RAJALAKSHMI ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University Chennai)

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM REGULATION – 2023

B.E. CIVIL ENGINEERING

CHOICE BASED CREDIT SYSTEM

VISION:

To be a department imparting knowledge in Civil Engineering education, research, entrepreneurship and industry outreach services for creating sustainable infrastructure and enhancing quality of life with professional and ethical values.

MISSION:

- To provide an effective teaching – learning environment enabling students to be a competent civil engineer.
- To motivate research and entrepreneurial initiatives in the field of Civil Engineering.
- To inculcate ethical values to serve the society with high order professionalism.

PROGRAMME EDUCATIONAL OBJECTIVES: (PEO's)

1. Graduates will possess fundamental knowledge in all fields of Civil Engineering and be able to apply in the profession in Public and Private Sectors.
2. Graduates will have knowledge and preparation to tackle real-life Complex Problems and provide sustainable solutions to Civil Engineering Industry.
3. Graduates will have the ability to update themselves with developments and new technologies, pursue higher studies to face the Challenges.
4. Graduates will become Entrepreneurs, to meet the infrastructural needs of the society, following professional and ethical values.
5. Graduates will be enthusiastic in pursuing lifelong learning and involve themselves in Research and Development.

PROGRAMME OUTCOMES: (PO'S) Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering Solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES: (PSOs)

PSO 1: The students will be proficient in the fundamental concepts and apply them to various Civil Engineering projects in Structural Engineering, Geotechnical Engineering, Environmental Engineering, Construction Materials and Management, Transportation Engineering, Water Resources and Management for Sustainable Environment.

PSO 2: The students will be competent to solve complex problems using both conventional & modern technologies to prepare cost estimation for Civil Engineering Projects.

PSO 3: The students will be skilled professionals to support the society focusing on sustainable development and uphold professional ethics.

CURRICULUM
SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	GE23117	தமிழர் மரபு / Heritage of Tamils	HS	1	0	0	1	1
2.	HS23111	Technical Communication I	HS	2	0	0	2	2
3.	MA23112	Algebra and Calculus	BS	3	1	0	4	4
4.	CE23111	Building Materials	PC	3	0	0	3	3
5.	CE23112	Engineering Drawing for Civil Engineers	PC	2	0	4	6	4
LAB ORIENTED THEORY COURSES								
6.	PH23131	Physics of Materials	BS	3	0	2	5	4
LABORATORY COURSES								
7.	GE23121	Engineering Practices - Civil and Mechanical	ES	0	0	2	2	1
MANDATORY COURSE								
8.	MC23112	Environmental Science and Engineering	MC	3	0	0	3	0
			3TOTAL	**17**	**1**	**8**	**26**	**19**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	GE23217	தமிழரும் தமிழில் நடபமம் / Tamils and Technology	HS	1	0	0	1	1
2.	MA23212	Differential Equations and Complex Variables	BS	3	1	0	4	4
3.	GE23211	Engineering Mechanics	ES	2	1	0	3	3
LAB ORIENTED THEORY COURSES								
4.	CY23233	Engineering Chemistry	BS	3	0	2	5	4
5.	EE23133	Basic Electrical and Electronics Engineering	ES	3	0	2	5	4
6.	GE23231	Programming Using Python	ES	1	0	4	5	3
LABORATORY COURSES								
7.	CE23221	Computer Aided Building Drawing for Civil Engineers	PC	0	0	4	4	2
8.	HS23221/ HS23222	Technical Communication II / English for Professional Competence	HS	0	0	2	2	1
9.	GE23122	Engineering Practices – Electrical and Electronics	ES	0	0	2	2	1
MANDATORY COURSE								
10.	MC23111	Indian Constitution and Freedom Movement	MC	3	0	0	3	0
			TOTAL	**16**	**2**	**16**	**34**	**23**

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	CE23311	Strength of Materials I	PC	3	0	0	3	3
2.	CE23312	Fluid Mechanics	PC	3	0	0	3	3
3.	CE23313	Construction Techniques, Equipment and Practice	PC	3	0	0	3	3
LAB ORIENTED THEORY COURSES								
4.	CE23331	Surveying	PC	3	0	2	5	4
5.	MA23331	Transforms and Statistics	BS	3	0	2	5	4
LABORATORY COURSES								
6.	CE23321	Construction Materials Laboratory	PC	0	0	4	4	2
7.	CS23422	Python Programming for Machine Learning	ES	0	0	4	4	2
			TOTAL	**15**	**0**	**12**	**27**	**21**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	CE23411	Strength of Materials II	PC	3	0	0	3	3
2.	CE23412	Hydraulics and Irrigation Structures	PC	3	0	0	3	3
3.	CE23413	Water Supply Engineering	PC	3	0	0	3	3
4.	CE23414	Highway and Railway Engineering	PC	3	0	0	3	3
LAB ORIENTED THEORY COURSES								
5.	CE23431	Soil Mechanics	PC	3	0	2	5	4
OPEN ELECTIVES								
6.		Open Elective I	OE	3	0	0	3	3
LABORATORY COURSES								
7.	CE23421	Strength of Materials and Hydraulic Engineering Laboratory	PC	0	0	4	4	2
8.	GE23421	Soft Skills – I	EEC	0	0	2	2	1
			TOTAL	**18**	**0**	**8**	**26**	**22**

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	CE23511	Design of Reinforced Concrete Elements	PC	3	1	0	4	4
2.	CE23512	Foundation Engineering	PC	3	0	0	3	3
3.	CE23513	Waste Water Engineering	PC	3	0	0	3	3
LAB ORIENTED THEORY COURSES								
4.	CE23531	Structural Analysis	PC	3	0	2	5	4
PROFESSIONAL ELECTIVE COURSES								
5.		Professional Elective I	PE	3	0	0	3	3
OPEN ELECTIVES								
6.		Open Elective – II	OE	3	0	0	3	3
LABORATORY COURSES								
7.	CE23521	Water and Waste Water Analysis Laboratory	PC	0	0	4	4	2
8.	CE23522	Survey Camp	PC	0	0	2	2	1
9.	GE23521	Soft Skills – II	EEC	0	0	2	2	1
			TOTAL	**18**	**1**	**10**	**29**	**24**

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	CE23611	Design of Steel Structures	PC	3	1	0	4	4
2.	CE23612	Construction, Planning, Scheduling and Management	PC	3	0	0	3	3
3.	CE23613	Structural Dynamics and Earthquake Engineering	PC	3	0	0	3	3
PROFESSIONAL ELECTIVE COURSES								
4.		Professional Elective II	PE	3	0	0	3	3
LAB ORIENTED THEORY COURSES								
5.	CE23631	Structural Design and Drawing	PC	3	0	2	5	4
LABORATORY COURSES								
6.	GE23621	Problem Solving Techniques	EEC	0	0	2	2	1
7.	GE23627	Design Thinking and Innovation	EEC	0	0	4	4	2
TOTAL				**15**	**1**	**8**	**24**	**20**

SEMESTER VII

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1.	CE23711	Estimation, Costing and Valuation Engineering	PC	3	0	0	3	3
2.	CE23712	Hydrology	PC	3	0	0	3	3
PROFESSIONAL ELECTIVE COURSES								
3.		Professional Elective III	PE	3	0	0	3	3
4.		Professional Elective IV	PE	3	0	0	3	3
LABORATORY COURSES								
5.	CE23721	Building Information Modelling	PC	0	0	4	4	2
6.	CE23722	Design Project	EEC	0	0	4	4	2
7.	CE23723	Artificial Intelligence and Machine Learning for Civil Engineers	BS	0	0	4	4	2
8.	CE23724	Internship	EEC	0	0	2	2	1
			TOTAL	**12**	**0**	**14**	**26**	**19**

SEMESTER VIII

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PROFESSIONAL ELECTIVE COURSES								
1.		Professional Elective V	PE	3	0	0	3	3
2.		Professional Elective VI	PE	3	0	0	3	3
LABORATORY COURSES								
3.	CE23821	Project Work	EEC	0	0	12	12	6
			TOTAL	**6**	**0**	**12**	**18**	**12**

Summary

SEMESTER	HS	BS	ES	PC	EEC	PE	OE	TOTAL
I	3	8	1	7				19
II	2	8	11	2				23
III		4	2	15				21
IV				18	1		3	22
V				17	1	3	3	24
VI				14	3	3		20
VII		2		8	3	6		19
VIII					6	6		12
Total	**5**	**22**	**14**	**81**	**14**	**18**	**6**	**160**

VERTICALS

Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5	Vertical 6
Structural Engineering	**Environmental Engineering**	**Construction Materials and Management**	**Geotechnical Engineering**	**Geo-Informatics**	**Transportation Engineering**
CE23A11 Advanced Structural Analysis	CE23B11 Municipal Solid Waste Management	CE23C11 Advanced Construction Techniques	CE23D11 Analysis of Deep Foundation	CE23E11 Advanced Surveying Techniques	CE23F11 Intelligent Transport System
CE23A12 Maintenance, Repair and Rehabilitation of Structures	CE23B12 Industrial Waste WaterTreatment	CE23C12 Sustainable and Lean Construction	CE23D12 Ground Improvement Techniques	CE23E12 Hydrographic Surveying	CE23F12 Pavement Engineering
CE23A13 Design of Bridges	CE23B13 Air and Noise Pollution Control Engineering	CE23C13 Characterization of Materials	CE23D13 Geo-Environmental Engineering	CE23E13 Total Station and GPS Surveying	CE23F13 Smart cities
CE23A14 Prestressed Concrete Structures	CE23B14 Solid and Hazardous Waste Management	CE23C14 Smart Materials and Structures	CE23D14 Geosynthetic Engineering	CE23E14 Remote Sensing	CE23F14 Urban Planning and Development
CE23A15 Structural Health Monitoring	CE23B15 Environmental and Social Impact Assessment	CE23C15 Energy Efficient Buildings	CE23D15 Soil exploration and field testing	CE23E15 Cartography and GIS	CE23F15 Transport Management System
CE23A16 Pre-Engineered Structures	CE23B16 Marine Pollution and Control	CE23C16 Safety in Construction	CE23D16 Rock Mechanics	CE23E16 Photogrammetry	CE23F16 Airport and Harbour Engineering
CE23A17 Tall Structures	CE23B17 Global Climate Change	CE23C17 Project Management for Civil Engineers	CE23D17 Machine Foundation	CE23E17 RS and GIS applications for Civil engineers	CE23F17 Traffic Engineering and Management

SEMESTER I

Course Code	Course Title (Theory course)	Category	L	T	P	C
GE23117	தமிழர் மரபு / HERITAGE OF TAMILS	HS	1	0	0	1
Common to all branches of B.E/B. Tech programmes						

அலகு I	மமொழி மற்ற ோம் இலக்கியம்	3
இந்திய தமொழிக் க ோட ோம் பங்கள் - திரொவிட தமொழிகள் - தமிழ் ஒர ோ தொம் தமொழி - தமிழ் தொவ் வலிக்கியங் கள் - ொங் க இலக்கியத்தினொ் ொமய ொரப் ற்ற தன் மம - ொங் க இலக்கியத்தில் பகிரத் ல் அறம் - திருக்க ோறளில் மமலணொ் மமக் கருத ொக்கள் - தமிழிக் கொப்பியங் கள், தமிழகத்தில் ொமண தபௌத்த ொமயங் களின் தொக்கம் - பக்தி இலக்கியம், ஆழ்வொர்க் ள் மற்றும் நொயன் மொர்க் ள் - சிற்றிலக்கியங் கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச் சி - தமிழ் இலக்கிய வளர்ச் சியில் பொரதியொர் மற்ற ோம் பொரதிதொென் ஆகிமயொரின் பங்களிப்பு.		
அலகு II	மரபு - பிறற ஓவியங் கள் ம ோதல் நவீன ஓவியங் கள் வறர - சிற்பக் கறல	3
நட ோகல் ம ோதல் நவீன சிற்பங் கள் வமர - ஐம்தபொனின் சிமலகள் - பழங் க ோடியினர் மற்றும் அவர்க் ள் தயொரிக்க ோம் மகவிமனப் தபொர ோட்க் ள், தபொம்மமகள் - மதர் தொய்யும் கமல - சுட ோமண் சிற்பங் கள் - நொடடி ப்ப ோறத் ததய்வங் கள் - க ோமரிம ோமனயில் திருவள்ள ோவர் சிமல - இமெக் கருவிகள் - மிருதங் கம், பமற, வீமண, யொழ், நொதஸ் வரம் - தமிழரக் ளின் ொமூக தபொருளொதொர வொழ்வில் மகவில் களின் பங் க ோ.		
அலகு III	நொட ோப்ப ோறக் கறலகள் மற்ற ோம் வீர விறளயொட்டுகள்	3
ததருக்கூத ொ , கரகொட ம், வில்ல ோப்பொட , கணியன் கூத ொ, ஒயிலொட்டம், மதில் பொமவகக் கூத ொ, சிலம்பொட ம், வளரி, ப ோலியொட ம், தமிழரக் ளின் விமளயொட்டுகள்.		
அலகு IV	தமிழர்களின் திறன க்க கொட்பொடுகள்	3
தமிழகத்தின் தொவரங் கள ோம், விலங் க ோகள ோம் - ததொல் கொப்பியம் மற்ற ோம் ொங் க இலக்கியத்தில் அகம் மற்றும் ப ோறக் மகொட்பொட ோகள் - தமிழரக் ள் மபொற்றிய அறக்மகொட்பொடு - ொங் ககொலத்தில் தமிழதி ல் எழுதறிவ ோம், கல்வியும் - ொங் ககொல நகரங் கள ோம் ொமற ம ோகங் கள ோம் - ொங் ககொலத்தில் ஏற்றுமதி மற்றும் இறக்க ோமதி - கடல்கடந்த நொட ோகளில் ம ொழரக் ளின் தவற்றி.		
அலகு V	இந்திய கதசிய இயக்கம் மற்ற ோம் இந்திய பன் பொட்டிற்க ோத் தமிழர்களின் பங்களிப்பு	3
இந்திய விட ோதமலப்மபொரில் தமிழரக் ளின் பங்கு - இந்தியொவின் பிறப்பக ோதிகளில் தமிழ் ப் பண் பொட்டி னின் தொக்கம் - ச ோயமரியொமத இயக்கம் - இந்திய மருத ொவதத்தில், சித்த மருத ொவதத்தின் பங்கு - கல்தவடடு கள், மகதயழ ோத ொப்படிகள் - தமிழ்ப் ப ோத்தகங் களின் அெ்சு வரலொற ோ.		
Total Contact Hours: 15		

TEXT-CUM-REFERENCE BOOKS:
தமிழக வரலொறு - மக்கள ோம் பண் பொட ோம் - மக.மக. பிள்மள (தவளியீட ோ: தமிழ் நொடு பொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
கணினித் தமிழ் - முமனவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

கீழடி - மவம க நதிக்கமரயில் ெங்ககல நகர நாகரிகம் (ததால்லியல் Fமற தவளியீட)
தபாருமந - ஆற்றங்கமர நாகரிகம். (ததால்லியல் Fமற தவளியீட)
Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies.
Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and
Educational Services Corporation, Tamil Nadu)
Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Prepared by Name and signature	Approved by Name and Signature

Course Code	Course Title (Theory course)	Category	L	T	P	C
HS23111	TECHNICAL COMMUNICATION I	HS	2	0	0	2
Common to all branches of B.E/B. Tech programmes						

Objectives:
To facilitate students develop their comprehension skills
To enable students to improve their receptive skills
To equip learners with better vocabulary and enhance their writing skills
To aid students speak effectively in all kinds of communicative contexts.
To improve the learners' basic proficiency in workplace communication

UNIT-I	DEVELOPING COMPREHENSION SKILLS	6
Listening: Introduction to Informational listening – Listening to Podcasts, News **Reading**: Short Narratives and Skimming Passages. **Speaking:** Introducing Oneself, Narrating a Story / Incident. **Writing:** Sequential Writing (Jumbled Sentences), Process Description **Grammar:** Verbs – Main & Auxiliary: Simple Tenses – Form, Function and Meaning. **Vocabulary**: Word formation – Prefix, Suffix, Compound Words.		
UNIT-II	**LISTENING AND EXTENDED READING**	**6**
Listening: Deep Listening – Listening to Talk Shows and Debates **Reading**: In-depth Reading - Scanning Passages **Speaking**: Describing Current Issues, Happenings, etc.., **Writing**: Note Making, Note Taking – Paragraph Writing **Grammar**: Continuous Tenses, Prepositions, Articles **Vocabulary**: One Word Substitutes, Phrasal Verbs.		
UNIT-III	**FORMAL WRITING AND VERBAL ABILITY**	**6**
Listening: Listening to Lectures and Taking Notes **Reading:** Interpretation of Tables, Charts and Graphs **Speaking:** SWOT Analysis on Oneself **Writing:** Formal Letter Writing and Email Writing **Grammar:** Perfect Tenses, Phrases and Clauses, Discourse Markers **Vocabulary :** Verbal Analogy / Cloze Exercise		
UNIT-IV	**ENHANCING SPEAKING ABILITY**	**6**
Listening: Listening to eminent voices of one's interest (Martin Luther King, APJ Abdul Kalam, etc..) **Reading:** Timed Reading, Filling KWL Chart. **Speaking:** Just a Minute, Impromptu **Writing:** Check-list, Instructions. **Grammar:** 'Wh' Questions / 'Yes' or 'No' Questions, Imperatives **Vocabulary:** Synonyms, Antonyms, Different forms of the same words.		
UNIT-V	**LANGUAGE FOR WORKPLACE**	**6**
Listening: Extensive Listening (Audio books, rendering of poems, etc.) **Reading**: Extensive reading (Jigsaw Reading, Short Stories, Novels) **Speaking**: Short Presentations on Technical Topics **Writing:** Recommendations, Essay Writing **Grammar:** Impersonal Passive, Reported Speech, Concord **Vocabulary :** Informal Vocabulary and Formal Substitutes		
Total Contact Hours: 30		

Course Outcomes:
On completion of the course students will be able to
• apply their comprehension skills and interpret different contents effortlessly
• read and comprehend various texts and audio visual contents
• infer data from graphs and charts and communicate it efficiently in varied contexts
• participate effectively in diverse speaking situations
• to present, discuss and coordinate with their peers in workplace using their language skills

SUGGESTED ACTIVITIES

Ice breaker
Just A Minute
Ship wreck
Hot seat
Vocabulary building
Chinese whispers

Case study

SUGGESTED EVALUATION METHODS
Assignment topics
Quizzes
Class Presentation/Discussion
Continuous Assessment Tests

TEXT BOOK(S):
Effective Technical Communication by M. Ashraf Rizvi (Author) 2nd Edition Paperback 2017
Sylvan Barnet and Hugo Bedau, 'Critical Thinking Reading and Writing', Bedford/st. Martin's: Fifth Edition (June 28, 2004)
Meenakshi Upadhyay, Arun Sharma – Verbal Ability and Reading Comprehension.
Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMeng Goh, Cambridge University Press

REFERENCE BOOKS(S) / WEB LINKS:
Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers 2nd Edition by Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor)
Reading Development and Difficulties By Kate Cain
The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK
Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content Hardcover by Ann Handley (Author)

HS23111	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-
CO 2	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-
CO 3	-	1	-	1	-	-	-	-	-	3	-	-	-	-	-
CO 4	-	-	-	2	-	-	-	-	1	3	-	-	-	-	-
CO 5	-	-	-	1	-	-	-	-	1	3	-	-	-	-	-
Average	**-**	**1**	**-**	**1.2**	**-**	**-**	**-**	**-**	**1**	**3**	**-**	**-**	**-**	**-**	**-**

Prepared by Name And Signature	**Approved by Name And Signature**
ALL FACULTY DEPARTMENT OF ENGLISH	

Course Code	Course Title (Theory course)	Category	L	T	P	C
MA23112	ALGEBRA AND CALCULUS	BS	3	1	0	4

Common to I sem. B.E. – Aeronautical Engineering, Automobile Engineering, Mechanical Engineering, Mechatronics, Robotics & Automation, Civil Engineering and B.Tech. - Biotechnology, Food Technology & Chemical Engineering

Objectives:

- To introduce the matrix techniques and to illustrate the nature of the matrix.
- To address data and synthesis of the information to provide valid conclusions.
- To explain techniques of calculus which are applied in the solutions of engineering problems.
- To analyse special types of integrals by analytical methods and numerical techniques.
- To practice the techniques of Integration in finding area and volumes.

UNIT-I	**MATRICES**	**12**

Matrices - Eigenvalues and eigenvectors - Diagonalization of matrices using orthogonal transformation - Cayley-Hamilton Theorem(without proof) -Quadratic forms- Reduction to canonical form using orthogonal transformation- Numerical computation of Eigen value using Power method

UNIT-II	**FUNCTIONS OF SEVERAL VARIABLES**	**12**

Partial differentiation–Total derivative–Change of variables–Jacobians–Partial differentiation of implicit functions–Taylor's series for functions of two variables–Maxima and minima of functions of two variables–Lagrange's method of undetermined multipliers.

UNIT-III	**INTEGRAL CALCULUS**	**12**

Integral Calculus: Definite Integrals as a limit of sums - Applications of integration to area, volume - Improper integrals: Beta and Gamma integrals - Numerical computation of integrals: Trapezoidal rule - Gaussian Two point quadrature

UNIT-IV	**MULTIPLE INTEGRALS**	**12**

Double integrals – Change of order of integration – Area enclosed by plane curves–Triple integrals–Volume of solids– Numerical computation of double integrals: Trapezoidal rule.

UNIT-V	**REGRESSION**	**12**

Scatter diagram - Karl Pearson coefficient of correlation for raw data –Spearman rank correlation coefficient - Lines of regression - Regression equation X on Y and Y on X- Curve fitting by Principle of least squares - Fitting a straight line y = ax+b and a parabola $y = ax^2 + bx + c$.

Total Contact Hours:60

Course Outcomes:

On completion of the course students will be able to:

- Demonstrate the matrix techniques in solving the related problems in engineering and technology.
- Analyse and interpret data, and synthesize information to provide valid conclusions.
- Interpret the problems in Engineering and Technology using the principles of mathematical calculus.
- Apply the analytical methods and numerical techniques to solve the related engineering problems.
- Evaluate multiple integrals to conduct investigations of complex problems.

SUGGESTED ACTIVITIES

Problem solving sessions

Activity Based Learning

Implementation of small module

SUGGESTED EVALUATION METHODS

Problem solving in Tutorial sessions

Assignment problems

Quizzes and class test

Discussion in classroom

Text Book(s):

Grewal B.S., " Higher Engineering Mathematics ", Khanna Publishers, New Delhi, 43rd Edition, 2014.

Gupta S.C. and Kapoor V.K."Fundamentals of Mathematical Statistics", Sultan and Sons 10th Edition,2000.

T Veerarajan, Engineering Mathematics –I , Mc Graw Hill Education, 2018.

I.R. Miller, J.E. Freund and R. Johnson , "Probability and Statistics for Engineers ",4th Edition, Pearson, 2018.

A. Goon, M. Gupta and B.Dasgupta , "Fundamentals of Statistics ",Vol. I & Vol. II, World Press, 2019.

Reference Books(s) / Web links:
Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
T Veerarajan ,Fundamentals of Mathematical Statistics , yesdee publications, 2017.
Erwin Kreyszig ," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 2006.
N. Draper & H. Smith,"Applied Regression Analysis" III edition, Wiley, 1998.

MA23112	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	1	1	0	0	1	1	2	3	2	1
CO 2	3	3	2	3	2	1	1	0	0	1	1	2	3	2	2
CO 3	3	3	2	3	2	1	1	0	0	1	1	2	3	2	1
CO 4	3	3	2	3	3	1	1	0	0	1	1	2	3	3	2
CO 5	3	3	3	3	3	1	2	0	0	1	1	2	3	3	2
Average	**3**	**3**	**2.2**	**2.8**	**2.4**	**1**	**1.2**	**0**	**0**	**1**	**1**	**2**	**3**	**2.4**	**1.6**

Prepared by Name and signature	**Approved by Name and Signature**
DEPARTMENT OF MATHEMATICS	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23111	BUILDING MATERIALS	PC	3	0	0	3

Objectives:

- To acquire knowledge on the classification, testing methods and properties of bricks and stones.
- To identify the different types of cement and lime based on the testing methods as per IS code for specific applications.
- To choose appropriate proportion of mortar and concrete based on the strength requirements.
- To characterize the timber products, steel and Aluminium that could be used as building material
- To appraise the properties and uses of advanced materials apart from conventional ones used in construction.

UNIT-I	**STONES & BRICKS**	**9**

Building Stones: Classification of stones- Characteristics of good building stones, important types of building stones, their properties and uses – aggregates.

Brick and other Clay Products: Composition of brick-earth, manufacturing process of bricks, characteristics of good building bricks, classification and testing of bricks, special types of bricks and their uses. Types of tiles and theiruse in buildings. Terracotta, stoneware

UNIT-II	**LIME AND CEMENT**	**9**

Lime and Cement: IS classification of lime and uses, chemical composition of cement, IS specifications and tests on Portland cement, Manufacture Process-different types of cements and their uses.

UNIT-III	**MORTAR AND CONCRETE**	**9**

Mortar and Concrete: Preparation of cement mortar and concrete for different types of works, factors affecting strength of concrete, types of concrete- Admixtures and their specific use.

UNIT-IV	**TIMBER & STEEL**	**9**

Timber and Wood Based Products: Classification of timber trees, cross section of exogenous tree, hard wood and soft wood, seasoning of timber, ply wood and its uses.

Steel and Aluminium: Types of steel-mild steel, high carbon steel, high strength steel properties and uses, light Gauge steel, commercial forms of steel and aluminium and their uses.

UNIT-V	**OTHER MATERIALS**	**9**

Introduction to Advanced Materials: Ferro cement, FRP, FAL-G brick, plastics, Lightweight Blocks, paints, and geotextiles.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the student will be able to

- Classify and characterize building stones, bricks and will know the manufacturing process of bricks
- Comprehend the manufacturing process lime , cement and will know the types of cement
- Select appropriate admixtures to proportion the concrete and mortar for customized applications.
- Recognize the preservation methods of timber and metals
- Identify the advanced Civil Engineering materials and the appropriate usage in construction practice

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

Seminar on new material that is not included in this module.

Case study of various building materials used in an ongoing project with a suggestion of alternate materials that can be used with justification.

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

A project report on the above mentioned case study.

Text Book(s):

Building Materials, Duggal, S.K, New Age International (P) Limited Publishers., Jan 2019, 5th Edition

Building and Construction Materials, Gambhir, McGraw Hill Education (India), 2014

Civil Engineering Materials, Peter A. Claisse, Butterworth- Heinemann, 2016, 1st Edition.

Reference Books(s) / Web links:

1.Essentials of Civil Engineering Materials. Kathryn E. Schulte Grahame, Steven W. Cranford, Craig M. Shillaber, and Matthew J. Eckelman. Cognella Academic Publishing, San Diego, 2020, 1st Edition.

2.Building Materials in Civil Engineering, Haimei Zhang. Woodhead Publishing Limited and Science Press, 2011, 1st Edition.

Online Resources:

https://onlinecourses.nptel.ac.in/noc21_ce10/preview
https://onlinecourses.nptel.ac.in/noc20_ar04/preview

CE23111	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	1	1	2	1	1	2	1	1	3	2	1
CO 2	3	2	2	2	1	2	2	1	1	2	1	1	3	2	1
CO 3	3	3	3	2	3	2	2	1	1	3	2	2	3	3	1
CO 4	2	2	2	3	1	2	2	2	1	2	1	1	3	2	2
CO 5	3	2	2	2	3	2	3	2	1	3	2	2	3	3	3
Average	**2.8**	**2.2**	**2.2**	**2.2**	**1.8**	**1.8**	**2.2**	**1.4**	**1**	**2.4**	**1.4**	**1.4**	**3**	**2.4**	**1.6**

Prepared by Name and signature	Approved by Name and Signature
DR.S.GEETHA, PROFESSOR & HEAD, DEPARTMENT OF CIVIL ENGINEERING	

Course Code	Course Title (Theory Course)	Category	L	T	P	C
CE23112	ENGINEERING DRAWING FOR CIVIL ENGINEERS	PC	2	0	4	4

Objectives:
• To develop knowledge on basic drawing and Standards
• To expose them to know about different Building Components.
• To improve their visualization skills so that they can apply these skills in developing new products.
• To improve their technical communication skill in the form of building bye-laws & submission of drawings
• To Understand the regulation and requirement of building as per National Building Code

UNIT-I	INTRODUCTION & BASIC DRAWINGS	12
Use of Drafting Instruments - BIS Conventions and Specifications - Size, Layout and Folding of Drawing Sheets - Lettering and Dimensioning – Symbols – Types of Views - Layout of Views – Title Block – Scales - Principal Planes, Projection of Points using Four Angles of Projection, Projection of Straight Lines – Lines parallel or inclined to one plane – Projection of Plane - Inclined to any one Principal Plane – Panelled & Flush door – window		
UNIT-II	**BUILDING COMPONENTS**	**12**
Types of Structures - Foundation and its types – Bricks, Blocks & Bonds – Beam-Column Joint – Lintel-cum-Sunshade – Steel roof truss – Rain water harvesting – Material Symbols (Hatch).		
UNIT-III	**ISOMETRIC & PERSPECTIVE VIEWS PROJECTION AND FREE HAND SKETCH**	**12**
Isometric & Perspective Views and Projections - Visualization concepts and Free Hand sketching:–Representation of Three Dimensional objects - Freehand sketching of multiple views from pictorial views of objects.		
UNIT-IV	**BUILDING BYE-LAWS & SUBMISSION OF DRAWINGS**	**12**
Objects of bye-laws- Importance of bye-laws- Function of local authority- Setbacks - Plot Coverage- Number of floors- Height of building- Built up Area- Floor space index (FSI) - Views and details necessary for the preparation ofa civil engineering drawing- Site Plan – Necessity for Approval of plans from local body- Layout plan and key plan- Requirements for submission of drawing for approval.		
UNIT-V	**BUILDING DRAWINGS**	**12**
Requirements of a building planning as per NBC (residential and public) - Plan, Section and Elevation of different buildings.		
Total Contact Hours:60		

Course Outcomes:
On completion of the course, the student will be able to
• comprehend to draw the basic building components.
• draw the building structural member and symbols used.
• visualize and prepare Isometric & Perspective view and free hand sketch.
• draw the building as per Necessity for Approval.
• draw the Plan, Section and Elevation of building.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic
Problem solving sessions – All Five units
Activity Based Learning – Model Making

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic
Tutorial problems
Assignment problems

Text Book(s):
Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
V.B Sikka "Civil Engineering Drawing", S.K Kataria & Sons, New Delhi.

Reference Books(s) / Web links:
Basant Agrawal, Agrawal C.M., "Engineering Drawing", 3rd Edition, McGraw Hill Education, 2019.
National Building Code of India 2016.

CE23112	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	1	0	2	1	0	0	2	1	1	0	3	2	2
CO 2	2	2	3	0	3	1	0	0	2	2	1	0	3	2	2
CO 3	3	3	3	1	3	1	0	0	3	2	2	0	3	2	1
CO 4	1	3	3	1	2	3	0	3	1	2	1	0	3	3	3
CO 5	3	3	3	1	3	1	0	0	3	2	2	0	3	2	2
Average	**2.2**	**2.6**	**2.6**	**1**	**2.6**	**1.4**	**0**	**3**	**2.2**	**1.8**	**1.4**	**0**	**3**	**2.2**	**2**

Prepared by Name and signature	Approved by Name and Signature
MR.MAHAMOOD UL HASAN.N, ASSISTANT PROFESSOR (SG)/ CIVIL	

Course Code	Course Title (Lab oriented Theory Course)	Category	L	T	P	C
PH23131	PHYSICS OF MATERIALS	BS	3	0	2	4

Common to I sem. B.E. – Aeronautical Engineering, Automobile Engineering, Civil Engineering, Mechanical Engineering
and
Common to II sem. B.E. Mechatronics and Robotics & Automation

Objectives:

- To enhance the fundamental knowledge of elasticity and its applications relevant to engineering streams.
- To become proficient in crystal growth and crystal systems.
- To introduce the essential of phase transformation in materials.
- To impart knowledge on the structure, properties, treatment, testing and applications of metals and alloys.
- To familiarize students with thermal properties and applications.

UNIT-I PROPERTIES OF MATTER **9**

Elasticity–Hooke's law-stress–strain-modulus of elasticity-stress-strain diagram-Poisson's ratio-rigidity modulus-twisting couple on a cylinder-moment of inertia - torsional pendulum method. Bending of beams -bending moment-cantilever depression-theory and experiment - Young's modulus determination–uniform and non-uniform bending-I-shape girders. Viscosity-flow of motion-Reynolds number.

UNIT-II THERMAL PHYSICS **9**

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation –rectilinear heat flow – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT-III PHASE DIAGRAMS **9**

Solid solutions - Hume-Rothery's rules –Gibb's phase rule – unary phase diagram- binary phase diagrams - isomorphous systems - tie-line and lever rule - eutectic, eutectoid, peritectic, peritectoid, monotectic and syntectic systems - formation of microstructures-homogeneous and non-homogenous cooling – nucleation (Qualitative)– iron-carbon phase diagram - eutectoid steel – hypo-eutectoid and hyper-eutectoid steel – diffusion - Fick's laws – T-T-T diagrams.

