MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC, NBA & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

DESIGNING YOUR FUTURE

Estd. 2000

B.E-Department of Civil Engineering

Curriculum/Syllabus

Regulation-2016

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Rasipuram - 637 408, Namakkal Dt, Tamil Nadu.

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INSTITUTION VISION &MISSION

INSTUTION VISION

To be a Centre of Excellence in Engineering, Technology and Management on par with International Standards.

INSTUTION MISSION

- To prepare the students with high professional skills and ethical values
- To impart knowledge through best practices
- To instill a spirit of innovation through Training, Research and Development
- To undertake continuous assessment and remedial measures
- To achieve academic excellence through intellectual, emotional and social stimulation

INSTUTION MOTTO

Rural upliftment through Technical Education.

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DEPARTMENT VISION & MISSION

DEPARTMENT VISION

To Excel in Education, Research and Technological Services in Civil Engineering with strong Ethical Values to Cater to the local and Global Needs of the Society.

DEPARTMENT MISSION

- To impart quality education to produce Civil Engineers capable of globally extending technological services
- To provide conducive ambience for collaborate research to develop contemporary and sustainable technologies.
- To develop and Transfer Innovative applications of Engineering, Science and Technology to improve Civil Engineering Practices.

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DEPARTMENT PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

PROGRAM EDUCATIONAL OBJECTIVES

The Civil Engineering Graduates should be able to

PEO1: The graduates will have successful careers in industry that meet the needs of Indian and multinational standards.

PEO2: The graduates will have the ability to synthesize data and technical concepts for product design application.

PEO3: The graduates will be a part of team on multidisciplinary Project.

PEO4: The graduates will have a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering problems for post graduate studies.

PEO5: The graduates will have an awareness of the life-long learning with professional codes of ethics.

PROGRAM OUTCOMES

1. **Engineering Knowledge:** An ability to apply knowledge of basic mathematics, physical sciences and Civil Engineering.
2. **Problem Analysis:** An ability to analyze a problem, interprets data, and defines Structural system requirements.
3. **Design/Development solutions:** An ability to design, implements, and evaluate a Civil Engineering system, process, component to meet desired needs
4. **Conduct investigations of complex problems:** An ability to design modern structures which will provide Solutions for the complex problem in the Infrastructure domain.
5. **Modern tool usage:** An ability to use of modern Civil Engineering Software's to provide suitable solution in the domain of Civil Engineering

6. **The engineer and society:** An ability to give a contemporary technical and professional solutions in the practice of Civil Engineering problems to meet the society needs
7. **Environment and sustainability**: An ability to develop and use the Civil Engineering systems within realistic constraints environmental, health and safety, manufacturability, and sustainability considerations.
8. **Individual and Team work:** An Ability to understanding of professional, ethical, legal, security and social issues and responsibilities.
9. **Communication:** An ability to function effectively on teams and individually to accomplish a common goal.
10. **Project management and finance:** An ability to communicate effectively to the higher authorities and staff in the department.
11. **Lifelong learning:** An ability to demonstrate leadership and managerial characteristics
12. **Engineering solutions:** Recognize the need for and an ability to engage in life-long learning in Infrastructure system.

PROGRAM SPECIFIC OUTCOMES

PSO1: Professional Skill Development: An ability to design Complex Structures through or by design based software like STAAD PRO & STRUDS

PSO2: Analytical Skill and Problem Solving Expertise: Ability to design R.C.C & Steel Structures by use of modern design methods.

PSO3: Project development skill: Ability to work with complex Infrastructure projects.

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B.E.-CIVILENGINEERING
GROUPINGOFCOURSES

1. Humanities and Social Sciences (HS)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	16SHA01	Technical English	HS	5	3	2	0	4
2	16SHA02	Communicative English	HS	7	3	0	4	5
3	16SHA03	Business English	HS	5	3	2	0	4
4	16SHA04	Basics of Japanese	HS	5	3	2	0	4
5	16SHA05	Functional Japanese	HS	5	3	2	0	4
6	16SHA06	Basics of German	HS	5	3	2	0	4
7	16SHA07	Functional German	HS	5	3	2	0	4
8	16SHA08	Principles of Management and Engineering Ethics	HS	3	3	0	0	3

2. Basic Sciences (BS)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	16SHB01	Matrix, Calculus and Ordinary Differential Equations	BS	5	3	2	0	4
2	16SHB02	Complex Variables, Laplace Transforms and Vector Calculus	BS	5	3	2	0	4
3	16SHB03	Transforms Partial and Differential Equations	BS	5	3	2	0	4
4	16SHB04	Random Processes	BS	5	3	2	0	4
5	16SHB05	Probability and Queuing Theory	BS	5	3	2	0	4
6	16SHB06	Numerical Methods	BS	5	3	2	0	4
7	16SHB07	Statistics and Numerical Methods	BS	5	3	2	0	4
8	16SHB08	Discrete Mathematics	BS	5	3	2	0	4
9	16SHB09	Operations Research	BS	5	3	2	0	4
10	16SHB21	Engineering Physics	BS	6	2	0	4	4
11	16SHB22	Material Science	BS	3	3	0	0	3
12	16SHB23	Physics for Electrical Engineering	BS	3	3	0	0	3
13	16SHB24	Physics for Mechanical Engineering	BS	3	3	0	0	3
14	16SHB31	Engineering Chemistry	BS	6	2	0	4	4
15	16SHB32	Environmental Science and Engineering	BS	3	3	0	0	3

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3. Engineering Sciences (ES)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	16CEC01	Fundamentals of Computing and Programming	ES	6	2	0	4	4
2	16CEC02	Advanced C Programming	ES	6	2	0	4	4
3	16CEC03	Basics of Civil and Mechanical Engineering	ES	4	4	0	0	4
4	16CEC04	Basics of Electrical and Electronics Engineering	ES	3	3	0	0	3
5	16CEC05	Engineering Drawing	ES	5	1	0	4	3
6	16CEC06	Engineering Practices for Mechanical Sciences	ES	4	0	0	4	2
7	16CEC07	Engineering Geology	ES	3	3	0	0	3
8	16CEC08	Engineering Mechanics	ES	5	3	2	0	4
9	16CEC09	Construction Materials	ES	3	3	0	0	3
10	16CEC10	Object Oriented Programming	ES	6	2	0	4	4
11	16CEC11	Bio Mechanics	ES	3	3	0	0	3
12	16CEC12	Measurements and Instrumentation	ES	3	3	0	0	3
13	16CEC13	Renewable energy resources	ES	3	3	0	0	3
14	16CEC14	Fundamentals of Nanotechnology	ES	3	3	0	0	3
15	16CEC15	Remote Sensing and GIS	ES	3	3	0	0	3

4. Professional Core (PC)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	16CED01	Mechanics of Solids	PC	5	3	2	0	4
2	16CED02	Strength of Materials	PC	5	3	0	2	4
3	16CED03	Structural Analysis I	PC	5	3	2	0	4
4	16CED04	Structural Analysis II	PC	5	3	2	0	4
5	16CED05	Design of Steel Structures	PC	5	3	2	0	4
6	16CED06	Estimation and Quantity Surveying	PC	5	3	2	0	4
7	16CED07	Mechanics of Fluids	PC	3	3	0	0	3
8	16CED08	Surveying I	PC	5	3	0	2	4
9	16CED09	Surveying II	PC	3	3	0	0	3
10	16CED10	Concrete Technology	PC	3	3	0	0	3
11	16CED11	Soil Mechanics	PC	5	3	0	2	4
12	16CED12	Applied Hydraulic Engineering	PC	5	3	0	2	4
13	16CED13	Design of Reinforced Concrete Elements	PC	5	3	0	2	4

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14	16CED14	Water Supply Engineering	PC	3	3	0	0	3
15	16CED15	Foundation Engineering	PC	3	3	0	0	3
16	16CED16	Highway Engineering	PC	5	3	0	2	4
17	16CED17	Design of Reinforced Concrete Structures	PC	5	3	0	2	4
18	16CED18	Waste Water Engineering	PC	5	3	0	2	4
19	16CED19	Public Health and Irrigation Engineering Drawing	PC	3	3	0	0	3
20	16CED20	Prestressed Concrete Structures	PC	3	3	0	0	3
21	16CED21	Seismic design of Structures	PC	3	3	0	0	3
22	16CED22	Irrigation Engineering	PC	3	3	0	0	3
23	16CED23	Computer Aided Building Drawing	PC	3	1	0	2	2
24	16CED24	Survey Camp	PC	-	-	-	-	1
25	16CED25	Prefabricated Structures	PC	3	3	0	0	3

5. Professional Electives (PE)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	16CEE01	Hydrology	PE	3	3	0	0	3
2	16CEE02	Pavement Engineering	PE	3	3	0	0	3
3	16CEE03	Construction Planning and Management	PE	3	3	0	0	3
4	16CEE04	Traffic Engineering and Safety Transport	PE	3	3	0	0	3
5	16CEE05	Housing Planning and Management	PE	3	3	0	0	3
6	16CEE06	Environmental Impact Assessment in Civil Engineering Project	PE	3	3	0	0	3
7	16CEE07	Municipal Solid Waste Management	PE	3	3	0	0	3
8	16CEE08	Water Resources Engineering	PE	3	3	0	0	3
9	16CEE09	Industrial Waste Management	PE	3	3	0	0	3
10	16CEE10	Air Pollution and Management	PE	3	3	0	0	3
11	16CEE11	Industrial Structures	PE	5	3	0	0	3
12	16CEE12	Health Monitoring of Structures	PE	3	3	0	0	3
13	16CEE13	Engineering Economics and Cost Analysis	PE	3	3	0	0	3
14	16CEE14	Ground Improvement Techniques	PE	3	3	0	0	3
15	16CEE15	Building Services	PE	3	3	0	0	3

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16	16CEE16	Smart Materials and Smart Structures	PE	3	3	0	0	3
17	16CEE17	Ground Water Engineering	PE	3	3	0	0	3
18	16CEE18	Construction Technology	PE	3	3	0	0	3
19	16CEE19	Railways, Airports and Harbour Engineering	PE	3	3	0	0	3

6. Employability Enhancement Courses (EEC)

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			
					L	T	P	C
1	16CEF01	Project work Phase -I	EEC	6	0	0	6	3
2	16CEF02	Project work Phase -II	EEC	30	0	0	30	15
3	16CEF03	Comprehensive Skill	EEC	4	0	0	4	2
4	16CEF04	Design Project	EEC	4	0	0	4	2

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Department	Civil
Programme	B.E

SEMESTER - I

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	16SHA01	Technical English	3	2	0	4	5
2.	16SHB01	Matrix, Calculus and Ordinary Differential Equations	3	2	0	4	5
3.	16SHB22	Material Science	3	0	0	3	3
4.	16SHB31	Engineering Chemistry	2	0	4	4	6
5.	16CEC01	Fundamentals of Computing and Programming	2	0	4	4	6
6.	16CEC04	Basics of Electrical and Electronics Engineering	4	0	0	3	3
7.	16CEC06	Engineering Practices for Mechanical Sciences	0	0	4	2	4
		Total Credits				**24**	

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Department	Civil
Programme	B.E

SEMESTER - II

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	16SHA02	Communicative English	3	0	4	5	7
2.	16SHB02	Complex Variables, Laplace Transforms and Vector Calculus	3	2	0	4	5
3.	16SHB21	Engineering Physics	2	0	4	4	6
4.	16SHB32	Environmental Science and Engineering	3	0	0	3	3
5.	16CEC02	Advanced C Programming	2	0	4	4	6
6.	16CEC05	Engineering Drawing	1	0	4	3	5

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7.	16CEC08	Engineering Mechanics	3	2	0	4	5
		Total Credits				**27**	

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Department		Civil	
Programme		B.E	

SEMESTER - III

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	16SHB03	Transforms and Partial Differential Equations	3	2	0	4	5
2.	16CEC07	Engineering Geology	3	0	0	3	3
3.	16CEC09	Construction Materials	3	0	0	3	3
4.	16CED01	Mechanics of Solids	3	2	0	4	5
5.	16CED07	Mechanics of Fluids	3	0	0	3	3
6.	16CED08	Surveying I	3	0	2	4	5
7.	16CED23	Computer Aided Building Drawing	1	0	2	2	3
		Total Credits				**23**	

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Department	Civil
Programme	B.E

SEMESTER - IV

Sl. No.	Course Code	Course Name	Hours/ Week L	T	P	Credit C	Contact Hours
THEORY							
1.	16SHB07	Statistics and Numerical Methods	3	2	0	4	5
2.	16CED02	Strength of Materials	3	0	2	4	5
3.	16CED09	Surveying II	3	0	0	3	3
4.	16CED10	Concrete Technology	3	0	0	3	3
5.	16CED11	Soil Mechanics	3	0	2	4	5
6.	16CED12	Applied Hydraulic Engineering	3	0	2	4	5
7.	16CEE**	Elective -I	3	0	0	3	3
		Total Credits				**25**	

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Department	Civil
Programme	B.E

SEMESTER - V

Sl. No.	Course Code	Course Name	Hours/ Week L	T	P	Credit C	Contact Hours
THEORY							
1.	16CED03	Structural Analysis I	3	2	0	4	5
2.	16CED13	Design of Reinforced Concrete Elements	3	0	2	4	5
3.	16CED14	Water Supply Engineering	3	0	0	3	3
4.	16CED15	Foundation Engineering	3	0	0	3	3
5.	16CED16	Highway Engineering	3	0	2	4	5
6.	16CE***	Elective - II	3	0	0	3	3

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7.	16CED24	Survey Camp	-	-	-	1	-
					Total Credits	22	

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Department	Civil
Programme	B.E

SEMESTER - VI

Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P	C	
THEORY							
1.	16CED04	Structural Analysis II	3	2	0	4	5
2.	16CED05	Design of Steel Structures	3	2	0	4	5
3.	16CED17	Design of Reinforced Concrete Structures	3	0	2	4	5
4.	16CED18	Waste Water Engineering	3	0	2	4	5
5.	16CE***	Elective - III	3	0	0	3	3
6.	16CE***	Elective - IV	3	0	0	3	3
7.	16CEF04	Design Project	0	0	4	2	4
					Total Credits	24	

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Department	Civil
Programme	B.E

SEMESTER - VII

Sl. No.	Course Code	Course Name	Hours/ Week L	T	P	Credit C	Contact Hours
THEORY							
1.	16CED06	Estimation and Quantity Surveying	3	0	0	3	3
2.	16CEE07	Municipal Solid Waste Management	3	2	0	4	5
3.	16CEE12	Health Monitoring of Structures	3	0	0	3	5
4.	16CEE03	Construction Planning and Management	3	0	0	3	3
5.	16MEE13	Composite Materials (Elective – V)	3	0	0	3	3
6.	16MEE20	Power Plant Engineering (Elective – VI)	3	0	0	3	3
7.	16CEF01	Project- Phase I	0	0	4	2	4
		Total Credits				**21**	

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Department	Civil
Programme	B.E

SEMESTER - VIII

Sl. No.	Course Code	Course Name	Hours/ Week L	T	P	Credit C	Contact Hours
THEORY							
1.	16CEF02	Project Phase II	0	0	30	15	30
		Total Credits				**15**	

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COURSECOMPONENTSUMMARY

S.No.	Subject Area	CreditsPerSemester								Credits total	Percentage credits
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	4	5	-	-	-	-	3	-	12	6.25
2.	BS	11	11	4	4	-	-	-	-	30	16.66
3.	ES	10	10	8	4	4	-	-	-	36	20.83
4.	PC	-	-	11	12	16	8	3	-	50	27.08
5.	PE	-	-	-	3	6	9	6	-	24	16.66
6.	OE	-	-	-	-	-	4	3	-	7	4.16
7.	EEC	-	-	-	-	-	2	5	15	22	8.33
TOTAL		25	26	23	23	26	23	20	15	181	

TotalCredits:181

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16SHA01 **TECHNICAL ENGLISH** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.
- To make the learners to use the phrase and clauses error free.

COURSE OUTCOMES:

16SHA01.CO1 : Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
16SHA02.CO2 : Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
16SHA03.CO3 : Read different genres of texts adopting various reading strategies.
16SHA04.CO4 : listen/view and comprehend different spoken discourses/excerpts in different accents
16SHA05.CO5 : use the phrases and sentences clearly in their written communication

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHA01.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHA01.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA01.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA01.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA01.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I GRAMMAR & VOCABULARY **9**

Word formation with prefixes and suffixes – synonyms and antonyms – verb patterns- subject-verb agreement – tenses – voices – use of conditionals – comparative adjectives (affirmative and negative) – expanding– nominal compounds – articles – use of prepositions - phrasal verbs – British and American vocabulary – error detection – abbreviations and acronyms.

UNIT II LISTENING **9**

Extensive listening – listening for general content – listening to fill up gapped texts – intensive listening – listening for specific information: retrieval of factual information – listening to identify topic, context, function, speaker's opinion, attitude, etc. – global understanding skills and ability to infer, extract gist and understand main ideas – note-taking: guided and unguided

UNIT III SPEAKING **9**

Verbal and non verbal communication – speech sounds – syllables – word stress (structures and content words) – sentences stress – intonation – pronunciation drills, tongue twisters – formal and informal English – oral practice – developing confidence – introducing oneself – asking for or eliciting objects – expressing opinions (agreement / disagreement) – giving instructions

UNIT IV READING **9**

Exposure to different reading techniques – reading for gist and global meaning – predicting the content – text – identifying the topic sentence and its role in each paragraph – scanning – inferring / identifying lexical and contextual meanings – reading for structure and detail – transfer of information / guided note-making – understanding discourse coherence – sequencing of sentences – cloze reading.

UNIT V WRITING **9**

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Introductions to the characteristics of technical style – writing definitions and descriptions –paragraph writing (topic sentence and its role, unity, coherence and use of cohesive expressions) – process description (use of sequencing connectives) – comparison and contrast – classifying the data – analyzing / interpreting the data – formal letter writing (letter to the editor, letter for seeking practical training, and letter for undertaking project works in industries) – editing (punctuation, spelling and grammar)

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice. Oxford University Press,	Oxford University Press, New Delhi.	2011
2.	Rizvi, Ashraf. M.	Effective Technical Communication.	Tata McGraw-Hill, New Delhi.	2005

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Regional Institute of English	English for Engineers.	Cambridge University Press, New Delhi.	2006
2.	Mindscapes:	English For Technologists and Engineers	Department of English, Anna University, Chennai,	2012
3.	Rutherford, Andrea.	J Basic Communication Skills for Technology	Pearson, New Delhi.	2001
4.	Viswamohan, Aysha.	English for Technical Communication.	Tata McGraw-Hill, New Delhi.	2008
5.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice. Oxford University	Press, New Delhi.	2011

WEB URLs:

1. http://www.usingenglish.com
2. http://www.uefap.com
3. http://usefulenglish.ru/phonetics
4. http://study.com/academy/lesson/characteristics-of-technical-communication.html
5. https://letterpile.com/writing/Four-Types-of-Writing

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16SHA02 **COMMUNICATIVE ENGLISH** **L T P C**
3 0 4 5

COURSE OBJECTIVES:

- To understand the importance of listening and speaking in language acquisition process
- To engage in conversation intelligibly
- To use English accurately, appropriately and fluently in different situations (academic, social and professional) and familiarize themselves with all speech sounds in English
- To write academic, communicative and creative pieces of writing
- To devise different tasks / methods to enhance their learners' communication skills

COURSE OUTCOMES:

16SHA02.CO1 : Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.

16SHA02.CO2 : Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.

16SHA02.CO3 : Read different genres of texts adopting various reading strategies.

16SHA02.CO4 : listen/view and comprehend different spoken discourses/excerpts in different accents

16SHA02.CO5 : Communicate with others confidently

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHA02.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHA02.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA02.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA02.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA02.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I GRAMMAR & VOCABULARY 9

Phrases & Clauses- Kinds of Sentences - Types of sentences and sentence patterns – GRE Vocabulary - Synonyms - Antonyms - Word Formation- Error Spotting- Sentence Correction- Word Analogy- Idioms and Phrases- Direct and Indirect Speech- 'If' Conditionals

UNIT II LISTENING 9

Listening processes: top-down and bottom-up skills - Listening strategies - Sounds of English: Consonants, vowels and diphthongs - Phonemic transcription, tongue twisters, words often mispronounced - Word stress and sentence stress: content words, structural words, strong forms, weak forms - Intonation patterns - Language functions : [Inviting-accepting/declining invitation - Offering /accepting/ refusing help - Thanking/ responding to thanks - Congratulating , Complimenting - Apologizing/ accepting an apology - Asking for / giving / refusing permission - Asking for advice / giving advice - Asking about likes, preferences / expressing likes / dislikes - Asking for information / giving information

UNIT III SPEAKING 9

Greeting - Introducing Oneself -Invitation - Making Request - Expressing Gratitude - Complimenting and Congratulating - Expressing Sympathy - Apologizing - Asking for Information - Seeking Permission - Complaining and Expressing Regret - Using English in Real Life Situation [At the Bank/ post office/ College office - At the Green Grocer - At the Temple - At the College Canteen or Restaurant - At the Police station - At the Railway Station/ Bus Station - At the Medical Shop - At the Library - Interviews - Booking a Room in a Hotel - At the Travel Agency

UNIT IV READING 9

Importance of Reading - Why develop reading habits among students and How - Reading techniques [Skimming , Scanning , Intensive reading , Extensive] Question types [Inferring , Assumption, Evaluative , Extrapolative], Reading different text types [Menu ,Email , Letters , Cartoons , Advertisements, Recipe

Articles , Literary texts – stories, plays, poems, Biographies] – identifying lexical and Contextual meaning- Understanding Discourse Coherence – sequencing of sentences- Cloze Reading - Academic Reading.

UNIT V WRITING 9

Developing Proficiency in Writing - Text Types - Academic Writing [Paragraphs , Essays] - Writing for communicative purposes [Letters – official and personal , Messages / Notices, Reports , Emails , Advertisements ,Application for a job (covering letter and CV) - Creative Writing (Stories, Poems , Dialogues)

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice.	Oxford University Press, New Delhi.	2011
2.	Rizvi, Ashraf. M	Effective Technical Communication.	Tata McGraw-Hill New Delhi.	2005

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Regional Institute of English	English for Engineers. Cambridge University Press	New Delhi.	2006.
2.	Dr.Gunasekaran, Vishu "	Technical English Work Book.	Vishnu "Print Media, Krishna Publications	2011
3.	Rutherford, Andrea.	J Basic Communication Skills for Technology.	Pearson, New Delhi.	2001
4.	Viswamohan, Aysha.	English for Technical Communication.	Tata McGraw-Hill, New Delhi.	2008
5.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice.	Oxford University Press, New Delhi	2011

WEB URLs:

- http://www.usingenglish.com
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- www.brainboxx.co.uk/A3_ASPECTS/pages/reading.htm
- www.sparklebox.co.uk/literacy/vocabulary/word-lists/connectives/#.V613NH195kg
- www.letterwritingguide.com/

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16SHA03 **BUSINESS ENGLISH** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic Business communication skills.
- To Understand the formal and informal communication in the business organization
- To ensure that learners to understand the fundamentals of Business writing
- To inculcate the effective email writing skills for better business communication.
- To make the learners to use the phrase and clauses error free.

COURSE OUTCOMES:

16SHA03.CO1 : Communicate with one or many by using appropriate communicative strategies.
16SHA03.CO2 : Write business correspondence by constructing clear sentences and paragraphs using the appropriate selection of words
16SHA03.CO3 : Use economized words and emphasis in Sentence Design.
16SHA03.CO4 : Able to use electronic technology in business communication
16SHA03.CO5 : use the phrases and sentences clearly in their written communication

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHA03.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHA03.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA03.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA03.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA03.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I FUNDAMENTALS OF BUSINESS WRITING **9+6**

Adaptation and the selection of words- Non Discriminatory writing- economizing on words- giving sentences unity-arranging sentences for clarity- Accent on positive Language- Coherence- Transitional words

UNIT II BASIC PATTERNS OF BUSINESS LETTERS **9+6**

Asking for Information- Asking for Action- Orders-Inquiries about people-claims –Refusing Request-Adjustment Refusals- Credit Refusal- Structure of the Sales Letter- Letter of Authorization- Letter of Recommendation

UNIT III FUNDAMENTALS OF REPORT WRITING **9+6**

Determining the Report Purpose- Determining the Components-Gathering the Information Needed-Interpreting and Applying the Findings- Organizing the Report Information- Writing the Report

UNIT IV OTHER FORMS OF BUSINESS COMMUNICATION **9+6**

Public Speaking and Oral Reporting- Overcome Nervousness- Making Formal Speech-Audience Analysis-Use of Voice- Use of Visual Aids- Conducting and Participating in Meetings- Interviewing People- Using Telephone- Email Writing

UNIT V CORRECTNESS OF COMMUNICATION **9+6**

Standards of Punctuation – Apostrophe, Brackets, Colon, Comma etc...Standards for Grammar- Adjective-Adverb Confusion, Subject-Verb Agreement, Dangling Modifier, Parallelism, word use etc...

TOTAL: 45+30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication

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1.	Lesikar, Bamford	Basic Business Communication"	1st Canadian Edition (IRWIN DORSEY), Von Hoffmann Press,	1993
2.	Rizvi, Ashraf. M.	ffective Technical Communication.	Tata McGraw-Hill New Delhi.	2005

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Regional Institute of English	English for Engineers.	Cambridge University Press New Delhi.	2006.
2.	Mindscapes	English For Technologists and Engineers	Department of English, Anna University, Chennai,	2012
3.	Rutherford, Andrea.	J Basic Communication Skills for Technology.	Pearson New Delhi.	2001
4.	Viswamohan, Aysha.	English for Technical Communication	Tata McGraw-Hill, New Delhi.	2008
5.	Raman, Meenakshi & Sangeetha Sharma.	Technical Communication: Principles and Practice	Oxford University Press, New Delhi.	2011.

WEB URLs:

1. www.ego4u.com/en/business-english/communication
2. www.businessenglishpod.com/category/communication-skills
3. www.bbc.co.uk/worldservice/learningenglish/business/talkingbusiness
4. www.teachingenglish.org.uk/teaching-adults/resources/english-business
5. www.businessenglish.com/index_en.html

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16SHA04	BASICS OF JAPANESE	L T P C 1 0 4 3

COURSE OBJECTIVES:

- To teach pronunciation and intonation of Japanese sounds and to enable students to comprehend and speak simple sentences in Japanese
- To introduce Japanese language at the basic level, to enable students to read and write the phonetic scripts, *Hiragana* and *Katakana,* and approx.100 *Kanji,*
- To teach some aspects of Japanese society and culture.
- To enable students to comprehend and write simple sentences in Japanese.
- To enable students to comprehend and make simple conversation in different situations using basic sentence patterns

COURSE OUTCOMES:

16SHA04.CO1 : Communicate with one or many by using appropriate communicative strategies.

16SHA04.CO2 : Write Japanese correspondence by constructing clear sentences and paragraphs using the appropriate selection of words

16SHA04.CO3 : Use economized words and emphasis in Sentence Design.

16SHA04.CO4 : Able to use Japanese language for communication

16SHA04.CO5 : use Japanese phrases and sentences clearly in their written communication

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHA04.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHA04.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA04.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA04.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA04.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I INTRODUCTION TO LETTERS **9+6**

Introduction of the Japanese writing system, i.e. Hiragana, Katakana and Kanji (100-120), word-building, writing foreign names and loan words in Katakana

UNIT II BASIC WORDS **9+6**

Japanese Greetings; Basic sentence patterns to be applied in self introduction, identifying things; time of the day; calendar; counting using Japanese numerical classifiers

UNIT III BASIC PHRASES & CLAUSES **9+6**

Describing things; making comparisons; talking of daily activities; kinship terms used for address and reference; seasons; giving and receiving; shopping; making requests; talking of one's likes and dislikes

UNIT IV BASIC TENSES **9+6**

Making Sentences – Present, Past and Future, Progressive & Perfect Tenses

UNIT V CULTURE AND SOCIETY **9+6**

An introduction to some aspects of Japanese culture such as festivals, Japanese seasons, Japanese people and their love for nature; Japanese food, sports; society; geography; education system; Japan and the world etc. The objective is to create general awareness in students about life in Japan.

TOTAL: 45+30 Periods

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TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	George Trombley , Yukari Takenaka	panese from Zero! 1: Proven Techniques to Learn Japanese for Students and Professionals	Volume 1) 6th Edition Bay Foreign Language Books Ltd	2015
2.	Living Language Japanese, Complete Edition	panese reading & writing guide, and free online learning Paperback	Unabridged	2012

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Pimsleur	Japanese Level 1 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur;	3rd edition (Comprehensive)	2002
2.	Pimsleur	Japanese Level 2 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur;	Pimsleur; 3 edition	October 1, 2002
3.	Pimsleur	Japanese Level 3 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur	Pimsleur; 3 edition	October 1, 2002
4.	Eriko Sato	Practice Makes Perfect Basic Japanese 1st Edition, McGraw-Hill Education	Pimsleur; 1 edition	April 1, 2014
5.	Mr Tae K Kim,	A Guide to Japanese Grammar: A Japanese approach to learning Japanese grammar	CreateSpace Independent Publishing Platform	January23, 2014

WEB URLs:

1. https://nihongoshark.com/links
2. www.guidetojapanese.org/learn
3. www.coscom.co.jp
4. www.japanese-online.com
5. http://nihongo-e-na.com/eng

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16SHA05 **FUNCTIONAL JAPANESE** L T P C
3 0 2 4

COURSE OBJECTIVES:

- Students will be introduced to the basic structures of Japanese and encouraged to utilize them in appropriate situations.
- Students will be able to talk about themselves, their family, their likes and dislikes, their immediate happenings, etc. in simple sentences.
- Students will be able to complete basic communicative tasks in different social contexts such as shopping, ordering food, inviting others to do something with you.
- Students will be able to write short passages on the similar topics.
- Students will also learn aspects of Japanese culture that relate to the lesson topics.

COURSE OUTCOMES:

16SHA05.CO1 : Communicate with one or many by using appropriate communicative strategies.
16SHA05.CO2 : Write Japanese correspondence by constructing clear sentences and paragraphs using the appropriate selection of words
16SHA05.CO3 : Use economized words and emphasis in Sentence Design.
16SHA05.CO4 : Able to use Japanese language for communication
16SHA05.CO5 : use Japanese phrases and sentences clearly in their written communication

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHA05.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHA05.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA05.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA05.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA05.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I BASIC GRAMMATICAL STRUCTURE **9+6**

Expressing State-of-Being, Conjugating to the negative state-of-being, conjugating to the past state-of-being, Polite Form and Verb Stems Addressing People, Questions in polite form, relative clauses

UNIT II BASIC VOCABULARY **9+6**

Vocabulary- Family, Friends, Room, Home, Health, School, Hobbies, Student's Life Shopping etc...

9+6

UNIT IV BASIC PHRASES-II **9+6**

Simple conversation in situations such as shopping, making requests, talking of one's likes and dislikes, talking on telephone etc. and Asking Questions

UNIT V CULTURE AND SOCIETY **9+6**

An introduction to some aspects of Japanese culture such as festivals, Japanese seasons, Japanese people and their love for nature; Japanese food, sports; society; geography; education system; Japan and the world etc. The objective is to create general awareness in students about life in Japan.

