load carrying capacity of pile and pile group and pressure distribution behind retaining walls	[AN]

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	GopalRanjan 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	Gulhati SK &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/

Tentative 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	Apply	Quiz	**5**
C317.2	Evaluate	Test	**5**
C317.3	Create	Assignment	**5**
C317.4	Analyse	Quiz	**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	10
Analyse		75	30	20
Evaluate	20	-	30	30
Create	-	25	15	40

17CE318	HIGHWAY ENGINEERING	3/0/3/4

Nature of Course	Theory, Concept and Practical Application
Pre requisites	Nil

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:

Upon completion of the course, students shall have ability to

C318.1 Know the various cross sectional elements and alignment of highways. [R,U]
C318.2 Understand various methods of highway planning, road construction and highway financing. [U]
C318.3 Understand the properties and to select appropriate material for highway design. [U]
C318.4 Design various geometric elements of highways. [AP]
C318.5 Design of flexible and rigid pavement [AP]
C318.6 Evaluation pavement condition and to decide appropriate maintenance activity. [E]

Course Contents:

Highway Planning & Financing: Importance of Highway Transportation – Classification of Highways – Scope, advantage and important highway plans - Highway alignment and Engineering surveys for location – Highway financings – calculation of Annual cost – Economic analysis – methods.**Geometric Design of Roads:** Highway Cross Sectional Elements -Design of Horizontal Alignments – Super Elevation, widening of Pavements on Horizontal Curves – Transition Curves, Gradients, Summit and Valley Curves, Sight Distances – SSD, OSD, ISD,HSD – Highway drainage. **Design Of Rigid And Flexible Pavements:** 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- Joints.[IRC Recommendations – Problems]- MORTH Specifications.**Highway Materials:** Desirable Properties and Testing of Highway Materials: - Soil tests–Tests on Aggregate –Tests on Bitumen. **Highway Construction and Maintenance:** Construction practice- WBM road – Bituminous road – Cement Concrete road- Types of defects in Flexible Pavements –Failures in Rigid Pavement - Pavements Evaluation – Pavements Surface Conditions – Functional and Structural Evaluation - Evaluation of Pavements Failure and Strengthening – Overlay design by Benkleman Beam Method [Procedure only].

Lab Component

1. Determination of Specific gravity of Coarse and Fine Aggregates	E
2. Determination of Water absorption of coarse and fine Aggregates	E
3. Determination of Flakiness and Elongation Index of coarse aggregates	E
4. Evaluation of Crushing strength of coarse Aggregates	AN

5. Evaluation of Impact strength of coarse Aggregates	AN
6. Evaluation of Abrasion resistance of coarse Aggregates	AN
7. Determination of California Bearing Ratio of Soil	E
8. Evaluation of Penetration value of Bitumen	E
9. Determination of Ductility of Bitumen	E
10. Evaluation of Viscosity of Bitumen	E
Total Hours:	**60**

Text Books:

1. Kadiyali L R, Principles and Practices of Highway Engineering, Khanna Technical Publications, Delhi, 2012.
2. Khanna S.K and Justo C E G, Highway Engineering, Nem Chand & Bros, Roorkee,2014.

Reference Books:

1. Sharma S.K, "Principles Practices& Design of Highway Engineering" S.Chand& Co, 2011.
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

Web References:

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

Online Resources:

1.	http://web.mit.edu/emech/dontindex-build/

Assessment Methods & Levels (based on Blooms'Taxonomy)

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

17CE319	ENVIRONMENTAL ENGINEERING LABORATORY	0/0/3/2

Nature of Course	Practical application
Pre requisites	17CH105 Chemistry 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.
4. To study the settling characteristics of air pollutants

Course Outcomes

C319.1	Understand the methods of sampling and preservation of water and waste water	[U]
C319.2	Analyze the physical and chemical characteristics of water and waste water	[AN]
C319.3	Predict the bacteriological characteristics of water and waste water	[AP]
C319.4	Interpret the settling characteristics of sir pollutants	[AP]

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 Method & 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	-	-

17CE802	INTERNSHIP/INPLANT TRAINING	0/0/0/1
Nature of Course	Practical	
Pre requisites	NIL	
Course Objectives:		
1	To train the students in the field work so as to have a firsthand knowledge of practical problems related to Civil Engineering and Construction Management in carrying out engineering tasks.	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C802.1 C802.2 C802.3 C802.4	Identify a specific problem for the current need of the society Collect information related to the same through detailed review of literature Develop the methodology to solve the identified problem Develop skills in facing and solving the problems experienced in the field.	[U] [AN] [E] [AP]
	Total Hours:	**15**

Syllabus

The students individually undertake training in reputed engineering companies doing construction during the summer vacation for a specified duration of four weeks. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.