UNIT-IV CRYSTAL PHYSICS **9**

Basis – lattices – unit cell-crystal systems – Bravais lattices –number of atoms, atomic radius, co-ordination number and packing fraction - SC, BCC, FCC, HCP lattices and diamond structure - polymorphism and allotropy-graphite structure - Miller indices – determination of d-space-crystal growth techniques-solution growth –melt growth-Bridgmann and Czochralski - crystal defects.

UNIT-V ADVANCED MATERIALS & TESTING **9**

Metallic glasses – preparation, properties and applications - Composites – types and properties - Shape memory alloys – properties and applications - Nano-materials – top down and bottom up approaches –sol-gel method-pulsed laser deposition-ball milling- properties-applications - Tensile strength – Hardness – Fatigue - Impact strength – Creep - Fracture – types of fracture.

Contact Hours : 45

List of Experiments

1	Determination of Young's modulus of given material by non-uniform bending method.
2	Determination of moment of inertia of a disc and rigidity modulus of a given wire using Torsional pendulum.
3	Determination of Young's modulus of given beam by cantilever method.
4	Determination of viscosity of the given liquid using Poiseuille's method.
5	Determination of Thermal conductivity of a bad conductor – Lee's Disc method.
6	Determination of Velocity of ultrasound and compressibility of given liquid – Ultrasonic interferometer.
7	Determination of the wavelength of Laser and particle size of given powder.
8	Determination of the Hysteresis loss of ferromagnetic material by B-H curve experiment.
9	Find the thickness of a given thin wire – Air wedge method.
10	Study the characteristics of solar cell parameters.

Contact Hours : 30

Total Contact Hours : 75

Course Outcomes:

On completion of the course, the students will be able to

- Apply the elastic nature of materials and determine the elastic moduli of different materials.
- Apply the basic knowledge of crystal structure in solids.
- Analyze and measure the properties of alloys.
- Analyze various material testing methods and use them in suitable applications.
- Understand the concepts of heat transfer in various applications.

Suggested Activities

- Problem solving sessions

Suggested Evaluation Methods

●	Quizzes
●	Class Presentation / Discussion
Text Book(s):	
1	Bhattacharya, D.K. &Poonam, T. *"Engineering Physics".*Oxford University Press, 2018.
2	Gaur, R.K. & Gupta, S.L. *"Engineering Physics".*DhanpatRai Publishers, 2018.
3	Raghavan, V. *"Physical Metallurgy: Principles and Practice".* PHI Learning, 2019.
Reference Books(s) / Web links:	
1	Balasubramaniam, R. *"Callister's Materials Science and Engineering".*Wiley India Pvt. Ltd., 2017
2	Resnick, R., Halliday, D., & Walker, J. *"Principles of Physics*", Wiley India Pvt., 2018.
3	Raghavan, V. *"Materials Science and Engineering : A First course".* PHI Learning, 2019.
4	https://nptel.ac.in/courses/113104068
5	https://archive.nptel.ac.in/courses/115/105/115105099/

List of Equipment Available
(Common to B.E. Aero, Auto, Civil, Mechanical, Mechatronics Engineering and R&A)

S. No	Name of the equipment	Quantity Required	Quantity Available	Deficiency
1	Young's modulus by Non - Uniform bending method Travelling Microscopes, Meter scale etc.,	6	13	-
2	Rigidity Modulus - Torsional Pendulum Setup	6	19	-
3	Velocity of sound and compressibility of liquid – Ultrasonic Interferometer	6	14	-
4	Wavelength of Laser and Characteristics -Laser source And grating plate	6	15	-
5	B-H curve Setup and CRO	6	7	-
6	Thermal conductivity of bad conductor- Lee's Disc setup	6	16	-
7	LCR circuit kit	6	7	-
8	Thickness of a thin wire-Air wedge method – Travelling microscope	6	13	-
9	Solar cell parameters setup	6	8	-
10	Poiseuille's method set up	6	10	-

PH23131	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	1	2	1	1	1	2	2	3	2	2
CO 2	3	3	2	2	3	1	2	1	1	1	2	2	3	2	2
CO 3	3	3	3	3	3	1	3	1	1	1	2	2	3	3	2
CO 4	3	3	3	3	3	2	3	2	2	1	3	2	3	3	3
CO 5	3	3	2	2	2	2	3	2	2	1	2	2	3	2	3
Average	**3**	**3**	**2.4**	**2.4**	**2.6**	**1.4**	**2.6**	**1.4**	**1.4**	**1**	**2.2**	**2**	**3**	**2.4**	**2.4**

Prepared by Name and signature	Approved by Name and Signature
DR. B. LATHA **MS. R. BHAVANI** **MS. R. KAVITHA**	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
GE23121	ENGINEERING PRACTICES – CIVIL AND MECHANICAL	ES	0	0	2	1

Objectives:	
●	To provide exposure to the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.
List of Experiments	
CIVIL ENGINEERING PRACTICE	
1.	Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
2.	Preparation of basic plumbing line sketches for wash basins, water heaters, etc.
3.	Hands-on-exercise: Basic pipe connections – Pipe connections with different joining components.
Carpentry Works:	
4.	Study of joints in roofs, doors, windows and furniture.
5.	Hands-on-exercise: Woodwork, joints by sawing, planning and chiselling.
MECHANICAL ENGINEERING PRACTICE	
6.	Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
7	Gas welding practice.
Basic Machining:	
8	Simple Turning and Taper turning
9	Drilling Practice
Sheet Metal Work:	
10	Forming & Bending:
11	Model making – Trays and funnels
12	Different type of joints.
Machine Assembly Practice:	
13	Study of centrifugal pump
14	Study of air conditioner
	Total Contact Hours : 30

Course Outcomes:	
On completion of the course, the student will be able to	
□	perform plumbing activities for residential and industrial buildings considering safety aspects while gaining clear understanding on pipeline location and functions of joints like valves, taps, couplings, unions, reducers, elbows, etc.
□	perform wood working carpentry activities like sawing, planning, cutting, etc. while havingclear understanding of the joints in roofs, doors, windows and furniture.
□	produce joints like L joint, T joint, Lap joint, Butt joint, etc. through arc welding process whileacquiring in depth knowledge in the principle of operation of welding and other accessories
□	perform operations like Turning, Step turning, Taper turning, etc. in lathe and Drilling operationin drilling machine
□	perform sheet metal operations like Forming, Bending, etc. and fabricating models like Trays,funnels, etc.

List of equipment and components

(For a Batch of 30 Students)

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings - 15 Sets.
2. Plumbing vice (fitted to work bench) – 15 Nos.
3. Carpentry vice (fitted to work bench) - 15 Nos.
4. Standard woodworking tools - 15 Sets.
5. Models of industrial trusses, door joints, furniture joints - 5 each
6. Power Tools:
   - (a) Rotary Hammer - 1 No.
   - (b) Circular Saw - 1 No.
   - (c) Electric Planer - 1 No.
   - (d) Hand Drilling Machine - 1 No.
   - (e) Jigsaw - 1 No.
   - (f) Cutoff Machine – 1 No.

MECHANICAL

1. Arc welding transformer with cables and holders - 5 Nos.
2. Welding booth with exhaust facility - 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. - 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit - 1 No.
5. Centre lathe - 5 Nos.
6. Standard Sheet metal working tools – 2 sets
7. Study-purpose items: centrifugal pump, air-conditioner – 1 each.

GE23121	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	2	2	3	1	2	2	2	3	2	3
CO 2	2	3	3	2	1	2	2	3	1	2	2	1	3	2	3
CO 3	3	3	3	3	3	1	1	2	1	2	2	3	3	3	3
CO 4	2	3	3	3	2	2	2	2	1	3	3	2	3	3	3
CO 5	3	2	2	3	3	2	2	3	2	3	3	3	3	2	3
Average	**2.6**	**2.8**	**2.6**	**2.6**	**2**	**1.8**	**1.8**	**2.6**	**1.2**	**2.4**	**2.4**	**2.2**	**3**	**2.4**	**3**

Prepared by Name and signature	Approved by Name and Signature
DEPARTMENT OF MECHANICAL ENGINEERING	

Course Code	Course Title (Theory Course)	Category	L	T	P	C
MC23112	ENVIRONMENTAL SCIENCE AND ENGINEERING	MC	3	0	0	0

Common to I sem. B.E. Aeronautical Engineering, Automobile Engineering, Biomedical Engineering, Civil Engineering, Mechanical Engineering, Mechatronics, and Robotics and Automation
and
B.Tech. – Biotechnology, Information Technology, Food Technology & Chemical Engineering
and
Common to II sem. B.E. – Electronics and Communication Engineering, Electrical and Electronics Engineering, Computer Science and Engineering, Computer Science and Design & Computer Science and Engineering (Cyber Security)
and
B.Tech. – Artificial Intelligence & Machine Learning and Artificial Intelligence & Data Science.

Objectives:
To develop the understanding of environmental and associated issues
To develop an attitude of concern for the environment
To promote enthusiasm in participating environmental protection initiatives
To nurture skills to solve environmental degradation issues
To develop the knowledge about the environmental laws

UNIT-I	**AIR AND NOISE POLLUTION**	**9**
Definition –sources of air pollution –chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, ozone depletion, particulate pollutants-Air quality standards-Air quality indices - control of particulate air pollutants-gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP)-catalytic converters. Noise pollution –sources - health effects - standards- measurement and control methods.		
UNIT-II	**WATER POLLUTION AND ITS MANAGEMENT**	**9**
Definition-causes-effects of water pollution-point and nonpoint sources of wastewater-marine pollution - thermal pollution - Control of water pollution by physical, chemical and biological methods – wastewater treatment-primary, secondary and tertiary treatment-sources and characteristics of industrial effluents- zero liquid discharge.		
UNIT-III	**SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT**	**9**
Solid waste – types- municipal solid waste management: sources, characteristics, collection, and transportation- sanitary landfill, recycling, composting, incineration, energy recovery options from waste - Hazardous waste – types, characteristics, and health impact - hazardous waste management: neutralization, oxidation reduction, precipitation, solidification, stabilization,incineration and final disposal. E-waste-definition-sources-effects on human health and environment- E-waste management- steps involved - Role of E-waste management within the initiatives of the Govt. of India- Swachh Bharat Mission.		
UNIT-IV	**SUSTAINABLE DEVELOPMENT**	9
Sustainable development- concept-dimensions-sustainable development goals - value education- gender equality – food security - poverty – hunger - famine - Twelve principles of green chemistry - Green technology - definition, importance - Cleaner development mechanism - carbon credits, carbon trading, carbon sequestration, eco labeling- International conventions and protocols-Disaster management.		
UNIT-V	**ENVIRONMENTAL MANAGEMENT AND LEGISLATION**	9
Environmental Management systems - ISO 14000 series- Environmental audit-Environmental Impact Assessment- life cycle assessment- h uman health risk assessment - Environmental Lawsand Policy- Objectives - Polluter pays principle, Precautionary principle - The Environment (Protection) Act 1986 - Role of Information technology in environment and human health.		
		Total Contact Hours:45

Course Outcomes:
On completion of the course, the student will be able to
• Associate air and noise quality standards with environment and human health.
• Illustrate the significance of water and devise control measures for water pollution.
• Analyze solid wastes and hazardous wastes.
• Outline the goals of sustainable development in an integrated perspective.
• Comprehend the significance of environmental laws.

SUGGESTED EVALUATION METHODS

- Continuous assessment tests
- Assignments
- Case studies, class room presentations (or) site visit

Text Book(s):
Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016
Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publisher, 2018.
Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi

Reference Books(s) / Web links:
R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. Edition 2010.
Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
Fowler B, Electronic Waste – 1 st Edition (Toxicology and Public Health Issues), 2017 Elsevier
NPTEL course url https://onlinecourses.nptel.ac.in/noc19_ge22/ NPTEL https://news.mit.edu/2013/ewaste-mit
For downloading text/reference books the weblink is given below can be used **http://libgen.rs/**

MC23112	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	3	2	2	1	3	3	1	0	1	0	2	3	2	2
CO 2	2	3	2	2	2	3	2	1	0	1	0	2	3	2	2
CO 3	2	3	3	3	2	2	3	1	1	1	1	2	3	3	2
CO 4	2	2	3	2	1	3	3	1	1	1	0	3	2	2	3
CO 5	2	3	2	2	1	2	3	3	2	1	1	2	3	2	3
Average	**2**	**2.8**	**2.4**	**2.2**	**1.4**	**2.6**	**2.8**	**1.4**	**1.3**	**1**	**1**	**2.2**	**2.8**	**2.2**	**2.4**

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DEPARTMENT OF CHEMISTRY	

SEMESTER II

Course Code	Course Title (Theory course)	Category	L	T	P	C
GE23217	தமிழரும் மதொழில் நுட்பமும் / TAMILS AND TECHNOLOGY	HS	1	0	0	1
Common to all branches of B.E/B. Tech programmes –Second Semester						

அலகு I	**மநசவு மற்றூம் பாறனத் ம தொழில் நுட்பம்**	**3**
செங்க காலத்தில் தநசெவுத் ததொழில் - பானைத் ததொழில் நுட்பம் - கருப்பு சிவப்பு பாண் டங்கள் - பாண் டங்களில் கீறல் குறியீடுகள்.		
அலகு II	**வடிவறமப்பு மற்றும் கட்டிடத் மதொழில் நுட்பம்**	**3**
செங்க காலத்தில் வடிவமமப்பு மற்றும் கட்டு மானங்கள் & செங்க காலத்தில் வீட்டு பத்பாரூட்களில் வடிவமமப்பு - செங்க காலத்தில் கட்டு மான தபாரூட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மமமட அமமப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், மகாவில்களும் - மசாழர் காலத் ப் தபரூங் மகாயில்கள் மற்றும் பிற வழிபாட்டு த் தலங்கள் - நாயக்கர் காலக் மகாயில்கள் - மாதிரி கட்ட மமப்புகள் பற்றி அறிதல், மதுமர மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமமல நாயக்கர் மஹால் - தசட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் தசன்மனயில் இந்மதா - சாமராதசனிக் கட்டிடக் கமல.		
அலகு III	**உற்பத்தித் மதொழில் நுட்பம்**	**3**
கப்பல் கட்டு ம் கமல - உமலாகவியல் - இரும்புத் ததொழிற்சாமல - இரும்மப உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக தசம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் ததொழிற்சாமலகள் - கல் மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - செங்கு மணிகள் - எலும்புத் துண்டுகள் - ததால் லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வமககள்.		
அலகு IV	**கவளாண்மை றம மற்றும் நீர்ப்பாசனத் மதொழில் நுட்பம்**	**3**
அமண, ஏரி, குளங்கள், மதகு - மசாழர்க் காலக் குமுழித் தூம்பின் முக்கியத்துவம் - காலல்நமட பராமரிப்பு - கால்நமடகளுக்காக வடிவமமக்கப்பட்ட கிணறுகள் - மவளாண்மம மற்றும் மவளாண்மமச் சார்ந்த தசயல்பாடுகள் - கடல்சார் அறிவு - மீன் வளம் - முத்து மற்றும் முத்துக்குளித்தல் - தபருங்கடல் குறித்த பண்மடய அறிவு - அறிவுசார் சமூகம்.		
அலகு V	**அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்**	**3**
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்கமள மின்பதிப்பு தசய்தல் - தமிழ் தமன் தபாருட்கள் உருவாக்கம் - தமிழ் இமணயக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இமணயத்தில் தமிழ் அகராதிகள் - தசாற்குமவத் திட்டம்.		
Total Contact Hours: 15		
Text Book(s):		
தமிழக வரலாறு - மக்களும் பண்பாடும் - மக.மக. பிள்மள (தவளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).		
கணினித் தமிழ் - முமனவர் இல. சுந்தரம். (விகடன் பிரசுரம்).		

கீழடி - மவும க நதிக்கமரயில் ெங்ககல நகர நாகரிகம் (ததல்லியல் ிமற தவளியீட)
தபாருநை - ஆறம்றங்கமர நாகரிகம். (ததல்லியல் ிமற தவளியீட)
Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies.
Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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ALL FACULTY DEPARTMENT OF ENGLISH	

Course Code	Course Title (Theory Course)	Category	L	T	P	C
MA23212	DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES	BS	3	1	0	4

Common to II Sem. B.E. –Aeronautical Engineering, Automobile Engineering, Biomedical Engineering, Civil Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering, Mechanical Engineering, Mechatronics & Robotics & Automation
and
B. Tech. – Biotechnology, Food Technology & Chemical Engineering

Objectives:

To provide students with an introduction to the theory of ordinary differential equations through applications, methods of solution, and numerical approximations.

To introduce students to how to solve linear Partial Differential with different methods.

To enable the students to study the Laplace Transforms, properties of Laplace Transform, inverse Laplace Transform and some applications to solve the differential equations and integral equations.

To explain the concept of a vector integration in a plane and in space.

To describe basic properties of complex variables and to have the ability to compute complex integrals.

UNIT-I	ORDINARY DIFFERENTIAL EQUATIONS	12

Second and higher order Linear differential equations with constant coefficients - Method of variation of parameters – Legendre's linear equations – Numerical solution of ODE - Single Step methods: Taylor's series method, Euler's method.

UNIT-II	PARTIAL DIFFERENTIAL EQUATIONS	12

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

UNIT-III	LAPLACE TRANSFORM	12

Laplace transform –Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse functions, periodic functions. Inverse Laplace transform – Problems using Convolution theorem – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques

UNIT-IV	VECTOR CALCULUS	12

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT-V	COMPLEX VARIABLES	12

Analytic functions — Construction of analytic function - Bilinear transformation –Singularities – Cauchy's integral theorem (without proof) - Residues – Residue theorem (without proof) - Simple problems - Contour integral over $|z|=1$.

Total Contact Hours: 60

Course Outcomes:
On completion of the course students will be able to:

- Apply the methods as a potent tool in the solution of a variety of problems in the natural sciences and technology.
- Develop specific methodologies, techniques and resources in Partial differential equations to conduct research andproduce innovative results in the area of specialisation.
- Use Laplace transform and inverse transform techniques to solve the complex problems in engineering and technology.
- Apply the concepts in multivariable analysis, including space curves; directional derivative; gradient; multipleintegrals; line and surface integrals; vector fields; divergence, curl ; the theorems of Green and Stokes, and the divergence theorem in different fields of engineering.
- Demonstrate the concept of Analytic functions, conformal mapping and complex integration in solving Engineering problems.

SUGGESTED ACTIVITIES
Problem solving sessions
Activity Based Learning (https://www.geogebra.org/?lang=en)

SUGGESTED EVALUATION METHODS
Problem solving in Tutorial sessions Assignment problems Quizzes and class test Discussion in classroom

Text Book(s):
Grewal B.S., " Higher Engineering Mathematics ", Khanna Publishers, New Delhi, 43rd Edition, 2014.
Veerarajan. T, Engineering Mathematics –II, Mc Graw Hill Education, 2018.
Erwin Kreyszig," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th Edition, New Delhi, 2011.
Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5 th Edition, New Delhi, 2017.

Reference Books(s) / Web links:
Ramana. B.V., "Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
T Veerarajan, Transforms and Partial Differential Equations, Third Edition, 2018.
Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 4th Edition 2006.
Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.

MA23212	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	0	1	0	0	0	0	3	3	2	1
CO 2	3	3	2	2	2	1	2	0	0	0	0	3	3	2	2
CO 3	3	3	2	2	3	0	1	0	0	0	0	3	3	2	1
CO 4	3	3	3	3	2	1	2	1	0	0	0	3	3	3	2
CO 5	3	3	2	2	2	0	1	0	0	0	0	3	3	2	1
Average	**3**	**3**	**2.2**	**2.2**	**2**	**1**	**1.4**	**1**	**0**	**0**	**0**	**3**	**3**	**2.2**	**1.4**

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DEPARTMENT OF MATHEMATICS	

Course Code	Course Title (Theory Course)	Category	L	T	P	C
GE23211	ENGINEERING MECHANICS	ES	2	1	0	3
Common to Mech, Aero, Auto, Civil and MCT						

Objectives: The students can be able to	
●	To understand the basics of mechanics and apply the concept of equilibrium of system of forces.
●	To understand the concept of equilibrium and to solve problems of rigid bodies.
●	To learn about the centroid and centre of gravity of objects and moment of inertia
●	To learn the basic concepts of friction.
●	To learn the concepts in kinematics and kinetics of rigid bodies in plane motion.

UNIT-I	STATICS OF PARTICLES	9
Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Resolution of forces – Vector operations of forces - 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**	**9**
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 and three dimensions(class room lecture only) – (Descriptive treatment only)		
UNIT-III	**PROPERTIES OF SURFACES AND SOLIDS**	**12**
Centroids - First moment of area – Second moment of area 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 –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.		
UNIT-IV	**DYNAMICS OF PARTICLES**	**7**
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 AND RIGID BODY DYNAMICS**	**8**
Friction force – Laws of sliding friction - Characteristics of dry friction – equilibrium analysis of simple systems with sliding friction –wedge friction, Ladder friction, Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.		
Total Contact Hours: 45		

Course Outcomes: Upon completion of this course, the students will be able to:	
CO1	Analyze the forces in the system and to understand vectorial and scalar representation of forces andmoments
CO2	Study about the rigid body in equilibrium and to analyze the problems in engineering systemsusing the concept of static equilibrium
CO3	Determine the properties of surfaces and solids by means of finding centroid , centre of gravityand moment of inertia.
CO4	Solve problems involving kinematics and kinetics of rigid bodies in plane motion.
CO5	Solve problems involving frictional phenomena in machines by understanding the concept offriction and the effects by the laws of friction
Text Books:	
1	Beer, F.P and Johnston Jr. E.R, Cornwell and Sanghi ., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 12th Edition, McGraw-Hill Publishing company, New Delhi (2018).

2	Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rdEdition, Vikas Publishing House Pvt. Ltd., 2005.

Reference Books(s) / Web links:	
1	Meriam J.L. and Kraige L.G., "Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2",7th Edition, Wiley India, 2018.
2	Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 14th Edition,Pearson Education 2017.
3	Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics" 4thEdition, Pearson Education 2006.
4	Bhavikatti S S, Engineering Mechanics, New Age International Publishers, 2016
5	Vela Murali, "Engineering Mechanics", Oxford University Press 2010
6	Palanichamy M S, Nagan S, Elango P, Engineering Mechanics: Dynamics, Tata McGraw-Hill Publishing Company Limited, 2004.

GE23211	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	2	3	2	1	2	0	0	1	0	2	3	2	2
CO 2	3	3	3	2	2	1	2	0	0	1	1	2	3	2	2
CO 3	3	2	2	2	2	0	2	0	0	1	1	2	3	2	2
CO 4	3	2	2	3	2	1	2	0	0	1	0	3	3	3	2
CO 5	3	2	2	2	2	1	2	0	0	1	0	2	3	2	2
Average	**3**	**2.4**	**2.2**	**2.4**	**2**	**1**	**2**	**0**	**0**	**1**	**1**	**2.2**	**3**	**2.2**	**2**

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DEPARTMENT OF MECHANICAL ENGINEERING	

Course Code	Course Title (Lab oriented Theory Course)	Category	L	T	P	C
CY23233	ENGINEERING CHEMISTRY	BS	3	0	2	4
Common to B.E. – AERONAUTICAL, AUTOMOBILE, MECHANICAL and CIVIL ENGG.						

Objectives:
• To understand the types of corrosion and its prevention
• To develop an understanding of the basic concepts of phase rule and its applications
• To provide a brief outline of polymers and composites in mechanical sciences
• To interpret the different types of batteries and fuel cells
• To provide an insight on nanomaterials and lubricants

UNIT-I	CORROSION SCIENCE AND CONTROL	9
Corrosion: Introduction- chemical and electrochemical theory of corrosion- types of corrosion-galvanic, differential aeration (waterline and pitting) and stress corrosion (caustic embrittlement)- corrosion penetration rate (CPR). **Corrosion control:** Cathodic protection- Metallic coatings- Electroplating- electroplating of chromium (hard and decorative)- Electroless plating-electroless plating of nickel- Chemical conversion coatings-Organic coatings-paints-constituents-functions - special paints.		
UNIT-II	**PHASE RULE AND THERMAL ANALYSIS**	**9**
Phase rule - Introduction, definition of terms - phase, components and degree of freedom - phase diagram- one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system. Alloys - significance of alloying - heat treatment of steel. **Thermal analysis** - Thermogravimetric analysis- Differential thermal analysis- Differential scanning calorimetry-instrumentation (block diagram) and applications.		
UNIT-III	**POLYMERS AND COMPOSITES**	**9**
Plastics - Types-preparation, properties and uses of Teflon, polycarbonate and PMMA **Rubbers** - Types-vulcanization-synthetic rubber-Buna N rubber, Butyl rubber. **Composite Materials** - Introduction-Types– MMC, CMC and PMC-Fiber-Reinforced composites-preparation, properties, and applications.		
UNIT-IV	**FUELS AND ENERGY STORAGE DEVICES**	**9**
Fuels - Introduction, calorific value- numerical problems GCV and NCV-Green fuels-Introduction, synthesis and applications of power alcohol and biodiesel-High energy fuels-Production of hydrogen by electrolysis of water and its advantages. **Energy devices -** Electrode potential-electrochemical series - construction, working and applications of lead acid battery, Lithium-ion battery-Fuel Cell-Hydrogen-Oxygen (H_2-O_2) fuel cell, proton exchange membrane and solid oxide fuel cells.		
UNIT-V	**NANOMATERIALS AND LUBRICANTS**	**9**
Nanomaterials - Introduction, size-dependent properties - Synthesis of Nanomaterials-sol-gel, precipitation, hydrothermal and solvothermal methods - Carbon based nano materials - Introduction to CNT, Graphene and Fullerenes- synthesis, properties and applications of CNT. **Lubricants**: Classification- properties of lubricants- mechanism of lubrication- additives to lubricants- solid lubricants (graphite and MoS_2).		
Total Contact Hours:45		

Description of the Experiments	Total Contact Hours:30
Estimation of the acid by pH metry	
Determination of corrosion rate on mild steel by weight loss method	
Estimation of mixture of acids by conductometry	
Estimation of extent of corrosion of Iron pieces by potentiometry	
Determination of flash and fire points of lubricating oil	
Determination of cloud and pour points of lubricating oil	
Determination of molecular weight of a polymer by viscometry method	
Synthesis of nanomaterials by simple precipitation method	
Determination of phase change temperature of a solid	
Determination of strength of an acid in Pb acid battery	
Synthesis of biodiesel	

Determination of acid value of biofuel

Course Outcomes: At the end of the course the student will be able to:
• Explain and the fundamental concepts of corrosion, its control and surface modification methods such as electroplating and electroless plating
• Apply the concept of phase rule in alloying and predict its thermal properties
• Identify the different types of plastics and composite materials of industrial importance
• Categorize the types of fuels and the energy storage devices
• Synthesize nanomaterials for modern engineering and technology

SUGGESTED ACTIVITIES
Electroplating of desired metal on substrate. Synthesis of biodiesel

SUGGESTED EVALUATION METHODS
Continuous assessment tests Assignments Model lab examination End semester examination

Text Book(s):
P. C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
O.G.Palanna, "Engineering Chemistry", McGraw Hill Education (India) Pvt, Ltd, New Delhi, 2nd Edition, 2017.
Shikha Agarwal "Engineering Chemistry-Fundamentals and applications", Cambridge University Press, New Delhi, 2019

Reference Books(s)
Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers,4th Edition, 2021
A Text Book Engineering Chemistry, Sunita Rattan, S.K. Kataria & Sons, 1st 2018
A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.2011.
PradeepT, "A Text Book of Nanoscience and Nanotechnology", Tata McGraw Hill, New Delhi, 2012.
Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai & Co.

Weblinks
http://libgen.rs/ https://nptel.ac.in/courses/104/103/104103019/ https://ndl.iitkgp.ac.in/ https://www.youtube.com/watch?v=j5Hml6KN4TI https://www.youtube.com/watch?v=1xWBPZnEJk8

Lab equipment required:

S. No	Name of the Equipment	Quantity Required	Remarks
1.	Conductivity meter	10	
2.	Potentiometer	10	
3	pH meter	10	
4	Magnetic stirrer with hot plate	1	
5	Flash and Fire point apparatus	2	
6	Cloud and pour point apparatus	2	

SUGGESTED EVALUATION METHODS

Experiment based viva Quizzes

Web links for virtual lab (if any)
https://drive.google.com/drive/folders/1k8g7fGRJ0Dl8FPbjQYg4l5jS1U9qIXnJ

CY23233	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	1	1	1	1	2	2	2	3	2	1
CO 2	3	3	2	2	2	1	1	1	1	2	2	2	3	2	2
CO 3	3	2	2	2	1	1	1	1	1	1	2	2	3	2	2
CO 4	3	3	3	3	3	2	2	1	1	2	2	3	3	3	3
CO 5	3	2	3	3	3	2	3	1	1	2	2	3	3	3	3
Average	**3**	**2.6**	**2.4**	**2.4**	**2.2**	**1.4**	**1.6**	**1**	**1**	**1.8**	**2**	**2.4**	**3**	**2.4**	**2.2**

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DEPARTMENT OF CHEMISTRY	

Course Code	Course Title (Lab oriented Theory Course)	Category	L	T	P	C
EE23133	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	ES	3	0	2	4

Objectives:

- To provide knowledge on the analysis of DC circuits.
- To provide knowledge on the analysis of AC circuits
- To expose the principles of electrical machines and electronic devices.
- To teach the concepts of different types of electrical measuring instruments and transducers.
- To experimentally analyze the electrical circuits and machines, electronic devices and transducers.

UNIT-I	DC CIRCUITS	9

Electrical circuit elements (R, L and C), Voltage and current sources, Kirchhoff 's laws, Analysis of simple circuits with DC excitation, Superposition, Thevenin and Norton Theorems.

UNIT-II	AC CIRCUITS	9

Representation of sinusoidal waveforms, Power and Power factor, Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations, Series resonance, Three phase balanced circuits

UNIT-III	ELECTRICAL MACHINES	9

Construction, Principles of operation of DC machines, Single phase Transformers, Synchronous machines, Single phase induction motors. (Qualitative Treatment Only).

UNIT-IV	ELECTRONIC DEVICES & CIRCUITS	9

Review of PN Junction diode – Forward and Reverse Bias – Bipolar Junction Transistor – Common Emitter characteristics – MOSFET - Introduction to operational Amplifier –Inverting and Non-Inverting Amplifier.

UNIT-V	MEASUREMENTS & INSTRUMENTATION	9

Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Piezoelectric, - Classification of instruments - PMMC and MI Ammeters and Voltmeters – Digital Storage Oscilloscope.

Contact Hours	:	45

List of Experiments

1	Verification of Kirchhoff's Laws.
2	Load test on DC Shunt Motor (Virtual Lab)
3	Load test on Single phase Transformer (Virtual Lab)
4	Load test on Single phase Induction motor (Virtual Lab)
5	Characteristics of P-N junction Diode.
6	Characteristics of CE based NPN Transistor.
7	Characteristics of MOSFET
8	Characteristics of LVDT, RTD and Thermistor.

Contact Hours	:	30
Total Contact Hours	:	75

Course Outcomes:

On completion of the course, the students will be able to

- analyse DC circuits and apply circuit theorems.
- calculate the power and power factor in AC circuits
- understand the principles of electrical machines.
- comprehend the principles of different types of electronic devices, electrical measuring instruments and transducers.
- experimentally analyze the electric circuits and machines, electronic devices, and transducers.

Suggested Activities

- Problem solving sessions

Suggested Evaluation Methods

- Quizzes
- Class Presentation / Discussion

Text Book(s):

1. J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2010.
2. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum Series and Systems", Schaum"s Outlines, Tata McGrawHill, Indian. 5th Edison , 2017
3. Thereja .B.L., "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co. Ltd., 2008

Reference Books(s) / Web links:

1. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2015
2. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2007
3. Allan S Moris, "Measurement and Instrumentation Principles", Elseveir, Third Edition, 2006

4	Rajendra Prasad, "Fundamentals of Electrical Engineering", Prentice Hall of India, Third Edition, 2014
5	A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, "Basic Electrical Engineering", McGraw Hill Education(India) Private Limited, 2009
6	D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint ,2016
7	https://nptel.ac.in/courses/108108076

Lab Equipment Required:

Sl. No.	Name of the Equipment	Quantity Required (For a batch of 30 students)
1.	**Verification of ohms and Kirchhoff's Laws** DC Regulated Power supply (0 - 30 V variable) Bread Board Resistors Multimeter Connecting wires	 1 1 As per Circuit diagram1 As Required
2.	**Load test on DC Shunt Motor.** Ammeter MC (0-20A) Voltmeter MC (0-300)V Tachometer 4. Field Rheostat 500 Ω, 1.5 A Connecting wires	 1 1 1 1 As Required
3.	**Load Test on Induction Motor** Ammeter MI (0-20A) 2. Voltmeter MI (0-300)V 3. Wattmeter – 300V, 30 A 4. Tachometer – Digital 5. Connecting Wires 6. Single phase Induction motor	 1 1 1 1 As Required1
4.	**Load test on Single phase Transformer** mmeter (0-30) A, (0-5) A oltmeter (0-150)V, (0-300)V Wattmeter – 300V, 5A, UPF Autotransformer Single phase Transformer Connecting Wires	 **1** **1** **1** **1** **1** As Required
5.	**Characteristics of PN and Zener Diodes** 1. PN Diode (IN4007), Zener diode (6.8V, 1A) 2. Resistor 1 KΩ, 100Ω 3. Bread Board 4. DC Regulated Power supply (0 - 30 V variable) 5. Multimeter 6. Connecting wires	 1 1 1 1 1 As Required
6.	**Characteristics of BJT** 1. Transistor (BC107) 2. Resistors- 1kΩ, 470KΩ, 1MΩ 3. Bread Board 4. DC Regulated Power supply (0 - 30 V variable) 5. Multimeter 6. Connecting wires	 1 1 1 1 1 As Required

7.	**Characteristics of MOSFET** MOSFET (IRF510) Resistors- 100kΩ, 1kΩ 3. Bread Board 4. DC Regulated Power supply (0 - 30 V variable) Multimeter Connecting wires	 1 1 1 1 1 As Required
8.	**Measurement of displacement of LVDT, RTD and Thermistor** LVDT Kit RTD Thermistor Multimeter	 1 1 1 1 1

EE23133	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	-	3	1	1	2	1	1	1	1	1	1
CO 2	3	3	3	3	-	3	1	1	2	1	1	1	1	1	1
CO 3	3	3	3	3	-	3	1	1	2	1	1	1	1	1	1
CO 4	3	3	3	3	-	3	1	1	2	1	1	1	1	1	1
CO 5	3	3	3	3	-	3	1	1	2	1	1	1	1	1	1
Average	**3**	**3**	**3**	**3**	**0**	**3**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS	

Course Code	Course Title (Lab oriented Theory Course)	Category	L	T	P	C
GE23231	PROGRAMMING USING PYTHON Common to all branches of B. E. / B.Tech program (Except– CSE, CSBS, CSD, IT, AI/ML, CYBER SECURITY, AI/DS)	ES	1	0	4	3

Course Objectives:

	To understand computers, programming languages and their generations and essential skills for a logical thinking for problem solving.
	To write, test, and debug simple Python programs with conditionals, and loops and functions
	To develop Python programs with defining functions and calling them
	To understand and write python programs with compound data-lists, tuples, dictionaries
	To search, sort, read and write data from /to files in Python.