TOTAL: 45+30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication

1.	George Trombley , Yukari Takenaka "	Japanese from Zero! 1: Proven Techniques to Learn Japanese for Students and Professionals (Volume 1) 6th Edition"	Bay Foreign Language Books Ltd	2015
2.	Living Language Japanese, Complete Edition:	Beginner through advanced course, including 3 coursebooks, 9 audio CDs, Japanese reading & writing guide, and free online learning Paperback	Unabridged	February 7, 2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Pimsleur ,	Japanese Level 1 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur;	3 edition (Comprehensive) 3rd Edition	October 1, 2002
2.	Pimsleur ,	Japanese Level 2 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur;	3 edition	October 1, 2002
3.	Pimsleur	Japanese Level 3 CD: Learn to Speak and Understand Japanese with Pimsleur Language Programs Pimsleur;	3 edition	October 1, 2002
4.	Eriko Sato,	Practice Makes Perfect Basic Japanese 1st Edition, McGraw-Hill Education;	1 edition	April 1, 2014
5.	Mr Tae K Kim,	A Guide to Japanese Grammar: A Japanese approach to learning Japanese grammar , CreateSpace	Independent Publishing Platform	January 23, 2014

WEB URLs:

1. https://nihongoshark.com/links/
2. www.guidetojapanese.org/learn/
3. www.coscom.co.jp/
4. www.japanese-online.com/
5. http://nihongo-e-na.com/eng

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16SHA06 **BASIC GERMAN** L T P C
3 0 2 4

COURSE OBJECTIVES:

- To teach pronunciation and intonation of German sounds and to enable students to comprehend and speak simple sentences in German
- To introduce German language at the basic level, to enable students to read and write the phonetic scripts of German,
- To teach some aspects of German society and culture.
- To enable students to comprehend and write simple sentences in German.
- To enable students to comprehend and make simple

COURSE OUTCOMES:

16SHA06.CO1 : Communicate with one or many by using appropriate communicative strategies.
16SHA06.CO2 : Write German correspondence by constructing clear sentences and paragraphs using the appropriate selection of words
16SHA06.CO3 : Use economized words and emphasis in Sentence Design.
16SHA06.CO4 : Able to use German language for communication
16SHA06.CO5 : use German phrases and sentences clearly in their written communication

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHA06.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHA06.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA06.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA06.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA06.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I BASIC GERMAN **9+6**

Alphabet - Numbers - Personal pronouns - Verb endings in the present tense - Verbs with vowel change - Possessive adjectives - Plural of nouns - The accusative case - The imperative - Seperable verbs - Modal verbs: können, müssen - Word order

UNIT II BASIC GRAMMAR – I **9+6**

Nouns and Articles : Nouns gender: masculine (der Mann) feminine (die Frau neuter das Kind) plural (die Leute) formation of the feminine (die Lehrerin, die Direktorin)compound nouns (das Mineralwasser die Geburtstagsparty) case: nominative (Der Mathelehrer heißt Herr Lenz). accusative (Hast du den Mantel gekauft?) dative(Wir fahren mit dem Bus) and Articles

UNIT III BASIC GRAMMAR – II **9+6**

Pronouns- Personal, Nominative, accusative, dative, reflexive, interrogative; Adjectives- attributive, possessive, comparative, superlative; Adverbs; Numbers- cardinal and ordinal

UNIT IV BASIC TENSES **9+6**

Making Sentences – Present, Past and Future, Progressive & Perfect Tenses and conditional, frequently used Prepositions and Conjunctions

UNIT V CULTURE AND SOCIETY **9+6**

An introduction to some aspects of German culture such as festivals, German people, German food, sports; society; geography; education system; German and the world etc.

TOTAL: 45+30 Periods

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TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Adams Media;	Edward Swick M.A The Everything Learning German Book: Speak, write, and understand basic German in no time	2 edition	November 18, 2009
2.	Eugene Jackson	rman Made Simple: Learn to Speak and Understand German Quickly and Easily	Revised Edition Made Simple Press; Revised edition	May 16, 2006

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Living Language German,	Complete Edition: Beginner through advanced course, including 3 coursebooks, 9 audio CDs, and free online learning Audio CD	Unabridged, Living Language; Com/Pap/Ps edition	August 9, 2011
2.	Ultimate German Beginner	Intermediate (Coursebook) (Ultimate Beginner-Intermediate) Revised & enlarged Edition Living Language;	Revised & enlarged edition	September 21, 2004
3.	Jolene Wochenske:	Practice Makes Perfect Basic German (Practice Makes Perfect Series) McGraw-Hill Education	1 edition	June 7, 2011
4.	Ed Swick :	Practice Makes Perfect German Conversation (Practice Makes Perfect Series) McGraw-Hill Education;	1 edition	August 7, 2012
5.	Astrid Henschel:	Practice Makes Perfect German Verb Tenses, 2nd Edition: With 200 Exercises + Free Flashcard App	2nd Edition McGraw-Hill Education; 2 edition	June 11, 2013

WEB URLs:

1. https:/babbel.com/learn-german-free
2. http://deutsch-lernen.com/
3. http://learning-german-online.org/
4. http://fluentin3months.com/german-learning-resources/
5. https://goethe.de/en/spr/ueb.html

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16SHA07 FUNCTIONAL GERMAN L T P C
3 0 2 4

COURSE OBJECTIVES:

- Students will be introduced to the basic structures of German and encouraged to utilize them in appropriate situations.
- Students will be able to talk about themselves, their family, their likes and dislikes, their immediate happenings, etc. in simple sentences.
- Students will be able to complete basic communicative tasks in different social contexts such as shopping, ordering food, inviting others to do something with you.
- Students will be able to write short passages on the similar topics.
- Students will also learn aspects of German culture that relate to the lesson topics

COURSE OUTCOMES:

16SHA07 .CO1 : Communicate with one or many by using appropriate communicative strategies.
16SHA07 .CO2 : Write German correspondence by constructing clear sentences and paragraphs using the appropriate selection of words
16SHA07 .CO3 : Use economized words and emphasis in Sentence Design.
16SHA07 .CO4 : Able to use German language for communication
16SHA07 .CO5 : use German phrases and sentences clearly in their written communication

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHA07.CO1	x	x	X	-	-	-	-	-	-	x	-	x	x	-	-
16SHA07.CO2	x	x	X	-	-	x	-	-	x	x	-	x	x	-	-
16SHA07.CO3	x	x	X	-	-	x	-	-	x	x	-	x	x	-	-
16SHA07.CO4	x	x	X	-	-	x	-	-	x	x	-	x	x	-	-
16SHA07.CO5	x	x	X	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I BASIC PRONUNCIATION **9+6**

How To Pronounce German Vowels, German Consonants, German Diphthongs (Gliding Vowels)

UNIT II BASIC VOCABULARY **9+6**

Vocabulary- Family, Friends, Room, Home, Health, School, Hobbies, Student's Life, Shopping etc...

UNIT III BASIC PHRASES - I **9+6**

Basic German Words / Phrases, Saying Hello in German / Introducing Yourself / Saying Goodbye in German, Simple conversation in situations such as describing things, making comparisons, talking of daily activities, giving and receiving of gifts, talking of illnesses and visit to a doctor,

UNIT IV BASIC PHRASES-II **9+6**

Simple conversation in situations such as shopping, making requests, talking of one's likes and dislikes, talking on telephone etc. and Asking Questions

UNIT V CULTURE AND SOCIETY **9+6**

An introduction to some aspects of German culture such as festivals, seasons, German people and their lifestyle; German food, sports; society; geography; education system; German and the world etc.

TOTAL: 45+30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication

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1.	Edward Swick M.A	e Everything Learning German Book: Speak, write, and understand basic German in no time , Adams Media;	2 edition	November 18, 2009
2.	Eugene Jackson	rman Made Simple: Learn to Speak and Understand German Quickly and Easily Revised Edition Made Simple Press	Revised edition	May 16, 2006

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Living Language German,	Complete Edition: Beginner through advanced course, including 3 coursebooks, 9 audio CDs, and free online learning Audio CD –	Unabridged, Living Language; Com/Pap/Ps edition	August 9,2011
2.	Ultimate German Beginner	Intermediate (Coursebook) (Ultimate Beginner-Intermediate) Revised & enlarged Edition Living Langua	Revised & enlarged edition	September 21, 2004
3.	Jolene Wochenske	Practice Makes Perfect Basic German (Practice Makes Perfect Series)	McGraw-Hill Education 1 edition	June 7, 2011
4.	Ed Swick	Practice Makes Perfect German Conversation (Practice Makes Perfect Series)	McGraw-Hill	2011
5.	Astrid Henschel	Practice Makes Perfect German Verb Tenses, 2nd Edition: With 200 Exercises + Free Flashcard App 2nd Edition	McGraw-Hill Education; 2 edition	June 11, 2013

WEB URLs:

1. https:/babbel.com/learn-german-free
2. http://deutsch-lernen.com/
3. http://learning-german-online.org/
4. http://fluentin3months.com/german-learning-resources
5. https://goethe.de/en/spr/ueb.html

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16SHA08 **PRINCIPLES OF MANAGEMENT AND ENGINEERING ETHICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To create an exposure to the students regarding the basic concepts of management.
- To inculcate the significance of Planning in decision making
- To create an awareness about the organization structure adopted by different firms.
- To make them understand the code of ethics
- To make them aware of the responsibilities ensuring safety

COURSE OUTCOMES:

16SHA08 .CO1 : Capable of applying the functions of management relevant to the present Scenario.
16SHA08 .CO2 : Able to take appropriate decisions under different circumstances.
16SHA08 .CO3 : Able to implement different strategies to manage the employees.
16SHA08 .CO4 : Able to follow the ethics in their profession
16SHA08 .CO5 : Aware of all the rights and safety measures

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHA08 .CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHA08 .CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA08 .CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA08 .CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHA08 .CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I INTRODUCTION **9+6**

Introduction – Definition of Management – Management significance – Management as an Art or Science - Roles of Managers – Functions of Management – Principles of Management – Current trends and issues of Management

UNIT II PLANNING AND ORGANIZING **9+6**

Nature and Importance of Planning – Methods of Planning – Organisation Structure – Job design – Recruitment and selection – Training methods

UNIT III COMMUNICATION AND CONTROL **9+6**

Meaning – Objectives – Importance – Process of Communication – Barriers to communication – Effective Communication – Control: definition – Objectives and process of control – types of control –and Information Technology

UNIT IV ENGINEERING ETHICS **9+6**

Introduction of Engineering Ethics – Code of ethics – Individual, professional and Institutional values – Leadership in Engineering and Industry – Commitment – Empathy - Self Confidence – Models of Professional roles

UNIT V SAFETY RESPONSIBILITIES AND RIGHTS **9+6**

Assessment of Safety and Risk – Risk Benefit analysis – Occupational crime – Professional rights – Environmental Ethics – Engineers as Managers – Code of Conduct – Corporate Social Responsibility.

TOTAL: 45+30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication

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1.	L.M.Prasad	Principles and Practice of Management	Sultan Chand & Sons	2007
2.	V.S.Senthilkumar	Engineering Ethics	Prentice Hall India Learning Private Limited	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	A.C.Tripathi	Principles of Management	Tata McGraw Hill Education	2012
2	Andrew J.Dubrin	Essential of Management	Thomson Southwestern	2012
3	Stephen P. Robbins,David A .De Cenzo and mary Coutler	Fundamentals of Management	Prentice Hall of India	2012.
4	Charless B. Fleddermann	Engineering Ethics	Prentice Hall India Learning Private Limited	2012
5	John R Boatright	Ethics and the Conduct of Business	Pearson Education- New Delhi	2013

WEB URLs:

1. https://www.youtube.com/watch?v=g1r5vBjnJAE
2. https://www.youtube.com/watch?v=azrUt008Uf0
3. https://www.youtube.com/watch?v=mDZrBxzfmOg
4. https://www.youtube.com/watch?v=upUN460U56A
5. https://www.youtube.com/watch?v=dguYC_qlF48

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16SHB01	MATRICES , CALCULUS & ORDINARY DIFFERENTIAL EQUATIONS	L T P C 3 0 2 4

COURSE OBJECTIVES:

- To realize the use of matrix algebra techniques in engineering applications and to develop for future applications.
- To familiarize the student with differential calculus concepts. this is needed in almost all branches of engineering.
- To learn the functions with several variables which finds applications in many engineering branches
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

COURSE OUTCOMES:

16SHB01.CO1 : This course equips students to have basic knowledge in matrix algebra techniques with its engineering applications

16SHB01.CO2 : This course helps students in understanding the concepts of differential calculus.

16SHB01.CO3 : The students will have knowledge on functions with several variables.

16SHB01.CO4 : The knowledge gained on ordinary differential equations will provide a strong platform to solve the research problems in model engineering

16SHB01.CO5 : The students will have the ability to solve the real time engineering problems with multiple integrals and their usage

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB01 .CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
16SHB01 .CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
16SHB01 .CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
16SHB01 .CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
16SHB01 .CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

UNIT I MATRICES **9+6**

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem (Without Proof) – Orthogonal transformation of a symmetric matrix to Diagonal form – Reduction of a quadratic form to canonical form by orthogonal transformation

UNIT II APPLICATIONS OF DIFFERENTIAL CALCULUS **9+6**

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes –Properties of envelope and evolutes

UNIT III FUNCTIONS OF SEVERAL VARIABLES **9+6**

Functions of two variables – Taylor series - Partial derivatives – Maxima and minima – Constrained maxima and minima – Lagrange's multipliers method – Jacobians

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS **9+6**

Linear differential equations of second and higher order with constant coefficient when the R.H.S is e^{ax}, x^n n>0, sin ax, cos ax, $e^{ax}x^n$, e^{ax}sinbx, e^{ax}cosbx – Cauchy's and Legendre's linear equations – simultaneous first order linear equations with constant co-efficients – Method of variation of parameter when the R.H.S is sec ax, cosec ax, tan ax, cot ax – Applications of ODE related simple harmonic motion.

UNIT V MULTIPLE INTEGRALS **9+6**

Double integrals in Cartesian coordinates – Change of order of integration – Area between two curves – Area of double integral - Triple integration in Cartesian coordinates – Volume as triple integrals

TOTAL: 45+30 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics, 9th edition	Laxmi Publications Pvt Ltd.	2016
2.	Grewal. B.S	Higher Engineering Mathematics, 43rd Edition	Khanna Publications, Delhi	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics, 4th Edition	Pearson Education	2016
2.	Erwin Kreyszig	Advanced Engineering Mathematics, 9th Edition	John Wiley and Sons, New Delhi	2014
3.	Jain R.K., Iyengar S.R.K.	Advanced Engineering Mathematics, 4th edition	Alpha Science International Ltd	2014
4.	Dass, H.K., Er. RajnishVerma	Higher Engineering Mathematics, 3rd Revised Edition	S. Chand Private Ltd	2014
5.	Peter V. O.Neil	Advanced Engineering Mathematics, 7th Edition	Cengage learning	2012

WEB URLs:

- prezi.com/lsvapbmxxlp9/real-world-application-of-matrices/
- nptel.ac.in/courses/111108081/
- www.youtube.com/watch?v=FmhMUTmUjhM
- www.analyzemath.com/appliedmath.html
- nptel.ac.in/courses/122104017/

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16SHB02	COMPLEX VARIABLES , LAPLACE TRANSFORMS & VECTOR CALCULUS	L T P C 3 0 2 4

COURSE OBJECTIVES:

- To construct relatively simple quantitative models of change, and to deduce their consequences.
- To develop an understanding of the standard techniques of complex variable theory
- To enable the student to apply complex integration theory with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated
- To learn the inverse Laplace transformations for solving real time Engineering problems.
- This course equips students to have basic knowledge in matrix algebra techniques with its engineering applications

COURSE OUTCOMES:

16SHB02.CO1 : The knowledge gained on vector calculus provides a framework for modeling systems in which there is change, and a way to deduce the predictions of such models.

16SHB02.CO2 : Using analytical functions for real world problems, engineer makes models of projects and then simulates its models in real world conditions.

16SHB02.CO3 : To enable the student to apply complex integration theory in fluid dynamics, aero dynamics, signal processing and flow of electric current

16SHB02.CO4 : The students will have the ability for the analysis of linear time-invariant systems such as electrical circuits, harmonic oscillators, optical devices, and mechanical systems.

16SHB02.CO5 : This course equips students to have basic knowledge in inverse Laplace transforms with its engineering applications

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB02 .CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB02 .CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB02 .CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB02 .CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB02 .CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I VECTOR CALCULUS 9+6

Gradient, divergence and curl – Line, surface and volume integrals – Green's, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Verification of the above theorems and evaluation of integrals using them

UNIT II ANALYTIC FUNCTIONS 9+6

Functions of a complex variable - Analytic function: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: w =az, 1/z and bilinear transformation.

UNIT III COMPLEX INTEGRATION 9+6

Cauchy's integral theorem (excluding proof) and Cauchy's integral formula(excluding proof) – Taylor's and Laurent's series expansions(excluding proof) – Singular points – Classifications – Cauchy's residue theorem – Contour integration- circle and semi-circle Contour (excluding poles on the real axis).

UNIT IV LAPLACE TRANSFORMS 9+6

Laplace transforms – Sufficient condition for existence – Transforms of elementary functions – Basic properties - Derivatives and integrals of transforms – Transforms of derivatives and integrals of functions - – Initial and final value theorems - Problems - Transform of periodic functions

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UNIT V INVERSE LAPLACE TRANSFORMS AND IT'S APPLICATIONS 9+6

Inverse Laplace transforms – convolution - convolution theorem - Problems – Partial fraction method – Problems – Applications of Laplace transforms – Solution of linear ODE of second order with constant coefficients – Solution of Boundary Value Problems – Solution of Integro Differential Equations.

TOTAL: 45+30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics, 4th Edition	Pearson Education	2016
2.	Grewal. B.S	Higher Engineering Mathematics, 43rd Edition	Khanna Publications, Delhi	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics, 9th edition	Laxmi Publications Pvt Ltd.	2016
2.	Erwin Kreyszig	Advanced Engineering Mathematics, 9th Edition	John Wiley and Sons, New Delhi	2014
3.	Tony Croft, Anthony Croft, Robert Davison, Martin Hargreaves, James Flint	Engineering Mathematics: A Foundation for Electronic, Electrical, Communications and Systems Engineers, 4th Revised Edition	Pearson Education	2012
4.	Peter V. O.Neil	Advanced Engineering Mathematics, 7th Edition	Cengage learning	2012
5.	J.Sureshkumar	Engineering Mathematics – II, 4th Edition	SK..JSK...,Publishers	2016

WEB URLs:

- http://mathinsight.org/
- http://nptel.ac.in/courses/111107056/7
- www.nptelvideos.in/2012/11/mathematics-ii.html
- http://freevideolectures.com/Course/2349/Networks-and-Systems/23
- http://nptel.ac.in/courses/122104018/node87.html

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16SHB03 **TRANSFORMS & PARTIAL DIFFERENTIAL EQUATIONS** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To develop Z transform techniques for discrete time systems
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes
- To introduce Fourier series analysis which is central to many applications in engineering
- To develop the basic knowledge in solving the boundary value problems.

COURSE OUTCOMES:

16SHB03 .CO1 : This course enables the students to apply Fourier transform techniques to many engineering problems.
16SHB03 .CO2 : Using this course, a student develops Z transform techniques for discrete time systems for real world problems.
16SHB03 .CO3 : It equips students to find the solutions of partial differential equations that model real time processes
16SHB03 .CO4 : Provides the students to have sound knowledge Fourier series analysis.
16SHB03 .CO5 : The students will have the ability to solve boundary value problems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB03 .CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB03 .CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB03 .CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB03 .CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB03 .CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I FOURIER SERIES **9+6**

Dirichlet"s conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval"s identity – Harmonic analysis

UNIT II FOURIER TRANSFORMS **9+6**

Statement of Fourier integral theorem - Fourier transforms pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity–Problems .

UNIT III Z - TRANSFORMS AND DIFFERENCE EQUATIONS **9+6**

Z- transforms - Elementary properties – Initial and final value theorem – Inverse Z - transforms – Partial fraction method – Residue method – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS **9+6**

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations - Lagrange"s linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous when the R.H.S is e^{ax+by}, x^m y^n m,n>0, sin (ax+by), cos (ax+by)

UNIT V BOUNDARY VALUE PROBLEMS **9+6**

Classification of PDE - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Fourier series solution in Cartesian coordinates – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges) on finite square plates (excluding circular plates).

TOTAL: 45+30 Periods

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LIST OF EXPERIMENTS

1. Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt and compound motor.
4. Load test on DC series motor.
5. Swinburne's test.
6. Speed control of DC shunt motor.
7. Study of starters and 3-phase transformers connections
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Polarity Test and Sumpner's test on single phase transformers.
11. Separation of no-load losses in single phase transformer.

TOTAL: 30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Erwin Kreyszig	Advanced Engineering Mathematics, 9th Edition	John Wiley and Sons, New Delhi	2014
2.	Grewal. B.S	Higher Engineering Mathematics, 43rd Edition	Khanna Publications, Delhi	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics, 4th Edition	Pearson Education	2016
2.	Bali N. P Manish Goyal	A Text book of Engineering Mathematics, 9th edition	Laxmi Publications Pvt Ltd.	2016
3.	Datta.K.B.	Mathematical Methods of Science and Engineering	Cengage Learning India Pvt Ltd, Delhi	2013
4.	Ray Wylie. C, Barrett.L.C	Advanced Engineering Mathematics, 6th Edition	Tata Mc Graw Hill Education Pvt Ltd, New Delhi	2012
5.	Ramana.B.V.	Higher Engineering Mathematics	Tata Mc Graw Hill Publishing Company, New Delhi	2008

WEB URLs:

1. www.thefouriertransform.com/
2. www.tutorialspoint.com/signals_and_systems/z_transforms_properties.htm
3. nptel.ac.in/courses/111103021/
4. www.fourier-series.com
5. www.youtube.com/watch?v=Fh8m6ZdFaqU
6. www.jirka.org/diffyqs/htmlver/diffyqsse31.html

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16SHB04	PROBABILITY & RANDOM PROCESSES	L T P C 3 0 2 4

COURSE OBJECTIVES:

- To develop probabilistic models. This can be used in several areas of science and engineering.
- To improve the ability to understand the importance of special continuous Distributions.
- To Acquire the knowledge the concept of convergence of random sequence and the study of random signals
- To gain knowledge in the application of family of random variables in real life situations.
- To be familiar with application of auto correlation and cross correlation functions.

COURSE OUTCOMES:

16SHB04.CO1 : The students will have a fundamental knowledge of the probability concepts.
16SHB04.CO2 : It helps to use standard distributions to the real life problems.
16SHB04.CO3 : It also helps to understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.
16SHB04.CO4 : Gained knowledge in the application of family of random variables helps to solve problems in real life situations
16SHB04.CO5 : Provides the required mathematical support in real life problems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB04.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB04.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB04.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB04.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB04.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I PROBABILITY AND RANDOM VARIABLES **9+6**

Axioms of probability–conditional probability– Baye's theorem, random variables– Discrete and continuous random variables – MGF

UNIT II STANDARD DISTRIBUTIONS **9+6**

Discrete distributions : Binomial, Poisson, Geometric, Negative Binomial and their properties – Continuous distributions : Uniform, Exponential, Gamma, Normal distributions and their properties

UNIT III TWO - DIMENSIONAL RANDOM VARIABLES **9+6**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables

UNIT IV RANDOM PROCESSES **9+6**

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations

UNIT V CORRELATION AND SPECTRAL DENSITIES **9+6**

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function

TOTAL: 45+30 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Oliver. C Ibe.	Fundamentals of Applied Probability and Random Processes, 2nd Edition	Academic Press	2014
2.	Stark. H., Woods. J.W.	Probability and Random Processes with Applications to Signal Processing, 4th Edition	Pearson Education, Asia	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	HweiP.Hsu	Schaum"s Outline of Theory and Problems of Probability, Random Variables and Random Processes	Mc Graw Hill Publishing Company, New Delhi	2014
2.	Henry Stark , John W. Woods	Probability, Statistics, and Random Processes for Engineers" , 2nd Edition	Pearson Education	2014
3.	Miller. S.L., Childers. D.G.	Probability and Random Processes with Applications to Signal Processing and Communications , 2nd Edition	Academic Press (Elsevier)	2012
4.	Yates. R.D., Goodman. D.J.	Probability and Stochastic Processes, 2nd Edition	Wiley India Pvt. Ltd., Bangalore	2012
5.	Peyton Peebles	Problems and Solutions in Probability, Random Variables and Random Signal Principles (SIE), 1st Edition	Mc Graw Hill Publishing Company, New Delhi	2012

WEB URLs:

1. www.khanacademy.org/math/probability/random-variables-topic/random-variables-prob-dist/v/random-variables
2. www.mathsisfun.com
3. http://nptel.ac.in/courses/105103027/13
4. http://nptel.ac.in/courses/117105085/
5. https://www.youtube.com/watch?v=AeRQG6bg51Y

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16SHB05 **PROBABILITY AND QUEUEING THEORY** L T P C
3 0 2 4

COURSE OBJECTIVES:

- To provide the required mathematical support in real life problems
- To develop probabilistic models. This can be used in several areas of science and engineering.
- To improve the ability to understand the importance of special continuous Distributions.
  To Acquire the knowledge the concept of convergence of random sequence and the study of random signals
- To gain knowledge in the application of family of random variables in real life situations.
- To provide knowledge objects and operations scheduling.

COURSE OUTCOMES:

16SHB05.CO1 : The students will have a fundamental knowledge of the probability concepts.
16SHB05.CO2 : It helps to use standard distributions to the real life problems.
16SHB05.CO3 : It also helps to understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.
16SHB05.CO4 : Gained knowledge in the application of family of random variables helps to solve problems in real life situations
16SHB05.CO5 : Acquire skills in analyzing queueing models.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB05.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB05.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB05.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB05.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB05.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I PROBABILITY AND RANDOM VARIABLES **9+6**

Axioms of probability–conditional probability– Baye's theorem, random variables– Discrete and continuous random variables – MGF

UNIT II STANDARD DISTRIBUTIONS **9+6**

Discrete distributions : Binomial, Poisson, Geometric, Negative Binomial and their properties – Continuous distributions : Uniform, Exponer tial, Gamma, Normal distributions and their properties.

UNIT III TWO - DIMENSIONAL RANDOM VARIABLES **9+6**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables

UNIT IV RANDOM PROCESSES **9+6**

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations

UNIT V CORRELATION AND SPECTRAL DENSITIES **9+6**

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function

TOTAL: 45+30 Periods

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TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Oliver. C Ibe.	Fundamentals of Applied Probability and Random Processes, 2nd Edition	Academic Press	2014
2.	Stark. H., Woods. J.W.	Probability and Random Processes with Applications to Signal Processing, 4th Edition	Pearson Education, Asia	2014

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	HweiP.Hsu	Schaum"s Outline of Theory and Problems of Probability, Random Variables and Random Processes	Mc Graw Hill Publishing Company, New Delhi	2014
2.	Henry Stark , John W. Woods	Probability, Statistics, and Random Processes for Engineers" , 2nd Edition	Pearson Education	2014
3.	Miller. S.L., Childers. D.G.	Probability and Random Processes with Applications to Signal Processing and Communications , 2nd Edition	Academic Press (Elsevier)	2012
4.	Yates. R.D., Goodman. D.J.	Probability and Stochastic Processes, 2nd Edition	Wiley India Pvt. Ltd., Bangalore	2012
5.	Peyton Peebles	Problems and Solutions in Probability, Random Variables and Random Signal Principles (SIE), 1st Edition	Mc Graw Hill Publishing Company, New Delhi	2012

WEB URLs:

1. www.khanacademy.org/math/probability/random-variables-topic/random-variables-prob dist/v/random-variables
2. www.mathsisfun.com
3. http://nptel.ac.in/courses/105103027/13
4. http://nptel.ac.in/courses/117105085/
5. https://www.youtube.com/watch?v=AeRQG6bg51Y

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16SHB06 **NUMERICAL METHODS** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To learn the methods of solving Eigenvalue problems
- To deal with interpolation and approximation for the application of finite element analysis
- To enhance the ability of applying effective mathematical tools to solve practical problems.
- To introduce numerical tools for the solutions of partial differential equations that model several physical processes
- To study the numerical methods for solving boundary value problems

COURSE OUTCOMES:

16SHB06.CO1 : The students will have a clear perception of the power of numerical techniques
16SHB06.CO2 : Students would be able to demonstrate the applications of numerical techniques to problems drawn from industry, management and other engineering fields.
16SHB06.CO3 : It equips students to solve fluid dynamics problems.
16SHB06.CO4 : The students will have the ability to do finite element analysis of mechanical structural analysis problems.
16SHB06.CO5 : This course makes students easy in solving boundary value problems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB06.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB06.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB06.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB06.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB06.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS **9+6**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method – Solution of linear system of a equations - Gauss elimination method –Gauss Jordon method - Iterative methods of Gauss Jacobi and Gauss-Seidel - Horner's Method – Eigen value of a matrix by power method

UNIT II INTERPOLATION AND APPROXIMATION **9+6**

Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION **9+6**

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by trapezoidal and Simpsons's 1/3 rules

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS **9+6**

Single step methods – Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods – Milne's and Adams-Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS **9+6**

Finite difference methods for solving two-point linear boundary value problems – Finite difference techniques for the solution of two Laplace's and Poisson's equations on rectangular domain – one dimensional heat equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

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TOTAL: 45+30 Periods

TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	S. K. Gupta	Numerical Methods for Engineers , 3rd Edition	New Age International Pvt Ltd Publishers	2015
2.	Chapra. S.C., Canale.R.P.	Numerical Methods for Engineers, 6th Edition	Tata McGraw Hill, , New Delhi	2012

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Grewal. B.S.	Numerical Methods in Engineering & Science: with Programs in C and C++, 10th Edition	Khanna Publishers, New Delhi	2010
2.	M.K. Jain	Numerical Methods for Scientific & Engineering Computation, 6th Edition	New Age International Publishers	2010
3.	Sankara Rao. K.	Numerical methods for Scientists and Engineers, 3rd Edition	Prentice Hall of India Private, New Delhi	2007
4.	Brian Bradie	A friendly introduction to Numerical analysis	Pearson Education, Asia, New Delhi	2007
5.	Gerald. C. F. Wheatley. P. O.	Applied Numerical Analysis,6th Edition	Pearson Education, Asia, New Delhi	2006

WEB URLs:

1. http://nptel.ac.in/courses/122102009/
2. http://nptel.ac.in/courses/111101003/
3. https://www.youtube.com/watch?v=m2p6hrQGaxQ
4. https://mat.iitm.ac.in/home/sryedida/public_html/caimna/ode/rk/rk.html
5. https://mat.iitm.ac.in/home/sryedida/public_html/caimna/pde/fifth/example.html

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16SHB07 STATISTICS AND NUMERICAL METHODS L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand concepts of testing of hypothesis
- To develop design of experiments model for research problems
- To learn the methods of solving Eigenvalue problems
- To deal with interpolation and approximation for the application of finite element analysis
- To enhance the ability of applying effective mathematical tools to solve practical problems.

COURSE OUTCOMES:

16SHB07.CO1 : Provides knowledge to apply testing of hypothesis to real life problems.
16SHB07.CO2 : This chapter enhances the students to do a systematic and scientific research.
16SHB07.CO3 : The students will have a clear perception of the power of numerical techniques
16SHB07.CO4 : Students would be able to demonstrate the applications of numerical techniques to problems drawn from industry, management and other engineering fields.
16SHB07.CO5 : The students will have the ability to do finite element analysis of mechanical structural analysis problems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB07 .CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB07 .CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB07 .CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB07 .CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB07 .CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I TESTING OF HYPOTHESIS 9+6

Sampling distributions - Tests for single mean, Difference of means (large and small samples) – Tests for single variance and equality of variances – chi-square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9+6

Completely randomized design – Randomized block design – Latin square design – One way- Two way Classification.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+6

Newton-Raphson method- Gauss Elimination method – Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Horner's Method – Eigen values of a matrix by Power method .