Assessment Method & Levels (based on Blooms'Taxonomy)

Summative assessment based on Report and Viva Voce Examination

Bloom's Level	Training Report [40 marks]	Viva Voce Examination [60 marks]
Remember	-	-
Understand	10	10
Apply	20	20
Analyse	40	40
Evaluate	30	30
Create	-	-

SEMESTER VI

17CE320	STRUCTURAL ANALYSIS : MODERN METHODS	4/0/0/4
Nature of Course	Concepts and Analytical	
Pre requisites	17CE313 Structural Analysis - Classical methods	
Course Objectives:		
1	To understand the behavior of indeterminate structures	
2	To know the concepts of elastic analysis and plastic analysis	
3	To understand the concepts of matrix analysis of Beams, Frames and Trusses by Flexibility Matrix method	
4	To understand the concepts of matrix analysis of Beams, Frames and Trusses by Stiffness Matrix method	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C320.1	Identify the method of analysis for indeterminate structures	[A]
C320.2	Know the importance of the shape factor and its importance	[AP]
C320.3	Distinguish determinate and indeterminate structures	[A]
C320.4	Perform matrix methods of analysis	[A]
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:** Suspension cables – Cables with two and three hinged stiffening girders **-** Analysis of space trusses using method of Tension coefficients. **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	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	Pandit GS & 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/	

Tentative Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C320.1	Analyse	Tutorial	**6**
C320.2	Apply	Quiz	**5**
C320.3	Analyse	Surprise test	**4**
C320.4	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	-	-	-	-

16CE321	DESIGN OF RC ELEMENTS	4/0/0/4

Nature of Course: Analysis and Design

Pre Requisites:16CE313 – Structural Analysis – Classical Methods

Course Objectives:

1. To understand the various design concepts in RCC
2. To analyze and design various structural elements

Course Outcomes

Upon completion of the course, students shall have ability to

C321.1 –To study the various properties of Materials	[R]
C321.2- To Analyse and Design of Slab and Beam	[U,AP]
C321.3- To Analyse and Design of Beam	[U,AP]
C321.4- To study the Design for Bond, Anchorage,Shear&Torsion	[U,AP]
C321.5-To understand the Design of Columns and Stair Cases	[U,AP]
C321.6-To know the Design of Footing and Detailing	[AP]

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

REINFORCEDCONCRETEMATERIALS

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:** analysisand 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:** designof 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. Sinha, S.N. Reinforced Concrete Design – Tata McGraw Hill Publishing Company Ltd. 2008.
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.Punmia .B.C, Ashok kumarjain and Arunkumarjain “Reinforced Concrete Structure”, Laxmi publications New Delhi, 2000.
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/

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C321.1	Remember & Understand	Outside Class Hours Technical Report I	**10**
C321.2			
C321.3			
C321.4	Apply	Outside Class Hours Technical Report II	**10**
C321.5			
C321.6			

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	-	-	-	-

16CE322	Estimation and Quantity Surveying	3/0/3/4

Nature of Course: Theory , Analytical and Practical Application

Pre Requisites: 16CE306– 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:

Upon completion of the course, students shall have ability to

C322.1	Understand the fundamentals of specification.	(U)
C322.2	Know about the basic concepts behind estimation.	(R)
C322.3	Estimate material quantities for simple structure like foundation steps and boundary walls.	(AP)
C322.4	Provide hands on experience on estimation of buildings.	(AP)
C322.5	Provide hands on experience on estimation of other structures.	(AP)
C322.6	Provide exposure to rate analysis and value estimates	(AP)

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. Patil B.S, 'Civil Engineering Contracts and Estimates', University Press, 2013.
5. Banerjee D.N, 'Principles and Practices of Valuation', V Edition, Estern Law House, 2015.
6. Seetharaman S, '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 Method & 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	-	-	-	-	-

17CE323	STRUCTURAL ANALYSIS DESIGN AND DETAILING LABORATORY	1/0/3/2

Nature of Course	Analysis and Design
Pre-requisites	17CE321 Design of RC elements, 17CE317Design of Steel Structures

Course Objectives:

1. To analyse and design Reinforced concrete frames under different loading conditions using analysing software and spreadsheets.
2. To analyse and design a roof truss and a workshop shed under different loadings conditions

Course Outcomes:

C326.1	Analysis and Design of 2-D RC frame using an analysis software for various loadconditions	[U,AN]
C326.2	Analysis and Design of 3-D RC frame using an analysis software for Various load conditions	[U,AN]
C326.3	Analysis and Design of Steel roof truss	[U,AN]
C326.4	Analysis and Design of Workshop shed	[U,AN]

Course Contents

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

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, "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:
http:// nptel.ac.in/courses/105105105/

Online Resources:

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

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

Summative assessment based on Continuous and End Semester Examination

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

17CE602	MINI PROJECT-II	0/0/0/1

Nature of Course	Practical
Pre requisites	NIL

Course Objectives:

1	To estimate the ability of the student in transforming the theoretical knowledge studied so far into application software.
2	For enabling the students to gain experience in organization and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year
3	To understand and gain the knowledge of software engineering practices, so as to participate and manage large software engineering projects in future

Course Outcomes:

Upon completion of the course, students shall have ability to

C602.1	Define a compelling and viable problem as project topic.	[U]
C602.2	Develop skill to create practical solutions to identified problem.	[AP]
C602.3	Ability to use software model and other artifacts appropriate for	[AN]
C602.4	problem Identify and master tools required for the project	[AP]
C602.5	To plan and work systematically towards completion of a project work	[E], [C]
C602.6	To develop the ability to explain and defend their work in front of an evaluation panel	[AP]
	Total Hours:	**15**

Syllabus

In this practical course, each group consisting of two/three members (four in special cases) is expected to design and develop practical solutions to real life problems related to industry, institutions and Civil Engineering research. Software usage should be followed during the development. The theoretical knowledge, principles and practices gained from various subjects should be applied to develop effective solutions to various computing problems. The knowledge gained during various practical subjects to work with various Designing tools should be utilized in various stages of development. Modeling Techniques, Design and Testing strategies should be documented properly.

A committee consisting of Head of the department, the Supervisor of the mini project and two senior faculty members of the department will perform the internal assessment of the mini project. A report on mini project should be submitted for evaluation and project work should be presented and demonstrated before the panel of examiners .