List of Experiments

1.	Study of algorithms, flowcharts and pseudocodes.
2.	Introduction to Python Programming and Python IDLE/Anaconda distribution.
3.	Experiments based on Variables, Data types and Operators in Python.
4.	Coding Standards and Formatting Output.
5.	Algorithmic Approach: Selection control structures.
6.	Algorithmic Approach: Iteration control structures.
7.	Experiments based on Strings and its operations.
8.	Experiments based on Lists and its operations.
9.	Experiments based on Tuples and its operations.
10.	Experiments based on Sets and its operations.
11.	Experiments based on Dictionary and its operations.
12.	Functions: Built-in functions.
13.	Functions: User-defined functions.
14.	Functions: Recursive functions.
15.	Searching techniques: Linear and Binary.
16.	Sorting techniques: Bubble and Merge Sort.
17.	Experiments based on files and its operations.
	Contact Hours : 75

Course Outcomes:

On completion of the course, students will be able to:

- Understand the working principle of a computer and identify the purpose of a computer programming language and ability to identify an appropriate approach to solve the problem.
- Write, test, and debug simple Python programs with conditionals and loops.
- Develop Python programs step - wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Apply searching, sorting on data and efficiently handle data using flat files.

Text Books:

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

Reference Books:

1.	JohnVGuttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press, 2013.
2.	Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd, 2016.
3.	Timothy A.Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
4.	Kenneth A. Lambert, Fundamentals of Python: First Programs, Cengage Learning, 2012.
5.	Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6.	Paul Gries, Jennifer Campbell and Jason Montojo, Practical Programming: An Introduction to Computer Science using Python3, Second edition, Pragmatic Programmers, LLC, 2013.

Platform needed: Python3 interpreter for Windows/Linux

CO -PO–PSO matrices of course

GE23231	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
GE23231.1	2	2	2	2	1	-	-	-	1	1	1	1	3	3	-
GE23231.2	2	1	1	1	1	-	-	-	-	-	1	1	3	2	-
GE23231.3	1	1	2	1	2	-	-	-	-	-	1	1	2	3	2
GE23231.4	2	2	3	2	2	-	-	-	-	-	2	1	2	2	2
GE23231.5	2	2	3	2	3	-	-	-	-	-	2	1	2	2	2
Average	**1.8**	**1.6**	**2.2**	**1.6**	**1.8**	**0.0**	**0.0**	**0.0**	**0.2**	**0.2**	**1.4**	**1**	**2.4**	**2.4**	**2**

Prepared by Name and signature	Approved by Name and Signature
DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
CE23221	COMPUTER AIDED BUILDING DRAWING FOR CIVIL ENGINEERS	PC	0	0	4	2

Objective:

- To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with developmentand control rules satisfying orientation and functional requirements as per National Building Code.

Description of the Experiments	Total Contact Hours: 60
Introduction to AutoCAD tools and commands.	
NBC provisions and Bye-laws for building planning, orientations, lighting and ventilation.	
Preparation of key plan and site plan.	
Introduction to building components such as foundation, super structure, roof, staircase, doors and windows.	
Plan, Section and Elevation of a single floor residential building - load bearing structure.	
Plan, Section and Elevation of a residential building – framed structure.	
Plan, Section and Elevation of a Primary health center.	
Plan, Section and Elevation of an Industrial building.	
Preparing approval plan as per the regulations.	
Introduction to BIM.	

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

- Employ various AutoCAD tools and commands.
- Plan the buildings based on NBC and Bye-laws
- Prepare plan, section and elevation for different types of load bearing buildings
- Prepare plan, section and elevation for framed buildings.
- Prepare approval plan for buildings.

SUGGESTED EVALUATION METHODS
Experiment based viva

Lab equipment required:

S. No	Name of the Equipment	Quantity Required	Remarks
1	AutoCAD Software Pack – Appropriate Version	1 Pack (30 Systems)	
2	Computers	30	

CE23221	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	3	-	3	-	-	-	1	-	-	-	3	2	1
CO 2	2	2	3	-	-	2	2	-	-	-	-	-	3	2	2
CO 3	2	-	3	-	-	-	1	-	1	-	-	-	3	2	1
CO 4	2	-	3	-	-	-	1	-	1	-	-	-	3	2	1
CO 5	2	2	3	-	-	2	1	-	-	1	-	-	2	2	1
Average	**2**	**1.3**	**3**	**0**	**3**	**2**	**1.3**	**0**	**1**	**1**	**0**	**0**	**2.8**	**2**	**1.2**

Prepared by Name and signature	Approved by Name and Signature
MR.M.MANOHARAN, ASSITANT PROFESSOR/ CIVIL	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
HS23221	TECHNICAL COMMUNICATION II	HS	0	0	2	1
Common to all branches of B.E/B. Tech programmes –Second Semester						

Objectives:
To facilitate students to improve their vocabulary for a better communication
To enable learners to understand and reproduce language
To aid students to write technical reports in a convincing manner
To expose students to different sentence structures
To equip learners to present their ideas in an efficient manner

UNIT-I	VOCABULARY FOR BETTER COMMUNICATION	6
Listening: Telephonic Conversations and TV News **Reading:** Newspapers and Magazines **Speaking**: Conversational Practice: Speaking in a given situation, Asking permission and requesting etc.., **Writing:** Job Application Letter and Resume **Grammar:** Reference words: pronouns and determiners **Vocabulary:** Guessing meanings of words in different contexts.		
UNIT-II	**FUNCTIONAL LANGUAGE ASPECTS**	**6**
Listening: Motivational listening – listening to real life challenges **Reading:** Articles and Technical reports **Speaking:** Using Polite Expressions, Indirect Questions **Writing:** Paraphrasing a Text, Poem **Grammar:** Purpose Statements, Cause and Effect Expressions **Vocabulary:** Neologisms.		
UNIT-III	**TECHNICAL REPORTWRITING**	**6**
Listening: Empathetic Listening – Giving Solutions to Problems **Reading:** Inferential Reading **Speaking:** Dialogues – Interviewing Celebrities / Leaders / Sportspersons, etc.., **Writing:** Report Writing **Grammar:** Functional Usage of Expressions – used to, gone / been, etc.., **Vocabulary:** Words Often Confused		
UNIT-IV	**STRUCTURAL GRAMMAR**	**6**
Listening: Comprehension (IELTS practice tests) **Reading:** Intensive Reading for specific information **Speaking:** Pick and Talk **Writing:** Proposals **Grammar:** Sentence Structures – Simple, Compound, Complex Sentences **Vocabulary:** Replacing dull words with vivid ones		
UNIT-V	**PRESENTATION SKILLS**	**6**
Listening: Discriminative listening – sarcasm, irony, pun, etc.., **Reading:** Practice of chunking – breaking up reading materials **Speaking:** Mini presentation on some topic **Writing:** Minutes of the meeting **Grammar:** Correction of Errors **Vocabulary:** Advanced vocabulary – fixing appropriate words in the given context.		
		Total Contact Hours: 30

Course Outcomes:
On completion of the course students will be able to
communicate effectively using appropriate vocabulary
use the acquired language skills to comprehend various types of language contents
evaluate different texts and write effective technical content
use appropriate sentence structures to convey their thoughts in varied contexts
present their concepts and ideas in an effective manner

SUGGESTED ACTIVITIES

Story Lines One truth and two lies Hang Man Pictionary Word Scramble Case study

SUGGESTED EVALUATION METHODS
Assignment topics Quizzes Class Presentation/Discussion Continuous Assessment Tests

Text Book(s):
Raymond Murphy, "Intermediate English Grammar," Second Edition , Cambridge University Press, 2018
Meenakshi Raman & Sangeeta Sharma, "Technical Communication" Third Edition, Oxford University Press, 2015
Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMeng Goh, Cambridge University Press

Reference Books(s) / Web links:
Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor), "Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers" 2nd Edition
Dale Carnegie, "The Art of Public Speaking," Insight Press
Jack C. Richards & Theodore S. Rodgers, " Approaches and Methods in Language Teaching, Second Edition, Cambridge University Press

HS23221	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-
CO 2	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-
CO 3	-	2	-	1	-	-	-	-	-	3	-	-	-	-	-
CO 4	-	-	-	1	-	-	-	-	2	3	-	-	-	-	-
CO 5	-	-	-	1	-	-	-	-	2	2	-	-	-	-	-
Average	**-**	**2**	**-**	**1**	**0**	**0**	**0**	**0**	**2**	**2.6**	**-**	**-**	**-**	**-**	**-**

Prepared by Name and signature	**Approved by Name and Signature**
ALL FACULTY DEPARTMENT OF ENGLISH	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
HS23222	ENGLISH FOR PROFESSIONAL COMPETENCE	HS	0	0	2	1
Common to all branches of B.E/B. Tech programmes –Second Semester						

Objectives:
To facilitate the learners in acquiring listening and reading competence
To enable the learners to communicate effectively through written and oral medium
To assist the learners in preparing for competitive examinations
To train the students in acquiring corporate skills
To inculcate professional standards among the students and make them realize their responsibility in addressing the challenges

UNIT-I	RECEPTIVE SKILLS	6
Listening – Comprehensive Listening – Watching the news – Listening to a peer giving presentation, etc. – Critical Listening – Watching a televised debate, Listening to poems – Reading – Extensive Reading – Short stories and One-act Plays – Intensive Reading – Articles or Editorials in Magazines, Blog posts on topics like science and technology, arts, etc.		
UNIT-II	**PRODUCTIVE SKILLS**	**6**
Speaking – Demonstrative Speaking – Process description through visual aids – Persuasive Speaking – Convincing the listener with the speaker's view – **Writing** – Descriptive Writing - Describing a place, person, process – Subjective Writing – Autobiography, Writing based on personal opinions and interpretations		
UNIT-III	**ENGLISH FOR COMPETITIVE EXAMS**	**6**
An introduction to International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Graduate Record Examination (GRE) – Civil Service, Indian Economic Service Examination, Indian Statistical Service Examination, Combined Defence Services Examination, Staff Selection- (Language Related) – Aptitude tests.		
UNIT-IV	**CORPORATE SKILLS**	**6**
Critical Thinking and Problem Solving – Case Study, Brainstorming, Q & A Discussion – **Team work and Collaboration** – Activities like Office Debates, Perfect Square, Blind Retriever, etc. – **Professionalism and Strong Work Ethics** – Integrity, Resilience, Accountability, Adaptability, Growth Mind set.		
UNIT-V	**PROJECT WORK**	**6**
Case Study based on the challenges faced by the employers and the employees – Devise Plan, Provide Solution		
Total Contact Hours: 30		

Course Outcomes:
On completion of the course students will be able to
interpret and respond appropriately in the listening and reading contexts.
express themselves effectively in spoken and written communication
apply their acquired language skills in writing the competitive examinations
exhibit their professional skills in their work place
identify the challenges in the work place and suggest strategies solutions

SUGGESTED ACTIVITIES

Online Quizzes on Vocabulary
Online Quizzes on grammar
Communication Gap Exercises
Presentations
Word Building Games
Case study

SUGGESTED EVALUATION METHODS

Assignment topics

Quizzes

Class Presentation/Discussion

Continuous Assessment Tests

Text Book(s):
How to Read Better & Faster, Norman Lewis, Goyal Publishers
Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine Chuen Meng Goh, Cambridge University Press
The Official Cambridge Guide To IELTS by Pauline Cullen, Cambridge University Press
The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK

Reference Books(s) / Web links:
Board of Editors. Sure Outcomes. A Communication Skills Course for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad, 2013.
Hartley, Mary. "The Power of Listening," Jaico Publishing House; First Edition (2015).
Chambers, Harry. "Effective Communication Skills for Scientific and Technical Professionals," Persues Publishing, Cambridge, Massachusetts, 2000.

HS23222	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-
CO 2	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO 4	-	-	-	-	-	-	2	2	-	3	-	-	-	-	-
CO 5	-	-	1	-	-	-	2	-	-	3	-	-	-	-	-
Average	**0**	**1**	**1**	**0**	**0**	**0**	**2**	**2**	**0**	**3**	**0**	**0**	**-**	**-**	**-**

Prepared by Name and signature	**Approved by Name and Signature**
ALL FACULTY DEPARTMENT OF ENGLISH	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
GE23122	ENGINEERING PRACTICES - ELECTRICAL AND ELECTRONICS	ES	0	0	2	1

Objectives:

- To provide hands-on experience on various basic engineering practices in Electrical Engineering.
- To provide hands-on experience on various basic engineering practices in Electronics Engineering.

List of Experiments

A. ELECTRICAL ENGINEERING PRACTICE

1	Residential house wiring using switches, fuses, indicators, lamp and energy meter.
2	Fluorescent lamp wiring.
3	Stair case wiring.
4	Measurement of electrical quantities – voltage, current, power & power factor in RL circuit.
5	Measurement of earth resistance using Megger.
6	Study of Ceiling Fan and Iron Box

B. ELECTRONICS ENGINEERING PRACTICE

1	Study of electronic components and equipment – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO/DSO.
2	Measurement of electrical quantities using Multimeter Testing of electronic components.
3	Study of logic gates: AND, OR, EXOR and NOT.
4	Generation of Clock Signals.
5	Soldering practice – Components Devices and Circuits – Using general purpose PCB.
6	Measurement of ripple factor of Half-wave and Full-wave Rectifiers.

Total Contact Hours	**:**	**30**

Course Outcomes:

On completion of the course, the students will be able to

- fabricate the basic electrical circuits
- implement the house wiring circuits
- fabricate the electronic circuits
- verify the truth table of logic gates
- design the Half-wave and Full-wave Rectifiers using diodes and passive components

SUGGESTED EVALUATION METHODS

Experiment based Viva

REFERENCE

1	Bawa H.S., "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, 2007.
2	Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
3	Jeyapoovan T., Saravanapandian M. &Pranitha S., "Engineering Practices Lab Manual",Vikas Publishing House Pvt.Ltd, 2006.
4	Rajendra Prasad A. &Sarma P.M.M.S., "Workshop Practice", SreeSai Publication, 2002.

Lab Equipment Required:

S.	Name of the Equipment	Quantity Required
1	Residential house wiring using switches, fuse, indicator, lamp	3 Nos
2	Fluorescent lamp wiring.	3 Nos
3	Stair case wiring	3 Nos
4	Measurement of electrical quantities – voltage, current, power &	2 Nos
5	Study purpose items: Iron box, Ceiling fan.	2 each
6	Megger (250V/500V)	2 Nos.
7	Soldering guns	10 Nos.
8	Assorted electronic components for making circuits	50 Nos.
9	Small PCBs	10 Nos.

10	Multimeters	10 Nos.
11	Digital trainer kit	5 Nos.
12	CRO	8 Nos.
13	Transformer	8 Nos.
14	Function Generator	8 Nos.

GE23122	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	-	-	2	-	3	2	-	3	1	1	1
CO 2	3	3	2	2	-	-	2	-	3	2	-	3	1	1	1
CO 3	3	3	3	2	-	-	2	-	3	2	-	3	1	1	1
CO 4	3	3	3	2	-	-		-	3	2	-	3	1	1	1
CO 5	3	3	3	2	-	-		-	3	2	-	3	1	1	1
Average	**3**	**3**	**2.67**	**2**	**-**	**-**	**2**	**-**	**3**	**2**	**-**	**3**	**1**	**1**	**1**

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS	

Course Code	Course Title (Theory course)	Category	L	T	P	C
MC23111	INDIAN CONSTITUTION AND FREEDOM MOVEMENT	MC	3	0	0	0
Common to all branches of B.E/B. Tech Programmes – First / Second/third Semester						

Objectives:
To apprehend the sacrifices made by the freedom fighters.
To inculcate the values enshrined in the Indian constitution.
To instil a sense of responsibility as the citizens of India.
To familiarize about the functions of the various levels of Government.
To be informed about Constitutional and Non- Constitutional bodies.

UNIT-I	**INDIAN FREEDOM MOVEMENT**	**9**
British Colonialism in India-Colonial administration till 1857- Revolt of 1857- Early Resistance to British Rule-Rise of Nationalism in India-I**ndian Freedom Struggle under Mahatma Gandhi-**Non- Cooperation Movement-Civil Disobedience Movement- Quit India Movement-British Official response to National movement- Independence of India Act 1947-Freedom and Partition.		
UNIT-II	**CONSTITUTION OF INDIA**	**9**
Historical Background – Indian Constitution: Constitution' meaning of the term, Sources and constitutional history, Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.		
UNIT-III	**STRUCTURE AND FUNCTIONS OF CENTRAL GOVERNMENT**	**9**
Union Government – Structure of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.		
UNIT-IV	**STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCAL BODY**	**9**
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts- Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati Raj: Introduction, Elected officials and their roles, Village level: Role of Elected and Appointed officials.		
UNIT-V	**CONSTITUTIONAL FUNCTIONS AND BODIES**	**9**
Indian Federal System – Centre – State Relations – President's Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.		
Total Contact Hours: 45		

Course Outcomes: Upon completion of the course, students will be able to:
appreciate the sacrifices made by freedom fighters during freedom movement.
be responsible citizens and abide by the rules of the Indian constitution.
be aware of the functions of the Indian government.
be knowledgeable about the functions of the state Government and the Local bodies.
apply the knowledge on constitutional functions and role of constitutional bodies and non-constitutional bodies.

SUGGESTED ACTIVITIES

Famous speeches from around the world relating to independence
Case study
Quiz on Portfolio and Cabinet
Discussions on International Associations like the UN, BRICS, QUAD
Presentation on issues around the world

SUGGESTED EVALUATION METHODS

Assignment topics
Quizzes
Class Presentation/Discussion
Continuous assessments (CAT)

Text Book(s):
M. Laxmikanth , "Indian Polity:, McGraw-Hill, New Delhi.
Durga Das Basu, "Introduction to the Constitution of India ", Lexis Nexis, New Delhi. 21st ed 2013.
P K Agarwal and K N Chaturvedi ,PrabhatPrakashan, New Delhi, 1st ed , 2017.

Reference Books(s) / Web links:
Sharma, Brij Kishore, "Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar
Bipan Chandra, India's Struggle for Independence, Penguin Books, 2016.
Maciver and Page, "Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.2nd ed, 2014.
Bipan Chandra, History of Modern India, Orient Black Swan, 2009.

MC23111	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	1	0	0	3	2	0	0	1	0	0	3	2	3
CO 2	3	2	3	0	0	3	3	2	0	2	0	1	3	2	3
CO 3	2	3	0	1	3	3	2	0	1	0	3	0	3	3	3
CO 4	1	2	3	1	3	2	1	0	3	1	3	0	3	3	3
CO 5	3	2	1	2	0	3	3	0	2	0	3	1	3	2	3
Average	**2.4**	**2.4**	**2**	**1**	**3**	**2.8**	**2.2**	**2**	**2**	**1.3**	**3**	**1**	**3**	**2.4**	**3**

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ALL THE FACULTY MEMBERS , DEPARTMENT OF ENGLISH	

SEMESTER III

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23311	STRENGTH OF MATERIALS I	PC	3	0	0	3

Objectives:

- To Analyze the stability of structures and the behavior of materials under stress and strain, including stress-strain relationships
- To equip students with the fundamental principles of beam analysis and design, enabling them to tackle complex problem
- To develop the skills necessary for designing mechanical components subjected to torsional load and springs for load-bearing applications.
- To evaluate the deflection and deformation in shafts and springs due to torsion
- To Solve complex truss and frame analysis problems, ensuring that the structures are both stable and safe.

UNIT-I	**STRESS AND STRAIN**	**9**

Introduction – Types of loads – Stability - Stresses and strains – Stress and strain diagram for steel – Elastic limit - Hooke ‘s law – Poisson ‘s ratio – Elastic constants – Young ‘s modulus – Shear modulus – Bulk Modulus-Volumetric strain - relationship between elastic constants- Thermal stresses – Compound stresses - Factor of Safety -Deformation of simple and compound bars.

UNIT-II	**SHEAR AND BENDING IN DETERMINATE BEAMS**	**9**

Types of beams – Types of supports and loads- Bending moment and Shear force – Sign conventions - Point of contra flexure-Shear force and bending moment diagrams for concentrated load, uniformly distributed load, uniformly varying load and Couples-Theory of simple bending – analysis of bending stresses – variation of shear stresses – shear stress distribution in rectangular, I section, solid circular section, hollow circular section, angle and channel sections – Flitched Beams.

UNIT-III	**TORSION AND SPRINGS**	**9**

Simple torsion – Torsional loads – Torsion equation for circular shafts and hollow circular shafts – Assumptions - Torsional rigidity - Power transmission – Modulus of rupture- closed and open coiled helical springs- leaf springs – springs in series and parallel

UNIT-IV	**DEFLECTION OF BEAMS**	**9**

Deflection of Beams –Double integration method - Macaulay's methods – Moment area method - conjugate beam method for computation of slopes and deflections of determinant beams.

UNIT-V	**PLANE TRUSSES**	**9**

Stability and equilibrium of plane frames – types of trusses – analysis of forces in truss members - method of joints, method of sections, method of tension coefficients.

	Total Contact Hours	**:**	**45**

Course Outcomes:

On completion of the course, the student will be able to

- Apply their knowledge to solve practical engineering problems related to materials and structural mechanics.
- Construct shear force and bending moment diagrams for various types of beams and loading conditions.
- Analyze torsional stresses and deformations in circular shafts and springs.
- Operate multiple methods to compute deflections and slopes in beams subjected to various loads.
- Evaluate forces in plane truss members using methods of joints, sections, and tension coefficients.

SUGGESTED ACTIVITIES

Problem solving sessions for all units

SUGGESTED EVALUATION METHODS

Tutorial problems for all units

Assignment problems for all units

Text Book (s):	
1	Rajput R.K., Strength of Materials, 7 th Edition, S. Chand & Company Ltd, New Delhi, 2018
2	Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010
Reference Book(s)/ Web link(s):	
1	Subramanian R., Strength of Materials, 3 nd Edition, Oxford University Press, 2016
2	Popov E P, Mechanics of Materials, 4 th Edition, Prentice Hall of India, 2016.

3	Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009

CE23311	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	1	1	1	1	1	1	2	3	2	1
CO 2	3	3	2	2	2	1	1	1	2	1	1	2	3	3	2
CO 3	3	3	3	2	2	1	2	1	2	1	1	2	3	3	2
CO 4	3	3	2	3	2	1	1	1	2	1	1	2	3	2	1
CO 5	3	3	3	3	2	2	2	2	2	2	2	3	3	3	3
Average	**3**	**3**	**2**	**2.4**	**1.8**	**1.2**	**1.4**	**1.2**	**1.8**	**1.2**	**1.2**	**2.2**	**3**	**2.6**	**1.8**

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DR.S.PREMKUMAR, ASSISTANT PROFESSOR (SS)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23312	FLUID MECHANICS	PC	3	0	0	3

Objectives:

- To provide fundamental knowledge of fluids, its properties and study of fluid at rest.
- To acquire knowledge on kinematics of fluid, dynamics of fluids concepts in Euler's and Bernoulli equations.
- To analyze flow through pipes in a flow system.
- To obtain knowledge on boundary layer thickness and separation.
- To enhance knowledge on dimensional analysis and model studies.

UNIT-I	**FLUID PROPERTIES AND FLUID STATICS**	**9**

Properties of fluid - Mass density – Specific weight - Specific volume – Specific gravity - Viscosity – Vapour pressure – Compressibility and elasticity - Surface tension – Capillarity- Fluid statics – Fluid pressure and measurement – simple and differential- Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies.

UNIT-II	**FLUID KINEMATICS AND FLUID DYNAMICS**	**9**

Classification of flows - Streamline, streak-line and path-lines - Stream function - Velocity potentials - Flow nets - Euler's equation of motion along a stream line - Bernoulli's equation

UNIT-III	**FLOW THROUGH PIPES**	**9**

Reynolds experiment - Laminar flow through circular pipe - Darcy-Weisbach equation - Moody diagram - Major and minor losses in pipe flow – Total energy line – Hydraulic gradient line - Pipes in series and parallel- Equivalent pipes

UNIT-IV	**BOUNDARY LAYER**	**9**

Boundary layer -boundary layer on a flat plate – laminar and turbulent boundary layer - displacement, energy and momentumthickness – Momentum integral equation-Boundary layer separation and control – drag on flat plate.

UNIT-V	**DIMENSIONAL ANALYSIS AND MODEL STUDIES**	**9**

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - dimensionless parameters - similitudes and model studies - distorted models.

Total Contact Hours: 45

Course Outcomes:
On completion of the course, the student will be able to

- Apply the concept of basic properties of fluids and behavior of fluids at rest and its applications in real world problems
- Compute the rate of flow through pipes and the concept of Bernoulli's equation to solve a variety of fluid flow problems.
- Estimate the major and minor losses in pipe flow and calculate the flow through pipes connected in series and in parallels
- Compute the boundary layer thickness and its separation during different types of fluid flow
- Employ the knowledge in dimensional analysis and model studies in real time

SUGGESTED ACTIVITIES
Problem solving sessions – All units

SUGGESTED EVALUATION METHODS
Tutorial problems
Assignment problems
Quizzes

Text Book(s):

Dr.Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.

K. Subramanya "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education PrivateLimited, New Delhi, 2010.

Reference Books(s) / Web links:

Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw Hill, 2000.

Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2013.

White, F.M., “Fluid Mechanics”, Tata McGraw Hill, 5th Edition, New Delhi, 2017.
Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2015.
Dr.A.K.Jain “Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition,2016.

CE23312	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	1	1	1	1	1	1	-	2	1	1	1
CO 2	3	2	1	2	1	1	1	1	1	1	-	2	1	1	1
CO 3	3	2	1	1	1	1	1	1	1	1	-	2	1	1	1
CO 4	3	2	1	2	1	1	1	1	1	1	-	2	1	1	1
CO 5	3	2	1	2	1	1	1	1	1	1	-	2	1	1	1
Average	**3**	**2**	**1**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1**	**-**	**2**	**1**	**1**	**1**

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MRS.A.J.JEYA ARTHI, ASSISTANT PROFESSOR (SS)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23313	CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICE	PC	3	0	0	3

Objectives:

- To gain insight about concrete mixing design, testing procedures, building materials, and the concreting process.
- To impart knowledge on the construction practices and techniques for foundations, masonry, formwork, weather and water proofing.
- To apply advanced techniques for underground construction, including tunneling, deep excavations, dewatering in complex geotechnical environments.
- To enable critical evaluation on the erection of complex structures, including heavy decks, offshore platforms while optimizing material handling and support structures for efficiency and safety.
- To assess factors influencing equipment selection, optimize cost-efficiency and maintenance strategies, and apply appropriate equipment for diverse construction tasks.

UNIT-I	CONCRETE TECHNOLOGY	9

Concrete – Mix and Grades of concrete - manufacturing of concrete – Batching – mixing – transporting – placing – compaction of concrete – curing and finishing - Extreme Weather Concreting – Under water concreting - Ready Mix Concrete - Non-destructive testing – Mixdesign – IS method – ACI method – Defects in concrete – Bleeding, Laitance and segregation.

UNIT-II	CONSTRUCTION PRACTICES	9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork – Masonry types – Bonds in masonry – Flooring (VDF) – damp proof courses – Joints in concrete – Building foundations – basements – Formwork techniques – shuttering and de-shuttering – slip forms – scaffoldings — weather and water proof.

UNIT-III	SUB STRUCTURE CONSTRUCTION	9

Techniques of Box jacking – Pipe Jacking - Tunneling techniques – Special piling techniques - well and caisson - cofferdam - cable anchoring and grouting - Need for deep excavations, susceptibilities of deep excavations- shoring for deep cutting - Applications and Construction of deep diaphragm walls - Well points - Dewatering and stand by Plant equipment for underground open excavation.

UNIT-IV	SUPER STRUCTURE CONSTRUCTION	9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.

UNIT-V	CONSTRUCTION EQUIPMENT	inte

Factors affecting Selection of equipment – Cost and maintenance - Earthwork equipment – Equipment for Graders, Scrapers and Rollers - Equipment for foundation and pile driving - Equipment for compaction and concreting - Equipment for material handling and erection of structures – Equipment for dewatering - Equipment for dredging, trenching, tunneling.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the student will be able to

- Analyze, design, and evaluate concrete mixes and processes, apply advanced testing methods, and address defects to ensure durable and sustainable concrete structures.
- Coordinate construction processes, implement advanced formwork and masonry techniques, and analyze methods for ensuring structural durability and weatherproofing.
- Comprehend advanced underground construction techniques, design solutions for deep excavations and dewatering, and ensuring safety and stability in complex geotechnical scenarios.
- Apply construction techniques for complex structures, design efficient material handling and erection strategies, and analyze support systems for heavy and lightweight components.
- Analyze and optimize the selection, operation, and maintenance of construction equipment, evaluate cost-efficiency, and design solutions for diverse applications.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

Seminars

Flipped classroom

Case studies

Activity Based Learning

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic Assignments Quiz Seminars
Text Book(s):
Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 7th Edition, McGraw Hill, Singapore, 2010.
Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", DhanpatRai and Sons, 2010.

Reference Books(s) / Web links:
Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2021.
Introduction to Modern Techniques in Geotechnical Engineering, Nainan P. Kurian, 2019, Alpha Science, 1st Edition.
Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi, 2019.
Deodhar S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 2012.
Dr. Mahesh Varma, “Construction Equipment and its Planning and Application”, Metropolitan Book Company, New Delhi, 1983.
Gambhir M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2017.

CE23313	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	2	2	-	2	-	3	3	2	1	3	2	2	3
CO 2	3	2	1	2	-	3	-	3	3	2	1	3	2	2	3
CO 3	3	2	3	3	2	3	-	3	3	2	1	3	3	3	3
CO 4	3	2	3	3	2	3	-	3	3	2	1	3	3	3	3
CO 5	3	1	2	2	2	2	-	1	3	2	2	3	2	2	2
Average	**3**	**1.60**	**2.20**	**2.40**	**2**	**2.60**	**-**	**2.60**	**3**	**2**	**1.20**	**3**	**2.40**	**2.40**	**2.80**

Prepared by Name and signature	Approved by Name and Signature
Mr.R.MADHAVAPERUMAL, ASSISTANT PROFESSOR /CIVIL	

Course Code	Course Title (Lab oriented Theory Course)	Category	L	T	P	C
CE23331	SURVEYING	PC	3	0	2	4

Objectives:

- To acquire knowledge on the classification and basic principles of chain and compass surveying.
- To integrate the theory and principles of levelling and contouring.
- To assimilate the working principle of theodolite and setting of different types of curves.
- To acquaint with tacheometric surveying, triangulation, trigonometric levelling and its significance.
- To apply the working principle of modern surveying equipments like total station and GPS.

UNIT-I CHAIN AND COMPASS SURVEYING **9**

Chain Surveying:
Definition – Principles – Classification – Plan and map – Scales – Ranging and chaining – Obstacles – Tape Corrections.

Compass Surveying:
Principles – Types of Compass – True and magnetic bearing – Dip and declination – Local attraction – Adjustment of errors.

UNIT-II LEVELING AND CONTOURING **9**

Principles and theory of Levelling - Level line – Horizontal line – Spirit level – Mean sea level – Bench mark – Types of Bench marks – Leveling instruments – Types of Levelling – Booking and reduction of levels – Curvature and refraction – Contouring – Characteristics and uses of contours – Calculation of earth work and reservoir capacity.

UNIT-III THEODOLITE SURVEYING AND CURVE SETTING **9**

Theodolite survey – Horizontal and vertical angle measurements - Temporary and permanent adjustments - – Curves –types – components and elements of simple curve – Setting out a simple curve by Rankine' s method and two theodolite method – Transition curves – Functions and requirements.

UNIT-IV TACHEOMETRIC AND TRIANGULATION SURVEYING **9**

Tacheometric systems – Tangential and stadia methods – Stadia systems – Determination of stadia constants – Anallatic lens – Triangulation – Towers and Signals - Satellite station – Reduction to centre – Trigonometric Levelling – Single and reciprocal observations.