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+6

Lagrange's and Newton's divided difference interpolation –Newton's forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal and Simpson's 1/3 rules

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+6

Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations – Adam's and Milne's predictor corrector methods for solving first order equations

TOTAL: 45+30 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S. K. Gupta	Numerical Methods for Engineers , 3rd Edition	New Age International Pvt Ltd Publishers	2015
2.	Walpole. R.E., Myers. R.H., Myers. S.L., Ye. K.	Probability and Statistics for Engineers and Scientists, 8th Edition	Pearson Education, Asia	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Douglas C. Montgomery, George C. Runger	Applied Statistics and Probability for Engineers (International Student Version)", 6th Edition	John Wiley & Sons, Inc.	2016
2.	Spiegel. M.R., Schiller. J., Srinivasan.R.A.	Schaum's Outlines on Probability and Statistics, 4th Edition	Tata McGraw Hill Education	2013
3.	Chapra. S.C., Canale.R.P.	Numerical Methods for Engineers, 6th Edition	Tata McGraw Hill, , New Delhi	2012
4.	Johnson. R.A., and Gupta. C.B.	Miller,Freund's Probability and Statistics for Engineers,11th Edition	Pearson Education, Asia	2011
5.	Grewal. B.S.	Numerical Methods in Engineering & Science: with Programs in C and C++, 10th Edition	Khanna Publishers, New Delhi	2010

WEB URI.s:

1. http://stattrek.com/tutorials/statistics-tutorial.aspx
2. http://nptel.ac.in/courses/111104075/5
3. http://nptel.ac.in/courses/122102009/
4. http://nptel.ac.in/courses/111101003/
5. https://www.youtube.com/watch?v=m2p6hrQGaxQ

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16SHB08 DISCRETE MATHEMATICS L T P C
3 0 2 4

COURSE OBJECTIVES:

- To extend student's Logical and Mathematical maturity
- To learn discrete objects and their properties.
- To deal with abstraction and the counting principles
- To introduce most of the basic terminologies used in computer science courses
- To study the concepts and properties of algebraic structures

COURSE OUTCOMES:

16SHB08.CO1 : Have knowledge of the concepts needed to test the logic of a program.
16SHB08.CO2 : Have an understanding in identifying structures on many levels.
16SHB08.CO3 : Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
16SHB08.CO4 : Be aware of the counting principles.
16SHB08.CO5 : Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB08.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB08.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB08.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB08.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB08.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I LOGIC AND PROOFS 9+6

Propositional Logic – Propositional equivalences-Predicates and quantifiers-Nested Quantifiers -Rules of inference-introduction to Proofs-Proof Methods and strategy.

UNIT II COMBINATORICS 9+6

Mathematical inductions-Strong induction and well ordering-.The basics of counting-The pigeonhole principle –Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion and applications.

UNIT III GRAPHS 9+6

Graphs and graph models-Graph terminology and special types of graphs-Representing graphs and graph isomorphism - connectivity-Euler and Hamilton paths.

UNIT IV ALGEBRAIC STRUCTURES 9+6

Algebraic systems-Semi groups and monoids-Groups-Subgroups and homomorphisms- Cosets and Lagrange'sTheorem - Ring & Fields (Definitions and examples)

UNIT V LATTICES AND BOOLEAN ALGEBRA 9+6

Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems –Sub lattices –direct product and Homomorphism-Some Special lattices- Boolean Algebra

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Narsingh Deo	Graph Theory with Applications to Engineering and Computer	Dover Publications Inc.	2016

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		Science, Reprint edition		
2.	Tremblay J.P, Manohar R	Discrete Mathematical Structures with application to computer science,30th Reprint	Tata Mc Graw Hill Pub.Co.Ltd,New Delhi,	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bernard Kolman , Robert C.Busby, Sharan Culter Ross	Discrete Mathematical Structures, 6th Edition	Pearson Education Pvt Ltd. ,New Delhi	2015
2.	Richard Johnsonbaugh	Discrete Mathematics , 7th Edition	Pearson Education Asia, New Delhi	2014
3.	Seymour Lipschutz, Mark Lipson, Varsha H. Patil	Discrete Mathematics Schaum's Outlines , Revised 3rd Edition	Mc Graw Hil Pub.Co.Ltd.,New Delhi	2013
4.	Ralph. P.Grimaldi	Discrete and combinatorial Mathematics : An Applied Introduction, 5th Edition	Pearson Education Asia,Delhi	2012
5.	Kenneth H. Rosen	Discrete Mathematics and its Applications, 7th Edition	Tata Mc Graw Hill Pub . co.Ltd.,New Delhi,Special Indian Edition	2011

WEB URLs:

1. www.dmtcs.org/dmtcs-ojs/index.php/dmtcs
2. www.tutorialspoint.com/discrete_mathematics/
3. http://nptel.ac.in/courses/106106094/#
4. www.artofproblemsolving.com/articles/discrete-math
5. http://dlmf.nist.gov/23.5

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16SHB09 **OPERATIONS RESEARCH** L T P C
3 2 0 4

COURSE OBJECTIVES:

- To provide knowledge and training in using optimization techniques.
- To learn about the transportation and assignment models
- To know the basics of integer programming and its applications.
- To develop an understanding of classical optimization theory.
- To provide knowledge objects and operations scheduling.

COURSE OUTCOMES:

16SHB09.CO1 : The knowledge gained on this course helps the students to do engineering optimization.

16SHB09.CO2 : Enable the students to prepare transportation and assignment model for business enterprise.

16SHB09.CO3 : Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems.

16SHB09.CO4 : This course equips students to have basic knowledge in classical optimization theory.

16SHB09.CO5 : It provides the knowledge to do production planning, inventory control and management.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB09.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB09.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB09.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB09.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB09.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I LINEAR PROGRAMMING MODELS 9+6

Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques- Variants of Simplex method

UNIT II TRANSPORTATION AND ASSIGNMENT MODELS 9+6

Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy -- Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem

UNIT III INTEGER PROGRAMMING 9+6

Cutting plan algorithm – Branch and bound methods, Multistage(Dynamic) programmimg .

UNIT IV CLASSICAL OPTIMISATION THEORY 9+6

Unconstrained external problems,Newton – Ralphson method –Equality constraints –Jacobian methods – Lagrangian method – Kuhn-Tucker conditions – simple problems

UNIT V OBJECT SCHEDULING 9+6

Network diagram representation – Critical Path Method – Time charts and resource leveling –PERT.

TOTAL: 45+30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication

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1.	D.S. Hira , P.K. Gupta	Operations Research, 7th Revised Edition (Reprint)	S.Chand & Co. Pvt.Ltd	2015
2.	Hamdy ATaha	Operations Research, 9th Edition	Pearson Education Asia	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mital.K.V. Mohan, Chander	Optimization Methods in Operations Research and Systems Analysis, 4th Edition	New Age International Publishers	2016
2.	Anand Sharma	Operation Research, 1st Edition	Himalaya Publishing House	2014
3.	Srinivasan. G	Operations Research: Principles and applications, 2nd Edition	PHIL Learning Private Limited	2010
4.	Paneer Selvam	Operation Research	Prentice Hall of India , 2nd Edition	2009
5.	N D Vohra	Quantitative Techniques in Management, 4th Edition	Tata Mc Graw Hill	2009

WEB URLs:

1. www.maths.adelaide.edu.au/matthew.roughan/Lecture_notes/OORII/03lecture_notes.html
2. nptel.ac.in/courses/110106059/
3. www.youtube.com/watch?v=a2QgdDk4Xjw&list=PL849A8B56B8320421
4. www.math.utah.edu/~cherk/teach/opt/course.html
5. www.youtube.com/watch?v=vUMGvpsb8dc

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16SHB21 **ENGINEERING PHYSICS** **L T P C**
3 2 0 4

COURSE OBJECTIVES:

- To understand the concepts in elasticity and transfer of heat energy through materials
- To acquire the knowledge in acoustical engineering and ultrasonic
- To enrich the principles involved in laser technology and its applications
- To understand the concept and significance in fiber optics
- To educate the basic concepts in quantum physics

COURSE OUTCOMES:

16SHB21.CO1 : An ability to apply knowledge in elasticity and heat transfer
16SHB21.CO2 : A knowledge of contemporary issues on ultrasonic studies
16SHB21.CO3 : An ability to apply knowledge in laser technology for engineering practice
16SHB21.CO4 : An ability to solve problems in fiber optics technology
16SHB21.CO5 : An ability to apply knowledge in wave theory

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB21 .CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB21 .CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB21 .CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB21 .CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB21 .CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I PROPRERTIES OF MATTER AND THERMAL PHYSICS **9**

Elasticity – Hook's law – Relationship between three modulii of elasticity (Qualitative) – stress and strain diagram – Poisson's ratio – factors affecting elasticity – bending moment – depression of a cantilever – young's modulus by uniform bending – I shaped girders. Modes of heat transfer – thermal conductivity – Newton's law of cooling – linear heat flow – lee's disc method – radial heat flow – rubber tube method – conduction through compound media (series and parallel method)

UNIT II ACOUSTICS AND ULTRASONICS **9**

Introduction of acoustics – Classification of sound-Weber-Fechner law- Reverberation – Reverberation time – Factors affecting acoustics of building and its remedy - Absorption coefficient – Measurement of Absorption coefficient.

Introduction– properties - Detection of ultrasonic waves, Magnetostriction effect - Magnetostriction generator – piezoelectric effect - piezoelectric generator-– Cavitations - Velocity measurement – acoustic grating method – SONAR - Non Destructive Testing – pulse echo system, through transmission and reflection modes.

UNIT III LASERS **9**

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion - pumping methods. Einstein's A and B coefficients – derivation - Types of lasers – He-Ne, CO_2, Nd-YAG, Semiconductor lasers (homojunction & heterojunction) - Industrial Applications - Lasers in welding, cutting, heat treatment – Medical applications - Holography (construction & reconstruction).

UNIT IV FIBRE OPTICS AND ITS APPLICATIONS **9**

Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle - Classification based on materials, refractive index profile – Double crucible technique of fibre drawing – Splicing - Loss in optical fiber - attenuation, dispersion, bending - Fibre optical communication system (Block diagram) – Fiber optic Light sources - Detectors - sensors – temperature & displacement - Endoscope.

UNIT V QUANTUM PHYSICS AND APPLICATION **9**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh –

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Jean's Law from Planck's theory – Compton effect - experimental verification – Matter waves – de Broglie's theory - Schrödinger's wave equation– Time independent and time dependent equations – Particle in one dimensional box - Physical significance of wave function - Electron Microscope – Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) – Advantages, disadvantages and application.

TOTAL: 45 Periods

LIST OF EXPERIMENTS:

1. (a) Determination of Wavelength and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
3. Determination of wavelength of mercury spectrum – spectrometer grating
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of Young's modulus by uniform bending method
6. Determination of Young's modulus by Non uniform bending method
7. Determination of Coefficient of viscosity of a liquid –Poiseuille's method
8. Determination of Dispersive power of a prism – Spectrometer
9. Determination of thickness of a thin wire – Air wedge method
10. Determination of Rigidity modulus – Torsion pendulum

TOTAL: 30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.N.Sankar & S.O.Pillai,	Engineering Physics I	New Age International Publishers	2015
2	Rajagopal K	Engineering Physics	PHI, New Delhi	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Tamilarasan.K &Prabhu.K	Engineering Physics-I	Mc Graw Hill Education	2015
2	Palanisamy P.K	Engineering Physics	SCITECH Publications	2011
3	Senthilkumar G	Engineering Physics I	VRB Publishers	2011
4	Gaur R.K. and Gupta S.L.	Engineering Physics	Dhanpat Rai publishers	2009
5	Sudarmozhi.G.	Engineering Physics I	Bharathi Publishers	2015

WEB URLs:

1. www.slideshare.net/shafie_sofian/thermal
2. www.slideshare.net/7878131049/final
3. www.slideshare.net/7878131049/laser
4. www.slideshare.net/RNBAJIYA/optical
5. www.slideshare.net/kumartvl/quantum

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16SHB22 **MATERIAL SCIENCE** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To understand the types of atomic structures in crystalline materials
- To understand the basic concepts in magnetism and superconductivity
- To impart knowledge on conducting and semiconducting materials
- To educate the concept of dielectric materials
- To understand the basic concepts in modern engineering materials

COURSE OUTCOMES:

16SHB22.CO1 : An ability to identify the types crystalline structure
16SHB22.CO2 : An ability to apply properties on magnetism and superconducting materials
16SHB22.CO3 : An ability to apply knowledge on superconducting materials and its applications
16SHB22.CO4 : An ability to apply knowledge on dielectric materials
16SHB22.CO5 : An ability to use the synthesis techniques in modern materials

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB22.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB22.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB22.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB22.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB22.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I CRYSTAL PHYSICS 9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius –Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and Graphite structures (Qualitative) – Crystal growth techniques – Bridgeman technique and Czochralski method.

UNIT II CONDUCTORS AND SEMICONDUCTORS 9

Classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann-Franz law – Quantum theory - Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

Properties of semiconductors - classification – Elemental and Compound semiconductors – Intrinsic and Extrinsic semiconductors - carrier concentration derivation in intrinsic semiconductors - band gap determination - Hall effect – Determination of Hall coefficient –Experimental method - Applications of Hall Effect.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Types – Dia, para, Ferro, anti ferromagnetic materials – Domain theory – Hysteresis – Soft and hard magnetic materials – Ferrites – preparation, properties and applications.

Properties of superconducting materials - BCS theory of superconductivity (Qualitative) - Types of super conductors – High T_c superconductors – Applications of superconductors – SQUID, Cryotron, Magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Basic definitions - Electrical susceptibility – dielectric constant – Types of polarization - electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius –Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials(capacitor and transformer) – ferroelectricity and applications

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UNIT V ADVANCED ENGINEERING MATERIALS 9

Metallic glasses: Preparation, properties and applications – metallic glasses as transformer cores.

Shape memory alloys (SMA): Types and Characteristics - properties of NiTi alloy- advantages and disadvantages of SMA - applications.

Nanomaterials: Synthesis– Eleectro deposition, Plasma arcing - properties of nanoparticles and applications.

Carbon nanotubes: Types - Single walled and multi walled nanotubes – Synthesis of carbon nanotube - pulsed laser deposition, chemical vapour deposition – Properties and applications

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.N.Sankar & S.O.Pillai	Engineering Physics I	New Age International Publishers	2015
2	Rajagopal K.	Engineering Physics	PHI, New Delhi	2011

REFERENCE BOOKS:

2	William Smith	Material science	Tata McGraw Hill publications	2012
3	Raghavan	Material science	Prentice Hall India Ltd.	2005
4	O.P.Kanna	Material Science and Metallurgy	Dhanpat Rai Publications	2012
5	Arumugam,	Material Science	Anuradha Publications	2010

WEB URLs:

1. www.lehigh.edu/~jdg4/classwork/crystalstructure.ppt
2. www.slideshare.net/shkrairo/superconductivity-and-its-applications
3. www.powershow.com/view/1d2c15-YTU3Y/
4. www.slideshare.net/vaishnavibathina/unit-3-35590134
5. www.slideshare.net/saurabhnandy007/carbon-nanotubes-25272300

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16SHB23 PHYSICS FOR ELECTRICAL ENGINEERING L T P C
3 0 0 3

COURSE OBJECTIVES:

- Define and explain electrical and thermal conductivity of conducting materials.
- Explain the theory of semi-conducting materials and its applications.
- Explain the properties and applications of magnetic and superconducting materials.
- Explain polarization process in dielectric materials and their temperature and frequency dependence and the causes of dielectric breakdown.
- Recognize the novel properties of new engineering materials.

COURSE OUTCOMES:

16SHB23.CO1 : An ability to identify the types crystalline structure
16SHB23.CO2 : An ability to apply properties on magnetism and superconducting materials
16SHB23.CO3 : An ability to apply knowledge on superconducting materials and its applications
16SHB23.CO4 : An ability to apply knowledge on dielectric materials
16SHB23.CO5 : An ability to use the synthesis techniques in modern materials

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB23.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB23.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB23.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB23.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB23.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory –band theory of solids (qualitative treatment only) - Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals – conducting materials in thermal relay and themostats

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductors – Energy band diagram – direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors - Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Extrinsic semiconductors – Carrier concentration in N-type and P-type semiconductors (Qualitative Treatment only) – Variation of Fermi level with temperature and impurity concentration – Compound semiconductors – Hall effect – Determination of Hall coefficient – Hall effect applications – Ohmic contacts – Schottky diode.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para and Ferromagnetic materials – Domain theory – Hysteresis – Soft and hard magnetic materials – Ferrites – applications of ferrites in telecommunication, radar and magnetic hard disc.

Superconductivity - Properties - Types of super conductor – BCS theory of superconductivity (Qualitative) - High Tc superconductors – Applications of superconductors: SQUID, cryotron, magnetic levitation in trains

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – Dielectric constant – Electronic, ionic, orientational and space charge polarization – Frequency and temperature dependence of polarization – Internal field – Clausius – Mosotti relation (derivation) – Physical significance of Maxwell's equations - Dielectric loss – Dielectric breakdown – Uses of

dielectric materials in capacitor and transformer – application of dielectrics in microwave oven and dielectric strain gauge.

UNIT V NEW ENGINEERING MATERIALS 9

Metallic glasses - preparation, properties and applications

Shape memory alloys (SMA) - characteristics, properties of NiTi alloy, applications, advantages and disadvantages of SMA

Nanoscience and Nanotechnology – significance of the nanoscale - different types of nanostructures (Confinement Dimensions 0-D, 1-D, 2-D and 3-D) - Categories of nanomaterials - Fabrication of nonomaterials - Ball milling method and Chemical vapour deposition technique - Carbon nanotubes - Types of carbon nanotubes - CNT structure – properties and applications.

Biomaterials (metals and alloys, ceramics) - classification and applications

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.N.Sankar& S.O.Pillai	Engineering Physics I	New Age International Publishers	2015
2	M. Arumugam,	Materials Science	Anuradha Publications	2006

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B. K. Pandey and S. Chaturvedi	Engineering Physics	Cengage Learning India Pvt. Ltd., Delhi,	2012
2	Rajendran, V, and Marikani A	Materials science	TMH Publications	2004
3	Jayakumar, S.	Materials science	R.K. Publishers, Coimbatore	2008
4	Palanisamy P.K	Materials science	Scitech Publications (India) Pvt. Ltd	2007
5	Sudarmozhi.G.	Engineering Physics II.	Bharathi Publishers,	2015

WEB URLs:

1. www.lehigh.edu/~jdg4/classwork/crystalstructure.ppt
2. www.slideshare.net/shkrairo/superconductivity-and-its-applications
3. www.powershow.com/view/1d2c15-YTU3Y/
4. www.slideshare.net/vaishnavibathina/unit-3-35590134
5. www.slideshare.net/saurabhnandy007/carbon-nanotubes-25272300

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16SHB24	PHYSICS FOR MECHANICAL ENGINEERING	L T P C 3 0 0 3

COURSE OBJECTIVES:

- Define the various moduli of elasticity and explain streamline and turbulent flow of liquid and apply Poiseuille's formula to determine the coefficient of viscosity of a liquid.
- Describe experimental methods to determine thermal conductivity and state the laws of thermodynamics and their applications in the field of Engineering.
- Define and explain electrical and thermal conductivity of conducting materials.
- Explain the theory of semi-conducting materials and its applications.
- Recognize the novel properties of new engineering materials

COURSE OUTCOMES:

16SHB24.CO1 : An ability to identify the types crystalline structure
16SHB24.CO2 : An ability to apply properties on magnetism and superconducting materials
16SHB24.CO3 : An ability to apply knowledge on superconducting materials and its applications
16SHB24.CO4 : An ability to apply knowledge on dielectric materials
16SHB24.CO5 : An ability to use the synthesis techniques in modern materials

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB24 .CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB24 .CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB24 .CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB24 .CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB24 .CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I PROPERTIES OF MATTER AND HYDRODYNAMICS 9

Elasticity - Poisson's ratio and relation between moduli (qualitative) - Stress-strain diagram- Factors affecting elasticity - Bending of beams - Cantilever - expression for bending moment – Measurement of Young's modulus by uniform and non-uniform bending - I shaped girders - Stream line flow - Turbulent flow- Poiseuille's formula for flow of liquid through a capillary tube – Determination of coefficient of viscosity of a liquid

UNIT II HEAT AND THERMODYNAMICS 9

Thermal conductivity - Forbe's and Lee's disc methods- Radial and cylindrical flow of heat -Thermal conductivity of rubber and glass - Thermal insulation of buildings - Thermal insulating materials - Thermal equilibrium - Zeroth law of thermodynamics - Internal Energy - First law of thermodynamics - Indicator diagram - Isothermal process - Work done in an isothermal expansion - Adiabatic process - Work done in an adiabatic expansion – Reversible and irreversible processes - Second law of thermodynamics - Carnot engine - Efficiency of Canot's cycle - Carnot's cycle as heat engine and refrigerator - Carnot's theorem - Comparative study of Ideal Otto and diesel engines and their efficiency (no derivation) - Entropy - temperature diagram of Carnot's cycle.

UNIT III CONDUCTING MATERIALS 9

Conductors - classical free electron theory of metals - Electrical and thermal conductivity - Wiedemann-Franz law - Lorentz number - Drawbacks of classical theory - Quantum theory -band theory of solids(qualitative treatment only) - Fermi distribution function - Effect of temperature on Fermi Function - Density of energy states - Carrier concentration in metals - application of conducting materials in induction furnace

UNIT IV SEMICONDUCTING MATERIALS 9

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Intrinsic semiconductors – Energy band diagram – direct and indirect band gap semiconductors -Carrier concentration in intrinsic semiconductors - Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Extrinsic semiconductors – Carrier concentration in N-type and P-type semiconductors (Qualitative Treatment only) – Variation of Fermi level with temperature and impurity concentration – Compound semiconductors – Hall effect – Determination of Hall coefficient – Hall effect applications - application of semiconductors in strain measurements

UNIT V NEW ENGINEERING MATERIALS **9**

Metallic glasses: Preparation - properties – applications

Shape memory alloys: Characterisitics - properties of Ni-Ti alloy – application- advantages and disadvantages of SMA

Advanced Ceramics: Introduction – characteristics – structural ceramics

Nanoscience and Nanotechnology – significance of the nanoscale - different types of nanostructures (Confinement Dimensions 0-D, 1-D, 2-D and 3-D) - Categories of nanomaterials - Fabrication of nonomaterials - Ball milling method and Chemical vapour deposition technique - Carbon nanotubes - Types of carbon nanotubes - CNT structure – properties and applications. Biomaterials (metals and alloys, ceramics) - classification and applications.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.N.Sankar& S.O.Pillai	Engineering Physics I	New Age International Publishers	2015
2	M. Arumugam,	Materials Science	Anuradha Publications	2006

REFERENCE BOOKS:

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2	Rajendran, V, and Marikani A	Materials science	TMH Publications	2004
3	Jayakumar, S.	Materials science	R.K. Publishers, Coimbatore	2008
4	Palanisamy P.K	Materials science	Scitech Publications (India) Pvt. Ltd	2007
5	Sudarmozhi.G.	Engineering Physics II.	Bharathi Publishers,	2015

WEB URLs:

1. www.lehigh.edu/~jdg4/classwork/crystalstructure.ppt
2. www.slideshare.net/shkrairo/superconductivity-and-its-applications
3. www.powershow.com/view/1d2c15-YTU3Y/
4. www.slideshare.net/vaishnavibathina/unit-3-35590134
5. www.slideshare.net/saurabhnandy007/carbon-nanotubes-25272300

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16SHB31 ENGINEERING CHEMISTRY L T P C
3 0 0 3

COURSE OBJECTIVES:

- The students familiar with characteristics of water and know the specification of boiler feed water. To understand the softening of hard water by using various purification techniques.
- To understand the principles involved in corrosion. The students able to apply these principles towards the prevention of corrosion.
- The students will understand the basic concepts of polymers chemistry and its applications. The students have sound knowledge of plastics and rubbers.
- The students understand the reaction of nuclear fission and fusion reaction and promote the knowledge about process of nuclear reactors. To understand various chemical reactions involved in the batteries.
- The students will have knowledge on industrial important abrasives and refractories.

COURSE OUTCOMES:

16SHB31.CO1 : The students will understand characteristics of water and softening of hard water by using various purification techniques.
16SHB31.CO2 : The students able to apply principles of corrosion towards the prevention of corrosion.
16SHB31.CO3 : The students have sound knowledge of polymers chemistry, plastics and rubbers and its applications.
16SHB31.CO4 : The students have adequate knowledge about process of nuclear reactors and various chemical reactions involved in the batteries.
16SHB31.CO5 : The students know industrial important abrasives, refractories and its applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB31.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB31.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB31.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB31.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB31.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I WATER TECHNOLOGY 9

Characteristics – Domestic water treatment – disinfection methods (chlorination, ozonation and UV treatment) – Boiler feed water-requirements-disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon, colloidal and carbonate conditioning methods)-external conditioning – zeolite and demineralization process – desalination and reverse osmosis.

UNIT II CORROSION AND CORROSION CONTROL 9

Corrosion – chemical corrosion- electrochemical corrosion – types-galvanic corrosion – differential aeration corrosion – factors influencing corrosion - corrosion control – sacrificial anodic method and impressed current cathodic protection method – corrosion inhibitors – paints-constituents and functions – electroplating of copper and electroless plating of nickel.

UNIT III POLYMERS 9

Polymers – definition – polymerization – types and mechanism of polymerization – addition polymerization (free radical mechanism), condensation polymerization and copolymerization – properties of polymers - Plastics, classification – preparation, properties and uses of PVC, Teflon, nylon-6,6 and PET-Rubber – vulcanization of rubber – butyl rubber, SBR .

UNIT IV NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear energy – fission and fusion reactions – nuclear chain reactions – characteristics – light water nuclear reactor for power generation – breeder reactor – solar energy conversion – solar cells – wind energy-Fuel cells – hydrogen and oxygen fuel cell – batteries – alkaline battery – lead acid battery, nickel-

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UNIT V ENGINEERING MATERIALS 9

Refractories – classification - acidic, basics and neutral refractories – properties – manufacture of alumina, magnesite and zirconia bricks-Abrasives – natural and synthetic abrasives – manufacture ,properties and uses of silicon carbide and boron carbide- application of abrasives- Glass-manufacture, types, properties and uses

TOTAL: 45 Periods

LIST OF EXPERIMENTS

1. Determination of hardness of water by EDTA method
2. Determination of alkalinity in water sample
3. Determination of dissolved oxygen content of water sample by Winkler's method.
4. Estimation of chloride content of water sample by argentometric method
5. Estimation of hydrochloric acid by pH meter
6. Determination of strength of CH_3COOH and HCl in a mixture using conductivity meter
7. Conductometric titration of HCl vs NaOH
8. Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4
9. Determination of molecular weight of polyvinylalcohol using Ostwald viscometer
10. Estimation of iron content of the given solution using potentiometer

TOTAL: 30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.P.Santhi & S.Elavarasan	Engineering Chemistry	Sri Kandhan Publications	Aug 2016
2.	Dr.A.Ravikrishnan	Engineering Chemistry I & II	Sri Krishna Hitech Publishing Company Pvt. Ltd	June 2016

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B P.C.Jain and Monica Jain	Engineering Chemistry	Dhanpat Rai Pub, Co., New Delhi	2013
2.	S.S. Dara	A text book of engineering chemistry	S.Chand & Co.Ltd., New Delhi	2013
3.	Shradha Sinha	Advanced Engineering Chemistry	Krishna Prakasan Media (P) Ltd., Meerut	2015
4.	B.Sivasankar	Engineering Chemistry	Tata McGraw-Hill Publishing Company,Ltd.,New Delhi	2008
5.	V.R.Gowariker N.V.Viswanathan and JayadevSreedhar	Polymer Science	New Age International P (Ltd.,),Chennai	2006

WEB URLs:

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2. www.nace.org/Corrosion-101/
3. www2.chemistry.msu.edu/faculty/reusch/virttxtjml/polymers.htm
4. www.nei.org/Knowledge-Center/How-Nuclear-Reactors-Work
5. www.vidyarthiplus.in/2012/01/engineering-chemistry1abrasives.html

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16SHB32 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To give a comprehensive insight into ecosystem, biodiversity and natural recourses.
- To create an awareness on the various environmental pollution aspects and issues and to educate the ways and means to protect the environment from various types of pollution.
- To import some fundamental knowledge on human welfare measures.
- To understand the role of government and non-government organization in environment managements.
- Discuss the impact of human population on the environment

COURSE OUTCOMES:

16SHB32.CO1 : The students can understand ecosystem, biodiversity and natural recourses.
16SHB32.CO2 : The students have knowledge about various environmental pollution and can able to protect the environment from pollution.
16SHB32.CO3 : The students have fundamental knowledge on human welfare and its measures.
16SHB32.CO4 : The students have adequate knowledge about various government and non-government organization in environment managements.
16SHB32.CO5 : The students know the impacts of human population on the environment.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16SHB32.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16SHB32.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB32.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB32.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16SHB32.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction to biodiversity definition – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and exsitu

Forest resources: Use and over-exploitation, deforestation, cause – effect-control measures – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems –Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT III ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution(c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – disaster management: floods, earthquake, cyclone and landslides.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people – environmental

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ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Forest conservation act – role of nongovernmental organization- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV /AIDS – women and child welfare – role of information technology in environment and human health.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.A.Ravikrishnan	vironmental Science and Engineering	Sri Krishna Hitech Publishing Company Pvt.Ltd	June 2016
2.	Gilbert M. Masters	rodution to Environmental Engineering and Science	Pearson Education Pvt., Ltd., Second Edition. ISBN 81-297-0277-0	2004

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dharmendra S. Sengar	Environmental Law	Prentice hall of India PVT LTD, New Delhi	2007
2.	R.K.Trivedi	Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol-I and II,	BS Publications	2010
3.	R.Rajagopalan	Environmental Studies	From Crisis to Cure, Oxford University Press	2015
4.	Benny Joseph	Environmental Science and Engineering	Tata McGraw-Hill,NewDelhi	2006
5.	T.G.Miller	Environmental Science	Wadsworth Publishing Co.	2004

WEB URLs:

1. www.yourarticlelibrary.com/environment/ecosystem/ecosystems-concept-structure-and-functions-of-ecosystems-with-diagram/28211/
2. www.importantindia.com/12331/types-of-natural-resources-in-india/
3. www.conserve-energy-future.com/causes-and-effects-of-environmental-pollution.php
4. http://agritech.tnau.ac.in/agriculture/agri_majorareas_watershed_rainwaterharvesting.html
5. www.yourarticlelibrary.com/essay/role-of-information-technology-in-environment-and-human-health/30230/

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16CEC03 **BASICS OF CIVIL AND MECHANICAL ENGINEERING** L T P C
4 0 0 4

COURSE OBJECTIVES:

- To posses knowledge about different type of surveying and Civil Engineering materials.
- To recognize the building components and structures.
- To explore various types of power generation, pumps and turbines.
- To realize about IC Engines and Boilers.
- To classify Refrigeration and Air Conditioning.