Assessment Method & Levels (based on Blooms'Taxonomy)

Summative assessment based on Continuous and Viva Voce Examination

Bloom's Level	Continuous Assessment [40 marks]			Project Book [20 marks]	Viva Voce Examination [40 marks]
	Review –I [10 marks]	Review –II [10 marks]	Review –III [20 marks]		
Remember	-	-	-	-	-
Understand	-	-	-	-	-
Apply	80	20	10	10	10
Analyse	20	20	20	20	20
Evaluate	-	40	20	20	20
Create	-	20	50	50	50

17CE802	INTERNSHIP / INPLANT TRAINING	0/0/0/1

Nature of Course	Practical
Pre requisites	NIL

Course Objectives:

1	To train the students in the field work so as to have a firsthand knowledge of practical problems related to Civil Engineering and Construction Management in carrying out engineering tasks.

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

C802.1	Identify a specific problem for the current need of the society	[U]
C802.2	Collect information related to the same through detailed review of literature	[AN]
C802.3	Develop the methodology to solve the identified problem	[E]
C802.4	Develop skills in facing and solving the problems experienced in the field.	[AP]
	Total Hours:	**15**

Syllabus

The students individually undertake training in reputed engineering companies doing construction during the summer vacation for a specified duration of four weeks. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.

Assessment Method & Levels (based on Blooms'Taxonomy)

Summative assessment based on Report and Viva Voce Examination

Bloom's Level	Training Report [40 marks]	Viva Voce Examination [60 marks]
Remember	-	-
Understand	10	10
Apply	20	20
Analyse	40	40
Evaluate	30	30
Create	-	-

SEMESTER VII

17CE324	BUILDING SERVICES	3/1/0/3

Nature of Course	Theory and 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 understand the principles of Illumination and Design
4	To study the air conditioning and safety measures for the building

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

C324.1	Understand the plan for essential services for the building	[U]
C324.2	Choose the appropriate equipment for buildings	[AN]
C324.3	Implement wiring systems & Prepare the plan for electrical wiring for buildings	[AP]
C324.4	Plan for Lighting facilities for the building	[R]
C324.5	Choose suitable air conditioning system for buildings	[AN]
C324.6	Understand fire safety for various types of buildings	[U]

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:	**45**

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

Tentative 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	Understand	Assignment	**3**
C324.2	Analyse	Technical Quiz	**4**
C324.3	Apply	Assignment	**3**
C324.4	Remember	Technical Presentation	**4**
C324.5	Analyse	Case study	**4**
C324.6	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	-	-	-	-

17CE325	DESIGN AND DETAILING OF R.C STRUCTURES	3/0/3/4

Nature of Course: Analysis and Design

Pre Requisites: 17CE321– 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:

	Upon completion of the course, students shall have ability to	
C325.1	To understand the basic principles of Retaining walls, Concrete Walls &Tanks	(U)
C325.2	To understand the basic theory behind Yield Line Theory.	(U)
C325.3	To understand the basic principles of Bridge and Flat Slab.	(U)
C325.4	To have a comprehensive design knowledge in Retaining Walls and Reinforced Concrete Walls	(AN)
C325.5	To have a comprehensive design knowledge in Water Retaining Structures, Staging and foundations of elevated water tanks and domes.	(AN)
C325.6	To understand and design of solid slab bridge and for IRC loadings and Flat Slab	(AN)

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 [C,AP]
2. Design and Detailing of Counterfort Retaining Wall [C,AP]
3. Design and Detailing of Dome [C,AP]
4. Design and Detailing of Under Ground Water Tank [C,AP]
5. Design and Detailing of Elevated Circular Water tank [C,AP]
6. Design and Detailing of Hexagonal Slab [C,AP]
7. Design and Detailing of Circular Slab [C,AP]
8. Design and Detailing of Triangular Slab [C,AP]
9. Design and Detailing of Flat Slab [C,AP]

10. Design and Detailing of Solid Slab Bridge [C,AP]

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 Method & 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
Apply	-	-	-	20	-
Analyse	80	80	80	-	80
Evaluate	-	-	-	-	-
Create	-	-	-	80	-

17CE603	DESIGN COMPREHENSION PROJECT	0/0/8/4

Nature of Course	Practical
Pre requisites	NIL

Course Objectives:

1	To provide students an opportunity to exercise their creative and innovative qualities in a group project environment.
2	To excite the imagination of aspiring engineers, innovators and technopreneurs
3	To impart and improve the design capability of the student.
4	To improve the skill of designing various problems related to Civil Engineering

Course Outcomes:

Upon completion of the course, students shall have ability to

C603.1	Communicate effectively and professionally in engineering workplace and compile design concepts in projects.	[AP]
C603.2	Hypothesize professional and ethical responsibilities of engineers through scenario study, and consider cost, quality, constructability, health and safety, sustainability, public consultation as well as responsibilities to stakeholders in the design project.	[AN]
C603.3	Design any Civil Engineering component such as an RC Structure, Waste water treatment plant, Foundation system, Traffic Intersection, etc.	[C]
C603.4	Draw detailed drawings and specifications for the components designed	[E], [AP]

Total Hours:	**60**

Course Contents:

This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

Assessment Method & Levels (based on Blooms'Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment [40 marks]			Project Book [20 marks]	End Semester Examination [40 marks]
	Review –I [10 marks]	Review –II [10 marks]	Review –III [20 marks]		
Remember	-	-	-	-	-
Understand	-	-	-	-	-
Apply	80	20	10	10	10
Analyse	20	20	20	20	20
Evaluate	-	40	20	20	20
Create	-	20	50	50	50

SEMESTER VIII

17CE604	PROJECT WORK	0/0/24/12
Nature of Course	Practical	
Course Objectives:		
1	To develop the ability to solve a specific problem right from its identification and literature review till the attainment of successful solution .	
2	To train the students in preparing project reports and to face reviews and viva voce examination.	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C604.1	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.	[AP], [AN]
C604.2	Acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.	[AP]
C604.3	Acquire collaborative skills through working in a team to achieve common goals	[AP]
C604.4	Formulate proper methodology for solving problems concerned with Civil Engineering	[C],[E]
	Total Hours:	**180**

Course Contents

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.