UNIT-V TOTAL STATION AND GPS **9**

Total Station: Types of EDM instruments - Fundamental quantities measured - Parts and accessories - working principle – Advantages.

GPS Surveying: Different segments - space, control and user segments - satellite configuration - Anti Spoofing and Selective Availability.

Contact Hours : 45

List of Experiments

Chain Survey

1.	Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset.
2.	Chaining & Ranging.
3.	Setting out works – Foundation marking using tapes single Room.

Levelling

4.	Study of levels and levelling staff
5.	Fly levelling using Dumpy level.

Theodolite

6.	Study of Theodolite
7.	Measurements of horizontal angles by reiteration.
8.	Measurements of horizontal angles by repetition.
9.	Measurements of vertical angles & height of an object with base accessible.
10.	Determination of elevation of an object using single plane method when base is inaccessible.

Tacheometry

11.	Determination of Tacheometric Constants.
12.	Heights and distances by Stadia Tacheometry.
13.	Heights and distances by Tangential Tacheometry.

Total Station & GPS

14.	Study of Total Station.
15.	Measuring Horizontal and vertical angles using Total Station

16.	Determination of distance and difference in elevation between two inaccessible points using Total station.			
17.	Study of GPS			
18.	Co-ordinates and elevation measurement using GPS			
19.	Area of building using GPS			
		Contact Hours	**:**	**30**
		Total Contact Hours	**:**	**75**

Course Outcomes:	
On completion of the course, the students will be able to	
●	Implement the procedure of Chain Survey to find different distances and areas.
●	Determine the reduced level of points using levelling instruments.
●	Locate the position of the object after finding the distance and heights using theodolite.
●	Apply the concepts of tacheometer surveying to find the height and distance of given object.
●	Implement the modern survey techniques using Total Station equipment and GPS.
Suggested Activities	
●	Problem solving sessions
Suggested Evaluation Methods	
●	Quizzes
●	Class Presentation / Discussion
●	Viva Voce
Text Book(s):	
1	Surveying I & II, B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Laxmi Publications, 2015.
2	Higher Surveying, Chandra A. M., New Age International Publishers, 2015.
3	Surveying Theory and Practice, James, M Anderson & Edward M., Tata Mc Graw Hill, 2012.
Reference Books(s) / Web links:	
1	Elementary Surveying, Charles D Ghilani, Paul R Wolf., Prentice Hall, 2012.
2	https://nptel.ac.in/courses/105107122
3	https://nptel.ac.in/courses/105104101
4	http://sl-iitr.vlabs.ac.in/sl-iitr/

Lab equipment required:

S. No	Name of the Equipment	Quantity Required	Remarks
1.	Total Station	3 No's	
2.	Theodolite	At least 1 for every 5 students	
3.	Dumpy level	At least 1 for every 5 students	
4.	Ranging rods	At least 1 for a set of 5 students	
5.	Levelling staff		
6.	Cross staff		
7.	Chains		
8.	Tapes		
9.	Arrows	At least 5 for a set of 5 students	
10.	GPS	3 no's	

CE23331	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	3	1	1	1	3	2	1	3	3	2	1
CO 2	3	2	2	2	3	1	1	1	3	2	1	3	3	2	1
CO 3	3	2	2	2	3	1	1	1	3	2	1	3	3	2	1

CO 4	3	2	2	2	3	1	1	1	3	2	1	3	3	2	1
CO 5	3	2	2	2	3	1	1	1	3	2	1	3	3	2	1
Average	**3**	**2**	**2**	**2**	**3**	**1**	**1**	**1**	**3**	**2**	**1**	**3**	**3**	**2**	**1**

Prepared by Name and signature	**Approved by Name and Signature**
Mrs.M.GOUTHAM PRIYA, ASSISTANT PROFESSOR (SG)/CIVIL	

Course Code	Course Title (Lab Oriented Theory Course)	Category	L	T	P	C
MA23331	TRANSFORMS AND STATISTICS	BS	3	0	2	4
Common to III sem. B.E. – Civil Engineering, Mechanical Engineering and Automobile Engineering						

Objectives:
To express Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
To represent continuous function arising in wave and heat propagation, signals and systems using Fourier Transforms.
To provide numerical techniques in solving the boundary value problems.
To formulate and test a hypothesis, using critical values to draw conclusions and determining probability of making errors in hypothesis tests.
To provide the necessary basic concepts of a few statistical methods in designing and solving problems.

UNIT-I	FOURIER SERIES	9
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**
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity - Application to boundary value problems.		
UNIT-III	**BOUNDARY VALUE PROBLEMS**	**9**
Solution of one dimensional wave equation with one non zero boundary conditions- Finite difference techniques for the solution for PDE - One Dimensional Wave Equation by Explicit method - One dimensional equation of heat conduction - Numerical computation :Heat flow equation by implicit and explicit methods		
UNIT-IV	**STATISTICAL TESTING**	**9**
Maximal Likelihood estimation – Parameters of Binomial and Poisson distribution - Tests of significance – Z test: Single mean, difference of means- Chi square - F test.		
UNIT-V	**ANOVA**	**9**
Design of Experiments - Completely randomized design – Randomized block design –Latin square design.		
		Total Contact Hours: 45

S.No	List of Experiment (using R Software)	Total Contact Hours: 30
1	Basic functions in MATLAB	
2	Mathematical functions in MATLAB	
3	Plotting data sets using MATLAB	
4	Control flow -Loops	
5	Reading and writing data sets – importing data sets	
6	Testing of Hypothesis – Z, t, F and chi-square testing	
7	ANOVA – one way and two way	
8	Fourier Series using MATLAB	
9	Fourier Transform using MATLAB	
10	BVP solving using MATLAB – using bvp4c and bvp5c solvers.	

Course Outcomes: On completion of course students will be able to	
●	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in engineering problems such as system communications, digital signal processing and field theory.
●	Apply the shifting theorems, Fourier integral theorems, Inverse Fourier sine and cosine transforms appropriate problems in engineering and technology.
●	Solve differential equations numerically that arise in course of solving complex engineering problems.
●	Formulate, test and interpret various nonparametric tests for problems in engineering and technology. That is, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
●	Design of experiments using suitable ANOVA techniques and draw conclusions.

SUGGESTED ACTIVITIES

Problem solving sessions Activity Based Learning Test of hypothesis and ANOVA using online calculator.

SUGGESTED EVALUATION METHODS Problem solving in Tutorial sessions Assignment problems Quizzes and class test Discussion in classroom

Text Books:	
1	Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
2	Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt.Ltd.,New Delhi, Second reprint, 2012.
3	Veerarajan T., 'Probability, Statistics and Random Processes (with Queueing Theory and Queueing Networks)', Mc Graw Hill, 2016.
4	Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2014.
5	Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

Reference Books / Web links:	
1	Kandasamy P., Thilagavathi and K. Gunavathi., "Statistics and Numerical Methods", S. Chand & Company Ltd. (2010).
2	Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
3	Ray Wylie C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
4	Johnson R.A., and Gupta. C.B., "Miller and Freund's Probability and Statistics for Engineers",11thEdition, Pearson Education, , Asia, 2011.
5	Walpole R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.
6	Spiegel M.R., Schiller. J., and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill Edition, 2004.

MA23331	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	3	2	1	-	-	-	-	-	-	1	2	1	2
CO 2	3	3	3	2	1	-	-	-	-	-	-	1	2	1	2
CO 3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	3	3	2	1	-	-	-	-	-	-	-	-	-	-	1
CO 5	3	3	3	2	-	-	-	-	-	-	-	-	-	-	1
Average	**3**	**2.8**	**2.6**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**1.5**

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DEPARTMENT OF MATHEMATICS	

Course Code	Course Title (Laboratory course)	Category	L	T	P	C
CE23321	CONSTRUCTION MATERIALS LABORATORY	PC	0	0	4	2

Objectives:

- To acquire knowledge on the quality of bricks through various laboratory tests.
- To develop proficiency in executing standard tests to assess compressive strength, consistency, specific gravity, and other critical parameters that determine the suitability of materials for construction purposes.
- To evaluate the suitability of various construction materials for specific applications based on their physical and mechanical properties, focusing on performance under different conditions.
- To conduct all standardized tests to assess the quality of bitumen.
- To develop an understanding on the determination of Binder Content in bituminous mixes.

List of Experiments

I	**TEST ON BRICKS**
1	Test for compressive strength
2	Test for Water absorption
3	Determination of Efflorescence
II	**TEST ON CEMENT**
4	Determination of fineness
5	Determination of consistency
6	Determination of initial and final setting time
7	Determination of specific gravity
III	**TEST ON AGGREGATES**
8	Compacted and loose bulk density of fine aggregate
9	Determination of elongation index and flakiness index
10	Determination of impact value and aggregate crushing value
IV	**TEST ON CONCRETE**
11	Test for slump
12	Test for Compaction factor
13	Test for Compressive strength - Cube & Cylinder
14	Test for Flexural strength
V	**NON DESTRUCTIVE TESTS**
15	Rebound Hammer
16	Ultra sonic Pulse velocity
VI	**TEST ON BITUMEN**
17	Specific gravity determination of the bitumen/asphalt sample.
18	Determination of consistency of the bituminous material.
19	Viscosity determination of bituminous binder.
20	Determination of softening point of the asphalt/bitumen sample
21	Determination of optimum binder content by Marshall method
22	Determination of ductility value of the bitumen sample
23	Estimation of loss of bitumen on heating
VII	**TEST ON BITUMEN MIXES**
24	Determination of stripping value of the bituminous mix Demonstration
25	Determination of bitumen content in the bituminous mix by cold solvent extraction method
	Total Contact Hours : 60

Course Outcomes:

On completion of the course, the students will be able to

- Analyze the quality of bricks through laboratory tests.
- Evaluate the tests of cement and aggregates through laboratory tests.
- Analyze the quality of concrete and methods of Non Destructive tests.
- Compute the standardized tests to assess the quality of bitumen.

	Determine the Binder Content in bituminous mixes.
Reference Book(s) / Web link(s):	
1	Construction Materials Laboratory Manual, Anna University, Chennai-600 025
2	Highway Materials and Pavement Testing, Nem Chand and Bros., Roorkee, Revised Fifth Edition, 2009
3	http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Transportation_Engineering_Lab/index.html
Code Book(s):	
1	IS 4031 (Part 1) – 1996 – Indian Standard Codes.
2	IS 4031 (Part 3 and Part 5) – 1988
3	IS 2386 (Part 1 to Part 6) – 1963
4	IS 383– 2016 Indian Standard specification for coarse and fine aggregates from natural sources forconcrete.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Quantity
1.	Concrete Cube moulds	6 No's
2.	Concrete Cylinder moulds	3 No's
3.	Concrete Prism moulds	3 No's
4.	Sieves	1 Set
5.	Concrete Mixer	1 No
6.	Slump cone	3 No's
7.	Flow table	1 No
8.	Vibrator	1 No
9.	Trovels	3 No's
10.	Compression Testing Machine	1 No
11.	Aggregate Impact testing machine	1 No
12.	Flexure Testing Machine	1 No
13.	Blains Apparatus	1 No
14.	Hot Air Oven	1 No
15.	Sieve Shaker– Motorized	1 No
16.	Electronic Weigh Balance – 100kg	1 No
17.	Electronic Weigh balance – 30kg	1 No
18.	Pyconometer	2 No's
19.	Bitumen density bottle	4 No's
20	Rebound Hammer Test Equipment	1 No
21	Ultrasonic Pulse Velocity	1 No
22	Marshall Stability Test Apparatus - (Motorized, 50kN capacity, single speed)	1 No
23	Laboratory California Bearing Ratio Test Apparatus - (Motorized; Three speed type; 50kN capacity)	1 No
24	Tar Viscometer	1 No
25	Ductility Testing Machine	1 No

26	Abrasion Testing Machine	1 No
27	Universal Penetrometer	1 No
28	Softening Point Apparatus	1 No
29	Centrifuge Extractor	1 No

CE23321	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	1	1	2	1	3	3	1	3	3	3	2
CO 2	3	3	3	2	1	1	2	1	3	3	1	3	3	3	2
CO 3	3	3	3	2	1	1	2	1	3	3	1	3	3	3	2
CO 4	3	3	3	2	1	1	2	1	3	3	1	3	3	3	2
CO 5	3	3	3	2	1	1	2	1	3	3	1	3	3	3	2
Average	**3**	**3**	**3**	**2**	**1**	**1**	**2**	**1**	**3**	**3**	**1**	**3**	**3**	**3**	**2**

Prepared by Name and signature	Approved by Name and Signature
MS. A. J. JEYA ARTHI, ASSISTANT PROFESSOR (SS) /CIVIL	

Course Code	Course Title (Laboratory course)	Category	L	T	P	C
CS23422	PYTHON PROGRAMMING FOR MACHINE LEARNING	ES	0	0	4	2

Course Objectives:

This course is aimed at enabling the students to:

	To understand the relationship of the data collected for decision making.
	To know the concept of principal components, factor analysis and cluster analysis for profiling and interpreting the data collected.
	Lay the foundation of machine learning and its practical applications and prepare students for real-time problem-solving in data science.
	Develop self-learning algorithms using training data to classify or predict the outcome of future datasets.
	Distinguish overtraining and techniques to avoid it such as cross-validation.

List of Experiments

1.	NumPy Basics: Arrays and Vectorized Computation
2.	Getting Started with pandas
3.	Data Loading, Storage, and File Formats
4.	Data Cleaning and Preparation
5.	Data Wrangling: Join, Combine, and Reshape
6.	Plotting and Visualization
7.	Data Aggregation and Group Operations
8.	Time Series
9.	Supervised Learning
10.	Unsupervised Learning and Pre-processing
11.	Representing Data and Engineering Features
12.	Model Evaluation and Improvement

Contact Hours : 60

Course Outcomes:

On completion of the course, students will be able to:

	Develop a sound understanding of current, modern computational statistical approaches and their application to a variety of datasets.
	Analyze and perform an evaluation of learning algorithms and model selection.
	Compare the strengths and weaknesses of many popular machine learning approaches.
	Appreciate the underlying mathematical relationships within and across machine learning algorithms and the paradigms of supervised and unsupervised learning.
	Design and implement various machine learning algorithms in a range of real-world applications.

Text Books:

1.	Wes McKinney, Python for Data Analysis - Data wrangling with pandas, Numpy, and ipython, Second Edition, O'Reilly Media Inc, 2017.
2.	Andreas C. Müller and Sarah Guido, Introduction to Machine Learning with Python - A Guide for Data Scientists, First Edition, O'Reilly Media Inc, 2016.

Reference Books:

1.	Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Media Inc, 2019.

CS23422	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	2	2	1	-	-	-	1	1	1	1	3	3	-
CO 2	2	1	1	1	1	-	-	-	-	-	1	1	3	2	-
CO 3	1	1	2	1	2	-	-	-	-	-	1	1	2	3	2
CO 4	2	2	3	2	2	-	-	-	-	-	2	1	2	2	2
CO 5	2	2	3	2	3	-	-	-	-	-	2	1	2	2	2
Average	**1.8**	**1.6**	**2.2**	**1.6**	**1.8**	**0.0**	**0.0**	**0.0**	**0.2**	**0.2**	**1.4**	**1**	**2.4**	**2.4**	**2**

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DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	

SEMESTER IV

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23411	STRENGTH OF MATERIALS II	PC	3	0	0	3

Objectives:

- To analyze and calculate the deflections of structures and mechanical components under various loading conditions
- To equip students with the tools to evaluate column stability, compute critical loads to ensure structural safety.
- To determine stress, strain, and deformation in cylindrical and shell-like structures subjected to internal pressures
- To provide students with the theoretical foundation and analytical skills required to understand and solve problems related to stress and strain analysis.
- To assess the unsymmetrical bending in beam sections and theories of failures.

UNIT-I	**ENERGY PRINCIPLES**	**9**

Strain energy – strain energy due to axial load (gradual, sudden and impact loads), shear, flexure and torsion – Castigliano's theorems I & II- Principle of virtual work – application of energy theorems for computing deflections in beams and trusses

UNIT-II	**COLUMNS**	**9**

Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Rankine's -Gordon's formula for eccentrically loaded columns – Eccentrically loaded short columns – middle third rule – core of the section

UNIT-III	**CYLINDER AND SHELLS**	**9**

Thin cylinders and shells under internal pressure – Deformation of Thin cylinders and shells - Thick cylinders – Compound cylinders.

UNIT-IV	**STATE OF STRESS IN 2D AND 3D**	**9**

Principal Stress – Principal Strain in 2D – Shear Stress - Determination of principal stresses and principal planes in three dimensions – Volumetric strain.

UNIT-V	**ADVANCED TOPICS AND THEORIES OF FAILURE**	**9**

Unsymmetrical bending of beams of symmetrical – curved beams – Winkler Bach formula - Theories of failure – Principal stress - Principal strain – shear stress – Strain energy and distortion energy theories – application in analysis of stress, load carrying capacity.

	Total Contact Hours	**:**	**45**

Course Outcomes:

On completion of the course students will be able to

- Be proficient in using energy theorems to compute deflections in beams and trusses.
- Analyze the stability of columns using Euler's theory and determine the critical load for columns with various end conditions.
- design cylinders by considering the interaction of concentric cylinders under pressure and evaluating stress distributions.
- Evaluate principal stresses, strains, and volumetric strain in multi-dimensional stress states.
- Assess structural safety using theories of failure and advanced concepts like unsymmetrical bending.

SUGGESTED ACTIVITIES

Problem solving sessions for all units

SUGGESTED EVALUATION METHODS

Tutorial problems for all units

Text Book (s):

1	Rajput R.K. "Strength of Materials (Mechanics of Solids)", S. Chand & company Ltd., New Delhi, 2010.
2	Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012.

Reference Book(s)/ Web link(s):

1	Kazimi S.M.A, “Solid Mechanics”, Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2	Punmia B.C. "Theory of Structures" (SMTS) Vol I&II, Laxmi Publishing Pvt Ltd, New Delhi 2004.
3	R.K. Bansal "Strength of Materials", Lakshmi Publications Pvt Ltd, New Delhi, 2018

CE23411	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	2	2	1	2	1	1	1	1	1	2	3	2	1
CO 2	3	3	2	2	2	1	1	1	2	1	1	2	3	3	2
CO 3	3	3	3	2	2	1	2	1	2	1	1	2	3	3	2
CO 4	3	3	2	3	2	1	1	1	2	1	1	2	3	2	1
CO 5	3	3	3	3	2	2	2	2	2	2	2	3	3	3	3
Average	**3**	**3**	**2.4**	**2.4**	**1.8**	**1.6**	**1.4**	**1.2**	**1.8**	**1.2**	**1.2**	**2.2**	**3**	**2.6**	**1.8**

Prepared by Name and signature	**Approved by Name and Signature**
DR.S.PREM KUMAR,ASSISTANT PROFESSOR (SS)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23412	HYDRAULICS AND IRRIGATION STRUCTURES	PC	3	0	0	3

Objectives:
• To impart knowledge on open channel flow and its characteristics.
• To provide a comprehensive understanding of the functions, working principles, and structural components of diversion headworks, regulators, canal escapes, outlets and cross-drainage works.
• To explore the gradually varied flow and its profiles.
• To analyze the rapidly varying flow.
• To evaluate the performance and characteristics of centrifugal pumps and Pelton turbine.

UNIT-I	**OPEN CHANNEL FLOWS**	**9**
Types of open channel flow – Characteristics of open channel - Velocity distribution in open channel - Steady uniform flow: Chezy's equation, Manning's equation - Best hydraulic sections for Uniform flow – Wide open channel.		
UNIT-II	**DIVERSION HEAD WORK AND REGULATORS**	**9**
Weir and Barrage – Gravity and Non –gravity weir- Layout of a diversion head works and its components – Under sluice –Divide wall- River training works- fish ladder. Canal regulation works –Distributary Head regulator and cross regulator- Types of canal escapes – Types of outlets - cross drainage works		
UNIT-III	**GRADUALLY VARIED FLOW**	**9**
Specific energy - Critical flow, Subcritical and Super Critical flow-Dynamic equations of gradually varied flows – Classification of flow profiles –Profile determination by Direct step method and Standard step method.		
UNIT-IV	**RAPIDLY VARIED FLOW**	**9**
Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation – Positive and Negative surges.		
UNIT-V	**PUMPS AND TURBINES**	**9**
Classification of Pumps - Centrifugal pumps – Work done - Minimum speed to start the pump - Multistage pumps – Characteristics curve. Classification of Turbines – Pelton wheel - Draft tube and cavitation - Specific speed – Characteristic Curves of Turbines.		
Total Contact Hours: 45		

Course Outcomes: On completion of the course students will be able to
• Explain the principles and computations of open channel flow, including velocity distribution, hydraulic sections, and flow characteristics.
• Analyze the functions and components of diversion headworks, regulators, canal escapes, outlets and cross drainage works.
• Analyze gradually varied flow profiles using dynamic equations and standard computation methods.
• Assess rapidly varying flows and their practical applications, including hydraulic jumps and surges.
• Determine performance characteristics of pumps and turbines, including specific speed.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

Problem solving sessions - Best hydraulic sections for Uniform flow

Flipped classroom - Diversion head works

Activity Based Learning - Flow profiles

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

Tutorial problems - Unit I, Unit III to Unit V

Assignment problems - Unit I, Unit III to Unit V

Quizzes - All Units

Class Presentation/Discussion – Unit -II

Text Book(s):

R.K. Bansal, "Fluid mechanics and hydraulic machines," Laxmi Publications (P) Ltd, 2006

P.N. Modi & S.M. Seth, "Hydraulics and fluid mechanics including hydraulic machines,"
Standard book house, 2005.

Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009.

Reference Books(s) / Web links:
K. Subramanya, "Flow in open channels", Tata McGraw Hill, New Delhi, 2000.
Arora K.R. Fluid Mechanics Hydraulics and Hydraulic Machines, Standard publishers, New Delhi, 2005
Santosh Kumar Garg "Irrigation Engineering and Hydraulic Structures" Khanna Publisher, 2012

CE23412	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	1	2	2	2	2	2	1	3	3	2	2
CO 2	2	2	2	3	1	2	2	2	2	2	1	3	2	2	2
CO 3	3	3	3	2	1	2	2	2	2	2	1	3	3	2	2
CO 4	3	3	3	2	1	2	2	2	2	2	1	3	3	2	2
CO 5	3	3	3	2	1	2	2	2	2	2	1	3	3	2	2
Average	**2.8**	**2.8**	**2.8**	**2.2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**	**2.8**	**2**	**2**

Prepared by Name and signature	**Approved by Name and Signature**
DR.M.UMA MAGUESVARI, PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23413	WATER SUPPLY ENGINEERING	PC	3	0	0	3

Objectives:

- To understand supply and demand concepts, to quantify water, to comprehend water characteristics and to know regulatory standards.
- To design water supply mains, understand how it is laid, jointed and tested and to know pipe materials, pumps and appurtenances.
- To know the principles, functions, construction, operation and maintenance aspects of water treatment units.
- To become familiarized with the principles, functions, operation and maintenance aspects of advanced water treatment methods.
- To determine the requirements of water distribution, design of service reservoirs, water distribution networks, house service connection and pipe fittings & fixtures.

UNIT-I	SOURCES OF WATER	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 – Source Water quality – Characterization – Significance – Drinking Water quality standards, quality of water for swimming pools.

UNIT-II	CONVEYANCE FROM THE SOURCE	9

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

UNIT-III	WATER TREATMENT	11

Objectives – Unit operations and processes – Principles, functions and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clariflocculator - Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Construction, Operation and Maintenance aspects.

UNIT-IV	ADVANCED WATER TREATMENT	8

Water softening – Desalination - R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems – Iron and Manganese removal - Defluoridation – Removal of Arsenic - Operation & Maintenance aspects – Recent advances.

UNIT-V	WATER DISTRIBUTION AND SUPPLY	8

Requirements of water distribution – Components – Service reservoirs– Functions – Network design – Economics – Analysis of distribution networks - Computer applications – Leak detection. Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing, effects of Corrosion in pipes and its prevention.

Total Contact Hours: 45

Course Outcomes:
On completion of the course, the students will be able:

- Estimate water demand, forecast future population, comprehend water characteristics & water quality standards.
- Design water transmission pipes, to understand laying, jointing and testing of pipes, appurtenances and pumps.
- Design treatment units like aerator of flash mixer, clarifloculator, plate and tube settler, pulsator clarifier, sand filter and disinfection units.
- Estimate the quantity of water softener & disinfectant and to incorporate suitable advanced treatment methods based on the water characteristics.
- Design service reservoirs, water distribution networks and be familiar with house service connection and pipe fittings & fixtures.

SUGGESTED ACTIVITIES:
Problem solving sessions:

Unit-1: Population forecasting problems

Unit-2: Flow through pipes problems

Unit-3: Problems on flash mixer, Clariflocculator and rapid sand filter

Unit-4: Problems on demineralization

Unit-5: Service reservoir problems

SUGGESTED EVALUATION METHODS: Tutorial problems Assignment problems

Text Book(s):
1. Garg S.K. 'Water Supply Engineering, Environmental Engineering, Vol.I', Khanna Publishers, New Delhi, 2022.
2. Dr. B.C. Punmia, B.C. Ashok Jain and Arun Jain, Water Supply Engineering, Environmental Engineering-I, Laxmi Publications (P) Ltd., New Delhi, 2016
3. Dr. P.N. Modi, Water Supply Engineering, Environmental Engineering-I, Standard Book House, Rajsons Publications Pvt Ltd, Delhi, 2018.

Reference Books(s) / Web links:
1. Syed R. Qasim and Edward M. Motley, Guang Zhu, Water Works Engineering, Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.
2. Warren Viessman Jr, Mark J. Hammer, Water Supply and Pollution Control, Pearson Publisher, 8th Edition, Jan 2015
3. Peavy, Rowe, Tchobanoglous, "Environmental Engineering", McGraw Hill Publishers, New Delhi, 7th Edition, 2017

Code Book & Manual:
1. IS10500:2012, Water Quality Standards, New Delhi
2. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.

CE23413	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	1	3	3	1	1	1	1	3	3	2	1
CO 2	3	3	3	2	1	3	3	1	1	1	1	3	3	2	1
CO 3	3	3	3	2	1	3	3	1	1	1	1	3	3	2	1
CO 4	3	3	3	1	1	3	3	1	1	1	1	3	3	2	1
CO 5	3	3	3	2	1	3	3	1	1	1	1	3	3	2	1
Average	**3**	**3**	**3**	**1.8**	**1**	**3**	**3**	**1**	**1**	**1**	**1**	**3**	**3**	**2**	**1**

Prepared by Name and signature	Approved by Name and Signature
DR.M.SELVAKUMAR, PROFESSOR & DEAN /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23414	HIGHWAY AND RAILWAY ENGINEERING	PC	3	0	0	3

Objectives:

- To analyze the development of highways in India and understand the fundamentals of highway classification, planning, and design.
- To design the various cross sectional elements of highway, including horizontal and vertical curves, and the application of IRC standards for pavement design.
- To impart knowledge on the best practices for construction and maintenance of highways, emphasizing material selection, testing methods, and drainage systems.
- To explore the elements of railway systems, focusing on track stress management, geometric design, and the integration of modern survey methods.
- To delve into railway construction methods, emphasizing earthwork, track stabilization, and tunneling, along with maintenance practices for longevity and efficiency.

UNIT-I	HIGHWAY ENGINEERING	8

History of road development in India – The role of highway transportation –Classification of highways Institutions for Highway planning, design and construction at different levels –master plan–20 year road development plan– principles of highway alignment – factors influencing highway alignment –Typical cross sections of Urban and Rural roads.

UNIT-II	DESIGN OF HIGHWAY ELEMENTS	10

Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients– pavement components and their role – Introduction to Design practice of flexible and rigid pavements (IRC methods only).

UNIT-III	HIGHWAY CONSTRUCTION AND MAINTENANCE	9

Highway construction materials, properties, testing methods – Construction practice of flexible and concrete pavement- Highway drainage–Evaluation and Maintenance of pavements.

UNIT-IV	RAILWAY PLANNING AND CONSTRUCTION	10

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods - Geometric design of railway, gradient, super elevation, widening of gauge on curves - Level Crossings.

UNIT-V	RAILWAY CONSTRUCTION AND MAINTENANCE	8

Earthwork – Stabilization of track on poor soil - Tunnelling Methods, drainage and ventilation – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and yards and passenger amenities.

Total Contact Hours: 45 PERIODS

Course Outcomes:

On completion of the course students will be able to

- Comprehend the historical context, classify different types of highways, and identify the key institutions involved in highway planning and design.
- Design highway elements following safety and performance standards, using IRC methods for flexible and rigid pavements.
- Identify high quality construction materials and apply testing techniques to maintain best practices for construction and maintenance of highways, emphasizing on drainage systems.
- Design railway tracks considering operational stresses and safety regulations, and apply modern methods for route alignment.
- Construct and maintain railway infrastructure, ensuring operational efficiency and passenger safety through advanced construction and maintenance techniques.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

Activity Based Learning - UNIT-1,2,3

Implementation of small module –UNIT-4,5

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

Quizzes-UNIT-1,2,3,4,5

Class Presentation/Discussion-UNIT-1,2,3

Text Book(s):
1. Traffic Engineering and Transport Planning, Kadiyali, L.R., Khanna Publishers, 2018, Ninth Edition.
2. Highway Engineering, Khanna, S.K., Justo C.E.G., and Veeraragavan A., Nem Chand and Bros., Roorkee, India,2017, Tenth Edition
3. Highway Materials and Pavement Testing, Khanna, S.K., Justo, C.E.G. and A.Veeraragavan, Nem Chand and Bros, Roorkee, India, 2013, Fifth Edition.
4. Railway Engineering, S.C. Saxena and S.P. Arora, Dhanpat Rai Publications, India, 2024, 8th Edition.

Reference Books(s) / Web links:
1. Principles of Pavement Design, Yoder E.J. and M.W. Witczak., Second Edition, John Wiley 3and Sons, New York,USA, 2012
2. Railway Engineering, Satish Chandra and M M Agarwal, Oxford University Press, 2013, 2nd Edition.
3. Principles of Transportation Engineering, Chakroborty, P. and Animesh Das., Prentice Hallof India Pvt. Ltd, New Delhi, India, 2017, Second Edition.

CE23414	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	1	1	1	2	1	1	1	1	1	3	1	1
CO 2	3	3	3	3	1	1	2	1	1	1	1	1	3	1	2
CO 3	3	2	2	1	1	1	2	1	1	1	1	1	3	1	1
CO 4	3	3	3	3	1	1	2	1	1	1	1	1	3	1	2
CO 5	3	3	3	3	1	1	2	1	1	1	1	1	3	1	1
Average	**3**	**2.6**	**2.6**	**2.2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**1.4**

Prepared by Name and signature	Approved by Name and Signature
MRS. GOUTHAM PRIYA M, ASSISTANT PROFESSOR (SG)/CIVIL	

Course Code	Course Title (Lab Oriented Theory Course)	Category	L	T	P	C
CE23431	SOIL MECHANICS	PC	3	0	2	4

Objectives:

- To understand the fundamental principles of soil classification, soil compaction, and their importance in geotechnical engineering.
- To develop a thorough understanding of effective stress principles, soil permeability, and the movement of water through soils, including laboratory and field methods for determining permeability and the application of flow nets in geotechnical engineering.
- To understand the principles of stress distribution, settlement analysis, and consolidation in soils and apply these concepts to compute settlement rates and evaluate soil behavior under load.
- To understand the fundamental concepts of shear strength in soils, the mechanics of stress-strain behavior, and the application of laboratory testing methods to evaluate shear strength under various drainage and loading conditions.
- To study the principles of slope stability, analyze the factors contributing to slope failures, and apply various analytical methods and design techniques to evaluate and ensure the stability of slopes in geotechnical engineering projects.

UNIT-I SOIL CLASSIFICATION AND COMPACTION **9**

Formation of soil – 3-phase soil system – Volumetric relationships and weight-volume relationships - Soil index properties – Particle Size Classification - Indian Standard Classification System – Clay Mineralogy - Compaction of Soil – Theory and factors influencing compaction of soil – Field compaction methods.

UNIT-II EFFECTIVE STRESS AND PERMEABILITY **9**

Types of Soil water – Capillary phenomena – Effective stress concepts in soil – Permeability – Darcy's law – Determination of Permeability of soil – Laboratory methods (Constant head and falling head methods) - Field measurement - pumping out test in unconfined and confined aquifer – Permeability of stratified soil - Factors influencing permeability of soil – Seepage velocity – Seepage pressure - Quick Sand Condition – Introduction to flow nets – properties and uses.

UNIT-III STRESS DISTRIBUTION AND SETTLEMENT **9**

Stress distribution in homogeneous and isotropic medium – Boussinesq's theory for point loads, uniformly loaded circular and rectangular areas – Newmark's influence chart – Contact pressure distribution in sand and clay, Components of settlement — Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. –- √t and log t methods, e-log p relationship.

UNIT-IV SHEAR STRENGTH **9**

Shear strength of cohesive and cohesionless soil – Normal and Shear Stresses on a plane – Mohr's Stress Circle - Mohr-Coulomb failure theory – Measurement of shear strength - Direct shear test, Triaxial compression test, Unconfined Compression test and Vane shear test - Different drainage conditions – Factors influencing shear strength of soil.