COURSE OUTCOMES:

16CEC03.CO1 : Demonstrate field measurement in surveying.
16CEC03.CO2 : Explore basic ideas of building components and structures.
16CEC03.CO3 : Familiar about the power generation, pumps and turbines.
16CEC03.CO4 : Outline basic ideas among the IC Engines and Boilers.
16CEC03.CO5 : Familiar about Refrigeration and Air Conditioning.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEC03.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEC03.CO2	x	x	x	-	-	x	-	-	x	x		x	x	-	-
16CEC03.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC03.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC03.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

A.CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS **12**

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES **12**

Foundations: Types, Bearing capacity – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

B. MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING **12**

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV IC ENGINES **12**

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM **12**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 60 Periods

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TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Shanmugam G and Palanichamy M S	Basic Civil and Mechanical Engineering	McGraw Hill Publishing Co., New Delhi	2016
2.	Shanmugasundaram and K. Mylsamy	Basic Civil and Mechanical Engineering	Cengage Learning India Private Limited	2012

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Ramamrutham S	Basic Civil Engineering	Dhanpat Rai Publishing Co. (P) Ltd.	2015
2.	Seetharaman S	Basic Civil Engineering	Anuradha Agencies	2015
3.	Venugopal K. and Prahu Raja V	Basic Mechanical Engineering	Anuradha Publishers, Kumbakonam	2016
4.	Shantha Kumar S R J	Basic Mechanical Engineering	Hi-tech Publications, Mayiladuthurai	2014
5	Selvaraj P, Periyasamy M and S.Selvakumar	Basic Civil and Mechanical Engineering	Scitech Publications (India) Pvt Ltd	2013

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1. http://nptel.ac.in/courses/105107122/
2. https://buildingtechnology.wordpress.com/2011/01/22/functions-of-building-components/
3. https://buildingtechnology.wordpress.com/2011/01/22/functions-of-building-components/
4. http://nptel.ac.in/courses/112104033/
5. https://www.youtube.com/watch?v=AyAd-gLO9CE

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16CEC06 ENGINEERING PRACTICES FOR MECHANICAL SCIENCES L T P C
0 0 4 2

COURSE OBJECTIVES:

- To choose the pipe connections in PVC and G.I pipes.
- To prepare various joints using carpentry tools and power tools.
- To interpret fitting tools and prepare various metal joints.
- To understand and practice different welding joints by arc and gas welding machine.
- To dismantle and identify the parts of Air conditioners and explain its working.
- To experiment different types of domestic wiring

COURSE OUTCOMES:

16CEC06.CO1 : Make pipe connections in PVC and G.I pipes.
16CEC06.CO2 : Prepare various joints using carpentry tools and power tools.
16CEC06.CO3 : Interpret fitting tools and prepare various metal joints.
16CEC06.CO4 : Understand and practice different welding joints by arc and gas welding machine.
16CEC06.CO5 : Dismantle and identify the parts of Air conditioners and explain its working. Experiment different types of domestic wiring.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEC06.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEC06.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC06.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC06.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC06.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I CIVIL ENGINEERING PRACTICE 25

1. PLUMBING WORKS

Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, Elbows and household fittings.

1. Basic pipe connections (PVC) involving the fittings like Valves, Taps, and Bends.
2. Mixed pipe (PVC and G.I) connections involving the fitting like Valves, Taps, and Bends

2. CARPENTRY WORKS

Study of Carpentry Tools

1. Preparation of T-Joint
2. Preparation of Lap joint
3. Preparation of Dovetail Joint

UNIT II MECHANICAL ENGINEERING PRACTICE 25

FITTING WORK

1. Study of Fitting work Tools
2. Preparation of L joint
3. Preparation of V joint

WELDING

1. Study of Welding Equipments and Tools
2. Preparation of Butt joint
3. Preparation of Lap joint
4. Preparation of Tee joint

MACHINE ASSEMBLY PRACTICE

1. Air conditioner repair and maintenance
2. Assembly and Dismantling for the two wheeler wheel.

UNIT III ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring

2. Fluorescent lamp wiring.
3. Staircase Wiring and Door bell wiring

TOTAL: 60 Periods

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jeyachandran K., Natarajan S. & Balasubramanian S	A Primer on Engineering Practices Laboratory	Anuradha Publications	2014
2.	Jeyapoovan T., Saravanapandian M. & Pranitha S	Engineering Practices Lab Manual	Vikas Puplishing House Pvt.Ltd.	2015
3.	Gowri S and Jeyapoovan T	Engineering Practices Lab Manual	Vikas Publishing House	2009
4.	Dash S S	Electrical Engineering Practice Lab Manual	Vijay Nicole Imprints P Ltd.-Chennai	2013
5.	Rajput R.K	Workshop Practice	Laxmi Publications	2016

WEB URLs:

1. www.dailymotion.com/video/x3lu1dp
2. www.americanradioworks.org/.../a-21st-century-vocational-high-...
3. www.youtube.com/watch?v=xs6dxC3sCkU
4. https://www.youtube.com/watch?v=Wsx6pK-RlZM
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16CEC05	ENGINEERING DRAWING	L T P C 1 0 4 3

COURSE OBJECTIVES:

- To construct various curves in engineering applications.
- To draw the projection of three dimensional objects representing machine structure.
- To analyze the principles of projection of various planes by different angle to project points, lines and planes.
- To draw the projection of simple solid when axis is inclined to one reference plane by change of position method.
- To identify the interior components of machinery (or) buildings by sectioning the solid, and to study the development of simple solids for fabrication of sheet metals.

COURSE OUTCOMES:

16CEC05.CO1 : Construct various curves in engineering applications.
16CEC05.CO2 : Draw the projection of three dimensional objects representing machine structure.
16CEC05.CO3 : Analyze the principles of projection of various planes by different angle to project points, lines and planes.
16CEC05.CO4 : Draw the projection of simple solid when axis is inclined to one reference plane by change of position method.
16CEC05.CO5 : Transform the manual drawings to CAD drawings.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEC05.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEC05.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC05.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC05.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC05.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

CONCEPTS AND CONVENTIONS (Not for Examination) 4

Importance of graphics in engineering applications, Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning.

COMPUTER AIDED DRAFTING (Not for Examination) 6

Importance 2d Drafting, sketching, modifying, transforming and dimensioning.

UNIT I PLANE CURVES 13

Curves used in engineering practices, Conics, Construction of ellipse, Parabola and hyperbola by eccentricity method, Construction of cycloid, construction of involutes of square and circle, Drawing of tangents and normal to the above curves.

UNIT II ISOMETRIC TO ORTHOGRAPHIC VIEWS 13

Representation of three dimensional objects, General Principles of Orthographic projection, Need for importance of multiple views and their placement, First angle projection, layout of views, Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT III PROJECTION OF POINTS, LINES AND PLANE 13

(Free hand sketching) Projection of points, Projection of straight lines located in the first quadrant, Determination of true lengths and true inclinations, Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT IV PROJECTION OF SOLIDS 13

(Free hand sketching) Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

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UNIT V SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **13**

(Free hand sketching) Sectioning of simple solids like prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids, Prisms, pyramids, cylinders and cones.

TOTAL: L: 15 + P: 60 = 75 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Natrajan K.V	A text book of Engineering Graphics	Dhanalakshmi Publishers, Chennai	2015
2.	Basant Agrawal and C.M. Agrawal	Engineering Drawing	McGraw Hill Education; Second edition	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gopalakrishnan K.R	Engineering Drawing (Vol. I&II combined)	Subhas Stores Bangalore	2007
2.	Luzzader, Warren.J. and Duff,John M	Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production	Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi	2005
3.	Shah M.B., and Rana B.C	Engineering Drawing	Pearson, 2nd Edition	2009
4.	Venugopal K. and Prabhu Raja V	Engineering Graphics	New Age International (P) Limited	2008
5.	Bhatt N.D. and Panchal V.M	Engineering Drawing	Charotar Publishing House, 50th Edition	2010

WEB URLs:

1. https://www.youtube.com/watch?v=mOv2kbZID2Q
2. https://www.youtube.com/watch?v=NEKJ9S28Fh8
3. https://www.youtube.com/watch?v=I1OxuLWrfbA
4. https://www.ycutube.com/watch?v=OSISqnclmWA
5. https://www.youtube.com/watch?v=ruu5yHoxcek

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16CEC08 **ENGINEERING MECHANICS** L T P C
3 2 0 4

COURSE OBJECTIVES:

- To generalize the scalar and vector representation of forces and moments.
- To explore truss, beam, frame and cable problems and respond to the distributed force systems.
- To predict Centroid and Moment of Inertia.
- To realize the Laws of Motion, Principle of Work and Energy, Kinematics & Kinetics of Motion and the interrelationship.
- To recognize the effect of impact of elastic bodies.

COURSE OUTCOMES:

16CEC08.CO1 : Generalize the scalar and vector representation of forces and moments.
16CEC08.CO2 : Explore truss, beam, frame and cable problems and respond to the distributed force systems.
16CEC08.CO3 : Predict Centroid and Moment of Inertia.
16CEC08.CO4 : Realize the Laws of Motion, Principle of Work and Energy, Kinematics & Kinetics of Motion and the interrelationship.
16CEC08.CO5 : Recognize the effect of impact of elastic bodies.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEC08.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEC08.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC08.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC08.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC08.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I BASICS AND STATICS OF PARTICLES 15

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces – additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES 15

Free body diagram – Types of supports – Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 15

Centroids and centre of mass – Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Theorems of Pappus – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia

UNIT IV DYNAMICS OF PARTICLE 15

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's laws of motion – Work Energy Equation – Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION 15

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction – Rolling – resistance.

TOTAL:L : 45 + T :30 = 75 Periods

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TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Beer, F.P and Johnston. E.R.,	Vector Mechanics for Engineers: Statics and Dynamics	Tata McGraw-Hill Publishing company, New Delhi	2013
2.	S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati	Engineering Mechanics	McGraw Hill Education; 5 edition	2013

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Hibbeller, R.C and Ashok Gupta	Engineering Mechanics: Statics and Dynamics	Pearson Education	2010
2	Irving H. Shames and Krishna Mohana Rao. G	Engineering Mechanics – Statics and Dynamics	Pearson Education	2006
3	Meriam J.L. and Kraige L.G	Engineering Mechanics	John Wiley & Sons	2013
4	Rajasekaran S and Sankarasubramanian G	Engineering Mechanics	Vikas Publishing House Pvt. Ltd	2005
5	Bhavikatti, S.S	Engineering Mechanics	New Age International (P) Limited Publishers	2015

WEB URLs:

1. https://www.math10.com/en/geometry/vectors-definitions/vectors.html
2. https://ecourses.ou.edu/cgi-bin/ebook.cgi?doc=&topic=st&chap_sec=05.2.
3. https://web.iit.edu/sites/web/files/departments/academic.../Moment_Inertia.pdf
4. https://www.khanacademy.org/...momentum/momentum.../what-are-momentum-
5. https://www.svce.ac.in/departments/mech/lessonplan/evenlp/GE6253.doc

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16CEC09 **CONSTRUCTION MATERIALS** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce students to various materials commonly used in civil engineering construction and their properties.
- To select suitable type of stones, bricks, lime and ceramic.
- To study about the concrete design mix.
- To know about the procedures in concreting.
- To understand special concrete and their use.

COURSE OUTCOMES:

16CEC09.CO1 : Able to demonstrate knowledge of construction materials and their usages in building projects.
16CEC09.CO2 : Able to apply learning to further research in advancement of civil engineering materials field.
16CEC09.CO3 : Identify the materials including their sources and production and properties.
16CEC09.CO4 : Understood characteristics of conventional building materials like stone, brick, wood etc.
16CEC09.CO5 : Learned about new and composite materials and their value adding characteristic of being lightweight, energy efficient, speedy construction among others.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEC09.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEC09.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC09.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC09.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC09.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I STONES – BRICKS – CONCRETE BLOCKS 9

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 – brick earth – composition and harmful constituents – Efflorescence – Bricks for special use –Refractory bricks – Cement, Concrete blocks – Light weight concrete blocks.

UNIT II CEMENT – AGGREGATES – MORTAR 9

Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Tests on cement– Industrial byproducts – Fly ash Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – abrasion Resistance – Grading – Sand Bulking.

UNIT III CONCRETE 9

Concrete – Ingredients – Manufacturing Process – RMC – Tests on fresh and hardened concrete – Modulus of rupture – Mix specification – Mix proportioning – BIS method –Admixtures and their functions – High Strength Concrete and HPC – Other types of Concrete – Durability of Concrete – Corrosion – Causes and effects – remedial measures – Thermal properties of concrete – Micro cracking of concrete – Quality of Water for mixing and curing – use of sea water for mixing concrete.

UNIT IV TIMBER AND OTHER MATERIALS 9

Timber – Market forms – Industrial timber– Plywood – Veneer – Thermacole – Panels of laminates .
Ferrous metals: Iron and steel, basic metallurgy, composition and grades, market forms and heat treatment 0 Steel as reinforcement – Corrosion of metals and protection.
Non –ferrous metals: Aluminum, copper, brass and glass products – properties – applications.

UNIT V MODERN MATERIALS 9

Glass – Ceramics – Sealants for joints – Fiber glass reinforced plastic – Clay products – Refractory's – Composite materials – Types – Applications of laminar composites – Fiber textile – Geo membranes and Geotextiles for earth reinforcement – polymers and plastics: walls, pipes and sanitary ware, glues and mastics – acid and chemical

resistant products

TOTAL: 45 Periods

TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1	Duggal.S.K	Building Materials	4th Edition, New Age International	2016
2	Edward Allen and Joseph Iano	Fundamentals of Building Construction: Materials and Methods	Wiley, 6th Edition	2013

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Varghese. P.C	Building construction	Prentice Hall of India Pvt. Ltd, New Delhi	2012
2	Shetty.M.S	Concrete Technology (Theory and Practice)	S. Chand and Company Ltd	2014
3	Arora S.P. and Bindra S.P	The Text Book of Building Construction	Dhanpat Rai and Sons	1999
4	G.S.Birdie, T.D.Ahuja	Building Construction and construction materials	Dhanpat Rai publishing company, New Delhi.	2007
5	Gambhir.M.L	Concrete Technology	3rd Edition, Tata McGraw Hill Education	2009

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16CEC15 **REMOTE SENSING AND GIS** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basic concepts of remote sensing.
- To provide an exposure about the types of platforms and sensors .
- To introduce the types of data products and image interpretation.
- To give knowledge on various types of map analysis.
- To provide an exposure about DBMS and its practical applications..

COURSE OUTCOMES:

16CEC15.CO1 : Ability to understand the basic concept of remote sensing .
16CEC15.CO2 : They will be able to select and finalize the remote sensing satellite data for different applications.
16CEC15.CO3 : They will be able to extract the different type of information from different remote sensing data products using various image processing techniques.
16CEC15.CO4 : Learned GIS for analysis of spatial and non spatial data.
16CEC15.CO5 : To apply problem specific remote sensing data for civil engineering applications.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEC15.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEC15.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC15.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC15.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC15.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I PRINCIPLES AND CONCEPTS 9

Definition – Historical Background, Components of Remote Sensing – Electromagnetic spectrum, Visible, Infra Red, NIR, Thermal IR, Microwave – Radiation Principle and Energy equations – Active and Passive Remote Sensing – platforms – Aerial and Space Platforms – Balloons – Helicopters, Aircrafts and satellites – Significance of Remote Sensing.

UNIT II ENERGY INTERACTION WITH ATMOSPHERE AND EARTH SURFACE MATERIALS 9

Atmospheric Characteristics – Atmospheric interference – Scattering of EMR – Rayleigh, Mie and Non Selective Scattering – Absorption – Atmospheric Windows – Spectral Signature interaction of EMR with atmosphere, earth surface, soils, water and vegetation.

UNIT III SATELLITE REMOTE SENSING AND DIGITAL IMAGE PROCESSING 9

Satellites – Classification – Based on orbits – Based on purpose – Remote sensing satellites – LANDSAT, SPOT, IRS and IKONOS – Their orbital characteristics – Sensors onboard – Characteristics of thermal imagery and radar imagery – Comparison with image types – Characteristics of digital image processing – Pre – processing – Image enhancement – Filtering – Classification.

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9

GIS – Components of GIS – Hardware, Software and organizational set up – Data – Spatial and Non spatial – Maps – Types of maps – Map Projection – Types of projection – Data input – Digitization – Editing – Raster and Vector data structures – Comparison – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlying, Buffering – Data output – Printers and plotters.

UNIT V APPLICATIONS OF REMOTE SENSING AND GIS 9

Data Base Management systems (DBMS) – Remote Sensing data attribute data analysis – integrated data analysis – data compression – modeling in GIS – DEM, DGM and DTM applications – transport, water resources, land information system & disaster management.

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TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anji Reddy, M	Textbook of Remote Sensing and Geographical Information System	Second edn. BS Publications, Hyderabad	2014
2	Lillesand, T.M., Kiefer, R.W. and J.W.Chipman	Remote Sensing and Image Interpretation	V Edn. John Willey and Sons (Asia) Pvt. Ltd., New Delhi	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Lo.C.P.and A.K.W.Yeung	Concepts and Techniques of Geographic Information Systems	Prentice0Hall of India Pvt. Ltd., New Delhi	2012
2	Peter A.Burrough, Rachael A.McDonnell	Principles of GIS	Oxford University Press	2007
3	Ian Haywood	An Introduction to GIS"	Pearson Education Asia	2010
4	Chang.T.K.	Geographic Information Systems	Tata McGrawHill	2008
5	Chrisman N R	Exploring Geographic Information Systems	2nd Edition, John Wiley & Sons, New York	2009

WEB URLs:

1. http://serc.carleton.edu/NAGTWorkshops/gis
2. http://kscst.iisc.ernet.in/
3. www.ida.liu.se/~746A27/Literature/Lecture_4.pdf
4. http://ydrologie.org/hsj/410/hysj_41_04_0593.pdf
5. https://www.law.berkeley.edu/files/Reddix0Smalls_Brenda_IPSC_paper_2014.pdf

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16CEC07 **ENGINEERING GEOLOGY** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To impart the concepts of geological agents and their processes.
- To provide knowledge on various properties of minerals and their engineering significance.
- To give knowledge on various classifications of rocks.
- To understand the importance of geological investigations and mapping.
- To understand the applications of geological surveys in civil engineering structures.

COURSE OUTCOMES:

16CEC07.CO1 : Understand the application of geology knowledge to Civil Engineering construction.
16CEC07.CO2 : Understand the concepts of various geological materials.
16CEC07.CO3 : Understand the properties, behaviour and engineering significance of different type of rocks and minerals.
16CEC07.CO4 : Learned the interpretation skills of geological maps having different type of geological features.
16CEC07.CO5 : Learned consideration and importance of geological aspects in civil engineering related infrastructure projects.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEC07.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEC07.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC07.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC07.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEC07.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I PHYSICAL GEOLOGY 9

Role of Geology in civil engineering – Branches of geology – Earth structures and composition – Elementary knowledge on continental drift and plate tectonics – Earth processes – weathering – soils – Geological work of river, wind and sea – Engineering importance – Earthquake belts in India – Ground water – Mode of occurrence – Prospecting .

UNIT II MINEROLOGY 9

Elementary knowledge on symmetry elements of important crystallographic systems – Physical properties of minerals – Study of the rock forming minerals – Quartz family – Feldspar family – Mica – Pyroxene family minerals – Fundamentals of process of formation of ore minerals – Properties, behaviour and engineering significance of clay minerals – Coal and petroleum – Their origin and occurrence in India.

UNIT III PETROLOGY 9

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Occurrence, Engineering properties and distribution – Igneous rocks – Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt – sedimentary rocks – Sandstone, limestone, shale, conglomerate and breccias – Metamorphic rocks – Quartzite, marble, slate, phyllite, gneiss and schist.

UNIT IV STRUCTURAL GEOLOGY AND MAP 9

Attitude of beds – Outcrops – Contours – Introduction to geological maps – Folds – Faults and joints – Their bearing on engineering construction – Seismic and electrical methods for civil engineering investigations. Study of structures.

UNIT V GEOLOGICAL INVESTIGATION 9

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings. Causes and preventions – Sea erosion and Coastal protection.

TOTAL: 45 Periods

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TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Parbin Singh.	A Text book of Engineering and General Geology	Katson publishing house, Ludhiana.	2010
2	Varghese, P.C	Engineering Geology for Civil Engineering	PHI Learning Private Limited, New Delhi	2012

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Muthiayya, V.D	A Text of Geology	Oxford IBH Publications, Calcutta.	2010
2	Blyth F.G.H. and De Freitas M.H	Geology for Engineers	Edward Arnold, London	2010
3	F.G.Bell.	Fundamentals of Engineering Geology	B.S. Publications. Hyderabad	2011
4	Dobrin, M.B	An introduction to geophysical prospecting	McGraw0Hill, New Delhi	2010
5	KVGK Gokhale	Principles of Engineering Geology	BS Publications, Hyderabad	2011

WEB URLs:

1. https://www.youtube.com/watch?v=aTVDiRtRook&list=PL4328D0CC955E24CB
2. https://www.youtube.com/watch?v=MWs5id2_0sY&list=PL4328D0CC955E24CB&index=5
3. https://www.youtube.com/watch?v=kVopWFgOcrU&list=PL4328D0CC955E24CB&index=8
4. https://www.youtube.com/watch?v=Bd8ORQ9FWUg&index=4&list=PL4328D0CC955E24CB
5. http://nptel.ac.in/courses/105105106/

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16CED01 **MECHANICS OF SOLIDS** **L T P C**
3 2 0 4

COURSE OBJECTIVES:

- To develop understanding of the state of stresses and strains in structural components as a result of different loading conditions.
- To provide knowledge on shear force and bending moment for all statically determinate beams by recognizing the beam type, loading, shear and bending stress.
- To provide knowledge on deflection of determinate beam.
- To have knowledge on principal stress and strain and analysis of plane truss
- To understand the effect of torsion on shafts and springs.

COURSE OUTCOMES:

16CED01.CO1 : Realize the state of stresses and strains in structural components under tension, compression and shear.
16CED01.CO2 : Plot the Shear force and bending moment diagrams for all the statically determinate beams.
16CED01.CO3 : Analyze the deflection of determinate beam by different methods.
16CED01.CO4 : Determine principle stress, strain and analysis of plane truss.
16CED01.CO5 : Comprehend the behavior of members under pure torsion and spring.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED01.CO1	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CED01.CO2	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CED01.CO3	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CED01.CO4	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CED01.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

UNIT I STRESS AND STRAIN 9

Stress and strain at a point - Tension, Compression, Shear Stress – Hook's Law - Relationship among elastic constants - Stress Strain Diagram for Mild Steel - Ultimate Stress - Yield Stress - Factor of Safety - Thermal Stresses - Strain Energy due to Axial Force - Resilience - Stresses due to impact and Suddenly Applied Load - Compound Bars -Thin cylinder & shells.

UNIT II SHEAR AND BENDING IN BEAMS 9

Beams and Bending - Types of loads, supports - Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load. Theory of Simple Bending - Analysis of Beams for Stresses - Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions

UNIT III DEFLECTION 9

Double integration method - Macaulay's methods - Area moment method - conjugate beam method for computation of slopes and deflections of determinant beams

UNIT IV PRINCIPAL STRESS AND STRAIN & ANALYSIS OF PLANE TRUSS 9

Plane stress - Principal stresses and maximum shear stress - Mohr's circle for plane stress - Determination of principal stresses and planes - plane strain - Applications of plane stress - Maximum stresses in beams- Spherical and deviatory components of stress tensor – Determination of principal stresses and principal planes-Truss-Methods of joints - method of sections.

UNIT V TORSION OF SHAFTS AND SPRING 9

Torsional deformations of a circular bar - Circular bars of linearly elastic materials – Non uniform torsion - Stresses and strains in pure shear - transmission of power by circular shafts - Stepped shafts - Shafts fixed at

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both ends - Strain energy in torsion and pure shear - Springs - Types - Helical and leaf springs - Stresses and deflection of springs.

TOTAL: 45 + 30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rajput.R.K	Strength of Materials	S.Chand and Co, New Delhi	2015
2.	Gambhir.M.L	Fundamentals of Solid Mechanics	PHI Learning Private Limited., New Delhi	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Subramanian R	Strength of materials	Oxford University Press, New Delhi	2012
2.	Ramamrutham S	Strength of Materials	Dhanpat Rai & Sons	2014
3.	Bansal R.K	Strength of materials	Laxmi Publications, New Delhi	2014
4.	William A. Nash	Theory and Problems of Strength of Materials	Schaum's Outline Series, Tata McGraw-Hill publishing co., New Delhi	2010
5.	Srinath L.S	Advanced Mechanics of Solids	Tata McGraw-Hill Publishing Co., New Delhi	2017

WEB URLs:

1. www.informationvine.com/Answers
2. www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture11-KD.pdf
3. www.stem.org.uk/resources/elibrary/.../mathematics-simple-beam-deflection
4. www.springer.com/cda/content/document/cda.../9783319243290-c1.pdf?SGWID
5. www.engineersedge.com/spring_torsion_calc.htm

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16CED02 **STRENGTH OF MATERIALS** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To understand the concept of energy principles.
- To analyze the indeterminate beams.
- To analyze columns and thick cylinder.
- To understand the concept of theories of failure and state of stress in three dimensions.
- To understand advanced concepts like unsymmetrical bending, stresses in curved bars and locating shear centre.

COURSE OUTCOMES:

At the end of this course the students will be able to

16CED02.CO1 : Understand energy method for estimating the slope and deflections of beams and trusses.

16CED02.CO2 : Analyze the indeterminate beams such as propped cantilever, fixed beams and continuous beams

16CED02.CO3 : Formulate the safe load and crippling load on the column for different end conditions and also thick cylinder.

16CED02.CO4 : Analyze the stress distribution in three dimensions.

16CED02.CO5 : Analyze the advanced method of symmetrical and unsymmetrical bending of beams.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED02.CO1	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CED02.CO2	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CED02.CO3	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CED02.CO4	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CED02.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

UNIT I ENERGY PRINCIPLES 9

Strain energy and strain energy density - strain energy in traction, shear in flexure and torsion -castigliano's theorems - principle of virtual work - application of energy theorems for computing deflections in beams and trusses - Maxwell's reciprocal theorems

UNIT II INDETERMINATE BEAMS 9

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, noncentral), uniformly distributed load, triangular load (maximum at centre and maximum at end) – theorem of three moments - analysis of continuous beams - shear force and bending moment diagrams for continuous beams.

UNIT III COLUMNS AND CYLINDER 9

Eccentrically loaded short columns - middle third rule - core section - columns of unsymmetrical sections - (angle channel sections) - Euler's theory of long columns - critical loads for prismatic columns with different end conditions; Rankine's-Gordon formula for eccentrically loaded columns - thick cylinders - compound cylinders.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS 9

Spherical and deviatory components of stress tensor - determination of principal stresses and principal Planes - volumetric strain - dilatation and distortion - theories of failure - principal stress dilatation - Principal strain - shear stress - strain energy and distortion energy theories - application in analysis of Stress, load carrying capacity and design of members - residual stresses.

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS 9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections - curved beams Winkler Bach formula - stress concentration - fatigue and fracture.

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TOTAL: 45 Periods

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen (Izod and Charpy)
6. Hardness test on metals (Rockwell and Brinell Hardness Tests)
7. Deflection test on wooden and metal beam
8. Tension and Compression test on helical spring

TOTAL: 30 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rajput R.K	ngth of Materials	S.Chand & Company Ltd., New Delhi	2015
2.	Bansal R.K	ngth of Materials	Laxmi Publications, New Delhi	2016

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kazimi S.M.A	l Mechanics	Tata McGraw-Hill Publishing Co., New Delhi	2017
2.	William A Nash	Theory and Problems of Strength of Materials	Schaum's Outline Series, Tata McGraw Hill Publishing Company Ltd	2010
3.	Khurmi R.S	Strength of Materials (Mechanics of Solids)	S.Chand& Company Ltd	2010
4.	Srinath, L.S	Advanced mechanics and solids	Tata-McGraw Hill publishing company ltd	2017
5.	Punmia B.C, Ashok K. Jain and Arun K Jain	Mechanics of Structures (SMTS I)	Laxmi Publications, New Delhi	2011

WEB URLs:

1. *www.britannica.com/science/conservation-of-energy*
2. www.ocw.tudelft.nl/wp-content/uploads/Statically-Indeterminate-Beams-.pdf
3. www.hydraulicspneumatics.com/200/TechZone/Cylinders/.../TechZone-Cylinders
4. www.informationvine.com/Three+Dimensions
5. www.brainkart.com/.../Strength-of-Materials--Advanced-Topics-In-Bending-of-Beam

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16CED03 **STRUCTURAL ANALYSIS I** L T P C
3 2 0 4

COURSE OBJECTIVES:

- To gain knowledge on computing deflection of determinate structures using work- energy methods.
- To know about concepts of force method.
- To gain knowledge on influence lines for statically determinate and indeterminate structures.
- To analyze arched and cable profiled structures.
- To gain knowledge on Plastic Analysis for statically indeterminate structures.

COURSE OUTCOMES:

At the end of this course the students will be able to

16CED03.CO1 : Determine the deflection of determinate structures by using work- energy methods.
16CED03.CO2 : Gain knowledge about force method.
16CED03.CO3 : Draw influence lines for statically determinate and indeterminate structures.
16CED03.CO4 : Solve arched and cable profiled structures.
16CED03.CO5 : Solve problems on Plastic Analysis for statically indeterminate structures.

Course Outcomes	Program Outcomes													PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED03.CO1	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED03.CO2	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED03.CO3	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED03.CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED03.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I WORK-ENERGY METHODS 9

Work Energy Principles- Principle of Virtual Displacement-Principle of Stationary Potential Energy – Principle of Complimentary Energy – Principle of Virtual Forces – Castigliano's First and Second Theorem – Engessor's First and Second Theorems – Betti Maxwell's Law – Application to Statically Determinate Beams, Trusses and Frames

UNIT II CONCEPTS OF FORCE METHOD 9

Definition and Determination of static and kinematic Indeterminacy – Beams, Trusses and frames – Analysis of statically indeterminate structures by force method – Theorem of three moments for continuous beams (Only two dimension)

UNIT III MOVING LOADS AND INFLUENCE LINES 9

Introduction – moving loads in ILD – Load categories- Single concentrated load - Udl longer than the span- Udl shorter than the span – Two concreted load – Multiple wheel loads - Influence lines for statically determinate structures – Applications of Muller- Breslau's principle (Indeterminate structures upto two degrees of freedom)

UNIT IV ARCHES AND SUSPENSION BRIDGES 9

Introduction – Analysis of three hinged and two hinged parabolic and circular arches - Analysis of suspension cables and suspension bridges with two and three hinged stiffening girders.

UNIT V PLASTIC ANALYSIS OF STRUCTURES 9

Statically indeterminate axial problems - Beams in pure bending - plastic moment of resistance - plastic modulus - shape factor - Load factor - plastic hinge and mechanism - plastic analysis of Indeterminate beams and frames (Single bay and single storey) - upper and lower bound theorems.