Assessment Method & Levels (based on Blooms'Taxonomy)

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment [40 marks]			Project Book [20 marks]	End Semester Examination [60 marks]
	Review –I [10 marks]	Review –II [10 marks]	Review –III [20 marks]		
Remember	-	-	-	-	-
Understand	-	-	-	-	-
Apply	80	20	10	10	10
Analyse	20	20	20	20	20
Evaluate	-	40	20	20	20
Create	-	20	50	50	50

ELECTIVE STREAM I STRUCTURAL ENGINEERING

17CE401	MAINTENANCE AND REHABILITATION OF STRUCTURES	3/0/0/3

Nature of Course: Concepts and Theory

Pre Requisites: 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

	At the end of the course the student should be able to	
C401.1	To remember different repair and maintenance strategies.	[R]
C401.2	To understand the concept of serviceability and durability of concrete	[U]
C401.3	To Know About The Special Materials For Repair	[U]
C401.4	To Understand Retrofitting Methods Of Structures	[U]
C401.5	To Apply Different Techniques For Repair And Demolition	[AP]

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. Denison Campbel, Allen and Harold roper " Concrete structures, materials, maintenance and repair ", Longman Scientific and Technical UK ,2000.
2. Allen RT and Edwards SC, " Repair of Concrete structures", Blakie and sons, UK, 2004.

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. Lakshmipathy N, Senthil.MR, 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
3. nptel.ac.in/courses/114106035/27

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C401.1	Remember	Quiz	**3**
C401.2	Understand	Surprise Test	**3**
C401.3	Understand	Group Assignment	**4**
C401.4	Understand	Technical Presentation	**5**
C401.5	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	-	-	-	-

17CE402	GREEN BUILDING TECHNOLOGY	3/0/0/3
Nature of Course	Concepts and Theory	
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: **Upon completion of the course, students shall have ability to**		
C402.1	Understand various components which makes the building energy efficient such as lighting, space conditioning, heat control and energy efficient.	[R]
C402.2	Understand various Green building systems, criteria for selection materials and their applications	[U]
C402.3	Understand green building implementation measures	[U]
C402.4	Understand the various green building rating systems along with its implementation for conventional buildings	[U]
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/

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C402.1	Remember	Quiz	**5**
C402.2	Understand	Group Assignment	**5**
C402.2	Understand	Test	**5**
C402.2	Understand	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	20	40	30	20
Understand	80	60	70	80
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CE403	PREFABRICATED STRUCTURES	3/0/0/3

Nature of Course: Concepts and Theory

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

Upon completion of the course, students shall have ability to

C403.1	Know the need for prefabrication & its principles.	[R]
C403.2	Behaviour of Prefabricated Components	[U]
C403.3	Design Principles of Prefabricated Members	[AP]
C403.4	Joints for different structural connections	[AP]
C403.5	Designing and detailing of precast unit for factory structures	[AP]

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:

4. civildigital.com/prefabricated-structures-prefabrication-concept-components-advantage
5. www.metcolleges.ac.in/Notes/CIVIL/FinalYear/CE2045/CE2045.docx
6. www.annauniverzity.com Civil Engineering

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C403.1	Remember	Quiz	**3**
C403.2	Understand	Assignment	**2**
C403.3	Understand	Surprise Test	**2**
C403.4	Understand	Group Assignment	**3**
C403.5	Apply	Technical Presentation	**5**
C403.6	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	-	-	-	-

17CE404	EARTHQUAKE RESISTANT STRUCTURES	3/0/0/3

Nature of Course: Concepts, Analysis and Design

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

C404.1	Remember the Concept of static and dynamic forces	[R]
C404.2	Remember the various types of damping forces on system	[R]
C404.3	Understand the concept of degree of freedom system.	[U]
C404.4	Learn the various natural and artificial sources of	[U]
C404.5	Apply the concept of Liquefaction for earthquake resistant	[AP]
C404.6	Apply the various ductility concepts into RC Structures	[AP]
C404.7	Design and analyse earthquake resistant structures as per	[AN]
C404.8	Analyse the structures provided with vibration control	[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
C404.1	Remember	Quiz	2
C404.2	Remember	Quiz	2
C404.3	Understand	Technical Presentation	2
C404.4	Understand	Power Point Presentation	2
C404.5	Apply	Surprise Test	2
C404.6	Apply	Surprise Test	2
C404.7	Analyse	Group Assignment	4
C404.8	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	-	-	-	-

17CE405	PRESTRESSED CONCRETE STRUCTURES	3/0/0/3
Nature of Course	Analysis and design	
Pre requisites	17CE325 Design and detailing of R C Structures	
Course Objectives:		
1	To understand the principle of prestressing and design of prestressed elements.	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C405.1	Understand the different methods of prestressing.	[R]
C405.2	Estimate the effective prestress including the short and long term losses.	[U]
C405.3	Analyze and design prestressed concrete beams under flexure and shear.	[A]
C405.4	Understand the methods of achieving continuity in prestressed concrete	[A]
C405.5	Analyze and design circular prestressed concrete structures	[A]
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 -codalrequirements**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 castin-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. **CircularPrestressing:** 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/	