UNIT-V SLOPE STABILITY **9**

Slope failures – Types and causes – Stability Analysis - Infinite slopes and finite slopes – Taylor's stability charts – Friction circle method - Swedish Circle Method - Fellenius method – Determination of center of most critical slip circle - Slope protection measures.

Contact Hours : 45

List of Experiments

1	**DETERMINATION OF INDEX PROPERTIES OF SOIL** Specific gravity of soil solids Grain size distribution – Sieve analysis Grain size distribution - Hydrometer analysis Atterberg's limits- Liquid limit, Plastic limit & Shrinkage limit tests Free Swell Index test
2	**DETERMINATION OF INSITU DENSITY & COMPACTION CHARACTERISTICS OF SOIL** Field Density test (Sand replacement method and Core cutter method) Determination of moisture – density relationship using Standard Proctor Compaction test Determination of Relative Density of coarse-grained soil
3	**DETERMINATION OF ENGINEERING PROPERTIES OF SOIL** Determination of Permeability of soil (Constant head method and Falling head method) One Dimensional Consolidation test (Determination of Co-efficient of consolidation only) Direct Shear test on cohesionless soil Unconfined Compression test on cohesive soil Laboratory Vane Shear test on cohesive soil Tri-axial Compression test (Demonstration only) California Bearing Ratio test

Contact Hours : 30

Total Contact Hours : 75

Course Outcomes:	
On completion of the course, the students will be able to	
●	Classify soils based on Indian Standard Classification System and analyze soil compaction behavior under different field conditions to optimize soil performance in engineering projects.
●	Evaluate the effective stress and permeability characteristics of soils through laboratory and field tests, and analyze seepage and flow conditions to address engineering challenges such as quicksand conditions and groundwater flow.
●	Analyze stress distribution in soils, assess settlement components, and apply consolidation theories to predict and mitigate settlement in geotechnical engineering projects.
●	Determine the shear strength of cohesive and cohesionless soils using different laboratory tests and analyze the factors influencing shear behavior for practical applications in geotechnical design and construction.
●	Analyze the stability of infinite and finite slopes using methods such as Taylor's stability charts and Swedish Circle Method, determine critical slip surfaces, and recommend appropriate slope protection measures.
Suggested Activities	
●	Problem solving sessions
Suggested Evaluation Methods	
●	Quizzes
●	Tutorial problems, Assignment problems
Text Book(s):	
1	Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.
2	Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2018.
3	Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publishers, 3rd Edition, 2019.
Reference Books(s) / Web links:	
1	Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
2	McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics". Prentice Education Ltd., 2014.
3	Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.
4	Venkatramaiah, C., "Geotechnical Engineering", New Age International (P) Limited, Publishers, Fourth Revised Edition, 2012.
5	Geotechnical Engineering Laboratory - - Unit 3 - Week 1 (nptel.ac.in)
6	Geotechnical Engineering Laboratory - - Unit 4 - Week 2 (nptel.ac.in)
7	Geotechnical Engineering Laboratory - - Unit 5 - Week 3 (nptel.ac.in)
8	Geotechnical Engineering Laboratory - - Unit 6 - Week 4 (nptel.ac.in)

Lab Equipment Required:

Sl. No.	Name of the Equipment	Quantity Required (For a batch of 30 students)
1.	Sieve Set	2
2.	Pycnometer	2
3.	Hydrometer Apparatus	2
4.	Liquid Limit, Plastic Limit & Shrinkage Limit Apparatus	2
5.	Sand Replacement Method Accessories	2
6.	Core Cutter Method Apparatus	2
7.	Standard Proctor Compaction Apparatus	2
8.	Relative Density Equipment	1
9.	Permeability Apparatus	1
10.	Three Gang Consolidation Test Equipment	1
11.	Direct Shear Test Equipment	1
12.	Unconfined Compression Test Equipment	1
13.	Laboratory Vane Shear Test Equipment	1
14.	Triaxial Compression Test Equipment	1
15.	California Bearing Ratio Test Equipment	1
16.	Weighing Balance – 30 kg capacity	1
17.	Weighing Balance – 1 kg capacity	2

CE23431	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	1	1	1	2	1	1	2	**3**	**3**	**2**
CO 2	3	3	2	2	1	1	1	1	2	1	1	2	**3**	**2**	**2**
CO 3	3	3	2	2	1	1	1	1	2	1	1	2	**3**	**2**	**2**
CO 4	3	3	2	2	1	1	1	1	2	1	1	2	**3**	**2**	**2**
CO 5	3	3	3	2	1	1	2	1	1	1	1	2	**3**	**1**	**2**
Average	**3**	**3**	**2.2**	**2**	**1**	**1**	**1.2**	**1**	**1.8**	**1**	**1**	**2**	**3**	**2**	**2**

Prepared by Name and signature	Approved by Name and Signature
MRS. S. MUTHU LAKSHMI, ASSISTANT PROFESSOR (SG)/CIVIL	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
CE23421	STRENGTH OF MATERIALS AND HYDRAULIC ENGINEERING LABORATORY	PC	0	0	4	2

Objectives:
• To assess the mechanical properties of materials through experimental investigation.
• To gain knowledge of the calibration process for flow measurement apparatus and its applications.
• To analyze and interpret losses occurring in pipe flow systems.
• To learn the principles of pump and turbine operations and explore their real-time applications.
• To identify and evaluate the properties of open channel flow through experiments.

Description of the Experiments	Total Contact Hours: 60
1. Tension Test on Mild Steel Rod.	
2. Double Shear Test on Metal.	
3. Torsion Test on Mild Steel Rod.	
4. Impact Test on Metal Specimen (Izod and Charpy).	
5. Hardness Test on Metals (Rockwell and Brinell Hardness Tests).	
6. Deflection Test on Metal Beams - Simply Supported Beam / Cantilever Beam.	
7. Compression Test on Helical Spring	
8. Tension Test on Helical Spring.	
9. Bernoulli's Experiment.	
10. Coefficient of Discharge of Orifice Meter / Venturi Meter.	
11. Determination of Friction Loss in Pipes	
12. Determination of Various Types of Minor Losses in Pipes	
13. Characteristics of Centrifugal pumps / Reciprocating Pump.	
14. Characteristics of Pelton wheel turbine.	
15. Characteristics of Francis turbine / Kaplan turbine.	
16. Open channel Flow	

Course Outcomes:
On completion of the course, the students will be able to
• Perform mechanical tests on materials, including tension, shear, torsion, impact, hardness, and deflection, to evaluate their properties and behavior.
• Analyze spring behavior under compression and tension through experimental testing.
• Determine fluid flow parameters using Bernoulli's experiment, orifice meters, and Venturi meters.
• Evaluate friction losses and minor losses in pipes to understand energy loss in fluid flow.
• Examine the performance characteristics of pumps, turbines, and open channel flow for hydraulic applications.

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic
Experiment based viva

Web links for virtual lab (if any)
https://fmc-nitk.vlabs.ac.in/
https://fm-nitk.vlabs.ac.in/List%20of%20experiments.html

Lab equipment required:

S. No	Name of the Equipment	Quantity Required	Remarks
1.	Universal Testing Machine	1	
2.	Torsion Testing Machine	1	
3.	Impact Testing Machine	1	

4.	Hardness Testing Machine Rockwell Brinell	1 Each	
5.	Beam Deflection Test Apparatus	1	
6.	Bernoulli's Experiment	One set up	
7.	Rotameter	One set up	
8.	Venturi meter/Orifice meter	One set up	
9.	Centrifugal Pump	One set up	
10.	Pelton Wheel turbine	One set up	
11.	Francis turbine	One set up	
12.	Kaplan Turbine	One set up	
13.	Open Channel Flow Apparatus	One set up	

CE23421	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	2	2	2	1	3	1	2	3	3	2	2
CO 2	3	3	2	2	2	2	3	1	3	2	1	2	3	3	2
CO 3	3	3	2	2	3	2	2	1	3	1	3	2	3	3	2
CO 4	3	3	3	2	3	3	3	2	3	3	2	3	3	3	3
CO 5	3	3	3	2	3	3	3	2	3	3	3	3	3	3	3
Average	**3**	**3**	**2.6**	**2**	**2.6**	**2.4**	**2.6**	**1.6**	**3**	**2**	**2.4**	**2.6**	**3**	**2.6**	**2.6**

Prepared by Name and signature	Approved by Name and Signature
MRS. S. YUGASINI, ASSITANT PROFESSOR /CIVIL	

Subject Code	Subject Name	Category	L	T	P	C
GE23421	SOFT SKILLS-I	EEC	0	0	2	1

Objectives:

- To help the students break out of shyness.
- To build confidence
- To enhance English communication skills.
- To encourage students‟ creative thinking to help them frame their own opinions.

Learning and Teaching Strategy:

The program is completely student centric where the focus is on activities led by students which include role plays,
discussions, debates other games as well. These activities would be supplemented by interactive use of technologyand brief trainer input.

Week	Activity Name	Description	Objective
1	Introduction	The trainer and the college facilitator talk to the students about the course and in turn the students introduce themselves.	To set expectations about the course and the students are made aware of the rules and regulations involved in this program
2	If I ruled the world	This is a quick and useful game by getting students to form a circle and provide their point of view. Each student then repeats what the other has said and comes up with their own opinion.	The aim of this activity is to for students to get to know each other and also develop their listening skillsas well as learning how to agree and disagree politely.
3	Picture Narrating	This activity is based on several sequential pictures. Students are asked to tell the story taking place in the sequential pictures by paying attention to the criteria provided by the teacher as a rubric. Rubrics can include the vocabulary or structures they need to use while narrating.	The aim of this activity is to make the students develop creative way of thinking.
4	Brainstorming	On a given topic, students can produce ideas in a limited time. Depending on the context, either individual or group brainstorming is effective and learners generate ideas quickly and freely. The good characteristics of brainstorming are that the students are not criticized for their ideas so students will be open to sharing new ideas.	The activity aims at making the students speak freely without the fear of being criticized. It also encourages students to come up withtheir own opinions.
5	Debate	Is competition necessary in regards to the learning process?	The aim of this activity is to develop the students ability to debate andthink out of the box
6	Short Talks	Here the students are given topics for which they take one minute to prepare and two minutes to speak. They can write down points but can‟t read them out they can only use it as a reference.	The activity aims at breaking the students‟ shyness and encouraging them to standup in front of the class and speak. It also aims at creating awareness that they are restricted for time so they only speak points that are relevant and important.
7	Debate	Will posting students‟ grades on bulletin boards publicly motivate them to perform better or is it humiliating?	This activity aims at enhancing the students unbiased thought process when it comes to exams and grades as well as develop their skills to debate
8	The Art of diplomacy	The facilitator proceeds to share multiple concepts of conversation and helps the participants to identify the various methods of being diplomatic and how do deal with misinformation.	The aim of the lesson is to provide an opportunity for the participants to learn about body language and choosing the appropriate words for conversation.

9	Debate	Are humans too dependent on computers?	The aim of this activity is to test the students debating skills and thought process with a topic that affects everybody in daily life.
10	Story Completion	The teacher starts to tell a story but after 2 sentences he/she asks students to work in groups to create the rest of the story which includes the plot and the ending.	This activity aims at building their narrating skills as well as their creativity and ability to work in a team.
11	Role play debate	Students scrutinize different points of view or perspectives related to an issue. For example, a debate about the question "Should students be required to wear uniforms at school?" might yield a range of opinions. Those might include views expressed by a student (or perhaps two students – one representing each side of the issue), a parent, a school principal, a police officer, a teacher, the owner of a clothing store, and others.	The aim of this activity is to get students to speak based on other people‟s perspective instead of their own. The students take the role of various characters and debate accordingly.
12	I Couldn‟t Disagree More	This is a game where students practice rebuttal techniques where one student provides a thought or an idea and the other students starts with the phrase I couldn‟t disagree more and continues with his opinion	The aim of this activity is to improve general communication skills and confidence.
	Feedback	At the end of the session in the final week (12) the trainer would provide feedback to the students on best practices for future benefits	The aim is to do both give feedback to students as well as obtain feedback on the course from them.
			Total Contact Hours:30

Course Outcomes: At the end of the course the student will be able to

- Be more confident
- Speak in front of a large audience
- Be better creative thinkers
- Be spontaneous
- Know the importance of communicating in English.

GE23421	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
CO 2	1	-	-	-	-	-	1	-	1	3	1	1	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO 5	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
Average	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**3**	**1**	**1**	**-**	**-**	**-**

SEMESTER V

Course Code	Course Title (Theory Course)	Category	L	T	P	C
CE23511	DESIGN OF REINFORCED CONCRETE ELEMENTS	PC	3	1	0	4

Objectives:

- To understand the design philosophies of various methods used for the design of RC structures and to know the design concepts of beam members by working stress method and limit state method as per Codal provision.
- To know the design procedure for flanged beams and for beams subjected to bending, shear and torsion as per limit state method as per Codal provision.
- To familiarize with the design of all types of slabs for different boundary conditions and design of staircase as per Codal provision.
- To gain knowledge in designing of columns at different location as per Codal provision.
- To know the design concepts for isolated, combined footings and masonry wall subjected to different loading as per Codal provision.

UNIT-I	INTRODUCTION	12

Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC –Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT-II	DESIGN OF BEAMS	12

Analysis and design of Flanged beams – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per IS code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion.

UNIT-III	DESIGN OF SLABS AND STAIRCASE	12

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams-Two way slab- Design of simply supported and continuous slabs using IS Code coefficients- Types of Staircases – Design of dog-legged Staircase.-Introduction to Flat Slabs.

UNIT-IV	DESIGN OF COLUMNS	12

Types of columns –Axially Loaded columns – Design of short Rectangular, Square and Circular Columns –Design of Slender columns- Design for Uniaxial and Biaxial bending using Design aids.

UNIT-V	DESIGN OF FOOTINGS	12

Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

Total Contact Hours	:	60

Course Outcomes:

On completion of the course, the students will be able to

- Analyze and design singly reinforced and doubly reinforced beams by working stress method and limit state method as per Codal provision.
- Analyze and design flanged beams and beams subjected to bending, shear and torsion as per limit state method.
- Design all types of slabs for different boundary conditions and design the doglegged staircase as per Codal provision.
- Design the columns for different types of location and loading condition as per Codal provision.
- Design the types of footing and masonry wall for loading as per Codal provision.

Text Book (s):

1. Subramanian,N.,“ Design of Reinforced Concrete Structures”, Oxford University Press, New Delhi, 2014.
2. Krishna Raju.N “Reinforced Concrete Structural Elements “, New Age International Publishers, Pvt. Ltd., 2016

Reference Book (s) / Web links:

1. Unnikrishna Pillai and Devdass Menon, Reinforced Concrete Design, Tata McGraw Hill Publishing Company Ltd., 2005.
2. Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017

3	Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.
4	Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publilcations, Pune, 2013
5	Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
6	Edward G. Nawy, Reinforced Concrete – A fundamental Approach, 6th Edition, Prentice Hall, 2008.
7	Dr.Ramachandra, " Limit state Design of Concrete Structures " Standard Book House, New Delhi.
8	Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
9	Online courses - http://www.nptel.iitm.ac.in/
10	American Concrete Institute-https://www.concrete.org/
11	Online Software-http://simplifieddesignofconcretestructures.weebly.com/beam-design.html
Code Book(s):	
1	IS 456:2000 Plain and Reinforced Concrete – Code of Practice.
2	IS 875(1-5):1987 Code of Practice for Design Loads for Buildings and Structures.
3	SP 16:1980 Design Aids for Reinforced Concrete to IS 456:1978.
4	SP 34:1987 Handbook of concrete reinforcement and detailing.

CE19511	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	3	3	1	3	1	1	3	2	1	3	3	3	1
CO 2	3	3	3	3	1	3	1	1	3	2	1	3	3	3	1
CO 3	3	3	3	3	1	3	1	1	3	2	1	3	3	3	1
CO 4	3	3	3	3	1	3	1	1	3	2	1	3	3	3	1
CO 5	3	3	3	3	1	3	1	1	3	2	1	3	3	3	1
Average	**3**	**3**	**3**	**3**	**1**	**3**	**1**	**1**	**3**	**2**	**1**	**3**	**3**	**3**	**1**

Prepared by Name and signature	**Approved by Name and Signature**
DR.S.GEETHA, PROFESSOR & HEAD / CIVIL	

Course Code	Course Title (Theory Course)	Category	L	T	P	C
CE23512	FOUNDATION ENGINEERING	PC	3	0	0	3

Objectives:
To understand the scope and methods of site investigation, soil exploration techniques, and sampling methods, and to interpret test results for selecting suitable foundations in geotechnical engineering projects.
● To comprehend the principles of shallow foundation design, evaluate bearing capacity and settlement characteristics, and apply Codal provisions and seismic considerations to ensure safe and effective foundation performance in various soil conditions.
● To understand the design principles and applications of various types of footings and raft foundations, including contact pressure distribution, rigid behavior, and Codal provisions, to ensure structural stability and performance.
● To study the types, functions, and design principles of pile foundations, including load-carrying capacity, group behavior, uplift resistance, and settlement analysis, while adhering to Codal provisions.
● To understand the principles of earth pressure theories, evaluate the earth pressures acting on retaining structures using analytical and graphical methods and to analyze the stability of retaining walls.

UNIT-I	SITE INVESTIGATION AND SELECTION OF FOUNDATION	9
Scope and objectives – Methods of exploration – boring - Depth and spacing of bore holes – Auguring, wash boring and rotary drilling — Soil samples – Representative and undisturbed – Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests - SPT and SCPT – Data interpretation - Bore log report and Selection of foundation.		
UNIT-II	**SHALLOW FOUNDATION**	**9**
Depth of foundation – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Codal provision - Factors affecting bearing capacity – plate load test – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlement – Codal provision – Methods of minimizing total and differential settlements.		
UNIT-III	**FOOTINGS AND RAFTS**	**9**
Types of Isolated footing, Combined footing, Mat foundation – Contact pressure distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision.		
UNIT-IV	**PILE FOUNDATION**	**9**
Types of piles and their functions – Factors influencing the selection of pile – Load carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hiley's) – insitu test – pile load test (routine test only) – Negative skin friction – Uplift capacity- Group capacity by different methods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pile group – Under reamed piles – Codal provisions.		
UNIT-V	**RETAINING WALLS**	**9**
Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Stability analysis of retaining walls – Codal provisions.		
Total Contact Hours: 45		

Course Outcomes:
On completion of the course, the students will be able to
Perform site investigations, analyze soil exploration data including penetration tests, prepare bore log reports, and recommend appropriate foundation types based on subsurface conditions.
● Calculate the bearing capacity of shallow foundations using Terzaghi's and BIS formulas, assess total and differential settlements, and recommend methods to minimize settlement in compliance with Codal provisions.
● Design isolated, combined, and mat foundations, evaluate contact pressure distribution, and apply Codal provisions to proportion foundations for rigid behavior and specific site conditions.
● Evaluate the load-carrying capacity of single and group piles, analyze settlement and uplift behavior, and design pile foundations using static and dynamic methods in compliance with Codal provisions.
● Calculate active and passive earth pressures using Rankine's and Coulomb's theories, apply Culmann's graphical method and perform stability analysis of retaining walls.

SUGGESTED ACTIVITIES
● Problem solving sessions

SUGGESTED EVALUATION METHODS
• Tutorial problems • Assignment problems

Text Book(s):	
1	Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
2	Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition 2017.

Reference Books(s) / Web links:	
1	Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
2	Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
3	Braja M Das, "Principles of Foundation Engineering" (Eigth edition), Cengage Learning 2014.
4	Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2014.
5	Venkatramaiah.C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017.
6	Joseph E bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition, 28th August 2015.
7	https://nptel.ac.in/courses/105/105/105105176/
8	https://www.clemson.edu/cecas/departments/ce/pdf/CE4210_%20Sample_Course%20Note s_2016.pdf
9	http://environment.uwe.ac.uk/geocal/foundations/founbear.htm
10	https://www.nitsri.ac.in/Department/Civil%20Engineering/CGE-202_7_Pile_Foundation_Design A_Student_Guide.pdf
11	https://pdhonline.com/courses/c155/c155content.pdf
12	IS Code 6403: 1981 (Reaffirmed 1997) "Bearing capacity of shallow foundation", Bureau of Indian Standards, New Delhi.
13	IS Code 8009 (Part 1):1976 (Reaffirmed 1998) "Shallow foundations subjected to symmetrical static vertical loads", Bureau of Indian Standards, New Delhi.
14	IS Code 8009 (Part 2):1980 (Reaffirmed 1995) "Deep foundations subjected to symmetrical static vertical loading", Bureau of Indian Standards, New Delhi.
15	IS Code 2911 (Part 1): 1979 (Reaffirmed 1997) "Concrete Piles" Bureau of Indian Standards, New Delhi.
16	IS Code 2911 (Part 2): 1979 (Reaffirmed 1997) "Timber Piles", Bureau of Indian Standards, New Delhi.
17	IS Code 2911 (Part 3): 1979 (Reaffirmed 1997) "Under Reamed Piles", Bureau of Indian Standards, New Delhi.
18	IS Code 2911 (Part 4): 1979 (Reaffirmed 1997) "Load Test on Piles", Bureau of Indian Standards, New Delhi.
19	IS Code 1904: 1986 (Reaffirmed 1995) "Design and Construction of Foundations in Soils", Bureau of Indian Standards, New Delhi.
20	IS Code 2131: 1981 (Reaffirmed 1997) "Method for Standard Penetration test for Soils", Bureau of Indian Standards, New Delhi.
21	IS Code 2132: 1986 (Reaffirmed 1997) "Code of Practice for thin – walled tube sampling for soils", Bureau of Indian Standards, New Delhi.
22	IS Code 1892 (1979): Code of Practice for subsurface Investigation for Foundations. Bureau of Indian Standards, New Delhi.
23	IS Code 14458 (Part 1): 1998 "Retaining Wall for Hill Area – Guidelines, Selection of Type of Wall" , Bureau of Indian Standards, New Delhi.
24	IS Code 14458 (Part 2): 1998 "Retaining Wall for Hill Area – Guidelines, Design of Retaining/Breast Walls" , Bureau of Indian Standards, New Delhi.
25	IS Code 14458 (Part 3) : 1998 "Retaining Wall for Hill Area – Guidelines, Construction Of Dry Stone Walls", Bureau of Indian Standards, New Delhi.

CE23512	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	2	3	1	2	1	2	1	1	1	2	3	2	3
CO 2	2	2	2	3	1	2	1	2	1	1	1	2	3	2	3
CO 3	2	2	3	2	1	2	1	2	1	1	1	2	3	2	3
CO 4	2	2	3	3	1	2	1	2	1	1	1	2	3	2	3
CO 5	2	2	2	2	1	2	1	2	1	1	1	2	3	2	3
Average	2	2	2.4	2.6	1	2	1	2	1	1	1	2	3	2	3

Prepared by Name and signature	Approved by Name and Signature
MRS. S. MUTHU LAKSHMI / ASSISTANT PROFESSOR (SG) / CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23513	WASTE WATER ENGINEERING	PC	3	0	0	3

Objectives:

- To calculate the quantity of sanitary sewage flow, storm water flow & to design the sewer.
- To design the primary treatment units and to know its construction, operation and maintenance aspects.
- To design the secondary treatment units and to know its construction, operation and maintenance aspects.
- To know disposal of sewage using various methods without affecting the environment.
- To design the sludge treatment units like digesters, thickeners and their ultimate disposal without affecting the environment.

UNIT-I	PLANNING AND DESIGN OF SEWERAGE SYSTEM	9

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

UNIT-II	PRIMARY TREATMENT OF SEWAGE	9

Objectives – Unit Operations and Processes – Selection of treatment processes - Onsite sanitation – Septic tank-Grey water harvesting – Primary treatment – Principles, functions and design of sewage treatment units - screens -grit chamber-primary sedimentation tanks – Construction, Operation and Maintenance aspects.

UNIT-III	SECONDARY TREATMENT OF SEWAGE	9

Objectives – Selection of Treatment Methods – Principles, Functions, - Activated Sludge Process and Extended aeration systems -Trickling filters– Sequencing Batch Reactor(SBR) – Waste Stabilization Ponds - Reclamation and Reuse of sewage – Recent Advances in Sewage Treatment – Construction, Operation and Maintenance aspects.

UNIT-IV	DISPOSAL OF SEWAGE	9

Standards for– Disposal - Methods – dilution – Mass balance principle - Self-purification of river- Oxygen sag curve – deoxygenation and reaeration - Streeter–Phelps model - Land disposal – Sewage farming – sodium hazards – Soil dispersion system.

UNIT-V	SLUDGE TREATMENT AND DISPOSAL	9

Objectives - Sludge characterization – Thickening - Design of gravity thickener- Sludge digestion - Standard rate and High rate digester design- Biogas recovery - Sludge Conditioning and Dewatering – Sludge drying beds – ultimate residue disposal - recent advances.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Estimate sanitary sewage flow, storm water flow & design the sewer and have acquired knowledge on sewer materials, sewer appurtenances, corrosion and its preventive measures.
- Design the primary treatment units and to manage its operation and maintenance.
- Design the secondary treatment units and to manage its operation and maintenance.
- Acquire knowledge on the disposal of sewage using various methods without affecting the environment.
- Design the sludge treatment units like digesters, thickeners and their ultimate disposal without affecting the environment.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions for unit 1, 2, 3, 5
- Oral Survey conducted in unit-1 and Unit-4 to test depth of knowledge gained in various topics.
- Activity Based Learning on treatment processes of Unit 2, 3

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Assignment in Unit 1, 2, 3, 4, 5
- Tutorial problems in relevant topics of Unit 1, 2, 3, 4, 5
- Spot class test conducted in Unit 1, 2, 3, 5 to assess knowledge gained by student
- Class Presentation/Discussion in Unit-4 and Unit-5

Text Book(s):
1. Garg, S.K., Sewage Waste disposal and Air Pollution Engineering, Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2017.
2. Punmia, B.C., Jain, A.K., and Jain, A.K., Wastewater Engineering (Including Air Pollution), Environmental Engineering, Vol. II, Laxmi Publications, 2016

Reference Books(s) / Web links:
1. Manual on Sewerage and Sewage Treatment Systems Part A, B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.
3. Dr.P.N.Modi "Sewage Treatment & Disposal and Wastewater Engineering", Standard book house, Rajsons Publication Pvt. Ltd., New Delhi., 2015.
4. Metcalf and Eddy – Wastewater Engineering – Treatment and Reuse, 4th Edition, 2017, Mc Graw-Hill, New Delhi.
5. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.
6. https://nptel.ac.in/courses/105/105/105105048/ ,
7. https://nptel.ac.in/courses/105/105/105105178/ ,
8. https://nptel.ac.in/courses/105/106/105106119/

CE23513	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	1	3	3	2	1	1	1	2	3	2	1
CO 2	3	3	3	2	1	3	3	2	1	1	1	2	3	2	1
CO 3	3	3	3	2	1	3	3	2	1	1	1	2	3	2	1
CO 4	3	3	3	2	1	3	3	2	1	1	1	2	3	2	1
CO 5	3	3	3	2	1	3	3	2	1	1	1	2	3	2	1
Average	**3**	**3**	**3**	**2**	**1**	**3**	**3**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**1**

Prepared by Name and signature	Approved by Name and Signature
DR. M. SELVAKUMAR, PROFESSOR & DEAN / CIVIL	

Course Code	Course Title (Lab oriented Theory Courses)	Category	L	T	P	C
CE23531	STRUCTURAL ANALYSIS	PC	3	0	2	4

Objectives:

- To introduce structural analysis methods and analyze indeterminate beams using the Theorem of Three Moments.
- To analyze indeterminate beams and frames using the Slope Deflection and Moment Distribution Method.
- To analyze indeterminate beams and frames using the direct Flexibility and Stiffness Matrix Method.
- To illustrate the influence line for determinate beams and trusses.
- To analyze various structural forms of arches and cables for different support conditions

UNIT-I INTRODUCTION AND THEOREM OF THREE MOMENTS **9**

Introduction to Structural Analysis- Introduction to Force and Displacement Methods. Determination of Static and Kinematic Indeterminacies for Various Structures – Types of Loads in the Structure.

Theorem of Three Moments -Analysis of Propped Cantilever, Fixed Beams, and Continuous Beams by Clapeyron's Theorem of Three Moments – Shear Force and Bending Moment Diagrams.

UNIT-II SLOPE DEFLECTION METHOD AND MOMENT DISTRIBUTION METHOD **9**

Slope Deflection Method -Slope Deflection Equations – Equilibrium Conditions - Analysis of Continuous Beams and Rigid Frames with Vertical Members Only. (Upto Three Degree of Redundancy).

Moment Distribution Method -Stiffness and Carry-Over Factors – Distribution and Carryover of Moments - Analysis of Continuous Beams- Plane Rigid Frames with And Without Sway – Support Settlement.

UNIT-III MATRIX METHODS **9**

Flexibility Matrix -Primary Structures - Compatibility Conditions – Formation of Flexibility - Analysis of Continuous Beams, Rigid Jointed Plane Frames and Indeterminate Pin-Jointed Plane Frames by Direct Flexibility Approach. (Upto Three Degree of Redundancy).

Stiffness Matrix-Restrained Structure – Formation of Stiffness - Equilibrium Conditions - Analysis of Continuous Beams, Pin-Jointed Plane Frames and Rigid Frames by Direct Stiffness Method. (Upto Three Degree of Redundancy).

UNIT-IV INFLUENCE LINES FOR DETERMINATE STRUCTURES **9**

Influence Lines for Reactions in Statically Determinate Beams – Influence Lines for Shear Force and Bending Moment – Calculation of Critical Stress Resultants Due to Concentrated and Distributed Moving Loads - Absolute Maximum Bending Moment - Influence Lines for Member Forces in Pin-Jointed Frames.

UNIT-V ARCHES AND CABLES **9**

Arches - Types of Arches – Analysis of Three-Hinged, Two-Hinged Arches - Parabolic and Circular Arches (Simple Cases Only)

Cables-Equilibrium of Cables – Length of Cable – Anchorage of Suspension Cables- Analysis of Forces in the Cable.

Contact Hours : 45

List of Experiments

1	Introduction To Analysis Software
2	Analysis Of Determinate Beams for Different Loading and Support Conditions.
3	Analysis Of Determinate Beams for Different Loading and Support Conditions.
4	Analysis Of Two-Dimensional Rigid Jointed Frames for Different Loading and Support Conditions.
5	Analysis Of Three-Dimensional Rigid Jointed Frames for Different Loading and Support Conditions.
6	Analysis Of Two-Dimensional Pin Jointed Frames for Different Loading and Support Conditions.
7	Analysis Of Three-Dimensional Pin Jointed Frames for Different Loading and Support Conditions.
8	Analysis Of Determinate Beams for Moving Loads. (Influence Line Diagram)
9	Analysis Of Arches for Different Loading and Support Conditions.
10	Analysis Of Cables for Different Loading and Support Conditions.

Contact Hours : 30

Total Contact Hours : 75

Course Outcomes:

On completion of the course, the students will be able to

- Identify and determine the static and kinematic indeterminacy of structures.
- Apply the slope-deflection and moment distribution methods to solve indeterminate structures.
- Utilize matrix methods (flexibility and stiffness approaches) to analyze structures systematically.
- Construct influence line diagrams for determinate structures to evaluate the effect of moving loads.
- Analyze arches and cables for internal forces and stability under different loading conditions.

Suggested Activities

- Creating Models

Suggested Evaluation Methods	
●	Continuous Assessment Test
●	Assignments
Text Book(s):	
1	Dr. Punmia B.C, Ashok Kumar Jain & Dr. Arun Kumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 2017
2	a. Bhavikatti,S.S, "Structural Analysis-I", Vikas Publishing House Pvt.Ltd., New Delhi, 2010. b. Bhavikatti S.S, "Structural Analysis –II", Vikas Publishing House Pvt. Ltd., New Delhi, 2013.
3	Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt .Ltd., 2011
Reference Books(s) / Web links:	
1	Reddy.C.S, "Basic Structural Analysis", The McGraw Hill companies, 2010.
2	Negi L.S and Jangid R.S, "Structural Analysis", Tata McGraw Hill Publishing Co.Ltd.2004
3	Vazrani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publisers,2015.
4	Pandit G.S.and Gupta S.P., "Structural Analysis – A Matrix Approach", The McGraw Hill companies, 2008
5	https://nptel.ac.in/courses/105105166
6	https://nptel.ac.in/courses/105101086

Lab Equipment Required:

Sl. No.	Name of the Equipment	Quantity Required (For a batch of 30 students)
1.	STAAD Pro V8i	30

CE23531	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
CO 2	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
CO 3	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
CO 4	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
CO 5	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
Average	**3**	**3**	**2**	**3**	**1**	**2**	**1**	**1**	**2**	**1**	**-**	**2**	**3**	**3**	**1**

Prepared by Name and signature	Approved by Name and Signature
MR. P.MUTHAIYAN, ASSISTANT PROFESSOR (SS) / CIVIL	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
CE23521	WATER AND WASTE WATER ANALYSIS LABORATORY	PC	0	0	4	2

Objectives:
● To analyze the physical, chemical and biological characteristics of water and wastewater.
● To quantify the dosage requirement for coagulation process.
● To investigate the growth of micro-organism and its quantification
● To determine the mineral content in water.
● To decide the biological characteristics of water and wastewater.