TOTAL : 45 +30 PERIODS

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TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Bhavikatti.S.S	Structural Analysis, Vol.1 and Vol. 2	Vikas Publishing House Pvt. Ltd	2011
2	Vaidyanadhan.R and Perumal.P	Comprehensive structural Analysis – Vol.1 & Vol.2	Laxmi Publications, New Delhi	2016

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Wang C K	Indeterminate Structural Analysis	Tata Mc Graw Hill Education Pvt. Ltd., New Delhi	2013
2	Gambhir. M.L	Fundamentals of Structural Mechanics and Analysis	PHI Learning Pvt. Ltd., New Delhi	2011
3	Negi L.S and Jangid R S	Structural Analysis	Tata Mc Graw Hill Publications, New Delhi, 6th Edition	2014
4	Reddy. C.S	Basic Structural Analysis	Tata Mc Graw Hill Education Pvt. Ltd., New Delhi	2013
5	B. C. Punmia Ashok Kumar Jain and Arun Kumar Jain	Theory of Structures	Laxmi Publications (P) Ltd., New Delhi	2012

WEB URLs

1 www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture06-KD.pdf
2 *www.nptel.ac.in/courses/Webcourse contents/IIT%20Kharagpur/.../pdf/m2l9.pdf*
3 www.engr.mun.ca/~swamidas/ENGI6705-StructuralAnalysis-ClassNotes3.ppt
4 www.ibo.org/globalassets/digital-tookit/pd/build-it/assessed-bridge-definitions.pdf
5 www.coursehero.com › University of Texas › CIVIL ENG. › CIVIL ENG. 382

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16CED04 **STRUCTURAL ANALYSIS II** L T P C
3 2 0 4

COURSE OBJECTIVES:

- To analyze the indeterminate structure by slope deflection method.
- To analyze indeterminate structures by Moment distribution method.
- To analyze statically indeterminate structures by flexibility matrix method.
- To formulate the element stiffness matrix and assemble the structure stiffness matrix for solving indeterminate structures.
- To understand the basics of finite element method and its applications.

COURSE OUTCOMES:

16CED04.CO1 : Determine shear force and bending moment of beams and frames using slope deflection method.
16CED04.CO2 : Determine shear force and bending moment using moment distribution method for beams and frames.
16CED04.CO3 : Analyze the statically indeterminate structures using flexibility matrix method.
16CED04.CO4 : Analyze the statically indeterminate structures using stiffness matrix method.
16CED04.CO5 : Apply the finite element method to structures.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED04.CO1	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED04.CO2	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED04.CO3	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED04.CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED04.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I **SLOPE DEFLECTION METHOD** 9

Continuous beams and rigid frames (with and without sway) – symmetry and anti -symmetry loading – Deformed shape, Bending moment and shear force diagram - (Unknowns restricted to three only).

UNIT II **MOMENT DISTRIBUTION METHOD** 9

Basic concepts – stiffness, distribution and carry over factors – Analysis of continuous Beams – plane and rigid frames with and without sway – Deflected shape, bending moment and shear force diagram.

UNIT III **FLEXIBILITY MATRIX METHOD** 9

Equilibrium and compatibility equation – Determinate Vs Indeterminate structures - Indeterminacy – Primary Structure – compatibility conditions – Analysis of indeterminate structures - continuous beams, Pin-jointed plane frames, rigid jointed plane frames (with redundancy restricted to two).

UNIT IV **STIFFNESS MATRIX METHOD** 9

Element and global stiffness matrices – Analysis of continuous beams – co-ordinate transformations – Rotation Matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin –Jointed plane frames and rigid frames (with redundancy restricted up to three).

UNIT V **FINITE ELEMENT METHOD** 9

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain Triangular elements (Concept Only).

TOTAL : 45 +30 PERIODS

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TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Bhavikatti.S.S	Structural Analysis, Vol.1 and Vol. 2	Vikas Publishing House Pvt. Ltd	2011
2	Vaidyanadhan.R and Perumal.P	Comprehensive structural Analysis – Vol.1 & Vol.2	Laxmi Publications, New Delhi	2016

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	T.S.Thandavamoorthy	Structural Analysis	Oxford university press, New Delhi	2011
2	Pandit & S.P.Gupta	Structural Analysis – A matrix Approach	Tata MCGraw Hill	2011
3	L.S. Negi& R.S. Jangid	Structural Analysis	Tata McGraw Hill Publications, New Delhi, 6th Edition	2014
4	Manickaselvam M.K.	Elements of Matrix And Stability Analysis of Structures	Khanna Publishers	2013
5	B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain	Theory of Structures	Laxmi Publications (P) Ltd., New Delhi	2011

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16CED05 **DESIGN OF STEEL STRUCTURES** L T P C
3 2 0 4

COURSE OBJECTIVES:

- To expose limit state design concepts on bolt and welded joints.
- To provide knowledge on design of tension members.
- To get familiar with compression member design.
- To have knowledge on design of beams and plate girder.
- To gain knowledge on design of industrial roof structure.

COURSE OUTCOMES:

16CED05.CO1 : Gain knowledge on limit state design concepts on bolt and welded joints.
16CED05.CO2 : Design tension members.
16CED05.CO3 : Design compression members.
16CED05.CO4 : Get trained with design of beams and plate girder.
16CED05.CO5 : Design components of industrial roof structures.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED05.CO1	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED05.CO2	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED05.CO3	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED05.CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED05.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I INTRODUCTION 9

Structural steel sections – Limit state design concepts – Connections bolted and welded joints - Failure of joints - Efficiency of joints – Eccentric connections.

UNIT II TENSION MEMBERS 9

Types of sections – Net area – net effective sections for angles and Tee in tension – Design of connections in tension members – use of lug angles – Design of tension splice – Concept of Shear lag.

UNIT III COMPRESSION MEMBERS 9

Effective length about major and minor principal axis - I.S code provisions permissible stresses - Design rules- Design of one component – two components and built up compression members under axial load- Design of Lacings and Battens - Different types of column bases - Slab base and Gusseted base - connection details.

UNIT IV BEAMS 9

Design of laterally supported and unsupported beams – Built up beams – design of Plate Girders – Intermediate and bearing stiffeners – Web splicing.

UNIT V ROOF TRUSS AND INDUSTRIAL STRUCTURES 9

Design of roof trusses – Elements of roof trusses – Design of purlins – Estimation of wind loads – Design of gantry girders

TOTAL : 45 +30 PERIODS

TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Subramanian N	Design of Steel Structures	Oxford University Press	2013

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2	Duggal S.K	Design of Steel Structures	Tata McGraw-Hill Education	2014

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Gaylord, E.H Gaylord, N.C and Stallmeyer, J.E	Design of Steel Structures	3rd edition, McGraw-Hill Publications	2012
2	S.S. Bhavikatti	Design of Steel Structures	I. K. International Pvt Ltd	2014
3	Gambhir. M.L	Fundamentals of Structural Steel Design	McGraw Hill Education India Pvt. Ltd	2013
4	Narayanan.R.et.al	Teaching Resource on Structural Steel Design	INSDAG, Ministry of Steel Publications	2014
5	-	IS 800:2007,General Construction in Steel – Code of Practice,(III rd Revision)	BIS, New Delhi	2014

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3. www.coursehero.com › ... › CE › CE CE5660
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16CED06 **ESTIMATION AND QUANTITY SURVEYING** **L T P C**
3 2 0 4

COURSE OBJECTIVES:

- To produce civil engineering students who have strong foundation in estimation of quantities required for roads and buildings
- To estimate the quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works.
- To estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents.
- Student should also be able to prepare value estimates.
- To familiarize with the knowledge of preparing reports for various engineering works.

COURSE OUTCOMES:

At the end of this course the students will be able to

16CED06.CO1 : Student will have the confidence to prepare detailed and abstract estimations for building.
16CED06.CO2 : Student will demonstrate the ability to prepare estimate for other structures.
16CED06.CO3 : Student will have the confidence to prepare specifications and tender documents.
16CED06.CO4 : Gain knowledge about valuation.
16CED06.CO5 : Gain knowledge about report preparation of projects.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED06.CO1	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
16CED06.CO2	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
16CED06.CO3	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
16CED06.CO4	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
16CED06.CO5	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-

UNIT I ESTIMATE OF BUILDINGS 9

Introduction – types of estimate- unit of measurement - methods of estimate-Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches.

UNIT II ESTIMATE OF OTHER STRUCTURES 9

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line –sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, siphon, fall.

UNIT III SPECIFICATION AND TENDERS 9

Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements.

UNIT IV VALUATION 9

Necessity – Basics of value engineering – Capitalized value – Depreciation – Escalation – Value of Building – Calculation of Standard rent – Mortgage – Lease.

UNIT V REPORT PREPARATION 9

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water Supply and sanitary installations – Tube wells – Open wells.

TOTAL : 45 +30 PERIODS

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TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Dutta, B.N.	Estimating and Costing in Civil Engineering	UBS Publishers & Distributors Pvt. Ltd	2017
2	Kohli, D.D and Kohli R.C.	A Text Book of Estimating and Costing (Civil)	S.Chand & Company Ltd.	2012

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	-	PWD Data Book.	Public Work Department	-
2	-	TamilNadu Transparencies in Tender Act.	-	2016
3	-	Arbitration and Concilation Act.	-	2015
4	-	Standard Bid Evaluation Form, Procurement of Gods or Works The World Bank, April.	-	2016
5	Rangwala	Estimating Costing and Valuation	Charotar publishning company pvt ltd	2015

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4. www.dce.edu.in/question-bank/ce6704-eqs-civil-viist-au-unit-iv.pdf
5. www.youtube.com/watch?v=D04uxZpgp6M

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16CED07 **MECHANICS OF FLUIDS** L T P C
3 2 0 4

COURSE OBJECTIVES:

- To understand the basic properties of fluids and fluid statics.
- To get a basic knowledge of fluids in kinematic and dynamics.
- To gain knowledge about various losses in pipes.
- To impart knowledge on boundary layers
- To select appropriate model and similitude in problem related to hydraulics.

COURSE OUTCOMES:

16CED07.CO1 : Determine the various fluid properties.
16CED07.CO2 : Impart knowledge on fluid in kinematics and dynamics
16CED07.CO3 : Determine the various losses in pipes.
16CED07.CO4 : Compute the energy and momentum thickness.
16CED07.CO5 : Explain the various applications of similitude and model analysis

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED07.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CED07.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED07.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED07.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED07.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I FLUID PROPERTIES AND STATICS 9

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – density-specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension-Fluid statics: concept of fluid pressure, absolute and gauge pressures-pressure measurements by manometers and pressure gauges.

UNIT II FLUID KINEMATICS AND DYNAMICS 9

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 –equation of motion-Euler's equation along a streamline-Bernoulli's equation-applications-flow measurements.

UNIT III FLOW THROUGH PIPES 9

Shear stress, pressure gradient relationship– Laminar flows through pipes and between plates – Hagen Poiseuille equation –Flow through pipes -Turbulent flow – Darcy- Weisbach formula –pipe roughness– Moody's diagram – Major and minor losses of flow in pipes-pipes in series and in parallel

UNIT IV BOUNDARY LAYER 9

Definition of boundary layer –boundary layer on a flat plate - thickness and classification – Displacement, energy and momentum thickness-Boundary layer separation and control-drag in flat plate- drag and lift coefficients.

UNIT V SIMILITUDE AND MODEL STUDY 9

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

TOTAL : 45 PERIODS

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TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Bansal R.K	Fluid Mechanics and Hydraulic Machines	Laxmi Publications (P) Ltd.	2016
2	Modi P.N. and Seth S.M	Hydraulics and Fluid Mechanics	Standard Book House, NewDelhi	2011

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Streeter, Victor L and Wylie, Benjamin E	Fluid Mechanics	McGraw- Hill Ltd	2013
2	John Finnemore, Joseph B and Franzini	Fluid Mechanics with Engineering Applications	McGraw-Hill Ltd	2014
3	Fox, Robert W and Macdonald, Alan T	Introduction to Fluid Mechanics	John Wiley & Sons	2011
4	Jain. A.K	Fluid Mechanics	Khanna Publishers	2013
5	Rajput R.K	A text book of Fluid Mechanics	S.Chand and Co	2010

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1. www.britannica.com/science/fluid-mechanics
2. www.mcgill.ca/study/2014-2015/courses/mech-331
3. www.pipes.digital/docs
4. www.britannica.com/science/boundary-layer
5. www.springer.com/cda/content/document/cda.../9783319134758-c1.pdf?SGWID

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16CED08 **SURVEYING I** **L T P C**
3 2 0 4

COURSE OBJECTIVES:

- To study the basics of linear measurements by using chain surveying.
- To impart the basics of compass and plane table surveying.
- To knowledge about leveling principles and applications
- To study the applications of theodolite and tacheometric surveying.
- To impart knowledge about various surveys adopted for execution of structures.

COURSE OUTCOMES:

16CED08.CO1 : Carry out preliminary surveying to prepare a layout of a given area.
16CED08.CO2 : Learn about compass and plane table surveying.
16CED08.CO3 : Execute leveling and knowledge about its applications
16CED08.CO4 : Measure the heights and distances using theodolite and tacheometric surveying.
16CED08.CO5 : Undertake survey works for various engineering projects.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED08.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
16CED08.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
16CED08.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
16CED08.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
16CED08.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

UNIT I INTRODUCTION AND CHAIN SURVEYING 9

Introduction – Principles – Classification – Maps – Scales – Conventional signs – Survey instruments – handling and adjustments– Reconnaissance, Preliminary and location surveys for Engineering projects – Chain surveying – Ranging and Chaining – Reciprocal ranging – Setting perpendiculars – Well conditioned triangles – Obstacles – Sources and limits of error and their correction.

UNIT II COMPASS AND PLANE TABLE SURVEYING 9

Compass – Types– Bearings – Magnetic and true north, magnetic declination and its variation – Traversing – Local attraction and its elimination – Plane table and its accessories – Merits and demerits – Radiation – Intersection – Resection – Traversing – sources of errors – applications.

UNIT III LEVELLING AND ITS APPLICATIONS 9

Levelling – Principles – Levels and staves – accessories – Temporary and permanent adjustments – Sensitiveness of bubble tube – Bench marks – Types of levelling – Booking – Reduced levels – Determination – Plotting LS and CS– Curvature and Refraction corrections–Contour – types – Plotting – Methods of interpolating contours – Computations of cross sectional areas and volumes - Earthwork calculations - Capacity of reservoirs.

UNIT IV THEODOLITE AND TACHEOMETRIC SURVEYING 9

Theodolite – Types - Description – Horizontal and vertical angles – Temporary and permanent adjustments – Heights and distances – Tangential and Stadia Tacheometry – Subtense method – Stadia constants – Anallactic lens.

UNIT V ENGINEERING SURVEYS 9

Setting out of structures – buildings – culverts – bridges – instruments – Hydrographic surveys –Tides – MSL– Sounding – methods – location – Three point problem – Station pointer.

TOTAL : 45 PERIODS

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LIST OF EXPERIMENTS

1. Measurement of distance and setting out offset using chain and its accessories.
2. Measurement of given area by triangulation using chain.
3. Layout preparation using Prismatic and Surveyors Compass.
4. Area calculation by Radiation and Intersection methods using plane table.
5. Location of points by Resection method -Three point problem.
6. Determination of Reduced levels of various locations-Simple levelling.
7. Determination of Reduced levels- Fly and check Levelling.
8. Plotting of LS and CS.
9. Plotting of Contours.
10. Measurement of horizontal and vertical angles by using theodolite.
11. Layout preparation by using theodolite.
12. Study on GPS and Total station.

TOTAL: 30 PERIODS

TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Punmia B.C	Surveying Vol I &II	Laxmi Publications (P) Ltd., New Delhi,	2012
2	Duggal S.K	Surveying Vol I&II	McGraw Hill Publishing Company Ltd., NewDelhi	2011

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Clark D	Plane and Geodetic Surveying Vols. I and II	C.B.S., Publishers and Distributors, New Delhi	2011
2	Bannister A and Raymond S	Surveying	Addison Wesley Longman Ltd, England	2010
3	Arora, K.R	Surveying Vol. I and II	Standard Book House	2015
4	Heribert Kahmen and Wolfgang Faig	Surveying	Walter de Gruyter	2013
5	Kanetkar .T.P and Kulkarni .S.V	Surveying and Levelling, Vol. I & II	Pune Vidyarthi Griha Prakashan	2017

WEB URLs

1. *www.ijecs.in/issue/v3-i5/44%20ijecs.pdf*
2. www-lib.tufs.ac.jp/opac/recordID/catalog.bib/BA61454843
3. www.ngs.noaa.gov/heightmod/Leveling
4. www.theodora.com/encyclopedia/t/tacheometry.html
5. www.mapquest.com/us/missouri/engineering-surveys-svc-289006027

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16CED09 **SURVEYING II** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To get introduced to different geodetic methods of survey such as triangulation, baseline corrections, trigonometric leveling.
- To impart about different sources of errors and their adjustments in a traverse.
- To give exposure to Total station (Electronic surveying) techniques.
- To impart knowledge about Global Positioning System(GPS)
- To expose about setting out of curves, hydrographic surveying techniques and Astronomical surveying.

COURSE OUTCOMES:

16CED09.CO1 : Carry out the base line measurements of triangulation and their corrections.
16CED09.CO2 : Carry out the sources of error and adjustments in traverse survey.
16CED09.CO3 : Understand the measuring & working principles, advantages of Total station (Electronic surveying) over conventional surveying methods.
16CED09.CO4 : Understand the working principle of GPS & segments, signal structure, and sources of errors.
16CED09.CO5 : Setting out the curves and sounding methods for hydrographic surveying.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED09.CO1	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CED09.CO2	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CED09.CO3	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CED09.CO4	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CED09.CO5	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-

UNIT I CONTROL SURVEYING 9

Triangulation – types & systems – Signals and towers – Baseline measurement – Instruments and accessories – Tape corrections – Satellite stations – Reduction to centre - Trigonometrical levelling – Geodetic observations – Corrections for refraction, curvature – Reciprocal observations.

UNIT II SURVEY ADJUSTMENT 9

Errors Sources- precautions and corrections – classification of errors – true and most probable values- weighed observations – method of equal shifts –principle of least squares -0 normal equation – correlates- level nets- adjustment of simple triangulation networks.

UNIT III TOTAL STATION SURVEYING 9

Basic Principle – Classifications -Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments.

UNIT IV THEODOLITE AND TACHEOMETRIC SURVEYING 9

Basic Concepts - Different segments - space, control and user segments - satellite configuration - signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment – Hand Held and Geodetic receivers –data processing.

UNIT V ADVANCED TOPICS IN SURVEYING 9

Curves-Simple curves – Compound and reverse curves - Setting out Methods – Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves - Sight distances. Hydrographic surveying – Tides - MSL - Sounding methods - Three-point problem - Strength of fix - Sextants and station pointer.

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TOTAL : 45 PERIODS

TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Punmia B.C	Surveying Vol. I and II	Laxmi Publications (P) Ltd., New Delhi	2017
2	Arora, K.R	Surveying" Vol. I &II	Standard Book House	1996

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Bannister A and Raymond S	Surveying	Addison Wesley Longman ltd, England	2010
2	Satheesh Gopi	Advanced Surveying	Pearson Education	2010
3	Satheesh Gopi	The Global Positioning System and Surveying using GPS	Tata McGraw	2010
4	Duggal R.K	Surveying Vol. I & II	Tata McGraw Hill Publishing Company Ltd., New Delhi	2012
5	Punmia B.C, Ashok Kumar Jain, Arun Kumar Jain	Higher Surveying	Laxmi Publications (P) Ltd., New Delhi	2017

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16CED10 CONCRETE TECHNOLOGY L T P C
3 0 0 3

COURSE OBJECTIVES:

- To study the properties of different constituent materials
- To give knowledge on chemical and mineral admixtures concrete.
- To design a mix using ACI and BIS methods and their suitability.
- To practice about various tests on fresh concrete and hardened concrete.
- To understand the concepts of special concretes and concreting methods.

COURSE OUTCOMES:

16CED10.CO1 : To have an exposure on quality of concrete.
16CED10.CO2 : To select a suitable admixture in concrete according to the required properties.
16CED10.CO3 : To do mix design under various methods.
16CED10.CO4 : To conduct various tests on fresh and hardened concrete
16CED10.CO5 : To familiarize about special concretes and their concreting methods.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED10.CO1	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED10.CO2	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED10.CO3	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED10.CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED10.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I CONSTITUENT MATERIALS 9

Cement-Different types-Chemical composition and Properties -Tests on cement - IS Specifications – Aggregates -Classification - Mechanical properties and tests as per BIS Grading requirements - Water - Quality of water for use in concrete – Sea water and their effects

UNIT II ADMIXTURES AND THEIR EFFECTS 9

Chemical admixtures like Accelerators - Retarders - Plasticizers- Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Their effects on concrete properties

UNIT III PROPORTIONING OF CONCRETE MIX 9

Principles of Mix Proportioning - Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - IS Method of Mix Design - Mix Design Examples

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE 9

Workability - Tests for workability of concrete - Slump Test and Compacting factor Test - Segregation and Bleeding - Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete - Determination of Compressive and Flexural strength - Stress-strain curve for concrete - Determination of Young's Modulus.

UNIT V SPECIAL CONCRETES 9

Light weight concretes - High strength concrete - Self compacting concrete - Fibre reinforced concrete - Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Smart concrete - Guniting and shotcreting - Polymer concrete - High performance concrete - Geopolymer Concrete

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Shetty. M.S	Concrete Technology, Theory & Practice	S.Chand & Co, Pvt.Ltd., New Delhi	2017
2.	Gambhir, M.L	Concrete Technology	Tata McGraw Hill	2017

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Santhakumar A.R	Concrete Technology	Oxford University Press	2017
2.	IS Board	IS: 456 – 2000 Plain and Reinforced Concrete	Bureau of Indian Standards	2000
3.	IS Board	IS:10262 – 2009 Recommended guide lines for concrete mix design	Bureau of Indian Standards	2009
4.	A.M. Neville,J.J Brooks	Concrete Technology	Pearson Education,	2010
5.	Nevile A.M	Properties of Concrete	Longman Publishers	2012

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2. www.cement.org/cement-concrete-applications/concrete.../chemical-admixtures
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4. www.nap.edu/read/13543/chapter/7
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16CED11 **SOIL MECHANICS** L T P C
3 0 2 4

COURSE OBJECTIVES:

- To provide knowledge on and classification of soil and compaction
- To acquire knowledge on soil water and permeability
- To impart idea about effective stress distribution due to applied loads and settlement
- To familiarize about shear strength
- To be acquainted with slope stability.

COURSE OUTCOMES:

16CED11.CO1 : Classify the soil based on index properties
16CED11.CO2 : Know about soil water and permeability
16CED11.CO3 : Find out the stress distribution and settlement
16CED11.CO4 : Estimate the shear strength of various types of soil.
16CED11.CO5 : Analyze the stability of slopes using different methods.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16EED04.CO1	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16EED04.CO2	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16EED04.CO3	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16EED04.CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16EED04.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

Nature of soil – phase relationships – Soil classification for engineering purposes – Index properties of soils - IS Classification system – Soil compaction – comparison of laboratory and field compaction methods – Factors influencing compaction

UNIT II SOIL WATER AND PERMEABILITY 9

Soil water – types – capillary stress – Permeability measurement in the laboratory and in field – factors influencing permeability of soils – Seepage – introduction to flow nets – Simple problems – effective stress concept in soil

UNIT III EFFECTIVE STRESS DISTRIBUTION DUE TO APPLIED LOADS AND SETTLEMENT 9

Boussinesq theory – ASSUMPTIONS – point load – circular load – rectangular load- 2:1 distribution method – equivalent point load method - use of new marks influence chart – components of settlement – immediate and consolidation settlement – computation of rate of settlement. -√t and log t methods - factors influencing consolidation behavior of soils.

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesion less soils – Mohr – Coulomb failure - assumptions – Measurement of shear strength, direct shear – Triaxial compression, UCC and Vane shear tests – Pore pressure parameters -Liquefaction

UNIT V SLOPE STABILITY 9

Slope failure mechanisms – Types - infinite slopes – finite slopes – Total stress analysis for saturated clay – c -ϕ soil method of slices - Friction circle method – Use of stability number - slope protection measures.

TOTAL: 45 Periods

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1. **COLLECTION OF SOIL SAMPLE USING SPLIT SPOON SAMPLER**
2. **DETERMINATION OF INDEX PROPERTIES**
   a. Special gravity of soil solids
   b. Grain size distribution – Sieve analysis and Hydrometer analysis
   c. Liquid limit, Plastic limit and shrinkage limit tests
3. **DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS**
   a. Field density Test (Core cutter and Sand replacement method)
   b. Moisture – density relationship using Standard Proctor Compaction test
4. **DETERMINATION OF ENGINEERING PROPERTIES**
   a. Permeability (constant head and falling head methods)
   b. One dimensional consolidation test on cohesive soil
   c. Direct shear test in cohesionless soil
   d. Unconfined compression test in cohesive soil
   e. California Bearing Ratio Test on Road materials
   f. Tri-axial compression test in cohesionless soil to estimate shear strength parameters

TOTAL: 30 PERIODS

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Arora. K.R	Soil Mechanics and Foundation Engineering	Standard Publishers and Distributors	2015
2.	Venkataramaiah C	Geotechnical Engineering	New Age International Publishers, New Delhi	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Punmia B.C	Soil Mechanics and Foundations	Laxmi Publications Pvt. Ltd, New Delhi	2010
2.	Kaniraj, S.R	Design aids in Soil Mechanics and Foundation Engineering	Tata McGraw Hill publishing company Ltd., New Delhi	2014
3.	Purushothama Raj. P	Soil Mechanics and Foundation Engineering	Pearson Education	2013
4.	Gopal Ranjan and Rao A.S.R	Basic and Applied Soil Mechanics	New Age International Publishers, New Delhi	2010
5.	Murthy V.N.S	Text Book of Soil Mechanics and Foundation Engineering	CBS Publishers	2011

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3. www.authorstream.com/.../gosaimadhuri-1561526-compaction-compression-consolidation
4. www.jstage.jst.go.jp/article/jscej1969/1980/300/1980_300_131/_article
5. www.nptelvideos.in/2012/11/soil-mechanics.html

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16CED12 **APPLIED HYDRAULIC ENGINEERING** L T P C
3 0 2 4

COURSE OBJECTIVES:

- To impart knowledge on basic concepts of open channel flows and their types.
- To provide knowledge on designing a most economical section of various shapes in uniform flow.
- To understand the behaviour of various types of non-uniform channel flows and their practical applications.
- To create knowledge on basic concepts of various pumps.
- To study the fundamental concepts of various types of turbines.

COURSE OUTCOMES:

16CED12.CO1 : Analyze the various classifications of open channel flows.
16CED12.CO2 : Design of various types of channels and velocity measurement in open channel flows.
16CED12.CO3 : Design silting basin for the given non-uniform flow condition.
16CED12.CO4 : Select a suitable pump according to the requirement.
16CED12.CO5 : Choose a suitable type of hydraulic turbine.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED04.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED04.CO2	x	x	x	-	-	x	x	-	x	x	x	x	x	-	-
16CED04.CO3	x	x	x	-	-	x	x	-	x	x	x	x	x	-	-
16CED04.CO4	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
16CED04.CO5	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-

UNIT I OPEN CHANNEL AND CRITICAL FLOW 9

Introduction to open channel flow – Types and regimes of flow – Velocity distribution in open channel flow – Wide open channel – Specific energy and specific force – Critical flow and its computation – Channel transition.

UNIT II UNIFORM FLOW 9

Uniform flow – Various methods of velocity measurements – Chezy's and Manning's formula – Determination of roughness coefficients- Determination of normal depth and velocity – Most economical section –Conditions for various types of open channels – Non Erodible channel.

UNIT III NON – UNIFORM FLOW 9

Dynamic equation of Gradually Varied Flow (GVF) – Determination of GVF profiles – Direct and standard step methods – Hydraulic jump – Sequent depths -- Introduction to positive and negative surge.

UNIT IV PUMPS 9

Classification of pumps based on field applications-Minimum speed to start the pump-NPSH - Centrifugal pump - Cavitations in pumps – Single and Multi-stage pumps – Reciprocating pump –Negative slip-Flow separation condition- Air vessels, indicator diagrams and its variations –Cavitations-rotary pumps: Gear pump

UNIT V TURBINES 9

Impact of jet on flat and curved plates, stationary and moving – Classification of turbines – impulse turbine – reaction turbine – radial flow turbine -Francis turbine – Propeller and Kaplan turbine – Draft tube and cavitations - performance of turbine-specific speed.

TOTAL: 45 Periods

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LIST OF EXPERIMENTS:

1. Determination of Coefficient of Discharge of Orifice and Mouthpiece.
2. Determination of Coefficient of Discharge of Notches.
3. Determination of Friction factor of a given pipe.
4. Determination of various minor losses in pipes.
5. Calibration of Venturimeter and Orifice meter.
6. Determination of Metacentric height of a ship model.
7. Performance study of single stage, multistage, variable speed centrifugal pumps.
8. Determination of efficiency of submersible and variable speed reciprocating pumps.
9. Performance study on Pelton wheel turbine.
10. Determination of Efficiency of Francis turbine.
11. Determination of Efficiency of Kaplan turbine.
12. Minihydraulic flume
13. Calibration of rotometer.
14. Determination of gear pump.

TOTAL: 30 PERIODS

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Subramanya K	Flow in Open channels	Tata McGraw-Hill Publishing Company	2011
2.	Bansal R.K	Fluid mechanics & Hydraulic machines	Laxmi Publishing Pvt Ltd,	2017

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jain A.K	Fluid Mechanics (including Hydraulic Machines)	Khanna Publishers, 8th Edition	2010
2.	Ranga Raju, K.G	Flow through Open Channels	Tata McGraw-Hill	2010
3.	Rajesh Srivastava	Flow through open channels	Oxford University Press	2016
4.	Rajput R.K	A Text book of Fluid Mechanics	S.Chand Publication Ltd., New Delhi	2015
5.	Modi .P.N and Seth S.M	Hydraulics and Fluid Mechanics	Standard Book House,	2013

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16CED13 **DESIGN OF REINFORCED CONCRETE ELEMENTS** L T P C
3 0 2 4

COURSE OBJECTIVES:

- To study the stress strain behavior of concrete and steel.
- To gain the knowledge of limit state design for beam
- To gain the knowledge of limit state design for slabs
- To understand the behavior of columns subjected to various load
- To study the design of various types of footing

COURSE OUTCOMES:

16CED13.CO1 : Design the reinforced concrete structural elements using various methods.
16CED13.CO2 : Design the reinforced concrete beams by LSM
16CED13.CO3 : Design the reinforced concrete slabs by LSM
16CED13.CO4 : Design the reinforced concrete columns by LSM
16CED13.CO5 : Select and design RC footings by using LSM.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED13.CO1	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED13.CO2	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED13.CO3	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED13.CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED13.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES 9

Concept of WSM, ultimate load method and limit state method - Advantages of Limit State method over other methods - Limit State philosophy as detailed in current IS Code - Design of rectangular beam section by working stress- Cracked and Uncracked section-Design of one way and two way slab by working stress method.

UNIT II LIMIT STATE DESIGN OF BEAMS 9

Design of singly and doubly reinforced rectangular and flanged beams - Use of design aids for flexure - Behavior of R.C. beams in shear and torsion - Shear and torsion reinforcement - Limit State design of R.C. members for combined bending, shear and torsion - Use of design aids - Design requirement for bond and anchorage as per IS code - Serviceability requirements.

UNIT III LIMIT STATE DESIGN OF SLABS 9

Behavior of one way and two way slabs - Design of one way simply supported, cantilever and continuous slabs - Design of two-way slabs for various edge conditions - Types of staircases - design of dog-legged staircase-Open well staircase.

UNIT IV LIMIT STATE DESIGN OF COLUMNS 9

Types of columns - Braced and unbraced columns - Assumptions - Design of rectangular and circular columns for axial load - Provisions of IS-456 & SP16 code for the analysis of columns subjected to axial load and uniaxial bending - Design of short and long columns subjected to axial load and biaxial bending moment.