Tentative Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C405.1	Remember	Quiz	**3**
C405.2	Understand	Class Presentation	**3**
C405.3	Analyse	Assigning Case studies	**4**
C405.4	Analyse	Assignment	**5**
C405.5	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	-	-	-	-

17CE406	PRE ENGINEERED INDUSTRIAL STRUCTURES	3/0/0/3

Nature of Course	Analysis and Design
Pre requisites	17CE321 Design of RC Elements

Course Objectives:

1	To understand the functional planning of Pre-engineered industrial structures.
2	To design differentcomponents of industrial structures.
3	To evaluate the performance of the Pre- engineeredbuildings.

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

C406.1	Understand the classification of the industries and site layout of industries	[U]
C406.2	Analyse the industrial buildings.	[AN]
C406.3	Analysethe gantry columns along with the connections.	[AN]
C406.4	Analyse the transmission line towers.	[AN]
C406.5	Understand the concepts of cold formed sections	[U]

Course Contents:

Introduction: Classification of Industries and Industrial structures – Pre Engineered Structures- Sitelayout.**Analysis of industrial buildings:** Analysis of industrial building for Gravity and Wind load. Analysis and design ofgableframes**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 elementsof 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
C406.1	Remember	Quiz	**4**
C406.2	Analyse	Tutorial	**4**

C406.3	Understand	Assignment	**2**
C406.4	Understand	Class Presentation	**5**
C406.5	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	-	-	-	-

17CE407	FINITE ELEMENT TECHNIQUES	3/1/0/3
Nature of Course	Concepts and analytical	
Pre requisites	17CE 202- Engineering Mechanics, 17ES207 – Solid Mechanics	
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**		
C407.1	Remember the concept of finite element	[R]
C407.2	Understand the concept of shape function	[U]
C407.3	Apply the numerical integration technique to solve problems	[AP]
C407.4	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, et.al, " 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**
C407.1	Remember	Quiz	**5**
C407.2	Understand	Quiz	**5**
C407.3	Apply	Announced Test	**5**
C407.4	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	-	-	-	-

17CE408	TALL BUILDINGS	3/0/0/3

Nature of Course	Analysis and design
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

C408.1	Understand the materials used in Tall Building construction	[U][R]
C408.2	Evaluate the loading acting in the buildings	[AN]
C408.3	Understand the behaviour of structural systems	[U]
C408.4	Apply the concepts for design and analysis of Tall Buildings	[A]
C408.5	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. **Behaviour of Various Structural Systems:** Factors affecting growth, Height and Structural form. High rise behaviour of Various structural systems – Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall-frames, tubular structures, cores, outrigger – braced and hybrid mega systems. **Analysis and Design:** Modelling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerised 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, Torsional 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
C408.1	Understand & Remember	Assignment	**3**
C408.2	Analyse	Technical Quiz	**5**
C408.3	Understand	Assignment	**3**
C408.4	Apply	Technical Presentation	**4**
C408.5	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	-	-	-	-

17CE409	GROUND IMPROVEMENT TECHNIQUES	3/0/0/3

Nature of Course	Theory and Application
Pre requisites	17CE309 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 Insitu treatment methods in cohesion and cohesion less soils

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

C409.1	Find the geotechnical problems in different type of soils	[R]
C409.2	Understand the role of ground improvement in foundation engineering	[U]
C409.3	Apply the drainage and dewatering techniques to improve soil stability	[AP]
C409.4	Apply the In situ treatment of Cohesion less and cohesive soil	[AP]
C409.5	Understand the concept of earth reinforcement	[U]
C409.6	Apply different grouting techniques for soil stability	[AP]

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 soil-** 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 Geotextile 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 andHall, 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 Jersey,

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
C409.1	Remember, Understand, Apply	Technical Presentation, Report I	**10**
C409.2			
C409.3			
C409.4			
C409.5	Remember, Understand, Apply	Technical Presentation, Report I	**10**
C409.6			
C409.7			
C409.8			

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	10
Understand	40	40	45	45
Apply	40	60	45	45
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

17CE410	ENVIRONMENTAL IMPACT ASSESSMENT AND RISK MANAGEMENT	3/0/0/3

Nature of Course	Theory and application
Pre requisites	NIL

Course Objectives:

1	To deal with the various impacts of infrastructure projects on the components of environment
2	To acquire knowledge regarding the methods of assessing the impact
3	To know about the various impacts of development projects on environment and the mitigating measures

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

C410.1	Be aware of the options for estimating environmental and social impacts	[U]
C410.2	Know the format of an EIA Report (Environmental Impact Statement, Environmental Statement);	[R],[U],[AP]
C410.3	Understand the issues that affect the quality of the EIA Report	[U], [AN]
C410.4	Be aware of the purpose of developing follow-up procedures, and the options for designing these procedures	[AP]

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

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C410.1	Understand	Quiz	**6**
C410.2	Understand,Remember,Apply	Group Discussion	**6**
C410.3	Understand, Analyse	Group Assignment	**4**
C410.4	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	-	-	-	-

17CE411	RENEWABLE SOURCES OF ENERGY	3/0/0/3

Nature of Course: Concepts and Theory

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

C411.1 Understand the renewable sources of energy available . (U)