Description of the Experiments	Total Contact Hours:45
1. Determination of pH, Turbidity and conductivity	
2. Determination of Hardness.	
3. Determination of Alkalinity and Acidity.	
4. Determination of Chlorides	
5. Determination of Phosphates and Sulphates.	
6. Determination of Iron and fluoride.	
7. Determination of residual chlorine and available chlorine in bleaching powder	
8. Determination of Oil and Grease.	
9. Determination of Suspended, settleable, volatile and fixed solids.	
10. Determination Dissolved Oxygen and BOD for the given sample.	
11. Determination of Optimum Coagulant dosage	
12. Determination of COD for given sample.	
13. Determination of SVI of Biological sludge and microscopic examination.	
14. Determination of MPN index of given water sample.	

Course Outcomes:
On completion of the course, the students will be able to
● Conduct tests to determine physical and chemical properties such as pH, turbidity, and conductivity of water samples.
● Analyze and quantify water hardness, alkalinity, acidity, and chlorides using standard laboratory techniques.
● Evaluate water pollution indicators by determining BOD, COD, dissolved oxygen, and other relevant tests.
● Apply modern analytical tools to assess environmental samples and provide data-driven recommendations for treatment processes.
● Demonstrate the ability to compile and present water quality reports with adherence to professional and ethical standards.

SUGGESTED EVALUATION METHODS
● Experiment based viva For All Experiments

Web links for virtual lab
● https://ee1-nitk.vlabs.ac.in/
● https://ee2-nitk.vlabs.ac.in/

Lab equipment required:

S. No.	Name of the Equipment	Quantity Required	Remarks
1	pH meter with pH Electrodes	1 No	For a Batch of 30 students
2	Thermometer	1 No	
3	Nepheolo turbidity water meter	1 No	
4	Conductivity meter with conductivity cell	1 No	
5	Spectrophotometer	1 No	
6	Jar test apparatus	1 No	
7	Hot Air Oven	1 No	
8	Weighing balance	1 No	
9	DO Meter	1 No	
10	Incubator	1 No	
11	Pipette	30 Nos	

12	Beaker	30 Nos	
13	Muffle Furnace	1 No	
14	Water bath	1 No	
15	Standard Flask	30 Nos	
16	Burette with stand	15 Nos	
17	Crucible	15 Nos	
18	Magnetic stirrer with hot plate	5 Nos	
19	COD Apparatus	1 No	
20	Desiccator	1 No	

CE23521	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	3	3	2	2	1	3	2	1	3	3	2	2
CO 2	3	3	2	3	2	3	2	1	3	2	1	3	3	3	2
CO 3	3	3	3	3	3	3	3	1	3	3	1	3	3	3	3
CO 4	3	2	3	3	3	3	3	2	3	3	2	3	3	3	3
CO 5	2	2	2	2	2	3	3	3	3	3	3	3	2	2	3
Average	**2.8**	**2.4**	**2.4**	**2.8**	**2.6**	**2.8**	**2.6**	**1.8**	**3**	**2.6**	**1.8**	**3**	**2.8**	**2.6**	**2.6**

Prepared by Name and signature	Approved by Name and Signature
DR. S.PREMKUMAR / ASSISTANT PROFESSOR (SS) / CIVIL	

Course Code	Course Name (Laboratory Course)	Category	L	T	P	C
CE23522	SURVEY CAMP*	PC	0	0	2	1

Objectives:
● To develop proficiency in using Total Station for traversing and to understand contouring methods for representing topographical features.
● To gain skills in levelling techniques for road and canal projects and learn to offset and plot building locations with precision.
● To understand astronomical observations for calculating sunrise and sunset times and determine azimuths using ex-meridian observations.
● To acquire skills in GPS-based traversing and to lay out curves on roads or railways using the deflection angle method.
● To learn and apply the principles of triangulation and trilateration for establishing control points and mapping areas.

Description of the Experiments	Total Contact Hours:15
1. Traversing using Total Station.	
2. Contouring – Radial and Block.	
3. Longitudinal and Cross Sectional Levelling of Road /Canal.	
4. Offset of Buildings and Plotting the Location.	
5. Estimation of Sun Rise/ Sun Set time using Sun Observations.	
6. Determination of Azimuth by Ex-Meridian observation.	
7. Traversing using GPS.	
8. Curve setting by deflection angle method.	
9. Triangulation.	
10. Trilateration.	

Course Outcomes:
On Completion of the course, the students will be able to
● Perform accurate traversing with a Total Station and generate contour maps using radial and block methods for land surveys.
● Execute longitudinal and cross-sectional levelling and accurately offset and map the location of buildings on site plans.
● Estimate sunrise/sunset timings and determine azimuth angles for navigation and surveying applications.
● Proficient in using GPS for accurate traversing and curve setting for infrastructure projects.
● Identify positions and create maps using triangulation and trilateration methods effectively.

(* Two weeks at the end of Semester IV)

SUGGESTED EVALUATION METHODS
● Experiment based viva voce
● Quizzes

Lab equipment required:

S. No	Name of the Equipment	Quantity Required	Remarks
1	Total Station	3 No's	
2	Theodolites	At least 1 for every 5 students	
3	Dumpy level / Filling level	At least 1 for every 5 students	
4	Ranging rods	1 for a set of 5 students	
5	Levelling staff		
6	Cross staff		
7	Chains		
8	Tapes		
9	Arrows		
10	GPS	3 No's	

CE23522	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	3	1	1	3	3	2	1	3	3	2	1
CO 2	3	2	2	2	3	1	1	3	3	2	1	3	3	2	1
CO 3	3	2	2	2	3	1	1	3	3	2	1	3	3	2	1
CO 4	3	2	2	2	3	1	1	3	3	2	1	3	3	2	1
CO 5	3	2	2	2	3	1	1	3	3	2	1	3	3	2	1
Average	**3**	**2**	**2**	**2**	**3**	**1**	**1**	**3**	**3**	**2**	**1**	**3**	**3**	**2**	**1**

Prepared by Name and signature	Approved by Name and Signature
MR. M.MANOHARAN / ASSISTANT PROFESSOR / CIVIL	

Course Code	Course Name (Laboratory Course)	Category	L	T	P	C
GE23521	SOFT SKILLS II	EEC	0	0	2	1

Course Objectives:

The major course objectives are:

1. To help students break out of shyness.
2. To build confidence.
3. To enhance English communication skills.
4. To encourage students' creative thinking to help them frame their own opinions,

Learning and Teaching Strategy:

The program is completely student centric where the focus is on activities led by students which include role plays, discussions, debates other games as well. These activities would be supplemented by interactive use of technology and brief trainer input.

Week	Activity Name	Description	Objective
1	The News hour	Students are made to read news articles from the English newspapers. The students also have to find words and their meaning from the article they have not come across before and share it with the group. They then use these words in sentences of their own	The aim of this activity is not only to get the students to read the newspaper but also aims at enhancing the students' vocabulary.
2	Court Case	The facilitator provides the participants the premise of a story and proceeds to convert the story into a court case. The students are required, department-wise to debate and provide their points to win the case for their clients.	The aim of the lesson is to encourage creative and out-of-the -box thinking to ensure a good debate and defense skills.
3	The ultimate weekend	The students design activities they are going to do over the weekend and they have to invite their classmates to join in the activity. The students move around the class and talk to other students and invite them.	The aim of this activity is to develop the art of conversation among students. It also aims at practicing the grammatical structures of "going to" "have to" and asking questions.
4	The Four Corners	This is a debate game that uses four corners of the classroom to get students moving. The following is written on the 4 corners of the room "Strongly Agree, Somewhat Agree, Somewhat Disagree and Strongly Disagree". The topics are then given to the class and students move to the corner that they feel best explains their opinions	This activity aims at getting students to come up with their own opinions and stand by it instead of being overshadowed by others and forcing themselves to change based on others opinions.
5	Debate	Boarding school or day school? Which is more beneficial for a student?	The aim of this activity is to encourage students to draw up feasible points on the advantages and benefits of both. And enhance their debating ability
6	Grand Master	The facilitator starts the session by keeping an individual in mind, upon which the students guess it only through "Yes or No" questions. Post few trials the students are given same opportunity to do the same with the crowd.	The aim of the lesson is designed to teach the art of questioning. It also helps to enhance the students' speaking and listening skills.
7	Debate	Does violence on the TV and Video games influence children negatively?	This activity aims at encouraging the students to debate on real life scenarios that most students spend a lot of time on.
8	Turn Tables	This is a speaking activity where the students need to speak for and against the given topics when the facilitator shouts out 'Turn Table'.	The aim of this activity is to make the participants become spontaneous and have good presence of mind.
9	Debate	Do marks define the capabilities of a student?	This debate activity aims at allowing the students to argue on this worrisome adage of marks.

10	FictionAD	The Participants are asked to create an Ad for a challenging topic only using fictional characters.	The activity aims at developing their creativity and presentation skills.
11	Debate	Are social networking sites effective, or are they just a sophisticated means for stalking people?	This activity aims at refining the students debating skills on a very real life situation
12	Talent Hunt	Talent Hunt is a fun activity where the students are selected at random and supported to present any of their own skills.	The aim of this activity is designed to evoke their inner talents and break the shyness and the fear of participating in front of a crowd
	Feedback	At the end of the session in the final week (12) the trainer would provide feedback to the students on best practices for future benefits.	The aim is to do both give feedback to students as well as obtain feedback on the course from them.

Course Learning Outcome:

On successful completion of the course, students should be able to:

1. Be more confident
2. Speak in front of a large audience without hesitation
3. Think creatively
4. Speak impromptu
5. Communicate in English

SEMESTER VI

Course Code	Course Title (Theory Course)	Category	L	T	P	C
CE23611	DESIGN OF STEEL STRUCTURES	PC	3	1	0	4

Objectives:

- To apprehend the design philosophy of steel structures and failure modes of steel structural connections.
- To learn the design procedure for tension members.
- To understand the behavior and design procedure of compression members.
- To learn the analysis and design of steel beams per Codal requirements.
- To know the behavior of industrial roofs truss, gantry girder and portal frames.

UNIT-I	INTRODUCTION TO STRUCTURAL STEEL AND DESIGN OF CONNECTIONS	12

General -Types of Steel -Properties of structural steel - I.S. rolled sections - Concept of Limit State Design - Design of Simple and eccentric Bolted and welded connections - Types of failure and efficiency of joint – prying action - Introduction to HSFG bolts.

UNIT-II	DESIGN OF TENSION & COMPRESSION MEMBERS	12

Behavior and Design of simple and built-up members subjected to tension - Shear lag effect- Tension splice - Behavior of short and long columns - Euler's column theory Design of simple and built-upcompression members with lacings and battens - Design of column bases - slab base and gusseted base.

UNIT-III	DESIGN OF BEAMS	12

Design of laterally supported and unsupported beams - Design of built-up beams - Design of plate girders without stiffeners.

UNIT-IV	INDUSTRIAL STRUCTURES	12

Design of roof trusses – loads on trusses – purlin design using angle and channel sections – Design ofjoints and end bearings–Design of gantry girder (Only design procedure) - Introduction to pre-engineered buildings.

UNIT-V	PLASTIC ANALYSIS AND DESIGN	12

Introduction to plastic analysis - Theory of plastic Analysis - Design of continuous beams and portal frames using plastic design approach.

	Total Contact Hours	:	60

Course Outcomes:

On completion of the course, the students will be able to

- Perceive the design philosophy of steel structures and predict the design strength of bolted and welded connections.
- Design the most suitable section for tension and compression members based on design criteria.
- Design the most suitable section for beams based on design considerations of IS 800
- Analyze and design of truss members as per the Codal requirements.
- Analyze and design beams and frames based on plastic analysis.

Text Book (s):

1. Duggal S.K., Limit State Design of Steel Structures, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2014.
2. Subramanian.N, Design of Steel Structures, Oxford University Press, New Delhi, 2016.

Reference Book (s) / Web links:

1. Bhavikatti S.S, Design of Steel Structures: By Limit State Method as Per IS: 800 - 2007, IK International Publishing House, New Delhi, 2017.
2. Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2013.
3. Narayanan.R.et.al., Teaching Resource on Structural steel Design, INSDAG, Ministry of Steel Publishing, 2000.
4. Sarwar Alam Raz, Structural Design in Steel, New Age International Publishers, 2014.
5. Jack C. McCormac and Stephen F Csernak, Structural Steel Design, Pearson Education Limited, 2013.
6. https://nptel.ac.in/courses/105/105/105105162/
7. https://nptel.ac.in/courses/105/106/105106112/
8. https://nptel.ac.in/courses/105/106/105106113/

Code Book(s):

1. IS 800:2007, General Construction in Steel-Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007.

2	SP 6 (1) Hand book on structural steel sections.
3	IS: 875 (Part 3) : 2015, Design Loads (Other than Earthquake) for Buildings and Structure – Code of Practice Part 3 Wind Loads (Third Revision), Bureau of Indian Standards, New Delhi, 2015.

CE23611	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	3	2	1	1	1	1	1	1	1	2	2	2	2
CO 2	3	3	3	2	1	2	1	1	1	1	1	2	3	2	3
CO 3	3	3	3	2	1	2	1	1	1	1	1	2	3	2	3
CO 4	3	3	3	2	1	2	1	1	1	1	1	2	3	2	3
CO 5	3	3	3	3	1	3	1	1	1	1	1	2	2	2	3
Average	**3**	**3**	**3**	**2.2**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2.6**	**2**	**2.8**

Prepared by Name and signature	**Approved by Name and Signature**
DR.S.GEETHA, PROFESSOR & HEAD / CIVIL	

Course Code	Course Name (Theory course)	Category	L	T	P	C
CE23612	CONSTRUCTION, PLANNING, SCHEDULING AND MANAGEMENT	PC	3	0	0	3

Objectives:

- To provide foundational knowledge in construction planning, including technology selection, work task definition, job layout, work breakdown structure and resource and duration estimation.
- To impart knowledge on construction scheduling techniques, including bar charts, CPM, PERT, resource-oriented scheduling, and advanced methods for managing constraints, uncertainties, and time-cost tradeoffs.
- To acquaint the principles of cost control, budgeting, forecasting, cash flow management, and integrating cost and schedule information for effective project management.
- To provide an understanding of safety management in construction, including safety programs, jobsite assessments, accident analysis, and quality control methods, along with ISO standards and statistical techniques for quality assurance.
- To introduce various types of construction organizations, project information management, and the use of computerized systems, databases, and information flow for effective construction project management.

UNIT-I	CONSTRUCTION PLANNING	9

Basic concepts in the development of construction plans - Choice of Technology and Construction method - Defining Work Tasks – Job layout - Work breakdown structure - Precedence relationships among activities - Estimating Activity Durations - Estimating Resource Requirements for work activities.

UNIT-II	SCHEDULING PROCEDURES AND TECHNIQUES	9

Relevance of construction schedules - Bar charts – CPM – PERT - Resource oriented scheduling - Scheduling with resource constraints and precedence - Use of Advanced Scheduling Techniques - Scheduling with uncertain durations - Crashing and time/cost tradeoffs - Improving the Scheduling process – Introduction to application software (Primavera and MS Project).

UNIT-III	COST CONTROL MONITORING	9

Introduction to Cost Control - The cost control problem - The project budget - Control of project cash flows - Schedule control - Schedule and Budget updates - Relating cost and schedule information.

UNIT-IV	SAFETY AND QUALITY IN CONSTRUCTION	9

Importance of safety - Elements of safety programme - Jobsite safety assessment - Site accidents - Causes - Classification - Approaches to improve safety - Safety codes and OSHA standards - Quality control in construction- Importance - Elements - Quality control methods - ISO 9000 family of standards - Statistical methods - Sampling by attributes - Sampling by variables - Techniques of QC.

UNIT-V	ORGANIZATION AND USE OF PROJECT INFORMATION	9

Types of Construction Organization - 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 Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Develop comprehensive construction plans with defined tasks, optimized layouts, and accurate resource and time estimates for effective project management.
- Develop and optimize construction schedules using advanced techniques, address resource constraints and uncertainties, and apply strategies like crashing to enhance project efficiency.
- Manage project budgets, control costs, forecast expenditures, update schedules, and relate cost and schedule data to ensure financial and timeline adherence in projects.
- Implement safety programs, assess risks, apply quality control methods and use statistical techniques to ensure construction site safety and meet ISO 9000 standards for quality management.
- Organize and manage construction project information using relational database models, understand database management systems, and efficiently transfer and flow information for project success.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Problem solving sessions
- Flipped classroom
- Seminars
- Activity Based Learning

Text Book(s):	
1.	Chitkara K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009.
2.	Srinath L.S., "PERT and CPM Principles and Applications", Affiliated East West Press, 2001.
3.	Seetharaman. S, "Construction Engineering and Management", 5th Edition, Umesh Publishing, 2019.

Reference Books(s) / Web links:	
1.	Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
2.	Moder J, Phillips C and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1985.
3.	Willis E.M., "Scheduling Construction projects", John Wiley and Sons, 1986.
4.	Halpin D.W., "Financial and Cost Concepts for Construction Management", John Wiley and Sons, New York, 1985.
5.	Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2002.

CE23612	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	3	2	2	2	2	1	1	1	2	3	3	3	2
CO 2	3	3	3	3	3	2	2	1	1	2	3	2	3	3	3
CO 3	3	3	3	3	3	2	2	1	1	2	3	2	3	3	3
CO 4	3	3	2	2	2	3	3	3	2	2	2	2	3	3	3
CO 5	3	3	3	3	3	2	3	2	2	2	3	3	3	3	3
Average	**3**	**3**	**2.8**	**2.6**	**2.6**	**2.2**	**2.4**	**1.6**	**1.4**	**1.8**	**2.6**	**2.4**	**3**	**3**	**2.8**

Prepared by Name and signature	**Approved by Name and Signature**
MR. R.MADHAVA PERUMAL, ASSISTANT PROFESSOR / CIVIL	

Course Code	Course Name (Theory course)	Category	L	T	P	C
CE23613	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	PC	3	0	0	3

Objectives:

- To understand the concept of formulation of equations of motion of SDOF system for free and forced vibration of damped and undamped structures.
- To gain knowledge about basic principles of free and forced vibration both undamped and damped multiple degree of freedom systems.
- To get familiarized with the elements of engineering seismology.
- To acquire knowledge on the performance of structures under earthquake loading and evaluate earthquake forces as per IS: 1893-2016.
- To recognize the principles of Earthquake Resistant Design and detailing as per IS: 13920-2016.

UNIT-I	SINGLE DEGREE OF FREEDOM SYSTEM	9

Definition of degree of freedom – Idealization of structure as Single Degree of Freedom (SDOF) system – Formulation of equation of motion for various SDOF system – D' Alembert's Principles – Effect of damping – Free and forced vibration of damped and undamped structures (Basics Only)

UNIT-II	MULTI DEGREE OF FREEDOM SYSTEM	9

Formulation of the equation of motion for multi-degree of freedom (MDOF) system – Evaluation of naturalfrequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.

UNIT-III	INTRODUCTION TO EARTHQUAKE ENGINEERING	9

Elements of Engineering Seismology – Definitions, Introduction to Seismic hazard, Earthquake phenomenon – Seismotectonics – Seismic Instruments – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters.

UNIT-IV	EARTHQUAKE EFFECTS ON STRUCTURES	9

Effect of earthquake on different types of structures – Behaviour of RCC, Steel and prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Evaluation of Earthquake forces – IS Code 1893: 2002 – Response Spectra – Lessons learnt from past earthquakes.

UNIT-V	CONCEPTS OF EARTHQUAKE RESISTANT DESIGN	9

Causes of damage – Planning considerations/Architectural concept (IS 4326–2013) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings– Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:2016).

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- Apply the concept of static and dynamic analysis of structures on SDOF systems.
- Analyze the modes of multi- degree of freedom systems.
- Understand the concepts of engineering seismology and estimate earthquake parameters..
- Evaluate seismic forces for various structures as per Indian Codal provision.
- Plan and design an Earthquake resistant masonry & RCC structure as per Indian Code guidelines.

SUGGESTED ACTIVITIES

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):	
1.	Anil K.Chopra, "Dynamics of Structures: Theory and Applications to Earthquake Engineering", Prentice Hall, Englewood Cliffs, New Jersy, Second Edition, 2001.
2.	Pankaj Agarwal "Earthquake Resistant Design of Structures",Prentice Hall of India Pvt Ltd.New Delhi,2006.
3.	S.K.Duggal"Earthquake Resistant Design of Structures",Tata McGraw-Hill Publishing,2008.

Reference Books(s) / Web links/IS codes:	
1.	Mario Paz, Structural Dynamics – Theory and Computations, Fourth Edition, CB publishers, 1997
2.	Manicka Selvam K., "Elementary Structural Dynamics", Dhanpatrai and sons, New Delhi,2001
3.	Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2002.
4.	IS 1893(Part 1):2016- Criteria for Earthquake Resistant Design of Structures.
5.	IS 13920:2016- Ductile Design and Detailing of Reinforced concrete structures subjected to Seismic forces-Code of Practice.
6.	IS 4326-2013 Earthquake Resistant Design and Construction of Buildings-Code of Practice.

CE23613	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
CO 2	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
CO 3	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
CO 4	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
CO 5	3	3	2	3	1	2	1	1	2	1	-	2	3	3	1
Average	**3**	**3**	**2**	**3**	**1**	**2**	**1**	**1**	**2**	**1**	**-**	**2**	**3**	**3**	**1**

Prepared by Name and signature	Approved by Name and Signature
MR. P.MUTHAIYAN, ASSISTANT PROFESSOR (SS) / CIVIL	

Course Code	Course Name (Lab oriented Theory Courses)	Category	L	T	P	C
CE23631	STRUCTURAL DESIGN AND DRAWING	PC	3	0	2	4

Objectives:

- To equip students with the knowledge to select, design, and analyze retaining walls while considering soil mechanics and structural behavior
- To gain a preliminary understanding of design knowledge and drawing about solid slab R.C Bridge
- To dispense a solid foundation in the principles of structural, geotechnical, and material design for liquid storage structures
- To provide knowledge and skills necessary to design and analyze steel components commonly used in industrial buildings and related structural elements.
- To get acquaint on behavior of Girder for different loading conditions.

UNIT-I	**RETAINING WALLS**	**9**

Reinforced concrete Cantilever and Counter fort Retaining Walls – Horizontal Backfill with Surcharge – Design of Shear Key - Design and Drawing**.**

UNIT-II	**FLAT SLAB AND BRIDGES**	**9**

Design of Flat Slabs with and without drops by Direct Design Method of IS code - Design and Drawing – IRC Specifications and Loading – RC Solid Slab Bridge - Design and Drawing.

UNIT-III	**LIQUID STORAGE STRUCTURES**	**9**

RCC Water Tanks - Elevated Circular, underground Rectangular Tanks - Design and Drawing

UNIT-IV	**INDUSTRIAL STRUCTURES**	**9**

Structural steel Framing - Steel Roof Trusses – Roofing Elements – Beam columns – Codal provisions - Design and Drawing.

UNIT-V	**GIRDERS AND CONNECTIONS**	**9**

Plate Girders – Behavior of Components-Deign of Welded Plate Girder - Design of Industrial Gantry Girders.

	Contact Hours	**:**	**45**

List of Experiments

1	Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcement details.
2	Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details.
3	Design and drafting of circular and rectangular RCC water tanks.
4	Design of plate Girder Bridge - Truss Girder bridges – Detailed Drawings including connections
5	Design and analysis of Multi Storied Building using Staad.pro. software

	Contact Hours	**:**	**15**
	Total Contact Hours	**:**	**60**

Course Outcomes:

On completion of the course, the students will be able to

- Design reinforced concrete retaining walls with consideration of stability and structural requirements.
- Apply IS code provisions for the design of flat slabs and reinforced concrete solid slab bridges.
- Analyze and design different types of liquid storage structures considering functional and structural requirements.
- Develop steel industrial structures, including framing, trusses, and roofing elements, adhering to codal provisions
- Understand the behavior and design of plate girders and industrial gantry girders using welded connections.

Suggested Activities

- Problem solving sessions for all Units

Suggested Evaluation Methods

- Tutorial problems
- Assignment problems

Text Book(s):

1	Krishnaraju N, Structural Design and Drawing, Universities Press, 2009.
2	PunmiaB.C, Ashok Kumar Jainand, Arun Kumar Jain, Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

Reference Books(s) / Web links:

1	Krishnamurthy D, Structural Design and Drawing VoI, II and III, CBS Publishers, 2010.
2	Shah V Land Veena Gore, Limit State Design of Steel Structures IS800-2007, Structures Publications, 2009.
3	IS 456(2000) Indian Standard Plain and Reinforced Concrete-Code of Practice, Bureau of Indian Standards, New Delhi.

Lab Equipment Required:

Sl. No.	Name of the Equipment	Quantity Required (For a batch of 30 students)
1.	Analysis and Design Software - Minimum 5 use License	1 No
2.	Computers Pentium IV	30 Nos
3.	Laser Printer	1 No

CE23631	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	3	1	1	1	1	1	1	2	3	3	3
CO 2	3	3	3	2	3	1	1	1	1	1	1	2	3	3	3
CO 3	3	3	3	2	2	1	1	1	1	1	1	2	3	3	3
CO 4	3	3	3	2	2	1	1	1	1	1	1	2	3	3	3
CO 5	3	3	3	2	-	1	1	1	1	1	1	2	3	3	3
Average	**3**	**3**	**3**	**2**	**1.6**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**3**	**3**

Prepared by Name and signature	Approved by Name and Signature
DR. S.PREMKUMAR / ASSISTANT PROFESSOR (SS) / CIVIL	

Course Code	Course Name	Category	L	T	P	C
GE23621	PROBLEM-SOLVING TECHNIQUES	EEC	0	0	2	1

Course Objectives:

- To improve the numerical ability**.**
- To improve problem-solving skills.

Course topics:

S.No.	Topics
1	Numbers system
2	Reading comprehension
3	Data arrangements and Blood relations
4	Time and Work
5	Sentence correction
6	Coding & Decoding, Series, Analogy, Odd man out and Visual reasoning
7	Percentages, Simple interest and Compound interest
8	Sentence completion and Para-jumbles
9	Profit and Loss, Partnerships and Averages
10	Permutation, Combination and Probability
11	Data interpretation and Data sufficiency
12	Logarithms, Progressions, Geometry and Quadratic equations.
13	Time, Speed and Distance

Course Outcome: On successful completion of the course, students should be able to:

- Have mental alertness.
- Have numerical ability.
- Solve quantitative aptitude problems with more confident

Course Code	Course Title (Lab Oriented Course)	Category	L	T	P	C
GE23627	DESIGN THINKING AND INNOVATION (TYPE - PROJECT BASED LEARNING)	EEC	0	0	4	2

Objectives:
• To understand the design thinking concepts and deep understanding of user needs and experiences.
• To find the problem statement and To develop innovative design solutions that address identified user challenges
• To master the process of prototyping and iterating on designs.
• To conduct thorough market analysis and financial planning
• To effectively communicate design concepts and findings.

Unit-I: Introduction to Design Thinking: The design thinking concepts - Different design thinking models - Details of Stanford Design thinking process: Empathize, Define, Ideate, Prototype, Test

Activities:

- Case studies of successful domain based Design Thinking and Innovative projects
- Group discussions on design thinking

Unit 2: Empathize and Define: User research methods (interviews, surveys, observation, contextual inquiry) - Persona development- Journey mapping – Brainstorming Defining the design problem statement

Activities:

- Conducting user interviews and surveys
- Creating user personas and journey maps
- Identifying key user needs and pain points
- Analyze the user needs and Brainstorming to define problem statement

Unit 3: Ideate and Create: Brainstorming techniques (e.g., mind mapping, SCAMPER) - Ideation tools (e.g., design thinking tools, concept sketching) - Concept generation and evaluation (e.g. Brainstorming)

Activities:

- Group brainstorming sessions to select the best idea
- Creating concept sketches and prototypes
- Evaluating ideas based on user needs and feasibility

Unit 4: Prototype and Test: Low, Medium and high level fidelity for prototyping-Usability testing -Iterative design

Activities:

- Building low-fidelity prototypes (e.g., paper prototypes)
- Conducting usability tests with users
- Iterating on designs based on feedback

Unit 5: Market Analysis and Implementation: Market research and analysis - Business model development- Financial planning-Implementation strategies

Activities:

- Conducting market research
- Developing a business model canvas
- Creating a financial projection
- Developing an implementation plan

Course Outcomes: On completion of the course, the students will be able to	
CO1	Construct design challenge and reframe the design challenge into design opportunity.
CO2	Interview the user, and know the feelings of users to foster deep user understanding and be able to uncover the deep user insights and needs.
CO3	Develop ideas and prototypes by brainstorming.
CO4	Organize the user walkthrough experience to test prototype
CO5	Develop smart strategies and implementation plan that will deliver/achieve the idea/solution deduced from earlier phases.

Assessment:

- Encourage students to work on real-world design challenges based on the user needs
- Group presentations
- Quizzes and exams
- Evaluation of Project report and viva and also encourage the students for filing patent/ copyright / presenting in conference / publishing in journal

Text Book(s):	
1	Handbook of Design Thinking by Christian Müller-Roterberg, Kindle Direct Publishing, 2018**.**
2	Design Thinking – A Beginner's Perspective, by E Balagurusamy, Bindu Vijakumar, MC Graw Hill, 2024

Reference Book(s):	
1	Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work – by Beverly Rudkin Ingle, Apress; 1st ed. Edition, 2013
2	Design Thinking: Understanding How Designers Think and Work by Nigel Cross, Bloomsbury Visual Arts; 2 edition 2023

Web links	
1	Design thinking Guide https://www.rcsc.gov.bt/wp-content/uploads/2017/07/dt-guide-book-master-copy.pdf
2	NPTEL Course on Design Thinking and Innovation By Ravi Poovaiah ; https://onlinecourses.swayam2.ac.in/aic23_ge17/preview
3	IITB Design course tools and Resources https://www.dsource.in/

GE23627	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	3	3	3	2	2	3	3	3	3	3	3	3	3
CO 2	3	2	3	3	3	2	2	3	3	3	3	3	3	3	3
CO 3	3	2	3	3	3	2	2	3	3	3	3	3	3	3	3
CO 4	3	2	3	3	3	2	2	3	3	3	3	3	3	3	3
CO 5	3	2	3	3	3	2	2	3	3	3	3	3	3	3	3
Average	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER VII

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23711	ESTIMATION, COSTING AND VALUATION ENGINEERING	PC	3	0	0	3

Objectives:
● To understand the philosophy, purpose, and methods of quantity estimation for various construction elements and infrastructure works.
● To learn the principles of rate analysis and costing for construction works by incorporating standard data, market rates, and schedule of rates.
● To familiarize students with detailed specifications, tendering processes, and preparation of project reports for construction activities.
● To gain knowledge about various types of construction contracts, their formation, conditions, and resolution of disputes in compliance with standard practices.
● To develop an understanding of valuation concepts, methods, and their applications in real estate and infrastructure projects.

UNIT-I	**QUANTITY ESTIMATION**	**11**
Philosophy – Purpose – Methods of estimation – Types of estimates – Approximate estimates – Detailed estimate – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls – culverts (additional practice in class room using computer softwares).		
UNIT-II	**RATE ANALYSIS AND COSTING**	**9**
Standard Data – Observed Data – Schedule of rates – Market rates – Rate Analysis for all Building works, canals, and Roads – Cost Estimates (Excel based preparation for estimation) - (Analysis of rates for the item of work asked, the data regarding labour, rates of labour and rates of material to be given in the Examination QuestionPaper).		
UNIT-III	**SPECIFICATIONS, REPORTS AND TENDERS**	**9**
Specifications – Detailed and general specifications (NRM 2) – Principles for report preparation – report on estimate of residential building – Culvert – Roads – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model tenders , E-tendering-Digitalsignature certificates - Encrypting - Decrypting – Reverse auctions.		
UNIT-IV	**CONTRACTS**	**7**
Contract – Types of contracts – Formation of contract – Contract conditions – Contract for labour, material,design, construction – Drafting of contract documents based on IBRD / MoRTH Standard bidding documents – Construction contracts – Contract problems – Arbitration and legal requirements - Construction disputes andresolution methods (FIDIC contract terms).		
UNIT-V	**VALUATION**	**9**
Definitions – Various types of valuations – Valuation methods - Necessity – Capitalised value – Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent – Mortgage – Lease.		
		Total Contact Hours: 45

Course Outcomes:
On completion of the course, the students will be able to
● Calculate the quantities for buildings, roads, septic tanks, soak pits, retaining walls, and culverts using both manual methods and computer software.
● Perform rate analysis and prepare cost estimates for buildings, canals, and roads with detailed calculations for labor, materials, and other resources.
● Capable of drafting project reports, model tenders, and understanding tender procedures, including E-tendering and digital encryption methods.
● Acquire skills in drafting and managing construction contracts while addressing legal requirements and dispute resolution using FIDIC terms.
● Conduct valuations for land and buildings, calculate depreciation, and assess capitalized value, standard rent, and other financial aspects related to real estate.

SUGGESTED ACTIVITIES
● Problem solving sessions
● Case Studies
● Flipped Classrooms

SUGGESTED EVALUATION METHODS

- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):	
1.	B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors (P) Ltd, 2016.
2.	B.S.Patil, 'Civil Engineering Contracts and Estimates', University Press, 2006.
3.	D.N. Banerjee, 'Principles and Practices of Valuation', V Edition, Eastern Law House, 2015.

Reference Books(s) / Web links:
1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD.
2. Tamil Nadu Transparencies in Tenders Act, 1998.
3. Arbitration and Conciliation Act, 1996.
4. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April 1996.
5. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003.