UNIT V LIMIT STATE DESIGN OF FOOTING 9

Classification of Foundations - Design guidelines - Codal provisions -Design of wall footing– Design of axially and eccentrically loaded square, rectangular and circular footing – Design of combined footing (rectangular and trapezoidal) - Detailing of RC footing.

TOTAL: 45 Periods

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LIST OF EXPERIMENTS:

1. Determine the Normal consistency, fineness, Initial setting and final setting time of cement.
2. Determine the Specific gravity and soundness of Cement.
3. Determine the Specific gravity of fine and coarse aggregates.
4. Determine the Fineness modulus of fine aggregate and coarse aggregate.
5. Determine the Bulking of fine aggregate and water absorption test on coarse aggregate.
6. Concrete mix design (IS method).
7. Determine the Compressive and splitting tensile strength of concrete.
8. Determine the Modulus of Elasticity/stress-strain curve in concrete.
9. Determine the flexural strength test of concrete.

TOTAL: 30 PERIODS

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	N. Krishna Raju and R. N. Pranesh	Reinforced Concrete Design – IS 456 – 2000 Principles and Practice	New Age International Publishers, New Delhi	2010
2.	P. C. Varghese	Limit State Design of Reinforced Concrete	Prentice Hall of India Ltd., New Delhi	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Punmia, B.C Ashok Kumar Jain and Arun Kumar Jain	Limit state Design of Reinforced concrete	Laxmi Publications Pvt. Ltd., New Delhi	2016
2.	Sinha, S.N	Reinforced Concrete Design	Tata McGraw Hill Publishing Company Ltd., New Delhi	2017
3.	I.C.Syal and A.K.Goel	Reinforced Concrete Structures	S.Chand and Company Ltd, New Delhi	2012
4.	Shah V L Karve S R	Limit State Theory and Design of Reinforced Concrete	Structures Publilcations, Pune	2013
5.	Gambhir.M.L	Fundamentals of Reinforced Concrete Design	Prentice Hall of India Private limited, New Delhi	2013

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16CED14 **WATER SUPPLY ENGINEERING** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To make the students conversant with sources, demand and characteristics of water.
- To expose the students to understand the concept of various water supply lines.
- To provide adequate knowledge about the water treatment processes.
- To prefer the suitable advanced treatment techniques.
- To provide knowledge on water distribution and plumbing system.

COURSE OUTCOMES:

16CED14.CO1 : Identify the quantity and quality of water from various sources.
16CED14.CO2 : Explain the processes involved in the water conveyance systems
16CED14.CO3 : Infer the design principles of unit operations and unit processes for water treatment
16CED14.CO4 : Justify the suitable advanced treatment techniques for water treatment
16CED14.CO5 : Choose the appropriate water distribution network for a city and plumbing systems for a building

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED14.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED14.CO2	x	x	x	-	-	x	x	-	x	x	x	x	x	-	-
16CED14.CO3	x	x	x	-	-	x	x	-	x	x	x	x	x	-	-
16CED14.CO4	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
16CED14.CO5	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-

UNIT I PLANNING FOR WATER SUPPLY SYSTEM 9

Public water supply system - Planning - Objectives -Design period - Population forecasting -Water demand - Sources of water and their characteristics - Surface and Groundwater- Impounding Reservoir -Development and selection of source - Water quality - Characterization and standards.

UNIT II CONVEYANCE SYSTEM 9

Water supply -intake structures -Functions and drawings -Pipes and conduits for water- Pipe materials - Hydraulics of flow in pipes -Transmission main design -Laying, jointing and testing of pipes - Drawings appurtenances - Types and capacity of pumps -Selection of pumps and pipe materials.

UNIT III WATER TREATMENT 9

Objectives - Unit operations and processes - Principles, functions design and drawing of chemical feeding, Flash mixers, flocculators, sedimentation tanks and sand filters - Disinfection- Residue Management - Construction and Operation & Maintenance aspects of Water Treatment Plants.

UNIT IV ADVANCED WATER TREATMENT 9

Principles and functions of Aeration - Iron and manganese removal, Defluoridation and demineralization - Water softening - Desalination - Membrane Systems - Recent advances.

UNIT V WATER DISTRIBUTION AND SUPPLY TO BUILDINGS 9

Requirements of water distribution -Components -Service reservoirs - Functions and drawings - Network design -Analysis of distribution networks - Appurtenances -operation and maintenance -Leak detection, Methods. Principles of design of water supply in buildings -House service connection -Fixtures and fittings - Systems of plumbing and drawings of types of plumbing.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S.K. Garg	Water Supply Engineering	Khanna Publications Pvt.Ltd. New Delhi.	2010
2	Modi, P.N	Environmental Engineering I	Standard Book House, Delhi	2015

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Cpheeco Manual	Manual on Water supply and Treatment	Government of India, New Delhi	2016
2	Birdie.G	Water Supply and Sanitary Engineering	Dhanpat Rai and sons	2011
3	-	Hand book on Water Supply and Drainage	SP35, B.I.S., New Delhi	2013
4	Syed R Qasim, Motley E M	Water Works Engineering – Planning, Design and Operation	Prentice- hall of India, New Delhi,	2013
5	Babbit. H. E., and Donald. J. J	Water Supply Engineering	McGraw Hill book Co	2012

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4. www.sswm.info/print/2820?tid=1257
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16CED15 **FOUNDATION ENGINEERING** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To get the basic knowledge of the geotechnical site investigation.
- To understand the types of shallow foundation and design principles.
- To discuss the different types of footing and raft design
- To study the types of pile foundation and its load bearing capacity
- To study the knowledge on retaining wall design and load analysis.

COURSE OUTCOMES:

16CED15.CO1 : Conduct subsurface investigation and select type of foundation based on soil condition.
16CED15.CO2 : Know about shallow foundation.
16CED15.CO3 : Know about footing tyoes and rafts
16CED15.CO4 : Calculate the load carrying capacity of piles.
16CED15.CO5 : Check the stability of retaining wall

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED15.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CED15.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED15.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED15.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED15.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Methods of exploration – boring technology – Depth of boring – Spacing of bore hole – Sampling – methods - thick, Thin wall samplers, Stationery piston sampler – Penetration tests - Bore log report – Data interpretation.

UNIT II SHALLOW FOUNDATION 9

Introduction – Location and depth of foundation – Codal provisions – bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems – Bearing capacity from in-situ tests (SPT, SCPT and plate load)Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9

Types of footings – Contact pressure distribution: Isolated footing – Combined footings – Types and proportioning – Mat foundation – Types – Proportioning of footing – Floating foundation.

UNIT IV PILE FOUNDATION 9

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – static formula – dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Group capacity and efficiency (Feld's rule, Converse – Labarra rule and block failure) – Settlement of pile groups – Interpretation of pile load test (routine test only) – Under reamed piles – Capacity under compression and uplift.

UNIT V RETAINING WALLS 9

Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesionless and cohesive soil – Coulomb's wedge theory – Earth pressure on retaining walls of simple configurations – Culmann Graphical method – Stability analysis of retaining walls.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Arora. K.R	Soil Mechanics and Foundation Engineering	Standard Publishers and Distributors	2015
2	Venkataramaiah C	Geotechnical Engineering	New Age International Publishers, New Delhi	2016

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Punmia B.C	Soil Mechanics and Foundations	Laxmi Publications Pvt. Ltd, New Delhi	2016
2	Varghese P.C	Foundation Engineering	Prentice Hall of India Pvt. Ltd., New Delhi	2010
3	Purushothama Raj. P	Soil Mechanics and Foundation Engineering	Pearson Education	2013
4	Gopal Ranjan and Rao A.S.R	Basic and Applied Soil Mechanics	New Age International Publishers, New Delhi	2017
5	Murthy, V.N.S	Text Book of Soil Mechanics and Foundation Engineering	CBS Publishers	2016

WEB URLs:

1. www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Foundation_Engineering/TOC-M1.html
2. www.geoengineer.org/sptprogram.html
3. www.kopykitab.com/ebooks/2016/.../sample_7428.pdf
4. www.iitg.ernet.in/amurali/IGJ/IGJ.../IGJ_41_3_108-120.pdf
5. www.britannica.com/technology/retaining-wall

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16CED16 **HIGHWAY ENGINEERING** L T P C
3 0 2 4

COURSE OBJECTIVES:

- To introduce the fundamentals related to the Planning and alignment of road.
- To provide knowledge on geometric design of highway components.
- To provide knowledge on design of flexible and rigid pavements.
- To provide knowledge on various materials and procedures in pavement construction.
- To provide knowledge on evaluation of pavement and maintenance methods.

COURSE OUTCOMES:

16CED16.CO1 : Apply the concepts behind the Highway planning and aligning.
16CED16.CO2 : Design the cross sectional elements, horizontal and vertical curves.
16CED16.CO3 : Design flexible and rigid pavements.
16CED16.CO4 : Choose the characteristics of pavement materials.
16CED16.CO5 : Perform evaluation and maintenance of pavement.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED16.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CED16.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED16.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED16.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CED16.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9

Significance of highway planning – Modal limitations towards sustainability - History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9

Typical cross sections of Urban and Rural roads - Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves - Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9

Design principles – pavement components and their role - Design practice for flexible and rigid Pavements (IRC methods only) - Embankments.

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 9

Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) - Quality control measures - Highway drainage - Construction machineries..

UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS 9

Pavement distress in flexible and rigid pavements – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements -Strengthening of pavements –Types of maintenance – Highway Project formulation.

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LIST OF EXPERIMENTS:

TESTS ON AGGREGATES:

1. Specific Gravity
2. Gradation of Aggregate
3. Crushing Strength
4. Abrasion Value
5. Impact Value
6. Water Absorption
7. Flakiness and Elongation Indices

TESTS ON BITUMEN:

1. Softening Point
2. Penetration
3. Ductility
4. Flash and Fire Points
5. Viscosity

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Khanna, K. and Justo C.E.G.	Highway Engineering	Khanna Publishers	2015
2	Kadiyali L R	Principles and practice of Highway engineering	Khanna Technical Publishers	2006

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Bindra S P	Highway Engineering	Dhanpat Rai & Sons	2012
2	Khiroliya R K	Principle of Highway Engineering	Dhanpat rai and Sons	2016
3	Brockenbrough R L Boedecker K J	Highway engineering handbook	Highway engineering handbook	2015
4	Subramaniyan K P	Highways,Railways,Airport And Harbour Engineering Engineering	Scitech Publications,Chennai	2010
5	-	Indian Road Congress(IRC), Guidelines and special Publications of Planning and design	IRC	-

WEB URLs:

1. www.istl.org/96-fall/choinski.html
2. www.nap.edu/.../a-performance-based-highway-geometry.pdf
3. www.fdot.gov/roadway/ppmmanual/Archive/ENGLISH-2003-2003-01-Vol1.pdf
4. www.trb.org/NotesDocs/25-25%284%29_FR.pdf
5. www.ci.northville.mi.us/.../MunicipalPavementManagements.pdf

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16CED17 DESIGN OF REINFORCED CONCRETE STRUCTURES

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To provide knowledge about cantilever and counterfort retaining walls.
- To provide knowledge on design of various components in the water tank by working stress method.
- To explain the basic concepts about the yield line theory for the analysis and design of slab of various cross sections.
- To provide knowledge on IRC loading ,Principle & design of bridges
- To provide knowledge on design of various reinforced concrete structures such as flat slabs, continuous and deep beams.

COURSE OUTCOMES:

16CED17.CO1 : To design cantilever and counterfort retaining walls
16CED17.CO2 : To design underground and overhead water tanks
16CED17.CO3 : To design Slab using yield line theory
16CED17.CO4 : To design RCC and Prestressed bridges.
16CED17.CO5 : To design and detailing of flat slab, grid floor, continuous and deep beams.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED17.CO1	x	x	x	-	-	-	-	x	-	x	-	x	x	-	-
16CED17.CO2	x	x	x	-	-	x	-	x	-	x	-	x	x	-	-
16CED17.CO3	x	x	x	-	-	x	-	x	-	x	-	x	x	-	-
16CED17.CO4	x	x	x	-	-	x	-	x	-	x	-	x	x	-	-
16CED17.CO5	x	x	x	-	-	x	-	x	-	x	-	x	x	-	-

UNIT I RETAINING WALLS 9

Design of cantilever and counter fort retaining walls

UNIT II WATER TANKS 9

Underground rectangular and Circular tanks – Domes – Overhead circular and rectangular tanks – Design of staging and foundations

UNIT III YIELD LINE THEORY 9

Assumptions – Characteristics of yield line – Determination of collapse load/ plastic moment – Application of virtual work method to square, rectangular, circular and triangular slabs

UNIT IV BRIDGES 9

Introduction-Types of bridges – IRC loading – Design of single and double lane slab culvert for class A loading – Principles of design of box culvert, balanced cantilever bridges and Prestressed concrete bridges

UNIT V SELECTED TOPICS 9

Design of flat slabs – Grid floors using Rankine Method – Grashoff *method* -Design of continuous beams - Deep beams-Design of continuous deep beam.

TOTAL: 45 Periods

LIST OF EXPERIMENTS:

Design and Detailing of Cantilever retaining wall
Design and Detailing of Counterfort retaining wall
Design and Detailing of Elevated circular water tank with staging
Design and Detailing of deep beams
Design and Detailing of Floor slab system with T beam
Design and Detailing of Reinforced concrete T beam bridge deck

TOTAL: 30 PERIODS

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	N. Krishna Raju	Advanced Reinforced Concrete Design	CBS Publishers and Distributors	2010
2	M.L.Gambhir	Design of Reinforced Concrete Structures	PHI learning Pvt. Ltd., New Delhi	2008

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	KrishnaRaju.N	Design of Bridges	Oxford and IBH	2010
2	Subramanian.N	Design of Reinforced Concrete Structures	Oxford University Press, New Delhi	2013
3	P. C.Varghese	Advanced Reinforced Concrete Design	Prentice Hall of India Ltd., New Delhi	2010
4	UnnikrishnaPillai. S DevdasMenon	Reinforced Concrete Design	Tata McGraw-Hill Publishing Company Ltd., New Delhi	2015
5	Sinha. S.N	Reinforced Concrete Design	Tata McGraw-Hill Publishing Company Ltd., New Delhi	2014

WEB URLs:

1. www.britannica.com/technology/retaining-wall
2. www.oregon.gov/deq/FilterDocs/dwpResourceList.pdf
3. *www.scielo.br/pdf/riem/v1n2/en_05.pdf*
4. www.vogel.ibk.ethz.ch/en/education/.../bridge-design.html
5. www.gerdau.com/en/products/slabs

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16CED18 **WASTE WATER ENGINEERING** L T P C
3 0 2 4

COURSE OBJECTIVES:

- To realize the principles of Planning, sources and estimation of waste water
- To impart knowledge on Selection of sewers and Pumps for various sources of wastewater
- To recognize the different primary treatment techniques for wastewater.
- To acquire knowledge in the principles of secondary treatment of wastewater.
- To expert in the sludge management.

COURSE OUTCOMES:

16CED18.CO1 : Estimate the sanitary sewage flow and storm runoff.
16CED18.CO2 : Design the sanitary and storm sewers.
16CED18.CO3 : Design and prefer the various primary wastewater treatment units.
16CED18.CO4 : Design and choose the various wastewater secondary treatment units.
16CED18.CO5 : Analyze the various methods on disposal of sludge.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED18.CO1	x	x	x	-	-	-	x	x	-	x	-	x	x	-	-
16CED18.CO2	x	x	x	-	-	-	x	x	-	x	-	x	x	-	-
16CED18.CO3	x	x	x	-	-	-	x	x	-	x	-	x	x	-	-
16CED18.CO4	x	x	x	-	-	-	x	x	-	x	-	x	x	-	-
16CED18.CO5	x	x	x	-	-	-	x	x	-	x	-	x	x	-	-

UNIT I PLANNING FOR SEWERAGE SYSTEMS 9

Sources of wastewater generation – Effects – Estimation of sanitary sewage flow – Estimation of storm runoff – Factors affecting Characteristics and composition of sewage and their significance – Effluent standards – Legislation requirements.

UNIT II SEWER DESIGN 9

Sewerage – Hydraulics of flow in sewers – Objectives – Design period - Design of sanitary and storm sewers – Small bore systems - Computer applications – Laying, joining & testing of sewers– appurtenances – Pumps – selection of pumps and pipe Drainage -. Plumbing System for Buildings – One pipe and two pipe system.

UNIT III PRIMARY TREATMENT OF SEWAGE 9

Objective – Selection of treatment processes – Principles, Functions, Design and Drawing of Units-Onsite sanitation - Septic tank with dispersion - Grey water harvesting – Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks– Construction, operation and Maintenance aspects.

UNIT IV SECONDARY TREATMENT OF SEWAGE 9

Objective – Selection of Treatment Methods – Principles, Functions, Design and Drawing of Units - Activated Sludge Process and Trickling filter – Oxidation ditches, UASB – Waste Stabilization Ponds – Reclamation and Reuse of sewage - sewage recycle in residential complex - Recent Advances in Sewage Treatment – Construction and Operation & Maintenance of Sewage Treatment Plants.

UNIT V DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT 9

Standards for Disposal - Methods – dilution – Self purification of surface water bodies – Oxygen sag curve – Land disposal – Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

TOTAL: 45 Periods

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LIST OF EXPERIMENTS:

1. Determination of pH & Turbidity
2. Determination of Hardness
3. Determination of Dissolved Oxygen & BOD
4. Determination of Optimum Coagulant Dosage
5. Determination of Suspended, Volatile and Fixed Solids
6. Determination of Chlorides
7. Determination of Ammonia Nitrogen
8. Determination of Sodium and Potassium
9. Determination of Nitrate and Phosphate
10. Determination of COD

TOTAL: 30 PERIODS

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Garg. S.K	Environmental Engineering", Vol.2	Khanna Publishers, New Delhi	2010
2	Hussain. S. K	Text Book of Water Supply and Sanitary Engineering	Oxford and IBH Publishing.	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Metcalf and Eddy	Wastewater Engineering – Treatment and Reuse	Tata McGraw Hill, New Delhi	2003
2	Punmia, B.C Ashok K Jain and Arun K Jain	Waste Water Engineering	Laxmi Publications Pvt. Ltd., New Delhi	2013
3	Shah.C. S	Water supply and Sanitation	Galgotia Publishing Company	2013
4	Mark J. Hammer, Mark J and Hammer J R	Water and Waste Water Technology	Prentice Hall of India	2012
5	Duggal. K.N	Elements of public Health Engineering	S.Chand and Company Ltd, New Delhi.	2017

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1. www.sswm.info/content/separate-sewers
2. www.britannica.com/technology/sewer
3. www.fao.org/docrep/t0551e/t0551e05.htm
4. www.open.edu/openlearn/...quality/content-section-1.5.1
5. www.sswm.info/content/land-application-sludge

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16CED19 PUBLIC HEALTH AND IRRIGATION ENGINEERING DRAWING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To draw the water supply layout
- To draw the waste water treatment plant layout
- To draw the impounding reservoir of the structures
- To draw the canal transmission structures
- To draw the canal regulator structures

COURSE OUTCOMES:

16CED19.CO1 : Design and draw the plan section and elevation of water supply treatment plant
16CED19.CO2 : Design and draw the plan section elevation of waste water treatment plant
16CED19.CO3 : Design and draw the impounding structures.
16CED19.CO4 : Design and draw the canal transmission structures.
16CED19.CO5 : Design and draw the canal regulator structures.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED19.CO1	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-
16CED19.CO2	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-
16CED19.CO3	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-
16CED19.CO4	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-
16CED19.CO5	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-

UNIT I WATER SUPPLY AND TREATMENT 9

Design & Drawing of flash mixer, flocculator, clarifier – Slow sand filter – Rapid sand filter –Infiltration gallery – Intake towers – Service reservoirs – Pumping station – House service connection for water supply and drainage.

UNIT II SEWAGE TREATMENT & DISPOSAL 9

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank & oxidation ditch – Trickling filters – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilization ponds - Septic tanks and disposal arrangements – Manholes.

UNIT III IMPOUNDING STRUCTURES 9

Gravity dam, Tank Surplus Weir, Tank Sluice with tower road – Drawing showing plan, elevation, half section including foundation details.

UNIT IV CANAL TRANSMISSION STRUCTURES 9

Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing showing plan, elevation and foundation details.

UNIT V CANAL REGULATOR STRUCTURES 9

Canal head works- Canal Regulator – Canal escape- Proportional Distributors – Drawing showing detailed plan, elevation and foundation.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Modi. P.N	Environmental Engineering I &II	Standard Book House, Delhi-6	2015
2	Sathyanarayana Murthy	Irrigation Design and Drawing	Published by Mrs L.Banumathi, Tuni east Godavari District. A.P	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Peary. H.S Rowe. D.R and Tchobanoglous.G	Environmental Engineering	McGraw-Hill Book Co., New Delhi	2012
2	Metcalf & Eddy	"Wastewater Engineering (Treatment and Reuse)", 4th edition	Tata McGraw-Hill, New Delhi	2003
3	Garg S.K	Environmental Engineering and design Structures	Khanna Publishers, New Delhi. dDelhi, 17th Reprint	2014
4	-	Manual on Water Supply and Treatment	CPHEEO, Government of India, New Delhi	2015
5	-	Manual on Sewerage and Sewage Treatment	CPHEEO, Government of India, New Delhi	2012

WEB URLs:

1. www.sswm.info/.../module-4-sustainable-water-supply
2. www.fao.org/.../16306-0394988de8168f0c9314d99f854975
3. www.sciencedirect.com/science/.../S001379441500714
4. www.dalekovod.com/en/transmission-lines.aspx
5. www.slideshare.net/.../canal-regulation-cross-drainage

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16CED20 **PRESTRESSED CONCRETE STRUCTURES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

To understand the basic concepts, principles and methods of Prestressing.
To compute flexural strength and ultimate shear resistance capacity as per IS code.
To determine the deflection of prestressed members and design the anchorage zone stresses.
To understand the concepts of composite and continuous beams.
To know about tension and compression members and methods of partial prestressing.

COURSE OUTCOMES:

16CED20.CO1 : Know the basic concepts of prestressing.
16CED20.CO2 : Obtain the design for flexure and shear as per IS codal provision.
16CED20.CO3 : Understand the deflection and design anchorage zone.
16CED20.CO4 : Design the composite and continuous beams.
16CED20.CO5 : Design tension and compression members.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED20.CO1	x	x	x	-	-	-	-	x	x	x	-	x	x	-	-
16CED20.CO2	x	x	x	-	-	-	-	x	x	x	-	x	x	-	-
16CED20.CO3	x	x	x	-	-	-	-	x	x	x	-	x	x	-	-
16CED20.CO4	x	x	x	-	-	-	-	x	x	x	-	x	x	-	-
16CED20.CO5	x	x	x	-	-	-	-	x	-	x	-	x	x	-	-

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons --Losses of prestress

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank & oxidation ditch – Trickling filters – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilization ponds - Septic tanks and disposal arrangements – Manholes.

UNIT III IMPOUNDING STRUCTURES 9

Gravity dam, Tank Surplus Weir, Tank Sluice with tower road – Drawing showing plan, elevation, half section including foundation details.

UNIT IV CANAL TRANSMISSION STRUCTURES 9

Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing showing plan, elevation and foundation details.

UNIT V MISCELLANEOUS STRUCTURES 9

Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Krishnaraju.N	Prestressed concrete	Tata McGraw Hill Publishing company Ltd., New Delhi	2015
2	Pandit.G.S. and Gupta.S.P	Prestressed Concrete	CBS Publishers and Distributers Pvt. Ltd	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Lin .T.Y., and Ned H. Burns	Design of prestressed concrete structures	John Wiley & Sons, International Edition, New York	2015
2	aratnam.P	Prestressed Concrete Structures	Oxford and IBH Publishing Company pvt, Ltd, New Delhi	2017
3	N.Rajagopalan	Prestressed Concrete	Narosana Publications	2013
4	Guyon, Y	Limit State Design of Prestressed Concrete Vols. I & II	Applied Science Publishers, London	2010
5	Sinha. N.C and Roy.S.K	Fundamentals of prestressed concrete	S.Chand and Co Ltd	2011

WEB URLs:

1.www.nptel.ac.in/courses/105106117
2.www.rmit.edu.au/courses/c6093cive56821045
3. www.bath.ac.uk/~abstji/end_blocks.htm
4. www.vtt.fi/inf/pdf/workingpapers/2010/W148.pdf
5. www.e-periodica.ch/cntmng?pid=bse-pe-005:1979:3::19

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16CED21 **SEISMIC DESIGN OF STRUCTURES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To impart knowledge on the theory of vibration and basics of structural dynamics.
- To impart knowledge on structural dynamics and its response.
- To know about basics of seismic elements.
- To impart the design philosophy of earthquake resistant design of structures
- To create awareness on the use of codal provisions for seismic design of structures.

COURSE OUTCOMES:

16CED21.CO1 : Analyze the amount vibration a structure can withstand it.
16CED21.CO2 : Analyze a structure by seismic coefficient method.
16CED21.CO3 : Knowledge about earthquake causes and intensity of magnitude.
16CED21.CO4 : Knowledge about earthquake resistant structures.
16CED21.CO5 : Design the building concept, ductility and design of masonry structures as per IS Codal provisions.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED20.CO1	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
16CED20.CO2	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
16CED20.CO3	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
16CED20.CO4	X	X	X	-	-	-	-	X	X	X	-	X	X	-	-
16CED20.CO5	X	X	X	-	-	-	-	X	-	X	-	X	X	-	-

UNIT I ELEMENTS OF VIBRATIONS 9

Introduction – Basic concept of Vibration – Static and Dynamic loading – Basic definitions – Types of Vibration – Response of the system – consequences of vibration-vibration control measures.

UNIT II STRUCTURAL DYNAMICS AND RESPONSE 9

Undamped free vibration – Derivation of equation of motion – Equivalent stiffness of spring combinations – Natural frequency and Time Period – Introduction to two degree of freedom system and Multi degree of Freedom system

UNIT III ELEMENTS OF SEISMOLOGY 9

Causes of earthquake – Geological faults – Tectonic Plate Theory – Elastic Rebound Theory – Epicenter – Hypocenter – Seismic waves – Seismogram – Magnitude and Intensity of Earthquake – Magnitude and Intensity scales – Information on Some Disaster Earthquakes – Concept of Seismic Microzonation

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE 9

Response and Design Spectra – Design Earthquake – Concept of Peak Acceleration – Site Specific Response Spectrum – Effect of Soil properties and Damping – Types of Base Isolation and its Effects.

UNIT V DESIGN MORPHOLOGY 9

Design concept of Buildings – IS: 1893-2002 – Importance of Ductility – Methods of Introducing Ductility in RC Structures as per IS: 13920- 1993 – Behavior and Design of Masonry Structures as per IS: 13827- 1993

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Pankaj Agarwal and Manish Shrikhande	Earthquake Resistant Design of Structures	PHI Pvt Ltd, NewDelhi	2010
2	Damodarasamy S.R.	Basics of Structural Dynamics and Aseismic Design	Laxmi publications, New Delhi	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Paz Mario	Structural Dynamics - Theory and Computation	CBS publishers	2010
2	en L.Kramer	Geotechnical Earthquake Engineering	Pearson Education, Inc, New Delhi	2016
3	Jai Krishna, Chandrasekaran.A.R and Brijesh Chandra	Elements of Earthquake Engineering	South Asia Publishers	2013
4	Humar.J.L	Dynamics of Structures	Prentice Hall Inc.	2015
5	Brijesh Chandra	Elements of Dynamic Structure	CBS publishers	2011

WEB URLs:

1. www-group.slac.stanford.edu/esh/.../seismic.pdf
2. www.ethz.ch/content/.../dynamics-and.../research.html
3. www.cos.ethz.ch/software/.../ses3d1.html
4. www.techno-press.com/?journal=eas&subpage=2
5. www.nibs.org/resource/resmgr/.../FEMA_P-749.pdf

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16CED22 **IRRIGATION ENGINEERING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

To obtain knowledge about irrigation system and crops season
To design the various methods of irrigation which are needed for the practical life.
To understand about canal structures and regulators
To learn about diversion head work and impounding structure
To provide knowledge on water management and to minimize irrigation water losses

COURSE OUTCOMES:

16CED22.CO1 : Assess the irrigation systems and crop seasons
16CED22.CO2 : Select the suitable methods of irrigation
16CED22.CO3 : Design various types of canal structures and regulators.
16CED22.CO4 : Select and design suitable type of dam based on the requirement
16CED22.CO5 : Examine various river training methods and providing solution to various issues on irrigation water management

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED22.CO1	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
16CED22.CO2	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
16CED22.CO3	X	X	X	-	-	X	-	X	X	X	-	X	X	-	-
16CED22.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
16CED22.CO5	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-

UNIT I INTRODUCTION 9

Necessity – Merits and demerits of irrigation– Crops and crop seasons–Soil- water- plant relations – saline, alkaline soils and their reclamation – root zone depth – Duty and Delta relationship – Factors affecting duty – Consumptive use of water by a crop – Estimation and assessment of irrigation water – Irrigation efficiencies – optimum utilization of water– Planning and development of irrigation– Problems on Irrigation

UNIT II IRRIGATION METHOD 9

Methods of irrigation– Canal irrigation – lift irrigation – tank irrigation – Surface and sub-surface methods of application of water – Sprinkler and drip irrigation methods.

UNIT III CANAL STRUCTURE AND REGULATORS 9

Alignment of canals – classification of canals – Design of canals based on Kennedy's and Lacey's silt theories – canal lining - water logging - canal drops – hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal head works – Functions of Regulators - Design of head and cross regulators– Classification of aqueducts and syphon aqueducts

UNIT IV DIVERSION HEAD WORK AND IMPOUNDING STRUCTURE 9

Functions of diversion head works – Types – Layout of diversion head works – Component parts – functions -Weir –types – Causes of failure of weirs and their remedies –Bligh's theory -Khosla's theory – Design of a vertical drop weir – Design principles for under sluices – Types of impounding structures– Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams

UNIT V IRRIGATION WATER MANAGEMENT 9

Need for optimization of water use – Minimizing irrigation water losses – On farm development works - Participatory irrigation management – Water users associations – Changing paradigms in water management due to climate change – Performance evaluation–River training methods - Investigation and

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preparation of irrigation project: Classification of projects, concepts of multipurpose projects.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Santosh Kumar Garg	Irrigation Engineering and Hydraulics Structures.	Khanna Publications Pvt.Ltd. New Delhi.	2016
2	Punmia B.C & Pande B.B Lal	Irrigation and water power Engineering.	Lakshmi publications, New Delhi.	2016

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Sharma R.K and Sharma T.K	Irrigation Engineering and Hydraulics Structures	S. Chand & Company Pvt.Ltd, New Delhi	2010
2	Michel A.M	Irrigation Engineering	Vikas Publishing House Pvt.Ltd, New Delhi	2009
3	Dilip Kumar Majumdar	Irrigation Water Management (Principles & Practices)	Prentice Hall of India (P), Ltd, New Delhi.	2013
4	Varshney and Gupta	Irrigation Engineering & Hydraulic Structure	Nem Chand & Bros., Roorkee	2010
5	Arora K R	Irrigation Water Power & Water Resources Engineering	Standard Publishers Distributors, Delhi	2010

WEB URLs:

1. www.nrcs.usda.gov/wps/portal/nrcs/main/.../irrigation
2. www.sswm.info/content/automatic-irrigation
3. www.slideshare.net/.../canal-regulation-cross-drainage
4. www.slideshare.net/.../diversion-headworks-50981492
5. www.omicsonline.org/.../irrigation-water-management

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16CED23 **COMPUTER AIDED BUILDING DRAWING** **L T P C**
1 0 2 2

COURSE OBJECTIVES:

- To make the students understand and learn various elements of Residential / Institutional /Workshop buildings.
- To impart fundamental knowledge on AutoCAD to make the students draw truss structures, the plan, elevation and sectional view of a building.