C411.2 Recognize the necessity of choosing alternate energy resources (U)

C411.3 Understand the concepts of biomass applications (U)

C411.4 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. 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
C411.1, C411.2	Remember	Quiz	3
C411.3, C411.4	Understand	Technical Presentation	4
C411.5	Understand	Surprise Test	3
C411.6	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	-	-	-	-

17CE412	INDUSTRIAL WASTEWATER MANAGEMENT	3/0/0/3

Nature of Course: Theory and Application

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:

Upon completion of the course, students shall have ability to

C412.1 Understand the characteristics and composition of industrial wastewater. (U)

C412.2 Recognize the regulations relevant to industrial effluents. (R)

C412.3 Learn the types of conventional and advanced treatment systems adopted for various industrial effluents. (U)

C412.4 Understand the concepts involved in sludge processing and disposal. (U)

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:

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

Online References:

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

Tentative 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
C412.1	Remember	Quiz	5
C412.2	Remember	Assignment	5
C412.3	Understand	Technical Presentation	5
C412.4	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	-	-	-	-

17CE413	SOLID AND HAZARDOUS WASTE MANAGEMENT	3/0/0/3

Nature of Course: Theory and Application

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:

Upon completion of the course, students shall have ability to

C413.1 Understand the properties and composition of solid wastes. (U)

C413.2 Recognize the regulations relevant to solid waste handling and disposal (R)

C413.3 Learn the various means of collection, transfer and transport system with respect to solid waste management. (U)

C413.4 Understand the concepts involved in off site processing and disposal of Municipal solid wastes. (U)

C413.5 Familiarise the concepts of hazardous waste management. (U)

C413.6 Analyse the collection systems to choose a suitable collection route. (AN)

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:

4. George Tchobanoglous, Hilary Theisen and Samuel Vigil. “Integrated Solid Waste Management”, McGraw-Hill Publishers, 1993.
5. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. “Environmental Engineering” McGraw-Hill

Publishers, 2013.
6. 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.

Web References:

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

Online References:

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

Tentative 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
C413.1, C413.2	Remember	Quiz	3
C413.3, C413.4	Understand	Technical Presentation	4
C413.5	Understand	Surprise Test	3
C413.6	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	-	-	-	-

17CE414	IRRIGATION WATER MANAGEMENT	3/0/0/3

Nature of Course	Theory and 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

C414.1	Understand the irrigation and its methods	[U]
C414.2	Understand the concepts various hydraulic structures	[U]
C414.3	Analyze various hydraulic structures	[AN]
C414.4	Understand the concepts of irrigation water management	[U]
C414.5	Apply the concepts of irrigation water management	[AP]
C414.6	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/			
Tentative Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C414.1,	Understand	Quiz	**3**
C414.2	Analyse	Technical Presentation	**3**
C414.3	Apply & Analyse	assignment	**5**
C414.4	Understand	Test	**3**
C414.5	Apply & Analyse	Test / Tutorials	**3**
C414.6	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	-	-	-	-

17CE415	APPLIED HYDROLOGY	3/0/0/3

Nature of Course	Theory and 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:
Upon completion of the course, students shall have ability to

C415.1:	Understand and Apply the basics of precipitation, abstraction, hydrologic cycle	[U, AP]
C415.2:	Understand and Analyze the hydrograph, types and their application	[U, AN]
C415.3:	Understand and Analyze the flood routing and its methods	[U, AN]
C415.4:	Understand and Apply the concepts of Groundwater	[U, AP]

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C415.1, C415.2, C415.3, C415.4	Understand	Quiz	**4**
C415.1, C415.4	Apply	Assignment	**5**
C415.2, C415.3	Analyse	assignment	**6**
C415.2, C415.3	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	-	-	-	-

17CE416	AIR AND WATER QUALITY MODELLING	3/0/0/3

Nature of Course: Theory and 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

C416.1 Remember the ambient air quality and water quality standards. (R)

C416.2 Understand the role of mathematical models in validating air and water quality parameters. (U)

C416.3 Understand various types of models for validating surface water quality parameters. (U)

C416.4 Understand various types of models for validating air quality parameters. (U)

C416.5 Understand various types of models for validating ground water quality parameters. (U)

C416.6 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. Boubel RW, Fundamentals of Air Pollution, Elsevier 2006

Reference Books:

1. Schnoor JL, 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

Tentative 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
C416.1	Remember	Quiz	2
C416.2	Remember	Quiz	2
C416.3	Understand	Technical Presentation	4
C416.4	Understand	Power Point Presentation	4
C416.5	Understand	Surprise Test	2
C416.6	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	-	-	-	-

17CE417	REMOTE SENSING AND GIS APPLICATIONS	3/0/0/3

Nature of Course: Theory and 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

C417.1 Understand the concepts of remote sensing	[U]
C417.2 Understand the concepts of optical and microwave sensing	[U]
C417.3 Apply the visual interpretation techniques in remote sensing image processing	[AP]
C417.4 Understand the basic concepts of GIS	[AN]
C417.5 Analyse the remote sensing images	[AN]
C417.6 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. Srinivas MG(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

Tentative 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
C417.1	Understand	QUIZ	5
C417.2	Understand	Surprise Test	5
C417.4	Apply	Assignment	5
C417.5	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	-	-	-	-

17CE418	SUBSURFACE CONTAMINANT REMEDIATION	3/0/0/3
Nature of Course	Theory and application	
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**		
C418.1	To do basic calculations for the analysis of contaminant fate in soil and groundwater	[U], [AP]
C418.2	To analyse the outcome of potential remediation technologies.	[R],[U],[AP]
C418.3	To understand the issues that affect the subsurface quality	[U], [AN]
C418.4	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	
Tentative Assessment Methods & Levels (based on Blooms'Taxonomy)		

Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C418.1	Understand	Quiz	**6**
C418.2	Understand,Remember,Apply	Design Project	**6**
C418.3	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

17CE419	RAILWAY, AIRPORT, DOCKS AND HARBOUR ENGINEERING	3/0/0/3

Nature of Course: Concepts and Theory

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

Upon completion of the course, students shall have ability to

C419.1	To study the components of railway track.	[R]
C419.2	To understand the urban transportation system.	[U]
C419.3	To plan the components of airport such as runway, taxiways, terminal building.	[U]
C419.4	To study the techniques of air traffic control.	[U]
C419.5	To plan the components of dock and harbour	[U]
C419.6	To design the geometric elements of railway track.	[AP]

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. SaxenaSubhash C and SatyapalArora, 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. Agarwal MM, 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

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C419 .1	Remember	Quiz	**3**
C419 .2	Understand	Assignment	**2**
C419 .3	Understand	Surprise Test	**2**
C419 .4	Understand	Group Assignment	**3**
C419 .5	Apply	Technical Presentation	**5**
C419 .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	-	-	-	-

17CE420	TRAFFIC ENGINEERING AND MANAGEMENT	3/0/0/3

Nature of Course: Concepts and Theory

Pre requisite : NIL

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

Upon completion of the course, students shall have ability to

C420.1 To study the various components of traffic engineering [R]
C420.2To studythe various traffic facilitiesfor road users.[R]
C420.3To understand the need of different traffic studies and their purposes.[U]
C420.4 To understand the traffic regulation by means of signs, markings and signal. [U]
C420.5 To understand the relationship between speed, flow and density. [U]
C420.6 To study the design and functions of at grade and grade separted intersections. [AP]

Course Contents with Course Outcomes/Blooms Taxonomy/Assessment Methods

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. Sharma SK (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. Salter RJ and Hounsel NB, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.
2. JotinKhisty C and Kent Lall B, 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

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C420.1	Remember	Quiz	3
C420.2	Understand	Assignment	2
C420.3	Understand	Surprise Test	2
C420.4	Understand	Assignment	3
C420.5	Understand	Technical Presentation	5
C420.6	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	-	-	-	-

17CE421	URBAN AND TOWN PLANNING	3/0/0/3

Nature of Course	Concepts and Theory
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:
Upon completion of the course, students shall have ability to

C421.1	To remember National policies and Strategies on Urban Development.	[R]
C421.2	To remember contents of Master plan , Detailed development plan and DCR planning.	[R]
C421.3	To understand Industrial ,financial and legal constraints of plan implementation.	[U]
C421.4	To understand different principles and methods of sustainable transportation.	[U]
C421.5	To assess its implications on Environment and resources and to know economic benefits of sustainable transportation.	[AN]
C421.6	To correlate urban development and sustainability principles and to find a balance between these two.	[AN]
C421.7	To understand Involvement of Public ,Private NGO ,CBO and beneficiaries in Urban development.	[U]

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

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C421.1	Remember	Quiz	**2**
C421.2	Remember	Test	**2**
C421.3	Understand	Writing Skills	**3**
C421.4	Understand	Class Presentation	**2**
C421.5	Analyse	Group Discussion	**3**
C421.6	Analyse	Group Assignment	**3**
C421.7	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	-	-	-	-

17CE422	CONSTRUCTION SAFETY MANAGEMENT	3/0/0/3

Nature of Course: Concepts and Theory

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

C422.1	understand the concepts of construction safety management	(U)
C422.2	Understand various construction accidents ,its causes and preventive measures	(U)
C422.3	Understand Safety in construction contracts and different Contractual Obligations	(U)
C422.4	understand different safety systems	(U)
C422.5	Understand the concept of Risk assessment and control.	(U)
C422.6	Apply the safety consideration in handling various equipments	(AP)

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:

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

Tentative 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
C422.1	Understand	Seminar	4
C422.2	Understand	Seminar	4
C422.3	Understand	Surprise Test	2
C422.4	Understand	Surprise Test	2
C422.5	Understand	Group Assignment	4
C422.6	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	-	-	-	-

17CE423	CONTRACT LAWS AND REGULATIONS	3/0/0/3
Nature of Course	Concepts and Theory	
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

C423 .1	Understand the different types of contracts in construction, arbitration and legal aspect and its provisions.	[U]
C423 .2	Identify the tendering methods, method of bidding and contract formation.	[R]
C423 .3	Understand the various legal requirements to make contract and Arbitration procedures.	[U]
C423 .4	To aware about the labour regulations and the impact of breach of any rule and regulation.	[U]

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 andCommercialPoints of View,Contract Formation and Interpretation, Potential Contractual 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

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C423 .1	Understand	Class Presentation	**5**
C423 .2	Remember	Quiz	**5**
C423 .3	Understand	Group Assignment	**5**
C423 .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	-	-	-	-

17CE424	FORMWORK SYSTEMS	3/0/0/3

Nature of Course: Theory and 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 prec17CE424autions in formwork

Course Outcomes

C424.1 Have a sound knowledge on various Formwork Practices [R]
C424.2 To select the different materials for formwork [U]
C424.3 Apply the advanced techniques in formwork [AP]
C424.4 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