CE23711	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	2	2	3	2	2	1	1	2	2	2	2	3	3	2
CO 2	2	3	3	2	3	1	1	1	2	1	2	2	3	3	2
CO 3	2	2	3	3	3	2	2	2	3	3	3	2	2	3	3
CO 4	2	2	2	2	2	3	2	3	2	2	3	2	2	2	3
CO 5	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
Average	**2.2**	**2.2**	**2.4**	**2.4**	**2.4**	**2**	**1.6**	**1.8**	**2.2**	**2**	**2.6**	**2.2**	**2.6**	**2.8**	**2.6**

Prepared by Name and signature	**Approved by Name and Signature**
MR.M.MANOHARAN, ASSISTANT PROFESSOR / CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23712	HYDROLOGY	PC	3	0	0	3

Objectives:
● To gain foundational knowledge of precipitation and associated losses.
● To develop skills in constructing hydrographs.
● To explore the impact and concept of floods and flood routing.
● To acquire insights into storage estimation and life of reservoirs.
● To develop knowledge of subsurface water hydrology and management.

UNIT-I	PRECIPITATION AND ABSTRACTIONS	10
Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges - Spatial analysis of rainfall data using Thiessen and Isohyetal Methods-Interception - Evaporation. Horton's equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton's equation - double ring infiltrometer, infiltration indices.		
UNIT-II	**RUNOFF**	**8**
Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical – Strange's table and SCS methods – Stage discharge relationships- flow measurements- Hydrograph – Unit Hydrograph – IUH.		
UNIT-III	**FLOOD AND DROUGHT**	**9**
Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts-Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis Drought Prone Area Program (DPAP).		
UNIT-IV	**RESERVOIRS**	**8**
Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve.		
UNIT-V	**GROUNDWATER AND MANAGEMENT**	**10**
Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas.		
		Total Contact Hours: 45

Course Outcomes:
On completion of the course, the students will be able to
• Analyze precipitation and abstraction processes using advanced meteorological methods, spatial rainfall analysis, and empirical equations to evaluate hydrological drivers in catchments.
• Analyze catchment characteristics and factors influencing runoff, estimate runoff using empirical methods, and interpret stage-discharge relationships and hydrographs, including unit hydrographs and IUH.
• Examine floods, droughts, and their management strategies.
• Comprehend the design principles of Reservoirs, storage estimation, sedimentation management, reservoir life and rule curve development.
• Analyze aquifer properties and flow dynamics, apply governing equations for groundwater movement, and evaluate artificial recharge and RWH strategies for sustainable resource management.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions – Runoff Estimation, Flood frequency Analysis
- Activity Based Learning – Hydrological cycle and Reservoir

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):
1. Subramanya. K. "Engineering Hydrology"- Tata McGraw Hill, 6th Edition 2024.
2. Jayarami Reddy. P. "Hydrology", Tata McGraw Hill, 2008
3. Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 1995.

Reference Books(s) / Web links:
1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007.
2. Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.
3. Raghunath. H.M., "Hydrology", Wiley Eastern Ltd., 1998.

CE23712	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	1	1	2	1	2	1	1	1	1	2	3	2	2
CO 2	3	3	3	1	2	2	2	1	1	2	1	2	3	3	2
CO 3	3	3	1	1	2	2	3	1	1	2	1	2	2	2	3
CO 4	3	1	3	1	2	3	3	1	1	2	3	1	3	2	3
CO 5	3	3	1	1	2	2	3	1	1	2	2	3	3	3	3
Average	**3**	**2.6**	**1.8**	**1**	**2**	**2**	**2.6**	**1**	**1**	**1.8**	**1.6**	**2**	**2.8**	**2.4**	**2.6**

Prepared by Name and signature	Approved by Name and Signature
MS.S.YUGASINI, ASSISTANT PROFESSOR / CIVIL	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
CE23721	BUILDING INFORMATION MODELLING	PC	0	0	4	2

Objectives:
● To gain the concepts of BIM
● To introduce software tools available for 2D and 3D drawing.
● To introduce the students to draft the 3D plan, elevation and sectional views of buildings
● To acquire knowledge on building documentation and quantity take off as per National Building Code.
● To acquire knowledge in schedule for a multi storied building

Description of the Experiments	Total Contact Hours:60
1. Introduction to BIM	
2. Introduction to software tools available for 2D and 3D Exercises	
3. Building Components – Walls, Doors, Windows and Roofs	
4. Building Components – Floors, Staircase and Ramp	
5. 3-D elevation for single storied building (output with Plan, Section and elevation rendering)	
6. 3-D elevation for multi storied building (output with Plan, Section and elevation rendering)	
7. Interior design for rooms with lighting effect	
8. Building walk through model.	
9. Single storied building documentation and quantity take off	
10. Multi storied building documentation and quantity take off	
11. Construction schedule for a multi storied building	

Course Outcomes:
On completion of the course, the students will be able to
● Understand the role and potential of BIM for the industry.
● Classify software tools available for 2D and 3D drawing.
● Develop skills to draft the 3D plan, elevation and sectional views of buildings
● Recognize the need of building documentation and quantity take off as per National Building Code.
● Develop skills in schedule for a multi storied building

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Experiment based viva
- Quizzes
- Mini Project

Web links for virtual lab (if any)
● https://www.coursera.org/courses?query=bim.
● https://www.udemy.com/course/bim-training/.

Lab equipment required:

S. No	Name of the Equipment	Quantity Required	Remarks
1	Autodesk Autocad 3D	35 nos	
2	Autodesk Revit Architecture	35 nos	
3	Microsoft Project / Primavera	35 nos	

CE23721	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	3	3	3	2	3	2	2	2	3	2	3	2	1
CO 2	3	1	3	3	3	2	3	2	2	2	3	2	3	2	1
CO 3	3	1	3	3	3	2	3	2	2	2	3	2	3	2	1

CO 4	3	1	3	3	3	2	3	2	2	2	3	2	3	2	1
CO 5	3	1	3	3	3	2	3	2	2	2	3	2	3	2	1
Average	**3**	**1**	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**1**

Prepared by Name and signature	**Approved by Name and Signature**
MR.MAHAMOOD UL HASAN N, ASSISTANT PEOFESSOR (SG) / CIVIL	

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
CE23722	DESIGN PROJECT	EEC	0	0	4	2

Objectives:

- To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

STRATEGY

The student has to identify a topic of interest on consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

Total Contact Hours	**:**	**60**

Course Outcomes:

On completion of the project, the students will be able to

- Identify the strategies for effective planning and plan the structure or facility for the topic identified.
- Identify the loading conditions and the design parameters for which the structure has to be designed.
- Apply the theoretical concepts in the actual design and analyze the real time structures.
- Analyze the cost estimate of the structure and give a detailed drawing of the designed structural components.
- Prepare the project report with all the relevant data and present the technical aspect of the work done.

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
CE23723	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR CIVIL ENGINEERS	BS	0	0	4	2

Objectives:
● To solve the problems of various domains of Civil Engineering through artificial intelligence and machine learning.

Description of the Project	Total Contact Hours: 30
A student group of 2 members works on a domain-specific topic under the guidance of a faculty member and prepares a report after completing the work to the satisfaction. The student will be evaluated based on internal reviews, report preparation and the viva voce examination.	

Course Outcomes:
● Solve the problems of various domains of Civil Engineering through artificial intelligence and machine learning.

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MR. P.MUTHAIYAN, ASSISTANT PROFESSOR (SS) / CIVIL	

Course Code	Course Title (Laboratory course)	Category	L	T	P	C
CE23724	INTERNSHIP*	EEC	0	0	2	1

Objectives:

- To enhance the knowledge of the students in professional engineering practice sought through industrial training on different current technologies.
- To expose students to real work life situations and to equip them with abreast of new technology that intensify their job acumen.
- To employ the students in structural industrial projects and strengthen the practical skills of the students.
- To develop significant commitment in the students' profession and specialization.

STRATEGY:

The students individually undertake training in reputed Civil Engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva- voce examination by a team of internal staff.

Course Outcomes:

On completion of the course, the students will be able to

- Demonstrate the ability to apply academic knowledge to real-world civil engineering projects, including structural analysis, materials testing, and project management.
- Integrate classroom theory with workplace practice.
- Acquire knowledge from the industry professionals who have assortment of knowledge in working in live-projects.
- Work on a research project or undertake work experience under the guidance of industry and academic supervision.
- Extend the knowledge through research and development in the chosen fields of specialization.

(* Two weeks at the end of Semester VI)

SEMESTER VIII

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
CE23821	PROJECT	EEC	0	0	12	6

Objectives:

- To develop the ability to interpret a specific problem.
- To formulate a proper methodology.
- To precede the work right from its identification and literature review till the successful solution of the same.
- To infer the various results and conclude the result.
- To prepare project reports and to face reviews and viva voce.

STRATEGY

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

Total Contact Hours	**:**	**200**

Course Outcomes:

On completion of the course, the students will be able to

- Pursue any challenging practical problems and find solution to the topic defined.
- Recognize the materials and technologies to be used to achieve the necessary characteristics.
- Formulate a methodology to conduct the work.
- Demonstrate the formulated methodology through studies on model/prototype and laboratory testing.
- Deduce important references and report the technical aspect of the work performed.

PROFESSIONAL ELECTIVES

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23A11	ADVANCED STRUCTURAL ANALYSIS	PE	3	0	0	3

Objectives:

- To acquire knowledge on analysis of portal and gable frames.
- To apply the concept of ILD to analyze two and three hinged arches.
- To learn the concept for analysis of space frames using matrix analysis.
- To learn the concept for analysis of multistoried frames.
- To acquire knowledge on analysis of elastic instability.

UNIT-I ANALYSIS OF PORTAL & GABLE FRAMES — **9**

Analysis of single bay portal frames with inclined legs, gable frames.

UNIT-II INFLUENCE LINES — **9**

Analysis of indeterminate beams, three hinged arches, two hinged arches using Influence Line Diagram (ILD).

UNIT-III MATRIX METHOD — **9**

Matrix analysis of Space frames

UNIT-IV MULTISTORIED FRAME ANALYSIS — **9**

Portal Frame Method and Substitute Frame Method for analysis of multi-storeyed frames

UNIT-V ELASTIC INSTABILITY — **9**

Analysis of elastic instability and second order effects

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- Analyse portal frames with inclined legs and gable frames.
- Calculate the resultants due to moving loads on two and three hinged arches.
- Analyze space frames using matrix methods.
- Analyze multistoried frames.
- Analyze the elastic instability.

Text Book(s):

1. G.S. Pandit and S.P.Gupta, "Matrix Methods of Structural Analysis", 2nd Edition, Tata McGraw Hill, 2000.
2. V.N. Vazirani and M.M. Ratwani, "Analysis of structures", Vol. I & II, 4th Edition, Khanna Publications, 2009.
3. Devdas Menon, "Advanced Structural Analysis", Narosa publishing house Pvt Ltd, 2012

Reference Books(s) / Web links:

1. Prakash Rao D.S., "Structural Analysis", 3rd Edition, Sagar books, 2008.
2. Bhavi Katti S.S, "Structural Analysis", Vol. I & II, 4th Edition, Vikas Publications, 2010.
3. Online Resources: https://archive.nptel.ac.in/courses/105/106/105106050/

CE23A11	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	1	1	1	1	1	1	2	3	2	2
CO 2	3	3	2	2	2	1	1	1	1	1	1	2	3	2	2
CO 3	3	3	3	3	3	1	1	1	1	1	1	3	3	3	2
CO 4	3	3	3	3	3	1	1	1	1	1	1	3	3	3	2
CO 5	3	3	3	3	3	1	1	1	1	1	1	3	3	3	2
Average	**3**	**3**	**2.6**	**2.6**	**2.6**	**1**	**1**	**1**	**1**	**1**	**1**	**2.6**	**3**	**2.6**	**2**

Prepared by Name and signature	Approved by Name and Signature
DR.S.GEETHA, PROFESSOR & HEAD /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23A12	MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES	PE	3	0	0	3

Objectives:

- Provide an understanding of maintenance, repair, and rehabilitation strategies for structures.
- Develop knowledge of the causes and preventive measures for structural deterioration and methods of evaluation.
- Explore the properties, applications, and benefits of special types of concrete.
- Equip students with techniques for structural repair, protection, and non-destructive testing.
- Introduce advanced methods for strengthening, retrofitting, and monitoring structural health, including demolition techniques and case studies.

UNIT-I MAINTENANCE AND REPAIR STRATEGIES **9**

Maintenance, Repair and Rehabilitation - Facets of Maintenance - Importance of Maintenance - Various aspects of Inspection - Assessment procedure for evaluating a damaged structure - causes of deterioration- surface deterioration - efflorescence - Causes and preventive measures.

UNIT-II STRENGTH AND DURABILITY OF CONCRETE **9**

Strength, Durability of concrete - Cracks, different types causes - Corrosion mechanism - Effects of cover thickness and cracking - Methods of corrosion protection – Inhibitors - Coatings - Cathodic protection for reinforcements

UNIT-III SPECIAL CONCRETES **9**

Polymer concrete - Sulphur infiltrated concrete - Fibre reinforced concrete - Fibre reinforced plastics- High strength concrete - High performance concrete - Vacuum concrete - Self compacting concrete – Geopolymer concrete - Reactive powder concrete – Bacterial Concrete - Concrete made with industrial wastes.

UNIT-IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS **9**

Non-destructive Testing Techniques, Load test for Stability - Epoxy injection, Shoring, Underpinning - Autogenous healing - Pre-packed concrete- Protective surface coating.

UNIT-V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES **9**

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, earthquake- Transportation of Structures from one place to other –Structural Health Monitoring- demolition techniques-Engineered demolition methods-Case studies

Total Contact Hours: 45

Course Outcomes:

On completion of the course the students will be able to

- Explain the importance of maintenance, repair, and rehabilitation in the lifecycle of structures.
- Assess structural damage and identify causes of deterioration, including surface defects like efflorescence, and propose preventive measures.
- Compare and contrast the properties and applications of special concretes, including high-performance and eco-friendly options like geopolymer and bacterial concrete.
- Apply techniques such as epoxy injection, shoring, and non-destructive testing for repairing and protecting damaged structures.
- Design and implement solutions for strengthening and retrofitting structures subjected to corrosion, fire, earthquakes, or other stresses, while incorporating modern demolition and structural monitoring techniques.

SUGGESTED ACTIVITIES

- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Modi, P.I., Patel, C.N. (2016). Repair and Rehabilitation of Concrete Structures, PHI India, New Delhi.
2. B.Vidivelli, Rehabilitation of Concrete Structures Standard Publisher 2021 edition.

Reference Books(s) / Web links:

1. IABSE, (2010). Case Studies of Rehabilitation, Repair, Retrofitting, and Strengthening of Structures, Volume

	12, Structural Engineering Documents (SED), Switzerland.
2.	Varghese.P.C. (2014), Maintenance, Repair & Rehabilitation and Minor Works of Buildings, PHI India, New Delhi.
3.	Bhattacharjee.J. (2017), Concrete Structures Repair Rehabilitation and Retrofitting, CBS Publishers & Distributors, New Delhi.
4.	Dov Kominetzky.M.S., Design and Construction Failures, Galgotia Publications Pvt.Ltd. 2001.
5.	Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And Rehabilitation of Concrete Structures, Allied Publishers, 2004.
6.	Hand Book on "Repair and Rehabilitation of RCC Buildings"–Director General works CPWD, Govt of India, New Delhi–2002.
7.	Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.

CE23A12	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	1	3	1	1	1	2	1	1	3	1	2
CO 2	2	3	3	2	1	3	1	1	1	2	1	1	3	3	2
CO 3	3	3	2	2	1	1	1	1	1	2	1	2	3	1	1
CO 4	1	2	3	2	1	3	1	1	1	2	2	2	3	3	3
CO 5	3	2	3	2	1	3	1	1	1	2	2	2	3	3	3
Average	**2.4**	**2.4**	**2.6**	**2**	**1**	**2.6**	**1**	**1**	**1**	**2**	**1.4**	**1.6**	**3**	**2.2**	**2.2**

Prepared by Name and signature	Approved by Name and Signature
MRS.A.J. JEYA ARTHI, ASSISTANT PROFESSOR (SS)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23A13	DESIGN OF BRIDGES	PE	3	0	0	3

Objectives:

- To comprehend the various types of bridges, loads acting on road and railway bridges.
- To propose a suitable bridge type for a given project.
- To get familiarized with analysis and design of RC & PSC bridges.
- To understand the loading mechanism on steel bridges.
- To recommend suitable type of bearings, piers, abutments and foundation of bridges.

UNIT-I **INTRODUCTION ON BRIDGES & LOADINGS** **9**

History of Bridges - Components of a Bridge and its definitions- Classification of Road Bridges - Selection of Site and Initial Decision Process - Survey and Alignment; Geotechnical Investigations and Interpretations. River Bridge: Selection of Bridge site and planning - Collection of Bridge design data - Hydrological calculation.

Road Bridges - IRC codes - Standard Loading for Bridge Design - Influence lines for statically determinate structures - I.L. for statically indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs.

Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre-design considerations; - Railroad vs. Highway bridges.

UNIT-II **SUPERSTRUCTURE** **9**

Selection of main bridge parameters, design methodologies -Choices of superstructure types; Orthotropic plate theory, load + techniques - Grillage analysis - Finite element analysis - Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.- Transverse Analysis of Bridge- Temperature Analysis-Distortional Analysis-Effects of Differential settlement of supports- Reinforced earth structures.

UNIT-III **DESIGN OF RC AND PSC BRIDGES** **9**

Design of slab bridges – Girder bridges – PSC bridges-design considerations.

UNIT-IV **DESIGN OF STEEL BRIDGES** **9**

Design of Truss Bridges – Design of Plate girder bridges.

UNIT-V **SUBSTRUCTURE, BEARINGS AND DECK JOINTS, PARAPETS AND RAILINGS** **9**

Substructure - Pier; Abutment - Wing walls- Importance of Soil-Structure Interaction - Types of foundations - Open foundation- Pile foundation- Well foundation- Simply supported bridge.

Continuous Bridge - Bearings and Deck Joints - Different types of bridge bearings and expansion joints - Parapets and Railings for Highway Bridges.

Total Contact Hours : 45

Course Outcomes:

On completion of the course, the students will be able to

- Perceive the basic concepts in proportioning of bridge in terms of aesthetics, geographical location and functionality.
- Choose a suitable bridge type for a given project taking into consideration the structural and economic aspects.
- Design and detail RC & PSC bridges for different loadings.
- Analyze and design steel truss and plate girder bridges.
- Develop skills to prefer suitable type of bearings, piers, abutments and substructure.

Text Book (s):

1. Johnson Victor D., Essentials of Bridge Engineering, 6th Edition, CBS Publishers & Distributors Pvt. Ltd., 2017.
2. Krishna Raju N., Design of Bridges, 5th Edition, Oxford and IBH publishing co., New Delhi, 2015.

Reference Book (s) / Web links:

1. Praveen Nagarajan, Design of Concrete Bridges (As per Latest IRC Codes), Wiley, 2020.
2. Ponnuswamy S., Bridge Engineering, 3rd Edition, Tata McGraw-Hill, New Delhi, 2017.
3. Rajagopalan. N. “Bridge Superstructure”, Alpha Science International, 2006.
4. Jagadeesh.T.R. and Jayaram.M.A., “Design of Bridge Structures”, Prentice Hall of India Pvt. Ltd. 2009.
5. https://nptel.ac.in/courses/105/105/105105165/

Code Book(s):

1	IRC: 5-2015, Standard Specifications and Code of Practice for Road Bridges, Section I – General Features of Design (Eight Revision), Indian Road Congress, 2015.
2	IRC: 6-2017, Standard Specifications and Code of Practice for Road Bridges, Section II – Loads and Load Combinations (Seventh Revision), Indian Road Congress, 2017.
3	IRC: 22-2015, Standard Specifications and Code of Practice for Road Bridges, Section VI – Composite Construction (Limit States Design) (Third Revision), Indian Road Congress, 2015.
4	IRC: 24-2010, Standard Specifications and Code of Practice for Road Bridges, Steel Road Bridges (Limit State Method) (Third Revision), Indian Road Congress, 2010.
5	IRC: 83-2015 (Part-I), Standard Specifications and Code of Practice for Road Bridges, Section IX Bearings, Part I: Roller & Rocker Bearings (Second Revision), Indian Road Congress, 2015.
6	IRC: 83-2015 (Part-II), Standard Specifications and Code of Practice for Road Bridges, Section IX Bearings (Elastomeric Bearings), Part II (First Revision), Indian Road Congress, 2015.
7	IRC: 83-2002 (Part-III), Standard Specifications and Code of Practice for Road Bridges, Section IX Bearings, Part III: POT, POT-CUM-PTFE, PIN and Metallic Guide Bearings, Indian Road Congress, 2002.
8	IRC: 83-2014 (Part IV), Standard Specifications and Code of Practice for Road Bridges, Section IX – Bearings (Spherical and Cylindrical), Indian Road Congress, 2014.
9	IRC: 112-2011, Code of Practice for Concrete Road Bridges. Indian Road Congress, 2011.

CE23A13	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	1	1	1	1	1	1	1	1	2	2	2
CO 2	3	3	3	2	1	2	1	1	1	1	2	1	3	2	3
CO 3	3	3	3	2	1	2	1	1	1	1	2	1	3	2	3
CO 4	3	3	3	2	1	2	1	1	1	1	2	1	3	2	3
CO 5	3	3	3	3	1	3	2	1	1	1	2	2	2	2	3
Average	**3.0**	**3.0**	**3.0**	**2.2**	**1.0**	**2.0**	**1.2**	**1.0**	**1.0**	**1.0**	**1.8**	**1.2**	**2.6**	**2.0**	**2.8**

Prepared by Name and signature	Approved by Name and Signature
DR.S.GEETHA, PROFESSOR & HEAD /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23A14	PRESTRESSED CONCRETE STRUCTURES	PE	3	0	0	3

Objectives:

- To understand the need for prestressed concrete and various methods of analysis of prestressed concrete structures.
- To design the prestressed concrete beams for flexure and shear as per the IS code.
- To evaluate the short &long term deflections and anchorage zone stress in prestressed concrete beams.
- To expertise in analysis and design of composite and continuous prestressed concrete beams.
- To acquire knowledge on various tension and compression members and understand the concept of partial prestressing.

UNIT-I	INTRODUCTION – THEORY AND BEHAVIOUR	9

Basic concepts – Advantages and disadvantages – 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 in post -tensioned and pre- tensioned members.

UNIT-II	DESIGN FOR FLEXURE AND SHEAR	9

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cablesin post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S.1343 Code.

UNIT-III	DEFLECTION AND DESIGN OF ANCHORAGE ZONE	9

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit states. Determination ofanchorage zone stresses in post-tensioned beams – design of anchorage zone reinforcement.

UNIT-IV	COMPOSITE BEAMS AND CONTINUOUS BEAMS	9

Analysis and design of composite beams – Methods of achieving continuity in continuous beams –Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design

UNIT-V	TENSION AND COMPRESSION MEMBERS	9

Role of prestressing in members subjected to Tensile forces and compressive forces - 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 Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- Acquainted with various methods of analysis of prestressed concrete structures.
- Determine flexural strength and shear based on various codes.
- Analyze and design anchorage zone stress in prestressed concrete beam with deflection.
- Predict deflections, cracking, and other failure modes in composite and prestressed beams under real-world loading conditions.
- Delineate tension and compression members and apply it for design of tanks, pipes and poles.

SUGGESTED ACTIVITIES

- Problem solving sessions For All 5 units

SUGGESTED EVALUATION METHODS

- Tutorial problems For All 5 units
- Assignment problems For All 5 Units

Text Book(s):

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi,2012.
2. Rajagopalan .N, "Prestressed Concrete", Narosa Publishing House, 2002.
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.

Reference Books(s) / Web links:

1. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2017.
3. https://www.pci.org/

CE23A14	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	2	2	1	1	-	1	-	2	3	3	2
CO 2	3	3	3	3	2	2	1	1	-	1	-	2	3	3	2
CO 3	3	3	3	3	2	2	1	1	-	1	-	2	3	3	2
CO 4	3	3	3	3	2	2	1	1	-	1	-	2	3	3	2
CO 5	3	3	3	3	2	2	1	1	-	1	-	2	3	3	2
Average	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**1**	**-**	**2**	**3**	**3**	**2**

Prepared by Name and signature	Approved by Name and Signature
DR.S. PREMKUMAR/ ASSISTANT PROFESSOR (SS) / CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23A15	STRUCTURAL HEALTH MONITORING	PE	3	0	0	3

Objectives:

- To study various types of techniques for SHM.
- To understand the basics of actuators and its engineering application.
- To get familiarized with the methods used for SHM of structures.
- To understand the conditional assessment of structures.
- To understand the techniques for strengthening and retrofitting of structures.

UNIT-I	INTRODUCTION ON NEED & CONCEPTS OF SHM	9

Need of Structural Health Monitoring, Definition & Concept of SHM, SHM & Biomimetic Comparison of SHM with NDT, Types & Components of SHM, Procedure of SHM, Objectives & Operational Evaluations of SHM, Advantages of SHM.

UNIT-II	INSTRUMENTATION AND SENSORS	9

Basics of Instrumentations & Measurements, Classifications, Input-Output Configurations of Instruments, Static & Dynamic Charecteristics, Functions. Various Types of Electromechanical, Electronics & Digital Instruments for SHM. Data Acquisition Systems-Types, Hardware & It's Components. Basics of Sensors, Transducers & Actuators, Classification of Sensors, Characteristics & Working Principles of Various Types of Sensors like Strain Gauges, LVDT, Accelerometers etc. Concept of Smart Materials & Smart Structures with SHM, Basics of Smart Materials like Piezoelectric, Shape Memory Alloys, ER & MR Fluids etc.

UNIT-III	METHODS OF SHM	9

Methodologies and Monitoring Principles, Local & Global Techniques for SHM, Static & Dynamic Field Testing, Short & Long-Term Monitoring, Active & Passive Monitoring. Vibration Based SHM Techniques - Use & Demonstration of Dynamic Properties of Structures for Damage Detection & SHM, Ambient Vibration Test, Acoustic Emission Technique, Electromechanical Impedance Technique, Wave Propagation Based Techniques, Fibre Optics Based Techniques, Remote & Wireless SHM Techniques, IoT Application in SHM, Artificial Intelligence & Machine Learning in SHM.

UNIT-IV	STRUCTURAL ASSESSMENT	9

Structural Assessment & Need for retrofitting: Introduction to health assessment of structures, structural damages & failures, Principles of structural assessment, Classification & levels of assessment, Current scenario of infrastructure through case studies.

UNIT-V	SHM FOR RETROFITTING	9

Concept of repair & retrofitting of structures: Case studies of structural & foundation failure, performance problems, responsibility & accountability, causes of distress in structural members, design and material deficiencies, factors causing extensive Deterioration. Retrofitting of structures: Fundamental of retrofitting, Flow of retrofitting process, Methods of retrofitting, Materials for retrofitting (conventional and smart materials), selection of retrofitting methods

	Total Contact Hours	:	45

Course Outcomes:

On completion of the course, the students will be able to

- Perceive various SHM techniques in engineering application.
- Identify suitable Sensors & Instruments required in SHM for in-service performance of structures.
- Assess the health of structures using different techniques of SHM.
- Identify suitable technique for structural condition assessment.
- Decide the appropriate strengthening & retrofitting techniques to regain the structural strength.

Text Book (s):

1. Daniel Balageas, Peter Fritzen, Alfredo Guemes, Structural Health Monitoring, John Wiley & Sons,2006.
2. Douglas E ,Health Monitoring of Structural Materials and Components Methods with Applications.

Reference Book (s) / Web links:

1. Victor Giurglutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc,2007.
2. Adams, John Wiley and Sons, Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
3. https://archive.nptel.ac.in/courses/114/106/114106046/

CE23A15	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	3	2	1	3	-	3	1	2	2	1	3	-	2
CO 2	2	3	3	-	-	3	-	3	1	2	-	1	3	3	2
CO 3	3	3	2	-	-	-	-	3	1	2	2	-	3	-	-
CO 4	1	2	3	2	1	3	1	3	1	2	-	2	3	3	3
CO 5	3	2	3	-	1	3	1	3	1	2	2	-	3	3	3
Average	**2.4**	**2.4**	**2.8**	**2**	**1**	**3**	**1**	**3**	**1**	**2**	**2**	**1.3**	**3**	**3**	**2.5**

Prepared by Name and signature	Approved by Name and Signature
DR.S.GEETHA, PROFESSOR & HEAD /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23A16	PRE-ENGINEERED STRUCTURES	PE	3	0	0	3

Objectives:

- To introduce the concepts of prefabrication, its types, and systems.
- To explore the structural behavior of prefabricated structures.
- To gain knowledge in the design of cross-sections and joints in prefabricated structures.
- To acquire detailed knowledge in designing and detailing various prefabricated units.
- To develop comprehensive knowledge in the design of structures subjected to earthquakes.

UNIT-I **FUNDAMENTALS OF PREFABRICATED STRUCTURES** **9**

Types of prefabrication, prefabrication systems and structural schemes - Need for prefabrication - Principles - Materials - Disuniting of structures - Handling and erection - Elimination of erection stresses.

UNIT-II **PREFABRICATED COMPONENTS** **9**

Production, Transportation & erection- Shuttering and Mold design - Dimensional tolerances - Erection of R.C. Structures, Total prefabricated buildings - Structural behaviour of precast structures - Large panel constructions - Construction of roof and floor slabs - Wall panels - Columns - Shear walls.

UNIT-III **DESIGN PRINCIPLES** **9**

Design of cross section based on efficiency of material used - Problems in design - joint flexibility - Allowance for joint deformation - Design of expansion joints.

UNIT-IV **STRUCTURAL MEMBERS** **9**

Design and detailing of boot reinforcement in beams, composite plank floor and corbel - Dimensioning and detailing of joints for different structural connections - industrial structures and water tanks.

UNIT-V **DESIGN FOR ABNORMAL LOADS** **9**

Progressive collapse - Codal provisions - Equivalent design loads for considering abnormal effects such as earthquakes, cyclones. Structural Integrity – alternate load path.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Examine the types and systems of prefabricated structures, apply principles and materials for prefabrication, and analyze handling, erection techniques, and the elimination of erection stresses.
- Apply techniques for the production, transportation, and erection of prefabricated components and analyze the structural behavior of precast elements such as panels, slabs, walls, and columns.
- Apply design principles for optimizing material efficiency, analyze issues such as joint flexibility and deformation, and design expansion joints for structural integrity.
- Design and detail structural members such as beams, composite plank floors, corbels, joints for various connections, industrial structures, and water tanks.
- Design structures to resist abnormal loads, apply codal provisions, and analyze structural integrity using concepts like progressive collapse and alternate load paths.

SUGGESTED ACTIVITIES

- Activity Based Learning

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Quizzes
- Case Study – Earthquake, Cyclones and abnormal effects.
- Class Presentation/Discussion

Text Book(s):

1. Hubert Bachmann and Alfred Steinle , Precast Concrete Structures, 2nd Edition March 2019.
2. Laszlo Mokk, Prefabricated Concrete for Industrial and Public Structures, Akademiai Kiado, Budapest, 1964.
3. Kim S. Elliott , Colin Jolly, “Multi-Storey Precast Concrete Framed Structures”. Wiley-Blackwell, 2014.

Reference Books(s) / Web links:

1. PCI Design Hand Book, 8th Edition, 2021.
2. Handbook on Precast Concrete for Buildings, ICI Bulletin 02, First Edition, 2016.
3. A.S.G. Bruggeling and G.F.Huyghe, Prefabrication with concrete, Netherlands: A.A. Balkema Publishers, 1991.

CE23A16	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	2	3	1	1	1	2	2	3	2	2
CO 2	3	3	3	2	3	2	3	1	1	2	2	2	3	3	2
CO 3	3	3	3	2	3	2	3	1	1	2	2	3	3	3	2
CO 4	3	3	3	2	3	2	3	1	1	2	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
Average	**3**	**3**	**2.8**	**2.2**	**2.8**	**2.2**	**3**	**1.2**	**1.2**	**2**	**2.4**	**2.6**	**3**	**2.8**	**2.4**

Prepared by Name and signature	Approved by Name and Signature
MRS.S. YUGASINI, ASSISTANT PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23A17	TALL STRUCTURES	PE	3	0	0	3

Objectives:

- To acquire knowledge of the design principles and materials used in tall buildings.
- To familiarize with various load types and combinations in tall structures.
- To explore the behavior of different structural systems in tall buildings.
- To learn analysis methods for tall structures, focusing on member forces, drift, and twisting.
- To gain insight into key design parameters for tall building stability.

UNIT-I DESIGN CRITERIA AND MATERIALS **9**

Design Philosophy - Modern concepts – Materials used - High Performance Concrete, Fiber Reinforced Concrete, Light weight concrete, Self-Compacting Concrete, Glass, High strength steel.

UNIT-II LOADING **9**

Gravity Loading – Dead load, Live load – Live load reduction techniques, Impact load, Construction load, Sequential loading. Wind Loading – Static and Dynamic Approach, Analytical method, Wind Tunnel Experimental methods. Earthquake Loading – Equivalent lateral Load analysis, Response Spectrum Method, Combination of Loads.

UNIT-III BEHAVIOUR OF STRUCTURAL SYSTEMS **9**

Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, in filled frames, Shear walls, Coupled Shear walls, wall – Frames, Tubular, Outrigger braced, Hybrid systems.

UNIT-IV ANALYSIS **9**

Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for member forces, drift and twist. Computerized 3D analysis.

UNIT-V DESIGN PARAMETERS **9**

Design for differential movement, Creep and Shrinkage effects, Temperature Effects and Fire Resistance. Stability of Tall Structures - PΔ Effects, Buckling analysis of Tall Buildings.