PROGRAMME OUTCOME (PO)

- Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOMES:

16CED23.CO1 : To know the various components of the different types of building.
16CED23.CO2 : To acquire knowledge of minimum size of the various elements of a building.
16CED23.CO3 : To draw a building plan for a given area.
16CED23.CO4 : To prepare an elevation and a sectional view of the given plan.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED23.CO1	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-
16CED23.CO2	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-
16CED23.CO3	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-
16CED23.CO4	x	x	x	-	x	x	-	x	-	x	-	x	x	-	-

PREREQUISITES:

Knowledge of Engineering Graphics and Introduction to Computer Science

ASSESSMENT PATTERN

Particulars	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Viva-Voce	15	15
Total	50	50

LIST OF EXERCISES

1. Develop a model of a Brick wall using basic commands
   - Flemish Bond
   - English Bond
   - Header Bond
   - Stretcher Bond
   - Raking Bond
   - Zigzag Bond
2. Create a model of a hexagonal, triangular shaped paver blocks for a given floor area
3. Joinery details for doors and windows
4. Plan, Elevation and Cross section of a Single and Multi-storied residential buildings for a given plan with electrical wiring and plumbing line.
5. Steel Truss
6. Develop a 3 Dimensional model of a single storey single bay residential building for a given plan of mini project

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TOTAL: 15+30 PERIODS

PRACTICAL SCHEDULE

S. No.	Exercises	Hours
1	Develop a model of a Brick wall using basic commands	3
2	Create a model of a hexagonal, triangular shaped paver blocks for a given floor area	6
3	Joinery details for doors and windows	10
4	Plan, section and Elevation for a single storied residential building	10
5	Plan, section and elevation of multi – storied residential building	6
6	Steel truss and its connection details	4

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16CED24	SURVEY CAMP	L T P C 0 0 0 1

AIM

The aim of the camp is to make the student familiar in mapping and contouring any type of area.

OBJECTIVES

- Ten days survey camp using Prismatic compass, Theodolite, Cross staff, Levelling staff, Tapes, Plane table and Total station and GPS. The camp must involve work on a large area of not less than 400 hectares. At the end of the Camp, each student shall have mapped and contoured the area. The camp record should include all original field observations, calculations and plots.

LIST OF EXPERIMENTS

1. Traversing – Compass, Plane Table
   a. Open Traverse
   b.Closed Traverse
2. Check Levelling by using dumpy level
3. Alignment of Road (LS and CS) by using total station
4. Contouring (Radial and Grid)
5. Setting out of work
   a.Curve
   b.Building
6. Triangulation
7. Trilateration
8. Sun / Star observation to determine azimuth
9. Use of GPS to determine latitude and longitude
10. Calculating and plotting the given area using GPS
11. Calculating and plotting the given area using Total Station

EVALUATION PROCEDURE

1. **Internal Marks:** 20 marks (decided by the staff in-charge appointed by the Institution)
2. **Evaluation of Survey Camp Report:** 30 marks (Evaluated by the external examiner appointed by the Institution)
3. **Viva voce examination:** 50 marks (evaluated by the internal examiner appointed by the HOD with the approval of HOI and external examiner appointed by the Institution – with equal Weightage)

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16CED25 **PREFABRICATED STRUCTURES** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the fundamentals related to the prefabricated structures.
- To provide knowledge on prefabricated reinforced concrete constructions.
- To provide knowledge on disunity of structures.
- To provide knowledge on types of wall joints and their behavior.
- To provide knowledge on abnormal loads.

COURSE OUTCOMES:

16CED25.CO1 : Understand the concepts behind the fundamentals related to the prefabricated structures.
16CED25.CO2 : Familiarize the behavior of prefabricated structural components
16CED25.CO3 : Apply the knowledge on disunity of structures and joint flexibility
16CED25.CO4 : Understand the joints of structural elements and their behavior.
16CED25.CO5 : Design the prefabricated structures for abnormal loads using various codal provisions.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CED25.CO1	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED25..CO2	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED25..CO3	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED25..CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CED25..CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I INTRODUCTION 9

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS 9

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT III DESIGN PRINCIPLES 9

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV JOINT IN STRUCTURAL MEMBERS 9

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT V DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc - Importance of avoidance of progressive collapse.

TOTAL: 45 PERIODS

TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Laszlo Mokk	Prefabricated Concrete for Industrial and Public Structures.	Akademiai Kiado, Budapest	2011

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2	Koncz.T	Manual of Precast Concrete Construction, Vol.I II and III & IV.	Bauverlag, GMBH	2011

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Warszawski A	Industrialization and Robotics in Building and A managerial approach.	Harper and Row	2010
2	Gerostiza C.Z Hendrikson C and Rehat D.R	Knowledge based process planning for construction and manufacturing.	Academic Press Inc.,	2011
3	-	CBRI	Building materials and components, India.	2010
4	Lewicki.B	Building with Large Prefabricates.	Elsevier Publishing Company, Amsterdam/ London/New York	2010
5	-	Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete.	Netherland Betor Verlag	2011

WEB URLs

1. www.readorrefer.in/article/-Principles-of-Prefabrication_4088
2. www.youtube.com/watch?v=jenYP9Acivg
3. www.youtube.com/watch?v=WdXg4M_i0-w
4. www.youtube.com/watch?v=7U4yPDC1u34
5. www.designingbuildings.co.uk/wiki/Shell_roof

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16CEE01

HYDROLOGY

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To know about the hydrological cycle and precipitation.
- To understand the precipitation and infiltration process.
- To acquire in depth knowledge on various types of hydrographs and their applications.
- To realize the importance of flood control and mitigation measures.
- To integrate the fundamental knowledge on ground water hydrology.

COURSE OUTCOMES:

16CEE01.CO1 : Understand the various components of hydrological cycle, rainfall and their interactions.
16CEE01.CO2 : Estimate the mean area precipitation, infiltration and their significance.
16CEE01.CO3 : Understand the various methods of hydrographs and its applications.
16CEE01.CO4 : Estimate the flood by various methods and concept of flood routing.
16CEE01.CO5 : Understand the dynamics of groundwater flow and their estimation.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE01.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEE01.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE01.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE01.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE01.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I PRECIPITATION 9

Hydrologic cycle - Hydro meteorological factors - Cloud formation - Winds and their movement - 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 - Density and Adequacy of rain gauges - Recording and non - recording rain gauges - Optimum number of rain gauges

UNIT II ABSTRACTION FROM PRECIPITATION 9

Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process - Infiltration capacity loss - Measurement of infiltration - Infiltration indices -Horton's equation - Effective rainfall Spatial distribution - Consistency analysis -Frequency analysis - Intensity, duration, frequency relationships - abstraction

UNIT III HYDROGRAPHS ANALYSIS 9

Flood Hydrograph - Components of flood hydrograph -Factors affecting shape of Hydrograph - Base flow separation - Unit hydrograph - Advantages - Instantaneous Unit hydrograph - S curve Hydrograph - Synthetic unit hydrograph -Applications - Derivation of unit hydrograph - Unit hydrograph of different deviations

UNIT IV FLOODS AND FLOOD ROUTING 9

Flood frequency studies - Recurrence interval - Flood estimation - Gumbel's method - Log Pearson type III method - Flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control.

UNIT V GROUND WATER HYDROLOGY 9

Types of Aquifers - Darcy's Law - Dupuit's assumptions - confined aquifer - unconfined aquifer - recuperation test - transmissibility - specific capacity - pumping test -steady flow analysis only.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Subramanya, K	Engineering Hydrology	Tata McGraw-Hill Publishing Co., Ltd,Delhi	2013
2.	Raghunath, H.M	Hydrology	Wiley Eastern Ltd	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	JayaRam Reddy	Text Book of Hydrology	Laxmi Publications	2016
2.	Singh V P	Hydrology	McGraw Hill Inc., Ltd	2016
3.	Chow,V.T. and Maidment	Hydrology for Engineers	Mc Graw - Hill Inc., Ltd	2013
4.	Santosh Kumar Garg	Hydrology and Water Resources Engineering	Khanna Publications Pvt.Ltd. NewDelhi	2017
5.	Warren Viessman and Gary L.Lewis	Introduction to Hydrology	Prentice Hall of India Pvt.Ltd NewDelhi	2017

WEB URLs:

1. www.slideshare.net/mahasabri/precipitation-and-its-forms-hydrology
2. www.engr.psu.edu/ce/HEC/FEMA/Lecture%204.ppt
3. www.kean.edu/~csmart/Hydrology/.../Lecture%2009l%20Intro%20Hydrographs.ppt
4. www.kean.edu/~csmart/Hydrology/.../Lecture%2015u%20Flood%20Routing%201.pp..
5. www.in.gov/dnr/water/files/WFWR_web26-50.pdf

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16CEE02 **PAVEMENT ENGINEERING** L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand the types of pavement.
- To gain the knowledge of flexible Pavements design as per IRC guidelines.
- To gain the knowledge of rigid Pavements design as per IRC guidelines.
- To know about the pavement evaluation and Maintenance.
- To study about Stabilization of Pavements.

COURSE OUTCOMES:

16CEE02.CO1 : To find the stress and deflections in pavements under repeated loading.
16CEE02.CO2 : To design flexible pavement based on IRC guidelines.
16CEE02.CO3 : To design rigid pavement based on IRC guidelines.
16CEE02.CO4 : To evaluate performance of pavements.
16CEE02.CO5 : To adopt suitable soil stabilization techniques for pavements

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE02.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEE02.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE02.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE02.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE02.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I TYPES OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM 9

Introduction - Pavement as layered structure - Pavement types rigid and flexible - Resilient modulus - Stress and deflections in pavements under repeated loading.

UNIT II DESIGN OF FLEXIBLE PAVEMENTS 9

Flexible pavement design - factors influencing design of flexible pavement - Empirical, Semi- empirical and theoretical methods - Design procedure as per IRC guidelines -design and specification of rural roads.

UNIT III DESIGN OF RIGID PAVEMENTS 9

Cement concrete pavements factors influencing CC pavements - Modified Westergaard approach - design procedure as per IRC guidelines - Concrete roads and their scope in India.

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE 9

Pavement Evaluation - causes of distress in rigid and flexible pavements - Evaluation based on Surface Appearance, Cracks, patches and Pot holes, Undulations, Raveling, Roughness, Skid Resistance - Structural evaluation by Deflection Measurements - Pavement Serviceability index pavement maintenance (IRC recommendations only).

UNIT V STABILIZATION OF PAVEMENTS 9

Stabilization with special reference to highway pavements - Choice of stabilizers - Testing and field control stabilization for rural roads in India - Use of Geosynthetics in roads

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Wright P.H.	Highway Engineers	John Wiley and Sons, Inc., New York	2009

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2.	Khanna S.K., Justo C.E.G and Veeraragavan.A.	Highway Engineering	Nem Chand and Brothers, 10th Edition, Roorkee	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	*Yoder R.J. and Witchak M.W.*	*Principles of Pavement Design*	*John Wiley*	*2016*
2.	*Rajib B. Mallick, Tahar El-Korchi*	*Pavement Engineering*	*Principles and Practice 2nd edition, CRC Press*	*2013*
3.	-	*Guidelines for the Design of Flexible Pavements - IRC 37*	*Indian Road Congress*	*2012*
4.	-	*Guideline for the Design of Rigid Pavements for Highways, IRC 58*	*Indian Road Congress*	*2016*
5.	-	*Standard Specifications and code of practice for construction of concrete roads, IRC - 015*	*Indian Road Congress*	*2011*

WEB URLs:

1. *www.civil.iitb.ac.in/tvm/1100_LnTse/401_lnTse/plain/plain.html*
2. *www.civil.iitb.ac.in/~kvkrao/uploads/5/9/3/7/.../ce742lec_14new.pdf*
3. www.civil.iitb.ac.in/tvm/1100_LnTse/411_lnTse/plain/plain.htmL
4. www.crridom.gov.in/sites/default/files/annual-report/Chapter4-2011-12.pdf
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16CEE03 **CONSTRUCTION PLANNING AND MANAGEMENT** L T P C
3 0 2 4

COURSE OBJECTIVES:

- To make the students to learn about basic concepts of planning and methods.
- To study about scheduling procedures and techniques involved in construction projects
- To learn about cost control monitoring and accounting systems.
- To know about the quality control and safety measures during construction practice.
- To learn about organization and use of project information in database management system.

COURSE OUTCOMES:

16CEE03.CO1 : Understand the requirement of planning techniques exercised in the construction projects.
16CEE03.CO2 : Choose suitable scheduling technique for the particular project.
16CEE03.CO3 : Practice modern cost account systems and control techniques adopted.
16CEE03.CO4 : Adopt the quality control and safety measures during construction.
16CEE03.CO5 : Understand the use of project information system.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE03.CO1	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CEE03.CO2	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CEE03.CO3	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CEE03.CO4	X	X	X	X	-	X	-	-	X	X	-	X	X	-	-
16CEE03.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

UNIT I CONSTRUCTION PLANNING 9

Necessity - Basic concepts - Phases and stages of project planning - Types of construction plans for projects - Planning for materials, labour and equipment - Defining activities and precedence relationships - Estimating activity durations and resource requirements - Program for progress of work and control - Bar and Milestone charts - Uses and drawbacks - Terminology - Coding systems

UNIT II MANAGEMENT TECHNIQUES 9

Evolution of networks - Inter-relationship of events and activities - Fundamental rules for network construction -Critical path method - Program Evaluation and Review Technique - Probability of project completion time -Precedence networks - Scheduling for activity - on-node networks - Resource oriented scheduling - Scheduling with resource constraints - Improving scheduling

UNIT III COST CONTROL MONITORING AND ACCOUNTING 9

The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts - Control of project cash flows – schedule control – schedule and budget updates – relating cost and schedule information

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety Concerns in Construction - Organizing for Quality and Safety - Work and Material Specifications - Total Quality control - Quality control by statistical methods - Statistical Quality control with Sampling by Attributes - Statistical Quality control by Sampling and Variables-Safety.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information - Accuracy and Use of Information - Computerized organization and use of Information - Organizing information in databases-relational model of Data bases - Other conceptual Models of Databases - Centralized database Management systems - Databases and application programs - Information transfer and Flow.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Chitkara. K.K	Construction Project Management	Tata McGraw Hill Publishing Co., New Delhi,	2015
2.	Srinath.L.S	PERT and CPM Principles and Applications", Affiliated East West Press, 2001	Wiley, 6th Edition	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Chris Hendrickson and Tung Au	Project Management for Construction	Prentice Hall, Pitsburgh,.	2012
2.	Moder.J., Phillips. C and Davis E	Project Management with CPM", PERT and Precedence Diagramming	Van Nostrand Reinhold co	2015
3.	Willis., E.M	"Scheduling Construction projects"	John Wiley and Sons,	2015
4.	Halpin, D.W	Financial and Cost Concepts for Construction Management	John Wiley and Sons, New York	2011
5.	Andrew Baldwin	Construction Planning and Scheduling	I.K International publishing	2014

WEB URLs:

1. www.ce.udel.edu/courses/CIEG%20486/scheduling_notes103002.pdf
2. www.slideshare.net/drravimr/modern-management-techniques\
3. www.careerbuilder.com/jobs-cost-control-monitoring-and-accounting-project
4. www.swg.usace.army.mil/.../26/.../Construction%20Quality%20Management/MOD6.p..
5. www.brighthubpm.co›ProjectPlanning

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16CEE04 **TRAFFIC ENGINEERING AND SAFETY TRANSPORT** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To familiarize the basics of traffic engineering.
- To give knowledge about traffic control system and geometric design of intersections.
- To familiarize about traffic management system.
- To impart knowledge about road transport systems and preventive measures
- To create awareness among students about road safety.

COURSE OUTCOMES:

16CEE04.CO1 : Have knowledge on traffic engineering basics.
16CEE04.CO2 : Apply geometric design of intersections.
16CEE04.CO3 : Knowledge about traffic management system
16CEE04.CO4 : Learn about road transport systems and preventive measures
16CEE04.CO5 : Understand the various road safety measures.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE04.CO1	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CEE04.CO2	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CEE04.CO3	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CEE04.CO4	x	x	x	x	-	x	-	-	x	x	-	x	x	-	-
16CEE04.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I INTRODUCTION 9

Significance and scope - Characteristics of Vehicles and Road Users - Skid Resistance and Braking Efficiency (Problems) - Components of Traffic Engineering - Road, Traffic and Land Use Characteristics - Traffic surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services - Basic principles of Traffic flow

UNIT II TRAFFIC CONTROL AND GEOMETRIC DESIGN OF INTERSECTIONS 9

Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems) - Traffic control aids and Street furniture - Street Lighting - Computer applications in Signal design - Conflicts at Intersections, Classification of 'At Grade Intersections' - Channelized Intersections - Principles of Intersection Design - Elements of Intersection Design - Rotary design - Grade Separation and interchanges - Design principles.

UNIT III TRAFFIC MANAGEMENT 9

Traffic Management - Transportation System Management (TSM) - Travel Demand Management (TDM) - Traffic Forecasting techniques - Restrictions on turning movements - One-way Streets - Traffic Segregation - Traffic Calming - Tidal flow operations - Exclusive Bus Lanes - Introduction to Intelligent Transportation System (ITS).

UNIT IV ROAD TRANSPORT 9

Introduction - factors for improving safety on roads - causes of accidents due to drivers and pedestrians - design, selection, operation and maintenance of motor trucks - preventive maintenance check lists - motor vehicles act - motor vehicle insurance and surveys.

UNIT V ROAD SAFETY 9

Road alignment and gradient-reconnaissance - ruling gradient, maximum rise per km - factors influencing alignment like tractive resistance, tractive force, direct alignment, vertical curves - breaking characteristics of vehicle-skidding-restriction of speeds-significance of speeds- Pavement conditions - Sight distance - Safety at intersections - Traffic control lines and guide posts-guard rails and barriers - street lighting and

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illumination overloading - concentration of driver.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kadiyali L R	Traffic Engineering and Transport Planning	Khanna Technical Publications	2016
2.	Khanna K and Justo C E G	Highway Engineering	Khanna Publishers	2017

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Subhash C.Saxena	A Course in Traffic Planning and Design	Dhanpat Rai Publications	2014
2.	C. Jotin Khisty, B. Kent Lall	Transportation Engineering - An Introduction	Prentice Hall of India Pvt Ltd	2010
3.	Babkov, V.F	Road Conditions and Traffic Safety	MIR Publications	2017
4.	-	Motor Vehicles Act	Government of India	2017
5.	K.W.Ogden	Safer Roads - A guide to Road Safety Engineering	Avebury Technical	2011

WEB URLs:

1. www.virginiadot.org/business/locdes/Traffic-Resource-Links.asp
2. www.gpo.gov/fdsys/pkg/FR-2013-06-17/pdf/2013-14266.pdf
3. www.youtube.com/watch?v=h7p606C-W8g
4. www.youtube.com/watch?v=3XaTwQIugJ4
5. www.youtube.com/watch?v=_YJY2JXk00c

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16CEE05 **HOUSING PLANNING AND MANAGEMENT** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To learn the basics about housing planning and management.
- To give awareness about the existing housing programmes.
- To train the students to do the planning and design of housing projects
- To give exposure about the cost effective construction techniques.
- To knowledge about housing finance and project appraisal.

COURSE OUTCOMES:

16CEE05.CO1 : Know the basics of housing planning and management system
16CEE05.CO2 : Learn the various housing programmes and role of public and private organization.
16CEE05.CO3 : Plan and design the housing projects.
16CEE05.CO4 : knowledge about the cost effective construction techniques
16CEE05.CO5 : Perform the economic analysis based project appraisal of housing projects.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE05.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE05.CO2	x	x	x	-	-	x	x	-	x	x	x	x	x	-	-
16CEE05.CO3	x	x	x	-	-	x	x	-	x	x	x	x	x	-	-
16CEE05.CO4	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
16CEE05.CO5	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-

UNIT I INTRODUCTION TO HOUSING 9

Definition of Basic Terms - House, Home, Household - Row houses, Apartments, Multi storied Buildings, Special Buildings - Objectives and Strategies of National Housing Policies - Principle of Sustainable Housing, Housing Laws at State level, Bye - laws at Urban and Rural Local Bodies - DC Regulations, Institutions for Housing at National, State and Local levels.

UNIT II HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for various Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects - Site Analysis, Layout Design, Design of Housing Units (Simple design problems) - Procedure for site analysis and layout planning.

UNIT IV CONSTRUCTION TECHNIQUES AND COST EFFECTIVE TECHNIQUE 9

New construction techniques - Cost effective, Modern Construction Materials, Building centers concept, Functions and Performance Evaluation.

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects - Housing Finance, Cost Recovery - Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems)

TOTAL: 45 Periods

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TEXT BOOKS:				
Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Meera Mehta and Dinesh Mehta	Metropolitan Housing Markets	Sage Publications Pvt. Ltd., New Delhi.	2015
2.	Francis Cherunilam and Odeyar D Heggade	Housing in India	Himalaya Publishing House, Bombay.	2012

REFERENCE BOOKS:				
Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Wiley- Blackwell	Neufert Architects	4th Edition, Blackwell Publishing Ltd.	2012
2.	Donald Watson and Michael J.Crosbie	Time Saver Standards for Architectural Design	8th Edition, Tata McGraw Hill Edition.	2011
3.	Walter Martin Hosack	Land Development Calculations	McGraw Hill 2nd Edition.	2010
4	Meera Mehta and Dinesh Mehta	Metropolitan Housing Markets	Sage Publications Pvt. Ltd., New Delhi.	2015
5	Francis Cherunilam and Odeyar D Heggade	Housing in India	Himalaya Publishing House, Bombay.	2012

WEB URLs:

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2. www.nhb.org.in/Urban Housing/Housing policies.php
3. www.jstor.org/stable/4394929
4. www.mhupa.gov.in/pdf/guidelines-scheme/urbanemp.../buildingcentres.pdf
5. www.unido.org/.../Environment_friendly_Indian_building_material_tec

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16CEE06 ENVIRONMENTAL IMPACT ASSESMENT IN CIVIL ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To Carry out scoping and screening of developmental projects for environmental and social assessments
- To explain different methodologies for environmental impact assessment
- To plan environmental prediction and assessments
- To evaluate environmental impact assessment reports and management plans
- To develop knowledge on case studies about EIA for infrastructure projects

COURSE OUTCOMES:

16CEE06.CO1 : Know Environmental Impact Assessment and Legal provisions
16CEE06.CO2 : Explain different methodologies for environmental impact assessment
16CEE06.CO3 : Plan environmental prediction and assessment
16CEE06.CO4 : Evaluate environmental impact assessment reports
16CEE06.CO5 : Case studies about environmental impact assessment.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE06.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE06.CO2	x	x	x	-	-	x	x	-	x	x	x	x	x	-	-
16CEE06.CO3	x	x	x	-	-	x	x	-	x	x	x	x	x	-	-
16CEE06.CO4	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-
16CEE06.CO5	x	x	x	-	-	x	x	-	x	x	-	x	x	-	-

UNIT I INTRODUCTION 9

Impact of development projects - Sustainable development - Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) - EIA capability and limitations - Legal provisions on EIA - Stages of EIA, Types of EIA.

UNIT II METHODOLOGIES 9

Methods of EIA - Check lists - Matrices - Networks - Cost-benefit analysis - Analysis of alternatives.

UNIT III PREDICTION AND ASSESSMENT 9

Formulation of Housing Projects - Site Analysis, Layout Design, Design of Housing Units (Simple design problems) - Procedure for site analysis and layout planning.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on environment - Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People – ISO 14000.

UNIT V CASE STUDIES 9

EIA for infrastructure projects - Dams - Highways - Multi-storey Buildings - Water Supply and Drainage Projects - Waste water treatment plants, STP.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Canter, R.L	Environmental Impact Assessment	McGraw Hill Inc., New Delhi	2016

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2.	Shukla, S.K. and Srivastava, P.R	Concepts in Environmental Impact Analysis	Common Wealth Publishers, New Delhi	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	John G. Rau and David C Hooten	Environmental Impact Analysis Handbook	McGraw Hill Book Company	2012
2.	Judith Petts	Handbook of Environmental Impact Assessment Vol.I &II	Blackwell Science	2014
3.	-	Environmental Assessment Source book", Vol. I, II & III	World Bank, Washington, D.C	2011
4.	Bala Krishnamoorthy	Environmental Management	Blackwell Science	2010
5.	Judith Petts	Environmental Assessment Source book", Vol. I, II & III	McGraw Hill Book Company	2011

WEB URLs:

1. www.researchgate.net/.../228322154_Environmental_Impact_Assessment_of_
2. www.tandfonline.com/doi/full/10.1080/03043790512331313831?src=recsys
3. www.impactjournals.us/download.php?...Environmental%20Impact%20Assessment%..
4. www.ecafir.com/cms/en/.../1/environmental-impact-assessment-projects.html
5. www.iitr.ac.in/.../Academics+Course_Structure+CE-601B_Environment_Impac..

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16CEE07 **MUNICIPAL SOLID WASTE MANAGEMENT** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To know about the different sources and types of municipal solid waste.
- To provide the knowledge about onsite processing and storage of municipal solid waste.
- To study about collection and transfer of municipal solid waste.
- To knowledge about off-site processing of solid waste.
- To understand the various disposal techniques.

COURSE OUTCOMES:

16CEE07.CO1 : Get an idea about different sources and types of municipal solid waste.
16CEE07.CO2 : Know about onsite storage and processing system.
16CEE07.CO3 : Understand the different methods of collection and transfer of solid waste.
16CEE07.CO4 : Select the suitable offsite processing method for various solid waste.
16CEE07.CO5 : Select the appropriate waste disposal method.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE06.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
16CEE06.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE06.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE06.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE06.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I SOURCES AND TYPES OF MUNICIPAL SOLID WASTE 9

Solid waste - sources - types - quantity - factors affecting generation - characteristics - Methods of sampling - effects of improper disposal of solid wastes - Public health effects and awareness -Elements of solid waste Management-Social and economic aspects-Municipal solid waste (M&H)-Integrated management - Role of NGOs; Legislation-Public awareness.

UNIT II ON-SITE STORAGE AND PROCESSING 9

On-site storage methods - materials used for containers - on-site segregation of solid wastes - Public health and Economic aspects of storage - waste segregation and storage - Reduction, Reuse and Recycling - options under Indian conditions - Critical Evaluation of Options.

UNIT III COLLECTION AND TRANSFER 9

Methods of Collection - types of vehicles - Manpower requirement - collection route- transfer stations -Need for transfer and transport, Selection of location, operation and maintenance - options under Indian conditions - Field problems- solving

UNIT IV OFF-SITE PROCESSING 9

Objectives of waste processing-Physical processing techniques and equipment - resource recovery from solid wastes - composting and biomethanation – Thermal processing options- Incineration - Pyrolysis

UNIT V DISPOSAL 9

E Land disposal of solid waste - sanitary landfills - site selection, design and operation of sanitary landfills - Management of leachate and landfill gas - landfill closure and environmental monitoring - Leachate collection and treatment – Landslide rehabilitation.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication

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1.	George Tchobanoglous	Integrated Solid Waste Management	McGraw- Hill	2014
2.	Sasikumar K & Krishna Sanoop Gopi	Solid Waste Management	PHI, New Delhi	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Vesilind, Aarne P & Worrell, William A & Reinhart, Debra R	Solid Waste Engineering	Cengage Learning Pvt. Ltd, New Delhi	2011
2.	Landreth.R.E and Rebers.P.A	Municipal Solid Wastes–Problems and Solutions	Lewis Publishers	2015
3.	Bhide.A.D. and Sundaresan.B.B	Solid Waste Management in Developing Countries	Dhanpat Rai and Sons	2012
4.	J. Cointreau	Waste Management	InTechOpen, Published	2011
5.	Jacqueline Vaughn	Waste Management	ABC-CLIO	2009

WEB URLs:

1. www.yourarticlelibrary.com › Solid Waste Management
2. www.open.edu/openlearncreate/mod/oucontent/view.php?id=209&section=1.4.
3. www.ncbi.nlm.nih.gov/pubmed/7341563
4. www shopplugin.net/workshopp/onsite-or-offsite-payment processing/
5. www.scribd.com/presentation/84295297/Waste-Management-2

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16CEE08 **WATER RESOURSE ENGINEERING** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To learn about water resources and collection of hydrological data.
- To study the Network design using hydrological data.
- To know the importance, features and uses of Water resources and its needs.
- To learn about reservoir planning and management.
- To learn about economic analysis of water resources.

COURSE OUTCOMES:

16CEE08.CO1 : Know general details about water resources
16CEE08.CO2 : Able to plan the Network design using Hydrological data.
16CEE08.CO3 : Familiarize about Water resources and its needs.
16CEE08.CO4 : Gain knowledge about reservoirs planning and management
16CEE08.CO5 : know about economic analysis of water resources.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE08.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE08.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE08.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE08.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE08.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I GENERAL 9

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Economics of water resources planning, physical and socio economic data – National Water Policy – Collection of meteorological and hydrological data for water resources.

UNIT II NETWORK DESIGN 9

Hydrologic measurements – Analysis of hydrologic data – Hydrologic station network – Station network design – Statistical techniques in network design.

UNIT III WATER RESOURCE NEEDS 9

Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan

UNIT IV RESERVOIR PLANNING AND MANAGEMENT 9

Reservoir - Single and multipurpose – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls -

UNIT V ECONOMIC ANALYSIS 9

Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors – Discounting techniques – Computer Applications.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Punmia .B.C. and Pande B.B.Lal	Irrigation and Water Power Engineering	Laxmi publications Pvt. Ltd, New Delhi	2012

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2.	K.Subramanya	Engineering hydrology	McGraw-Hill Inc, New York	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raghunath .H.M	Hydrology	New Age International Publishers, New Delhi	2014
2.	rma .R.K	Irrigation Engineering and Hydraulic Structures	Oxford and IBH Publishing Company, New Delhi	2014
3.	Raghunath .H.M	Ground Water Hydrology	Wiley Eastern Ltd., Second reprint	2015
4.	Goodman Alvin S	Principles of Water Resources Planning	Prentice - Hall India, New Delhi	2011
5.	Linsley R.K. and Franzini J.B	Water Resources Engineering	McGraw - Hill Inc, New York	2014

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2. www.slideshare.net/gauravhtandon1/ground-water-hydrology-25132362
3. www.rizzoassoc.com/cms/en/markets/dams-and-water-resources
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5. www.slideshare.net/dannycruise/irrigation-and-water-resources-engineering

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16CEE09 **INDUSTRIAL WASTE MANAGEMENT** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To impart the concepts of sources and effects of industrial wastes.
- To recognize about the cleaner production in waste management.
- To knowledge about various pollution arising from the major industries.
- To understand the concept of various treatment technologies for industrial waste.
- To learn about hazardous waste management.