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
CE424.1	Remember	Quiz	**5**
CE424.2	Understand	Surprise Test	**5**
CE424.3	Apply	Test	**5**
CE424.4	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	-	-	-	-

17CE425	QUANTITATIVE TECHNIQUES IN CONSTRUCTION MANAGEMENT	3/0/0/3

Nature of Course	Theory and Application
Pre requisites	NIL

Course Objectives:

1	Summarize the concepts of Operations Research
2	Analyze Linear Programming problems using Graphical and Simplex Methods, Transportation and Assignment Problems
3	Explain Decision Theory , devise Decision Rules for Decision making under conditions of certainty, risk and Uncertainity and generate Decision trees

Course Outcomes:

Upon completion of the course, students shall have ability to

C425.1	Summarize the concepts of Operations Research	[UN,AP]
C425.2	Analyze Linear Programming problems using Graphical and Simplex Methods, Transportation and Assignment Problems	[AN,AP]
C425.3	Explain Decision Theory and devise Decision Rules for Decision making	[R,U]
C425.4	Decision making under conditions of certainty, risk and Uncertainity and generate Decision trees	[E]

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
C425.1	Apply, Understand	Group Assignment	5
C425.2	Apply, Analyse	Tutorial	5
C425.3	Remember, Understand	Test	5

C425.4	Evaluate	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	20	-	-	20
Apply	20	30	30	20
Analyse	30	40	40	30
Evaluate	20	30	30	30
Create	-	-	-	-

17CE426	DESIGN OF SUB-STRUCTURES	3/0/0/3
Nature of Course	Analysis and Design	
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**		
C426.1	Select appropriate foundations type based on available soil conditions.	[R,U]
C426.2	Select appropriate foundations type based on available soil conditions..	[AP]
C426.3	Determine the load carrying capacity of each type of foundation.	[A]
C426.4	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	Varghese PC, “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/	
Tentative Assessment Methods & Levels (based on Blooms’ Taxonomy)		

Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C426.1	Remember, Understand	Quiz	5
C426.2	Apply	Assignment	5
C426.3	Analyze	Tutorial	10
C426.4	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	-	-	-	-

17CE427	PAVEMENT ENGINEERING	3/0/0/3

Nature of Course	Analysis and Design
Prerequisites	NIL

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:

Upon completion of the course, students shall have ability to

C427.1	Identify the factors governing the design	[U]
C427.2	Implement different methods of strengthening the pavement.	[AP]
C427.3	Analyse and design flexible and rigid pavements	[AP,AN]
C427.4	Implement maintenance and evaluation procedure of the pavement	[AN,E]

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:	**60**

Text Books:

1	Khanna SK & Justo EG (1998), Highway Engineering, Nemchand Brothers, Roorkee
2	PratabChraborthy&Animesh Das. (2004), Principles of Transportation Engineering, Tata McGraw Hill Co.
3	Yoder EJ and Witczak MW, Principles of Pavement Design, John Wiley, New York

Reference Books:

1	Sharma SK (1998), Principles, Practice and design of highway Engineering, S. Chand & Co Ltd, New Delhi
2	Huang YH, 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/

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

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

Course Outcome	Bloom's Level	Assessment Component	Marks
C427.1	Understand	Quiz	5
C427.2	Apply, Analyse	Tutorial	10
C427.3	Analyse, Evaluate		
C427.4	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

17CE501	DISASTER MANAGEMENT	3/0/0/3

Nature of Course: Concepts and Theory

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

C501 .1	To remember the principles and components of disaster management	[R]
C501 .2	To remember different disaster management schemes.	[R]
C501 .3	To analyse the potential effects of disasters and methods to deliver public health response to avert these effects	[U]
C501 .4	Tounderstand recent trends in disaster management	[U]
C501 .5	To apply disaster management in Forecasting and warning of disasters	[AP]
C501 .6	To apply the disaster management technique in Statistical seismology	[AP]
C501 .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 andmitigation 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 – NGOmanagement –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 – Roleof 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 andvulnerability – 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. PardeepSahni, AlkaDhameja, Uma Madury, PHI learning Pvt Ltd, 2013

Reference Books:

1. Sundar.I., Disaster Management , Sarup& Sons, 3rd edition 2007,New Delhi
2. SathishModh, 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

Tentative 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	Remember	Quiz	**2**
C501 .3	Understand	Surprise Test	**2**
C501 .4	Understand	Group Assignment	**3**
C501 .5	Apply	Technical Presentation	**3**
C501 .6	Apply	Mini project	**4**
C501 .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	-	-	-	-

17CE502	ENGINEERING RISK – BENEFIT ANALYSIS	3/0/0/3

Nature of Course	Concepts and Theory
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,

C502.1	Graduates can Identify information sources and risks for engineering projects	[U]
C502.2	Graduate understands the theory and concepts of aspect of Cost Benefit Analysis.	[U]
C502.3	Graduate will be able to perform Cost Benefit Analysis if required.	[A]
C502.4	Graduates will be able to sense and analyse the various possible uncertainties that may occur.	[A]
C502.5	Graduates will be able to analyse decision making problems decision analysis approaches.	[A]
C502.6	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:** Det**e**rmining 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	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

Tentative 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	3
C502.2	Understand	Quiz	3
C502.3	Analyse	Assignment	3
C502.4	Analyse	Assignment	3
C502.5	Analyse	Assignment	4
C502.6	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: Theory and Application

Pre Requisites: NIL

Course Objectives:

1. To possess knowledge about GIS techniques and its application in the field of Civil Engineering.
2. To possess knowledge on GIS application

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

Tentative 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	-	-	-	-