COURSE OUTCOMES:

16CEE09.CO1 : Gain knowledge about the sources and effects of industrial solid waste.
16CEE09.CO2 : Prefer the choices of cleaner production in waste management.
16CEE09.CO3 : Identify the pollution from major industries and treatment techniques.
16CEE09.CO4 : Select the suitable treatment technologies for different solid wastes.
16CEE09.CO5 : Understand the principles behind the hazardous waste management.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE09.CO1	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE09.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE09.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE09.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
16CEE09.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I INTRODUCTION 9

Types of industries and industrial pollution - characteristics of industrial wastes - population equivalent - bio-assay studies - effects of industrial effluents on streams, sewer, land, effluent treatment plants and human health - environmental legislations related to prevention and control of industrial effluents and hazardous wastes.

UNIT II CLEANER PRODUCTION 9

Waste management approach - waste audit – ISO 14000 volume and strength reduction - material and process modifications - recycle, reuse and byproduct recovery - applications.

UNIT III POLLUTION FROM MAJOR INDUSTRIES 9

Sources, characteristics, waste treatment flow sheets for selected industries - textiles, tanneries, pharmaceuticals, electroplating industries, dairy, sugar, paper, distilleries, steel plants, refineries, fertilizer and thermal power plants - wastewater reclamation concepts.

UNIT IV TREATMENT TECHNOLOGIES 9

Equalization -neutralization - removal of suspended and dissolved organic solids - chemical oxidation - adsorption - removal of dissolved inorganic - combined treatment of industrial and municipal wastes - residue management - dewatering - disposal

UNIT V HAZARDOUS WASTE MANAGEMENT 9

Hazardous wastes - physic - chemical treatment - solidification - incineration - secured landfills.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rao.M.N and Dutta.AK	Wastewater Treatment	Oxford - IBH Publication	2017

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2.	Eckenfelder Jr.W.W	Industrial Water Pollution Control	McGraw-Hill Book Company, New Delhi	2014

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr. Jagbir Singh	Solid Waste Management	I.K. International	2010
2.	Shen T.T	Industrial Pollution Prevention	Springer	2013
3.	Stephenson R.L. and Blackburn, Jr. J.B	Industrial Wastewater Systems Hand book	Lewis Publisher, New York	2016
4.	Freeman .H.M	Industrial Pollution Prevention Hand Book	McGraw-Hill Inc., New Delhi	2008
5.	Bishop, P.L	Pollution Prevention Fundamental and Practice	McGraw-Hill	2010

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1. www.epa.gov/sites/production/files/2016-03/.../industrial-waste-guide.pdf
2. www.un.org/esa/sustdev/sdissues/technology/cleanerproduction.pdf
3. www.conserve-energy-future.com/causes-effects-of-industrial-pollution.php
4. www.princeton.edu/~ota/disk3/1983/8323/832307.PDF
5. www.wbpcb.gov.in/pages/display/36-hazardous-waste-management

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16CEE10 **AIR POLLUTION AND MANAGEMENT** L T P C 3 0 0 3

COURSE OBJECTIVES:

- To impart knowledge about sources and effect of air pollution.
- To know about dispersion of pollutants.
- To impose the knowledge in the control of air pollution.
- To learn the concepts behind the air quality management.
- To deliver the sources, effect and control of noise pollution.

COURSE OUTCOMES:

16CEE10.CO1 : Classify the sources and effects of air pollution.
16CEE10.CO2 : Realize the dispersion characteristics and modeling of air pollution.
16CEE10.CO3 : know about air pollution control methods.
16CEE10.CO4 : Familiarize about air quality management system.
16CEE10.CO5 : Know the sources, effects and control of noise pollution.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE10.CO1	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE10.CO2	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE10.CO3	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE10.CO4	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE10.CO5	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS 9

Classification of air pollutants - particulates and gaseous pollutants - sources of air pollution - source inventory - effects of air pollution on human beings, materials, vegetation and animals - global warming - ozone layer depletion, sampling - basic principles - source and ambient sampling - analysis of pollutants.

UNIT II DISPERSION OF POLLUTANTS 9

Elements of atmosphere - meteorological factors - wind roses - lapse rate atmospheric stability and turbulence - plume rise - dispersion of pollutants - dispersion models - applications.

UNIT III AIR POLLUTION CONTROL 9

Concepts of control - principles and design of control measures - particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation - selection criteria for equipment - gaseous pollutants control by adsorption, absorption, condensation, combustion - pollution control for specific major industries.

UNIT IV AIR QUALITY MANAGEMENT 9

Air quality standards - Air quality monitoring - preventive measures - air pollution control efforts - Zoning - town planning regulation of new industries - legislation and enforcement - environmental impact assessment on air quality.

UNIT V HAZARDOUS WASTE MANAGEMENT 9

Sources of noise pollution - effects - assessment - standards - control methods - prevention measures.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication

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1.	Rao M.N. and Rao H.V.N	Air Pollution	McGraw Hill Education, New Delhi	2013
2.	Rao C.S	Environmental Pollution Control Engineering	Wiley Eassern Ltd., New Delhi	2005

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anjaneyulu D	Air Pollution and Control Technologies	Allied Publishers, Mumbai	2016
2.	Peavy S.W Rowe D.R. & Tchobanoglous G	Environmental Engineering	McGraw Hill	2010
3.	Garg, S.K.	Environmental Engineering Vol. II	Khanna Publishers, New Delhi.	1999
4.	Mahajan S.P	Pollution Control in Process Industries	Tata McGraw Hill, New Delhi,	2002
5.	Thod Godesh	Air Quality	Lewis Indian Edition	2013

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2. www.enviropedia.org.uk/Air_Quality/Dispersion.php
3. www.pollutionpollution.com › Pollution
4. www.epa.gov/air-quality-management.../air-quality-management-process-cycle
5. www.environmentalpollutioncenters.org/noise-pollution/

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16CEE11 **INDUSTRIAL STRUCTURES** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To impart knowledge on planning, layout and components of Industrial Structures
- To get knowledge on functional requirements of Industrial Structures
- To impart knowledge on design and detailing of industrial RC structures
- To know the concept of power transmission structures
- To design other industrial structures and prefabricated techniques

COURSE OUTCOMES:

16CEE11.CO1 : Draw layout for any industrial buildings.
16CEE11.CO2 : Demonstrate the functional requirements for any industry.
16CEE11.CO3 : Design of industrial RC structures.
16CEE11.CO4 : Demonstrate the uses and the steps involved in the design of transmission towers
16CEE11.CO5 : Design of machine foundations, Nuclear containment structures and Gantry girders

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE11.CO1	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE11.CO2	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE11.CO3	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE11.CO4	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE11.CO5	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-

UNIT I GENERAL 9

Classification of Industries and Industrial Structures – General requirements of various industries – planning and layout of building and components

UNIT II FUNCTIONAL REQUIREMENTS 9

Natural and artificial lighting - Protection from the sun light - Services - Electrical wiring fixtures - Cable and pipe bridge - Electrical installations - substations - Effluent disposal - Fire expanse and chutes - Fire alarm, extinguishers and hydrants - Heating and Ventilation - Air conditioning - Guidelines from factories act.

UNIT III INDUSTRIAL RC STRUCTURES 9

Design and detailing of R.C. gable frames, corbels, nibs, bunkers, silos, folded plate and chimneys - Cooling towers

UNIT IV POWER TRANSMISSION STRUCTURES 9

Cables - Transmission line towers - Tower Foundation - Testing of towers - Substation Structures

UNIT V OTHER STRUCTURES 9

Design of Nuclear containment structures - Gantry girders - Machine Foundations - Design procedure - Application of prefabrication techniques.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	N. Krishna Raju	Advanced Reinforced Concrete Design	CBS Publishers and Distributors	2016
2.	A. R. Santhakumar and S. S. Murthy	Transmission Line Structures	Tata McGraw Hill	2012

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REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	P. Dayaratnam	Deign of steel structures	A.H. Wheeler & Co., Ltd., Allahabad,	2007
2.	S. N. Manokar	Tall Chimneys – Design and Construction	Tata McGraw Hill	2012
3.	-	IS 4998-1	BIS	1992(R2013)
4.	-	IS: 4995(Part 1 & part 2)	BIS	1974(R2013)
5.	-	IS: 3483	BIS	1965(R2013)

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3. www.pollutionpollution.com › Pollution
4. www.epa.gov/air-quality-management.../air-quality-management-process-cycle
5. www.environmentalpollutioncenters.org/noise-pollution/

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16CEE12 **HEALTH MONITORING OF STRUCTURES** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To Study about maintenance and repair of structure
- To impart the quality and durability of concrete
- To Study about special materials for repair of structures.
- To learn about repair and demolition technique.
- To gain the knowledge about rehabilitation and strengthening of structures.

COURSE OUTCOMES:

16CEE12.CO1 : Obtain the knowledge of maintenance and repair of structures.
16CEE12.CO2 : Obtain the knowledge serviceability and durability of concrete
16CEE12.CO3 : Select suitable material for repair.
16CEE12.CO4 : Select appropriate techniques for repair and demolition
16CEE12.CO5 : Know about repair, rehabilitation and strengthening of structures

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE12.CO1	x	x	-	-	-	x	-	x	x	x	-	x	x	-	-
16CEE12.CO2	x	x	-	-	-	x	-	x	x	x	-	x	x	-	-
16CEE12.CO3	x	x	-	-	-	x	-	x	x	x	-	x	x	-	-
16CEE12.CO4	x	x	-	-	-	x	-	x	x	x	-	x	x	-	-
16CEE12.CO5	x	x	-	-	-	x	-	x	x	x	-	x	x	-	-

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance, repair and rehabilitation - Facts of Maintenance - importance of Maintenance various aspects of Inspection - Assessment procedure for evaluating a damaged structure - causes of deterioration - Diagnosis of causes and preventive measures.

UNIT II SERVICEABILITY AND DURABILITY OF CONCRETE 9

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.

UNIT III SPECIAL MATERIALS FOR REPAIR 9

Special concretes and mortar - concrete chemicals - special elements for accelerated strength gain - Expansive cement - polymer concrete - sulphur infiltrated concrete - ferro cement - Fibre reinforced concrete.

UNIT IV TECHNIQUES FOR REPAIR AND DEMOLITION 9

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 - coating and cathodic protection - Engineered demolition techniques for Dilapildated structures - case studies.

UNIT V REPAIRS, REHABILITATION & STRENGTHENING OF STRUCTURES 9

Repairs to overcome low member strength - Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure - Strengthening of Super Structures - plating - Conversion to composite construction - post stressing - Jacketing - Reinforcement addition, strengthening the substructures - Increasing the load capacity of footing.

TOTAL: 45 Periods

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TEXT BOOKS:				
Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Denison Campbell, Allen and Harold Roper	Concrete Structures, Materials, Maintenance and Repair	Longman Scientific and Technical UK	2006
2.	R.T.Allen and S.C.Edwards	Repair of Concrete structures	Blakie and Sons, UK	2007

REFERENCE BOOKS:				
Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.B Vidivelli	Rehabilitation of Concrete Structures	Standard Publishers Distributors	2013
2.	M.S.Shetty	Concrete Technology -Theory and Practice	S.Chand and Company, New Delhi	2006
3.	M.L. Gambhir	Concrete Technology	Tata McGraw Hill Company, Noida	2011
4.	Santhakumar, A.R	Training Course notes on Damage Assessment and repairs in Low Cost Housing,"RHDC–NBO"	Anna University	1995
5.	Lakshmipathy, M	Lecture notes of Workshop on "Repairs and Rehabilitation of Structures"	-	1999

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3. www.iitk.ac.in/nicee/wcee/article/11_2089.PDF
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16CEE13 ENGINEERING ECONOMICS AND COST ANALYSIS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To learn about basics of economics.
- To understand the concepts of demand and schedule.
- To learn about different types of organization
- To learn the concepts behind the process of financing.
- To learn about cost and break even analysis.

COURSE OUTCOMES:

16CEE13.CO1 : Know the basic concepts of economics.
16CEE13.CO2 : Know about demand and schedule
16CEE13.CO3 : Understand about different types of organizations
16CEE13.CO4 : Understood the financing process.
16CEE13.CO5 : Apply cost and break even analysis.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE13.CO1	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-
16CEE13.CO2	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-
16CEE13.CO3	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-
16CEE13.CO4	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-
16CEE13.CO5	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-

UNIT I BASIC ECONOMICS 9

Definition of economics - nature and scope of economic science - nature and scope of managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of production - land - its peculiarities - labour - economies of large and small scale - consumption - wants - its characteristics and classification - law of diminishing marginal utility - relation between economic decision and technical decision.

UNIT II DEMAND AND SCHEDULE 9

Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement - its significance - supply - supply schedule - supply curve - law of supply - elasticity of supply - time element in the determination of value - market price and normal price - perfect competition - monopoly - monopolistic competition.

UNIT III ORGANISATION 9

Forms of business - proprietorship - partnership - joint stock company - cooperative organization - state enterprise - mixed economy - money and banking - banking - kinds - commercial banks - central banking functions - control of credit - monetary policy - credit instrument.

UNIT IV FINANCING 9

Types of financing - Short term borrowing - Long term borrowing - Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations - analysis of financial statement – Balance Sheet - Profit and Loss account - Funds flow statement.

UNIT V COST AND BREAK EVEN ANALYSES 9

Types of costing - traditional costing approach - activity base costing - Fixed Cost - variable cost - marginal cost - cost output relationship in the short run and in long run - pricing practice - full cost pricing - marginal cost pricing - going rate pricing - bid pricing - pricing for a rate of return - appraising project profitability - internal rate of return - payback period - net present value - cost benefit analysis - feasibility reports - appraisal process - technical feasibility economic feasibility - financial feasibility - Break even analysis - basic assumptions - break even chart - managerial uses of break even analysis.

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TOTAL: 45 Periods

TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Dewett K.K and varma J.D	Elementary Economic Theory	S. Chand & Co	2006
2.	Sharma JC	Construction Management and Accounts	Oxford and IBH, New Delhi.	2013

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Adhikary M	Managerial Economics	Khosla Publishers.	2015
2.	n M Y and P K	Financial management	McGraw-Hill publishing	2013
3.	Varshney R L and Maheswary K L	Managerial Economics	S Chand and Co	2017
4.	Ramachandra Aryashri	Engineering Economics and Financial Accounting	McGraw-Hill	2015
5.	Collier, C.A and C. R. Glagola	Engineering Economic and Cost Analysis	Pearson	2012

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2. www.myaccountingcourse.com › Accounting Dictionary
3. www.merriam-webster.com/dictionary/organisation
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16CEE14 **GROUND IMPROVEMENT TECHNIQUES** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To get exposed to various methods of dewatering techniques
- To be familiar with compaction methods and influencing factors
- To Understand about consolidation and vertical drains
- To distribute Knowledge about various soil tabilization techniques and its applications
- To learn about various strengthening materials and techniques of soil

COURSE OUTCOMES:

16CEE14.CO1 : Choose the suitable method of dewatering.
16CEE14.CO2 : Identify the soil and select suitable compaction method
16CEE14.CO3 : Monitor consolidation of soil
16CEE14.CO4 : Apply suitable techniques for improving the soil properties in the field
16CEE14.CO5 : Use various types of to strengthening techniques.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE14.CO1	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE14.CO2	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE14.CO3	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE14.CO4	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE14.CO5	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-

UNIT I DEWATERING 9

Introduction - Ground improvement - scope - necessity - New Technologies - Basic concepts - drainage methods - ground water lowering by well points - Deep well - Vacuum and electro - osmosis methods.

UNIT II COMPACTION 9

Introduction - compaction mechanics - field procedure - Surface compaction -selection - compaction quality control -Vibration methods - vibro-compaction, blasting, vibratory probe, vibratory compactors - vibro-displacement compaction - displacement piles - vibro flotation - Sand compaction piles - stone columns - heavy tamping.

UNIT III CONSOLIDATION AND VERTICAL DRAINS 9

Introduction -compressibility of soil and consolidation - preloading and surcharge fills - monitoring of compression - vertical drains - principle, design, types, construction, efficiency and applications.

UNIT IV SOIL STABILIZATION 9

Introduction -Stabilization methods - mechanical stabilization, chemical stabilization - cement, lime, bitumen -electrical stabilization - stabilization of expansive clays - Pre wetting.

UNIT V MISCELLANEOUS METHODS 9

Grouting and injection - aspects, procedure and applications - geosynthetics - types, properties and applications - soil reinforcement - thermal methods.

TOTAL: 45 Periods

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TEXT BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	Klaus Kirsch and Alan Bell	Ground improvement	Taylor and Francis Group	2013
2.	C.A.Raison	Ground and Soil Improvement	Thomas Telford Publishing, London	2010

REFERENCE BOOKS:				
Sl.No	**Author(s)**	**Title of the Book**	**Publisher**	**Year of Publication**
1.	M.P.Moseley and K.Kirsch	Ground Improvement	Spon press, New York	2004
2.	Purushothama Raj, P	Ground Improvement Techniques	Laxmi Publications (P) Ltd., New Delhi	2016
3.	Reuben H. Karol	Chemical grouting and soil stabilization	Taylor and Francis	2010
4.	Mittal.S	An Introduction to Ground Improvement Engineering	Medtech Publisher	2015
5.	Nihar Ranjan Patra	Ground Improvement Techniques	Vikas Publishing house	2012

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2. www.ebookily.net/pdf/ground-improvement-techniques-notes
3. www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Foundation Engineering/Course home36
4. www.midstatecompanies.com/index.php/services/soil-stabilization
5. www.freevideolectures.com/Course/3435/Ground-Improvement-Techniqu

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16CEE15 **BUILDING SERVICES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To learn about different types of machineries.
- To know about electrical systems used in Buildings
- To understand principles and design of lighting system.
- To know about principles and applications of refrigeration.
- To learn about fire safety illuminations in buildings.

COURSE OUTCOMES:

16CEE15.CO1 : To know about different types of machineries.
16CEE15.CO2 : To implement wiring systems and prepare the plan for electrical wiring for buildings.
16CEE15.CO3 : To desing the lighting facilities for building.
16CEE15.CO4 : To choose suitable air conditioning system for the building.
16CEE15.CO5 : To choose fire safety systems for various types of buildings

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE15.CO1	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-
16CEE15.CO2	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-
16CEE15.CO3	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-
16CEE15.CO4	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-
16CEE15.CO5	X	X	X	-	-	X	-	X	X	-	-	X	X	-	-

UNIT I MACHINERIES 9

Hot Water Boilers -Lifts and Escalators -Special features required for physically handicapped and elderly - Conveyors - Vibrators - Concrete mixers -DC/AC motors - Generators - Laboratory services - Gas, water, air and electricity.

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS 9

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 building - Main and distribution boards - Transformers and switch gears - Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN 9

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.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS 9

Refrigerants-Refrigerant control devices - Electric motors -Starters - Air handling units - Cooling towers - Window type and packaged air- conditioners - Chilled water plant - Fan coil systems -Water piping - Cooling load -Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION 9

Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like non - combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	A.F.C. Sherratt	Air-conditioning and Energy Conservation	The Architectural Press, London	2006
2.	Derek Phillips	Lighting in Architectural Design	McGraw-Hill, New York	2012

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	E.R.Ambrose	Heat Pumps and Electric Heating	John and Wiley and Sons, Inc., New York	2013
2.	William H.Severns and Julian R.Fellows	Air-conditioning and Refrigeration	John Wiley and Sons, London	2006
3.	Arora and Bindra	Building Construction	Dhanpatrai &Sons	2012
4.	E.R.Ambrose	Heat Pumps and Electric Heating	John and Wiley and Sons, Inc., New York	2013
5.	-	National Building Codes	Bureau of Indian Standards	2015

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16CEE16 **SMART MATERIALS AND SMART STRUCTURES** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the smart material, function and response of the smart structures.
- To understand the various measuring techniques in smart structures.
- To ilearn about the sensors and their types.
- To understand the various actuator materials and actuating techniques.
- To understand the data acquisition and data processing using sensors.

COURSE OUTCOMES:

16CEE16.CO1 : Know about smart structures.
16CEE16.CO2 : Apply the measuring techniques to measure the various responses of the smart structures.
16CEE16.CO3 : Identify the types of sensors for the measurement techniques.
16CEE16.CO4 : Select the actuator material and technique for structural assessment.
16CEE16.CO5 : Apply the data acquisition and data processing techniques for a sensor

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE16.CO1	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE16.CO2	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE16.CO3	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE16.CO4	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE16.CO5	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-

UNIT I INTRODUCTION TO SMART STRUCTURES 9

Introduction - smart materials and structures - functions and response - sensing systems - self-diagnosis - signal processing consideration - actuation systems and effectors.

UNIT II MEASURING TECHNIQUES 9

Strain measuring techniques using electrical strain gauges – types - resistance, capacitance and inductance - Wheatstone bridge - types - pressure transducers - load cells - temperature compensation- strain rosettes - applications.

UNIT III SENSORS 9

Sensing technology -sensors - types - physical measurement using Piezo Electric strain measurement inductively read transducers - LVDT - fiber optic techniques - chemical and bio-chemical sensing in structural assessment - absorptive chemical sensors – spectroscopes - fiber optic chemical sensing systems and distributed measurement.

UNIT IV ACTUATORS 9

Actuator techniques - actuator - materials - Piezoelectric and Electrostrictive material - magneto-structure material - shape memory alloys - electro rheological fluids - electromagnetic actuation - role of actuators and actuator materials in structural assessment..

UNIT V SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data acquisition and processing - signal processing and control for smart structures - sensors as geometrical processors - signal processing - control system - linear and non - linear.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Brain Culshaw	Smart Structure and Materials	Artech House - Borton. London	2013
2.	A. V. Srinivasan & D.Michael McFarland	Smart Structures: Analysis and Design	Cambridge University Press; 1st Edition	2009

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	L. S. Srinath	Experimental Stress Analysis	Tata McGraw-Hill	2016
2.	J. W. Dally & W. F. Riley	Experimental Stress Analysis	Tata McGraw-Hill	2014
3.	M.V. Gandhi and B.S. Thompson	Smart Materials and Structures	Chapman & Hall, London; New York	2008
4.	Peter R. Savage	Smart Materials- Wiley	Chapman & Hall, London; New York	2014
5.	A.V. Srinivasan	Smart Structures: Analysis and Design	Cambridge University Press, Cambridge; New York	2009

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5. www.scribd.com/.../104080669-Applications-of-Smart-Materials-in-Civil-Engi.

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16CEE17 **GROUND WATER ENGINEERING** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To know about hydro geological parameters in ground water.
- To know about well hydraulics.
- To knowledge about ground water management.
- To learn about groundwater quality.
- To familiarize about groundwater conservation.

COURSE OUTCOMES:

16CEE17.CO1 : Understand about the hydro geological parameters of ground water.
16CEE17.CO2 : Knowledge about well hydraulics
16CEE17.CO3 : Learn about ground water management.
16CEE17.CO4 : Know about groundwater quality.
16CEE17.CO5 : Learn about groundwater conservation Techniques.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE17.CO1	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE17.CO2	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE17.CO3	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE17.CO4	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-
16CEE17.CO5	x	x	x	-	-	x	-	x	x	-	-	x	x	-	-

UNIT I HYDROGEOLOGICAL PARAMETERS 9

Introduction - water bearing Properties of Rock -Type of aquifers - Aquifer properties - Permeability, specific yield, transmissivity and storage coefficient - methods of Estimation - Ground water table fluctuation and its interpretations - ground water development and Potential in India - GEC norms

UNIT II WELL HYDRAULICS 9

Objectives of Ground water hydraulics - Darcy's Law-- Ground water equation - steady state flow - Dupuit Forchheimer assumption - unsteady state flow - thesis method - Jacob method - Slug tests - Image well theory -Partial penetrations of wells.

UNIT III GROUND WATER MANAGEMENT 9

Need for management model - Database for groundwater management - ground water balance study - Introduction to mathematical model - Conjunctive use - Collector well and infiltration gallery.

UNIT IV GROUNDWATER QUALITY 9

Groundwater chemistry - origin, movement and quality - water quality standards - health and aesthetic aspects of water quality - Saline intrusion - Environmental concern and regulatory requirements

UNIT V GROUNDWATER CONSERVATION 9

Artificial recharge techniques - Remediation of Saline Intrusion - Groundwater management studies - protection zone delineation, Contamination source inventory, remediation schemes - Ground water Pollution and legislation.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raghunath H.M.	ınd Water Hydrology	New Age International (P) Ltd. New Delhi	2010
2.	Todd D.K	ınd Water Hydrology	John Wiley and Sons, New York	2010

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raghunath H.M.	round Water Hydrology	New Age International (P) Ltd. New Delhi	2015
2.	Todd D.K	ınd Water Hydrology	John Wiley and Sons, New York	2013
3.	Fitts R Charles	Groundwater Science	Elsevier, Academic Press	2014
4.	Ramakrishnan,S	Advanced mechanics and solids	Tata-McGraw Hill publishing company ltd	2016
5.	Punmia B.C, Ashok K. Jain and Arun K. Jain	Ground water, K.J.	Graph arts, Chennai	2017

WEB URLs:

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2. www.books.google.com › science › earth sciences › meteorology & climatology
3. www.water.usgs.gov/ogw/pubs/twri3-b2/twri3-b2-with-links.pdf
4. www.amazon.com/handbook-groundwater-engineering-second/.../08493431
5. www.ocw.mit.edu/courses/civil-and...engineering/1-72-groundwater.../lecture-notes

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16CEE18 **CONSTRUCTION TECHNOLOGY** L T P C
3 0 0 3

COURSE OBJECTIVES:

- To know about the various types of foundation in building construction.
- To guide & know about the masonry & Wall in Buildings.
- To identify the types of roofs, floors and scaffolding for the construction activity.
- To know about the various Construction practices.
- To select the construction equipments as per requirements of construction.

COURSE OUTCOMES:

16CEE18.CO1 : Suggest a suitable type of foundation for a given building and soil condition.
16CEE18.CO2 : Supervise for the quality construction of brick and stone masonry works & Walls in buildings.
16CEE18.CO3 : Select suitable type of floors and roof as per the field condition & scaffolding and formworks for the construction activity.
16CEE18.CO4 : Learned about the various Construction practices.
16CEE18.CO5 : Select construction equipment for various construction activities.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE18.CO1	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-
16CEE18.CO2	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-
16CEE18.CO3	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-
16CEE18.CO4	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-
16CEE18.CO5	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-

UNIT I FOUNDATIONS 9

Concept of foundations - Factors affecting selection of foundations - Types of foundation - Shallow & Deep foundations - Piles and their classification - Foundation on black cotton soils.

UNIT II MASONRY & WALLS 9

Brick Masonry -Terminologies - Types of bonds in brick work and their suitability - Stone Masonry - Terminologies - Types of bonds in Stone masonry and their suitability - Classification of walls - Load bearing & Non-Load bearing - Hollow - Reinforced Brick Walls - Construction with fly ash bricks & Light weight bricks -Lintels and sunshade - Types & Construction

UNIT III FLOORS, ROOFS & SCAFFOLDING 9

Floors - Types of flooring - Repair of floors - Classification of roofs - Types of Pitched & Flat roofs -Roof covering materials - Drainage on pitched &flat roofs - Types of scaffolding - types of shoring - Methods of underpinning -Types of formwork - centering.

UNIT IV CONSTRUCTION PRACTICES 9

Specifications - details and sequence of activities and construction co-ordination-site clearance marking-earthwork - construction joints - movement and expansion joints - pre cast pavements - Causes of dampness; Methods of preventing dampness - Damp proofing materials and their classification - weather and water proof courses-roof finishes - acoustic and fire protection.

UNIT V CONSTRUCTION EQUIPMENT 9

Data acquisition and processing - signal processing and control for smart structures - sensors as geometrical processors - signal processing - control system - linear and non - linear.

TOTAL: 45 Periods

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TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Brain Culshaw	Smart Structure and Materials	Artech House - Borton. London	2013
2.	A. V. Srinivasan & D.Michael McFarland	Smart Structures: Analysis and Design	Cambridge University Press; 1st Edition	2009

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	L. S. Srinath	Experimental Stress Analysis	Tata McGraw-Hill	2016
2.	J. W. Dally & W. F. Riley	Experimental Stress Analysis	Tata McGraw-Hill	2014
3.	M.V. Gandhi and B.S. Thompson	Smart Materials and Structures	Chapman & Hall, London; New York	2008
4.	Peter R. Savage	Smart Materials- Wiley	Chapman & Hall, London; New York	2014
5.	A.V. Srinivasan	Smart Structures: Analysis and Design	Cambridge University Press, Cambridge; New York	2009

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2. www.wbdg.org/guides-specifications/building.../wall.../masonry-wall-systems
3. www.blackeaglescaffolding.london/scaffolding-services
4. www.acchelp.in/pdf/best-practices/Good-Construction-practices-1.pdf
5. www.constructionequipment.com/products/top-100/2016

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16CEE19 **RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To give exposure to planning of railway tracks.
- To provide proficiency in the railway construction and maintenance.
- To develop skills on planning of airports
- To give exposure on airport design.
- To have basic knowledge on components of docks and harbors.

COURSE OUTCOMES:

16CEE19.CO1 : Planning the railway track components.
16CEE19.CO2 : Perform the railway construction and maintenance.
16CEE19.CO3 : Possess knowledge on airport planning
16CEE19.CO4 : Do the design of runways, taxiways and apron.
16CEE19.CO5 : Familiarize the components of docks and harbors

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
16CEE19.CO1	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-
16CEE19.CO2	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-
16CEE19.CO3	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-
16CEE19.CO4	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-
16CEE19.CO5	x	x	-	-	-	x	-	x	x	-	-	x	x	-	-

UNIT I RAILWAY PLANNING 9

Significance of Road, Rail, Air and Water transports - Coordination of all modes to achieve sustainability - Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods (Remote Sensing, GIS & GPS, EDM and other equipments)- Soil suitability analysis - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 9

Earthwork – Stabilization of track on poor soil –- Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying - Construction and maintenance of tracks –Modern methods of construction & maintenance - Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.

UNIT III AIRPORT PLANNING 9

Floors - Types of flooring - Repair of floors - Classification of roofs - Types of Pitched & Flat roofs -Roof covering materials - Drainage on pitched &flat roofs - Types of scaffolding - types of shoring - Methods of underpinning -Types of formwork - centering.

UNIT IV CONSTRUCTION PRACTICES 9

Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles - Elements of Taxiway Design – Airport Zones , Clear Zone, Approach Zone, Buffer Zone, Turning Zone, wind direction indicators, Clearance over Highways and Railways - Passenger Facilities and Services - Runway and Taxiway Markings and lighting.

UNIT V HARBOUR ENGINEERING 9

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbors Requirements, Classification, Location and Design Principles – Harbor Layout and Terminal Facilities - Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and

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Floating Landing Stage - Inland Water Transport - Wave action on Coastal Structures and Coastal Protection Works - Environmental concern of Port Operations - Coastal Regulation Zone, 2011.

TOTAL: 45 Periods

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rangwala	Railway Engineering	Charotar Publishing House	2013
2.	Bindra S P	A Course in Docks and Harbour Engineering	Dhanpat Rai and Sons	2013

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rangwala	Airport Engineering	Charotar Publishing House	2013
2.	Dr.K.P.Subramanian	A text book on Railways, Airports, Docks and Harbours	Scitech, Chennai	2012
3.	Oza.H.P and Oza.G.H	A course in Docks & Harbour Engineering	Charotar Publishing Co.	2013
4.	Mundrey J.S	A course in Railway Track Engineering	Tata McGraw Hill	2017
5.	Saxena Subhash C and Satyapal Arora	A Course in Railway Engineering	Dhanpat Rai and Sons	2016

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3. www.youtube.com/watch?v=raRNItSeFBA
4. www.youtube.com/watch?v=F2lxPyD0fkg
5. www.youtube.com/watch?v=gT0rAkmNuD8

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