Total Contact Hours: 45

Course Outcomes:

On completion of the course students will be able to

- Examine modern design concepts and materials, including high-performance and specialty concretes, glass, and high-strength steel.
- Analyze gravity, wind, and earthquake loads using appropriate methods and assess their impact on structural performance.
- Evaluate the behavior of structural systems, including frames, shear walls, and hybrid systems.
- Analyze structures using modeling techniques, force evaluation, drift and twist assessment, and computerized 3D analysis methods.
- To design tall structures considering differential movement, material effects, temperature, fire resistance, and stability factors such as P-Δ effects and buckling.

SUGGESTED ACTIVITIES

- Activity Based Learning – Behaviour of structural systems

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Case study – HPC, SCC, FRC

Text Book(s):

1. Bryan Stafford Smith and Alex Coull, Tall Building Structures, Analysis and Design, John Wiley and Sons, Inc., 1991.
2. Bungale S. Taranath, Structural Analysis and Design of Tall Buildings: Steel and Composite construction, McGraw Hill, 2012.
3. Coull, A. and Smith Staford.B, Tall Buildings, Pergamon Press, London, 1997.

Reference Books(s) / Web links:

1. LinT.Y. and Burry D.Stotes, Structural Concepts and Systems for Architects and Engineers, John Wiley, 1994.
2. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.
3. Wolfgang Schuler, High Rise Building Structures, John Wiley & Sons, New York, 1977.

CE23A17	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	1	2	1	1	2	2	2	3	2	2
CO 2	3	3	3	2	3	2	3	2	1	2	2	3	3	3	2
CO 3	3	3	2	2	2	2	3	2	1	2	2	2	3	2	3
CO 4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
Average	**3**	**3**	**2.6**	**2.4**	**2.6**	**2.2**	**2.6**	**2**	**1.8**	**2.2**	**2.4**	**2.6**	**3**	**2.6**	**2.6**

Prepared by Name and signature	Approved by Name and Signature
MRS.S. YUGASINI, ASSITANT PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23B11	MUNICIPAL SOLID WASTE MANAGEMENT	PE	3	0	0	3

Objectives:

- To acquire knowledge on sources, types, characteristics, generation rates, effects of improper disposal of municipal solid waste and prevailing legislation in MSWM.
- To comprehend reduction, reuse, and recycling strategies for MSWM, onsite storage methods and onsite segregation methods.
- To gain knowledge on collection methods for solid waste, and to manage the operation and maintenance of transfer stations.
- Be familiar with the design, operation of safe landfill systems, ensuring environmental protection and public health safety.
- Introduce emerging challenges and technologies in e-waste management, including recycling, recovery, and regulatory compliance.

UNIT-I	SOURCES AND CHARACTERISTICS	9

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal ofsolid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management – Requirements and salient features of Solid waste management rules (2016) - Role of public and NGO's - Public Private participation – Elements of Municipal Solid Waste Management Plan.

UNIT-II	SOURCE REDUCTION, WASTE STORAGE AND RECYCLING	9

Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste – On- site storagemethods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – case studies under Indian conditions – Recycling of Plastics and Construction/Demolition wastes.

UNIT-III	COLLECTION, TRANSFER AND PROCESSING OF WASTES	9

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance; options underIndian conditions – Field problems- solving, Physical Processing techniques and Equipment; Resource recovery from solidwaste composting and bio methanation and thermal processing options.

UNIT-IV	WASTE DISPOSAL	9

Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills –Landfill liners – Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation.

UNIT-V	E-WASTE MANAGEMENT	9

E-waste generation in India, Composition of e-waste, E-waste management rules 2015 - Regulatory compliance including roles and responsibility of different stakeholders – producer, manufacturer, consumer, Environmental and public health issues, Emerging recycling and recovery technologies, Guidelines for establishment of integrated e-waste recycling and treatment facility, recovery of materials and metals from e-waste, Case studies.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the student is expected to be able to

- Analyse sources, types, and characteristics of municipal solid wastes and assess the impacts of improper disposal on public health and the environment.
- Apply integrated solid waste management principles, including reduction, reuse, recycling, and segregation, to real-world scenarios.
- Design and evaluate waste collection systems, transfer stations, and physical processing methods, considering local Indian conditions.
- Propose sustainable design and operational strategies for landfills, including leachate and landfill gas management, as well as dumpsite rehabilitation.
- Analyse e-waste management practices, understand regulatory frameworks, and evaluate emerging recycling and recovery technologies.

Text Book(s):

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid WasteManagement, Mc-Graw Hill International edition, New York, 1993.
2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. Evans, "Hazardous waste Management", Environmental Resources Management, Mc-Graw Hill International edition,New York, 2001.
3. Electronic Waste: Recycling and Reprocessing for a Sustainable Future, by Maria E. Holuszko, Amit Kumar and Denise C. R. Espinosa, E-book, Wiley, 2021

Reference Books(s) / Web links:

1. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization , Government of India, New Delhi, 2000.
2. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc.,Singapore, 2002.
3. Paul T Williams, Waste Treatment and Disposal, Wiley, 2005

4. The Complete Technology Book on E-Waste Recycling (Printed Circuit Board, LCD, Cell Phone, Battery, Computers) by NPCS Board of Consultants & Engineers, National Institute of Industrial Research (NIIR), 2015

SUGGESTED ACTIVITIES

- Problem solving sessions on analysis of waste collection systems – Unit 3
- Oral Survey conducted to test depth of knowledge gained in various topics, techniques and processes in Unit 1, 2, 4 and 5 by the student.
- Activity Based Learning - Each student given a waste collection (or) waste processing method to give a presentation in Unit 3 & 4

SUGGESTED EVALUATION METHODS

- Assignment in all units
- Tutorial problems in Unit-3
- Spot class test conducted in Unit 1, 2 and 5 to assess knowledge gained by student
- Class Presentation/Discussion in Unit-3 and Unit-4

CE23B11	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	3	3	1	0	2	1	2	3	2	2
CO 2	3	3	3	2	2	3	3	1	1	2	2	2	3	2	3
CO 3	3	3	3	3	3	2	2	0	2	3	3	2	3	3	2
CO 4	3	2	3	3	2	3	3	1	1	2	3	2	3	3	3
CO 5	3	3	2	2	2	3	3	1	0	2	1	3	3	2	3
Average	**3**	**2.8**	**2.6**	**2.4**	**2.2**	**2.8**	**2.8**	**0.8**	**0.8**	**2.2**	**2**	**2.2**	**3**	**2.4**	**2.6**

Prepared by Name and signature	Approved by Name and Signature
DR. M. SELVAKUMAR, PROFESSOR & DEAN /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23B12	INDUSTRIAL WASTE WATER TREATMENT	PE	3	0	0	3

Objectives:

- To understand the sources, characteristics, environmental impacts, and regulatory requirements of industrial wastewater.
- To acquire knowledge on pollution prevention techniques and strategies to control industrial pollution.
- To comprehend primary, secondary, and tertiary treatment processes for industrial wastewater.
- To evaluate various quality requirements for wastewater reuse and understand the treatment and disposal methods for industrial sludge.
- To develop an understanding of various industrial manufacturing processes and their corresponding wastewater treatment flow charts, particularly for industries such as tannery, textiles, pulp and paper, metal finishing, sugar, and distilleries.

UNIT-I INTRODUCTION **9**

Industrial scenario in India – Uses of water by Industry – sources, generation rates and characteristics of Industrial wastewaters – Toxicity of Industrial Effluents and Bioassay Tests – Environmental Impacts of Industrial Wastewaters – Regulatory requirements for Industrial wastewaters.

UNIT-II INDUSTRIAL POLLUTION PREVENTION **9**

Prevention Vs Control of Industrial Pollution – Benefits and Barriers – Waste Minimization Strategies – Evaluation of Pollution Prevention Options – Cost benefit analysis – Payback period.

UNIT-III TREATMENT OF INDUSTRIAL WASTEWATERS **9**

Physico–Chemical Treatment Processes – Equalisation, Neutralisation, Oil Separation, Flotation – Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen and Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Electrodialysis and Evaporation – Removal of Organic Constituents – Biological treatment Processes - Chemical Oxidation Processes - Advanced Oxidation processes — Treatability Studies.

UNIT-IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT **9**

Individual and Common Effluent Treatment Plants –Zero Effluent Discharge Systems and Management of RO Rejects, Quality requirements for wastewater reuse – Industrial reuse, Disposal on water and land – Residuals of Industrial Wastewater treatment – Quantification and Characteristics of Sludge – Thickening, Digestion, Conditioning, Dewatering and Disposal of Sludge – Solidification – Incineration – Secured Landfills.

UNIT-V CASE STUDIES **9**

Industrial manufacturing process description, Wastewater characteristics, Pollution Prevention Options and Treatment Flow sheets for selected Industries – Tanneries- Textiles- Pulp and Paper- Metal finishing – Sugar and Distilleries.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the student is expected to be able to

- Analyze the sources, characteristics, environmental impacts, and regulatory requirements of industrial wastewater.
- Evaluate various pollution prevention options and their effectiveness in minimizing industrial pollution.
- Design appropriate primary, secondary, and tertiary treatment processes for industrial wastewater treatment.
- Critically assess the quality requirements for wastewater reuse, sludge characterization, and the treatment and disposal methods of sludge.
- Assess various industrial manufacturing processes and treatment flowcharts for industries such as tannery, textiles, paper and pulp, metal finishing, sugar and distilleries.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Unit 1, 2, 3, 4: Oral Survey conducted to test depth of knowledge gained in various topics, techniques and processes by the student.
- Unit 4 & 5 : Activity Based Learning - Each student given a waste processing (or) waste disposal method to give a presentation
- Unit – 5 : Case Study PPT presentation

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Assignment in all units
- Unit 1, 2, 3, 4 : Spot class test conducted to assess knowledge gained by student
- Class Presentation/Discussion and evaluation in Unit-5

Text Book(s):

1. S.C.Bhatia, Handbook of Industrial Pollution and Control, Volume I & II, CBS Publishers New Delhi,2003.
2. Mahajan, S.P.Pollution Control in Process Industries, Tata McGraw Hill Publishing Co., NewDelhi, 1991.

Reference Books(s) / Web links:

1. Eckenfelder, W.W., „Industrial Water Pollution Control", Mc-Graw Hill, 2000.
2. Nelson Leonard Nemerow, "Industrial waste treatment – contemporary practice and vision for the future", Elsevier, Singapore, 2007.

3.	Frank Woodard, "Industrial waste treatment Handbook", Butterworth Heinemann, NewDelhi,2001.
4.	World Bank Group, „ Pollution Prevention and Abatement Handbook – Towards CleanerProduction", World Bank and UNEP, Washington D.C., 1998
5.	Paul L. Bishop, „ Pollution Prevention: - Fundamentals and Practice" , Mc-Graw Hill International, Boston,2000.
6.	Wang L.K., Yung-Tse Hung, Howard H.Lo and Constantine Yapijakis, „Handbook of Industrial andHazardous Wastes Treatment" , Marcel Dekker, Inc., USA, 2004.
7.	Arceivala, S.J., "Wastewater Treatment for Pollution Control", Tata McGraw Hill, 1998

CE23B12	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	2	2	1	2	1	1	2	1	3	2	1
CO 2	3	3	2	1	3	2	2	1	2	2	3	2	3	3	2
CO 3	3	3	3	2	3	2	2	2	2	2	3	1	3	3	2
CO 4	3	2	3	2	2	3	3	2	2	2	3	1	3	3	2
CO 5	3	3	3	3	3	2	3	2	3	3	3	2	3	3	3
Average	**3**	**2.6**	**2.4**	**1.8**	**2.6**	**2.2**	**2.2**	**1.8**	**2**	**2**	**2.8**	**1.4**	**3**	**2.8**	**2**

Prepared by Name and signature	Approved by Name and Signature
DR. M. SELVAKUMAR, PROFESSOR & DEAN /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23B13	AIR AND NOISE POLLUTION CONTROL ENGINEERING	PE	3	0	0	3

Objectives:

- To understanding of the sources, types, and impacts of air and noise pollution on the environment and human health.
- To equip students with skills to analyse air quality and noise levels using scientific methods and instrumentation.
- To provide knowledge of control technologies and strategies for mitigating air and noise pollution.
- To enable students to apply mathematical and simulation models for air quality and dispersion studies.
- To realize the importance of Air and Noise pollution measurement for maintaining environmental quality standards.

UNIT-I	INTRODUCTION	9

Atmosphere as a place of disposal of pollutants – Air Pollution – Definition -Classification of air pollutants - Man made - Natural sources - Type of air pollutants and Global Climate - Units of measurements of pollutants - Air quality criteria - emission standards - National ambient air quality standards - Air pollution indices - Air quality management in India.

UNIT-II	SOURCES AND EFFECTS OF AIR POLLUTANTS	9

Pollution due to automobiles - Analysis of air pollutants - Chemical, Instrumental and biological methods. Air pollution and its effects on human beings, plants and animals - Economic effects of air pollution - Effect of air pollution on meteorological conditions - Changes on the Meso scale, Micro scale and Macro scale.

UNIT-III	AIR POLLUTION CONTROL AND AIR QUALITY MODELLING	9

Elements of atmosphere - Meteorological factors - Wind rose diagram - Lapse rate - Atmospheric stability and turbulence - Plume rise - Effective stack height - Dispersion of pollutants - Dispersion models –Applications.- Concepts of control - Principles and design of control measures - Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation - Selection criteria for equipment - Gaseous pollutant control by adsorption, absorption, condensation, combustion - Pollution control for specific major industries- Air Quality Modeling.

UNIT-IV	NOISE POLLUTION	9

Sources, measurements, effects and occupational hazards of noise pollution- Assessment - Control methods - Noise Exposure Index - Prevention - Noise measurement strategies - Case Studies.

UNIT-V	NOISE AND AIR QUALITY MANAGEMENT	9

Noise and Air quality standards - Quality monitoring - Preventive measures - Pollution control efforts – Noise and Air quality Zoning - Town planning regulation of new industries - Legislation and enforcement - Environmental Impact Assessment on Air and Noise quality.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Analyze and classify various types of air and noise pollutants based on their sources, properties, and effects.
- Assess the economic, biological, and meteorological impacts of air pollution using advanced analytical techniques.
- Design and recommend appropriate control systems for particulates and gaseous pollutants based on industrial needs and environmental standards.
- Develop and apply air quality dispersion models to predict pollutant concentration and assess mitigation strategies.
- Comprehend noise and air quality management plans using zoning, legislative, and preventive measures to ensure sustainable development.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt Ltd, New Delhi, 2017
2. Dr. Y. Anjaneyulu, “Air Pollution and Control Technologies”, Allied publishers Pvt. Ltd., 2019.
3. C. S. Rao, “Environmental Pollution Control Engineering”, Wiley Eastern Limited, 2006.

Reference Books(s) / Web links:

1.	Noel De Nevers, "Air pollution control Engineering", McGraw Hill International Edition, McGraw Hill Inc, New Delhi, 2000.
2.	Lawrence K.Wang, Norman C.Pereira, Yung-Tse Hung, “Advanced Air and Noise Pollution Control”, 2nd edition 2010, Humana Press, United States
3.	Mukherjee, "Environmental Pollution and Health Hazards", causes and effects, 1986
4.	Antony Milne, “Noise Pollution: Impact and Counter Measures”, David & Charles PLC, 1979.

CE23B13	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	1	2	2	2	2	2	2	2	2	2	2
CO 2	3	2	2	2	2	2	2	1	2	2	2	1	2	2	2
CO 3	3	2	2	2	3	2	2	1	2	1	2	1	2	2	2
CO 4	3	2	2	2	2	2	1	1	2	3	2	2	2	2	2
CO 5	3	2	2	2	2	2	2	1	3	3	1	1	2	2	2
Average	**3**	**2**	**2**	**2**	**2**	**2**	**1.8**	**1.2**	**2.2**	**2.2**	**1.8**	**1.4**	**2**	**2**	**2**

Prepared by Name and signature	Approved by Name and Signature
MR.E.S. KARTHIC, ASSISTANT PROFESSOR /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23B14	SOLID AND HAZARDOUS WASTE MANAGEMENT	PE	3	0	0	3

Objectives:

- To evaluate sources, classification, and regulatory frameworks for solid and hazardous waste management
- To acquire a comprehensive understanding on waste characterization and source reduction of solid waste and hazardous waste.
- To plan and optimize systems for storage, collection, and transport of municipal and hazardous wastes.
- To understand and analyze suitable waste processing technologies for solid and hazardous waste along with the treatment of biomedical wastes.
- To devise suitable disposal method for solid waste and hazardous waste.

UNIT-I **SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK** **9**

Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management –- Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, nuclear wastes - lead acid batteries, electronic wastes, plastics and fly ash — Elements of integrated waste management and roles of stakeholders - Financing and Public Private Participation for waste management.

UNIT-II **WASTE CHARACTERIZATION AND SOURCE REDUCTION** **9**

Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan -Source reduction of wastes – Waste exchange - Extended producer responsibility - Recycling and reuse.

UNIT-III **STORAGE, COLLECTION AND TRANSPORT OF WASTES** **9**

Handling and segregation of wastes at source — storage and collection of municipal solid wastes — Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes — hazardous waste manifests and transport.

UNIT-IV **WASTE PROCESSING TECHNOLOGIES** **9**

Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies – methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous wastes - treatment of biomedical wastes - Health considerations in the context of operation of facilities, handling of materials and impact of outputs on the environment.

UNIT-V **WASTE DISPOSAL** **9**

Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of opendumps — landfill remediation.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the student is expected to be able to

- Analyze sources, classification, and Indian legislations for solid and hazardous wastes, and evaluate integrated management strategies and stakeholder roles including financing mechanisms.
- Devise source reduction methods and evaluate recycling and reuse strategies based on waste composition, hazardous characteristics, and extended producer responsibility.
- Propose methods for storage, collection, and transfer of solid wastes, and devise strategies for storage, labeling, handling, and transport of hazardous wastes, including transfer station optimization.
- Analyze and evaluate appropriate waste processing technologies for solid and hazardous wastes, considering conversion methods, stabilization, biomedical waste treatment, and health and environmental impacts.
- Design landfill systems, including site selection, operation, leachate and gas management, closure including open dump rehabilitation and landfill remediation.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Unit 3 : Problem solving sessions on analysis of collection systems
- Unit 1, 2, 4 and 5: Oral Survey conducted to test depth of knowledge gained in various topics, techniques and processes by the student.
- Unit 4 & 5 : Activity Based Learning - Each student given a waste processing (or) waste disposal method to give a presentation

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Assignment in all units
- Tutorial problems in Unit-3
- Spot class test conducted in Unit 1, 2 and 3 to assess knowledge gained by student
- Class Presentation/Discussion in Unit-4 and Unit-5

Text Book(s):

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid WasteManagement, Mc-Graw Hill International edition, New York, 1993.

2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. Evans, "Hazardous waste Management", Environmental Resources Management, Mc-Graw Hill International edition,New York, 2001.

Reference Books(s) / Web links:
1. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization , Government of India, New Delhi, 2000.
2. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc.,Singapore, 2002.
3. Paul T Williams, Waste Treatment and Disposal, Wiley, 2005

CE23B14	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	2	2	2	3	3	2	1	2	2	3	3	2	3
CO 2	3	3	3	3	2	3	3	2	1	2	2	3	3	3	3
CO 3	3	3	3	3	3	3	3	2	2	2	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
CO 5	3	3	3	3	2	3	3	3	2	2	3	3	3	3	3
Average	**3**	**3**	**2.8**	**2.8**	**2.4**	**3**	**3**	**2.4**	**1.6**	**2.2**	**2.4**	**3**	**3**	**2.8**	**3**

Prepared by Name and signature	**Approved by Name and Signature**
DR. M. SELVAKUMAR, PROFESSOR & DEAN /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23B15	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	PE	3	0	0	3

Objectives:

- To provide a comprehensive understanding of Environmental Impact Assessment (EIA) and its regulatory framework.
- To equip students with methodologies for predicting and evaluating environmental impacts using advanced tools and models.
- To impart knowledge on Socio-economic impact assessment and their relationship.
- To enable students to prepare, review, and implement Environmental Management Plans (EMP).
- To foster critical thinking through case studies to address real-world environmental challenges.

UNIT-I	GENERAL	9

Historical development of Environmental Impact Assessment (EIA). Environmental Clearance- EIA in project cycle. Legal and regulatory aspects in India – types and limitations of EIA –EIA process screening – scoping - terms of reference in EIA- setting – analysis – mitigation. Cross sectoral issues –public hearing in EIA- EIA consultant accreditation.

UNIT-II	IMPACT INDENTIFICATION AND PREDICTION	9

Matrices – networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modelling for impact prediction – assessment of impacts – air – water – soil – noise – biological — cumulative impact assessment

UNIT-III	SOCIO-ECONOMIC IMPACT ASSESSMENT	9

Socio-economic impact assessment - relationship between social impacts and change in community and institutional arrangements. Factors and methodologies- individual and family level impacts. Communities in transition-rehabilitation.

UNIT-IV	EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN	9

Environmental management plan - preparation, implementation and review – mitigation and rehabilitation plans – policy and guidelines for planning and monitoring programmes – post project audit – documentation of EIA findings – ethical and quality aspects of environmental impact assessment.

UNIT-V	CASE STUDIES	9

Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the student is expected to be able to

- Carry out scoping and screening of developmental projects for environmental and social assessments.
- Acquire knowledge on methodologies for predicting and evaluating environmental impacts using advanced tools and models.
- Comprehend socio-economic investigation of the environment in a project.
- Plan environmental impact assessments and environmental management plans.
- Analyze and prepare environmental impact assessment reports for various projects.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Barthwal R.R., “Environmental Impact Assessment”, 2nd Edition, New Age International Publishers, New Delhi, 2019.
2. Charles H. Eccleston., "Environmental Impact Assessment: A Guide to Best professional practices", 1st Edition, CRC Press.,United States, 2017.
3. Y.Anjaneyulu and ValliManikam, “Environmental Impact Assessment Methodologies”, 2nd Edition, B.S Publications., Hyderabad,2020.

Reference Books(s) / Web links:

1. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff “Risk Assessment and Management Handbook”, McGraw Hill Inc., New York,1996.

2. K. V. Raghavan and A A. Khan, "Methodologies in Hazard Identification and Risk Assessment", Manual by CLRI, 1990.
3. World Bank –Source book on EIA

CE23B15	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	1	1	2	3	2	3	2	1	1	1	2	3	2
CO 2	2	1	1	1	2	3	2	3	2	1	1	1	2	3	2
CO 3	2	1	1	1	2	3	2	3	2	1	1	1	2	3	2
CO 4	2	1	1	1	2	3	2	3	2	1	1	1	2	3	2
CO 5	2	1	1	1	2	3	2	3	2	1	1	1	2	3	2
Average	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**3**	**2**	**1**	**1**	**1**	**2**	**3**	**2**

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MR.E.S.KARTHIC/ASSISTANT PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23B16	MARINE POLLUTION AND CONTROL	PE	3	0	0	3

Objectives:

- To provide a fundamental understanding of marine environments, including physical, chemical, and geological aspects.
- To explore the diversity of marine resources and ecosystems and their interaction with climate.
- To analyze the sources, impacts, and standards of marine pollution.
- To equip students with techniques and tools for monitoring marine pollution using advanced technologies.
- To develop strategies for marine pollution control and integrated coastal zone management (ICZM).

UNIT-I MARINE ENVIRONMENT **9**

Seas and oceans, Continental area, Coastal zone, Properties of sea water, Principles of Marine Geology, coastal features – Beaches, Estuaries, Lagoons–The oceans and climate.

UNIT-II MARINE RESOURCES AND ECOSYSTEM **9**

Types and functions of marine resources – Renewable and Non-Renewable resources – Living marine resources and Non-living marine resources – Marine minerals-Placer deposits – Hydrocarbon deposits – Polymetallic nodules. Marine ecosystem- Mangroves – Seagrass – Seaweeds - Coral reef – Large marine ecosystem - Climate effects on living marine resources- Biological monitoring of marine ecosystem- Human impacts on marine ecosystem.

UNIT-III MARINE POLLUTION SOURCES AND EFFECTS **9**

Sources of Marine Pollution – Point and non-point sources, Pollution caused by Oil Exploration, Dredging, Offshore Structures, Agriculture Impacts of pollution on water quality and coastal ecosystems – Marine discharges and effluent standards.

UNIT-IV MONITORING OF MARINE POLLUTION **9**

Basic measurements - Sounding boat, lead lines, echo sounders – current meters - tide gauge - use of GPS – Measurement of coastal water characteristics – sea bed sampling – Modeling of Pollutant transport and dispersion - Oil Spill Models - Ocean Monitoring satellites – Applications of Remote Sensing and GIS in monitoring marine pollution.

UNIT-V MARINE POLLUTION CONTROL AND ICZM **9**

Design of out falls-Pollution Control strategies – Selection of optimal Outfall locations - National and International Treaties, Coastal Zone Regulation – Total Maximum Daily Load applications – Protocols in Marine Pollution – ICZM and Sustainable Development.

Total Contact Hours:45

Course Outcomes:

On completion of the course, the student is expected to be able to

- Analyze the characteristics and dynamics of marine environments and evaluate their role in global climate systems.
- Examine marine resources and ecosystems, assess their vulnerability to climate effects, and design sustainable management strategies.
- Acquired knowledge on the marine pollution and the effect of the same on the ecology.
- Develop and apply advanced monitoring techniques, such as remote sensing, GIS, and pollutant transport modeling, for marine pollution control.
- Formulate integrated pollution control strategies and apply ICZM principles to ensure the sustainable development of coastal regions.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Marine pollution Dr.P.C.Sinha , Anmol Publications Pvt. Ltd, 1998.
2. "Marine Pollution (5th Edition) R.B. Clark, C. Frid and M Atttrill Oxford Science Publications, 200

Reference Books(s) / Web links:

1. "Problems of Marine Pollution" : India and Canada, Raghavan, Sudha , Eastern Book Corporation, Delhi, India
2. Laws, E.A., "Aquatic pollution", an introductory text. John Wiley and Sons, Inc., New York, 2000.
3. Coastal Engineering Manual, Vol. I-VI, Coastal Engineering Research Centre, Dept. of the Army, US Army Corps of Engineers, Washington DC,2006.

CE23B16	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	2	3	1	2	2	1	1	3	3	3
CO 2	3	3	2	2	2	2	3	1	3	2	2	1	3	3	3
CO 3	3	3	2	2	2	2	3	1	2	2	2	1	3	3	3
CO 4	3	3	2	2	2	2	3	1	2	2	2	1	3	3	3
CO 5	3	3	2	2	2	2	3	1	3	2	2	1	3	3	3
Average	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**1**	**2.4**	**2**	**1.8**	**1**	**3**	**3**	**3**

Prepared by Name and signature	Approved by Name and Signature
MR.E.S.KARTHIC, ASSITANT PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23B17	GLOBAL CLIMATE CHANGE	PE	3	0	0	3

Objectives:

- To gain knowledge on the fundamental concepts of climatology and paleoclimatology, factors influencing global and regional climates, and the impact of various climate types on global climate change.
- To study the Earth's structure, driving forces, energy balance, carbon reservoirs, and cycles, as well as the impacts of greenhouse gases, global warming, and human activities.
- To examine global and India's emission status, international climate agreements, renewable energy use, and mitigation strategies such as energy conservation, carbon capture, and green infrastructure solutions.
- To explore the impacts and vulnerabilities of climate change on water, agriculture, forestry, coastal areas, and health, and to examine adaptation options, including community-based and ecological approaches.
- To explore the relationship between climate change and sustainable development, focusing on water and food security, conservation of natural resources, climate extremes, and nature-based solutions for conservation.

UNIT-I	INTRODUCTION TO WEATHER AND CLIMATE	9

Atmosphere – Climatology and Paleo climatology, Factors affecting global, regional and local climates, weather parameters. Tropical climate, Monsoons, Polar, Desert, Mid-latitude climates and their role in global climate change.

UNIT-II	ELEMENTS AND PROCESSES RELATED TO CLIMATE CHANGE	9

Structure and driving forces of the earth - Global energy balance. Earth's carbon reservoirs- marine and terrestrial, Carbon cycles, Global Ocean Circulation, Southern oscillation (El-Nino and La- Nina), Greenhouse gases and global warming - Industrialization and urbanization, RCP and SSP.

UNIT-III	CLIMATE CHANGE MITIGATION	9

Global and India emission status - , Nationally Determined Contribution (NDC), International agreements and protocols - Future use of renewable energy - Mitigation strategies: surface albedo environment – reflective roofing and reflective paving – enhancement of evapotranspiration - tree planting programme – green roofing strategies – energy conservation in buildings - CCS.

UNIT-IV	CLIMATE CHANGE ADAPTATION	9

Impacts and Vulnerability on Water, Agriculture, Forestry, Coastal and Health - Identifying adaption options – designing and implementing adaption measures – Traditional knowledge - Community and ecological based adaptation, Climate Adaptation measures in India (Funds and Missions).

UNIT-V	CONSERVATION OF NATURAL RESOURCES	9

Climate Change and Sustainable development, Water and Food Security, Need for Conservation of Natural Resources (Forestry and Coastal Eco-system), Climate Extreme events – heat wave, flood and droughts, Sea Level Rise and Ocean acidification and Natural based solution for conservation (NBS).

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- Rationalize different climate types, weather parameters, and their roles in global climate change, including tropical, monsoon, polar, desert, and mid-latitude climates.
- Comprehend the Earth's energy balance, carbon cycles, and ocean circulation, and analyze the effects of greenhouse gases, climate phenomena like El Niño and La Niña, and the influence of industrialization on global climate change.
- Analyze emissions data, international climate protocols, and implement effective mitigation strategies, including renewable energy adoption, energy conservation in buildings, and sustainable urban planning techniques.
- Identify climate change impacts on various sectors, design and implement adaptation measures, and integrate traditional knowledge and community-based solutions, particularly in the Indian context.
- Interpret the impacts of climate change on natural resources, climate extremes, and sea-level rise, and will be able to design nature-based solutions for conservation and sustainable development.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom
- Brainstorming
- Activity Based Learning
- Debate

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Case studies
- Assignments
- Quizzes
- Class Presentation/Discussion

Text Book(s):
1. Climate Change – The Science, Impacts and Solutions (2nd Edition) – A. Barrie Pittock, CSIRO Publishing, 2009.
2. Fundamentals of weather and climate (2nd Edition) – Robin Mcllveen, Oxford University Press, 2009.
3. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 20074
Reference Books(s) / Web links:
1. Climate change – Mitigation of Climate, IPCC, 2013.
2. IPCC Sixth Assessment Report, 2021.

3. Atmosphere Weather and Climate – K Siddartha, Kisalaya Publications Pvt. Ltd, 2013.
4. W. Neil Adger, Irene Lorenzoni and Karen L. O, Adapting to Climate Change: Thresholds, Values, Governance, Cambridge, 2009.
5. Vineet Kumar, Arjuna Srinidhi, Chandra Bhushan, Geetika Singh, Rising to the Call: Good Practices of Climate Change Adaptation in India, Centre For Science And Environment publisher, 2014.
6. Thomas E, Lovejoy and Lee Hannah "Climate Change and Biodiversity", TERI Publishers, 2005
7. https://www.un.org/en/sections/issues-depth/climate-change/

CE23B17	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	1	2	2	-	1	1	-	2	3	1	2
CO 2	3	3	2	2	2	2	2	-	1	1	-	3	3	3	3
CO 3	3	2	3	2	3	3	3	2	1	2	2	3	2	3	3
CO 4	2	2	3	3	2	3	3	2	2	1	2	2	2	2	3
CO 5	3	2	3	2	2	3	3	2	2	1	3	3	3	3	3
Average	**2.8**	**2.2**	**2.4**	**2**	**2**	**2.6**	**2.6**	**2**	**1.4**	**1.2**	**2.3**	**2.6**	**2.6**	**2.4**	**2.8**

Prepared by Name and signature	Approved by Name and Signature
MR.R.MADHAVA PERUMAL, ASSISTANT PROFESSOR / CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23C11	ADVANCED CONSTRUCTION TECHNIQUES	PE	3	0	0	3

Objectives:

- To impart knowledge on advanced substructure construction methods and stabilization techniques.
- To acquire advanced techniques for constructing superstructures and tall buildings.
- To familiarize the construction sequences and techniques of special structures.
- To explore strengthening methods and rehabilitating existing structures.
- To introduce safe and efficient demolition and dismantling methods.

UNIT-I	SUB STRUCTURE CONSTRUCTION	9

Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - Piling techniques - Driving well and caisson - sinking cofferdam – cable anchoring and grouting - Driving diaphragm walls, Sheet piles - Laying operations for built up offshore system - Shoring for deep cutting - large reservoir construction - well points – Dewatering for underground open excavation.

UNIT-II	SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS	9

Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ prestressing in high rise structures, Post tensioning of slab- aerial transporting – Handling and erecting lightweight components on tall structures. metal deck concrete flooring/roofing

UNIT-III	CONSTRUCTION OF SPECIAL STRUCTURES	9

Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries – Erection of articulated structures and space decks, precast concrete erection/temporary propping/connections.

UNIT-IV	REHABILITATION AND STRENGTHENING TECHNIQUES	9

Seismic retrofitting - Strengthening of beams - Strengthening of columns - Strengthening of slab - Strengthening of masonry wall, Protection methods of structures, Mud jacking and grouting for foundation – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques.

UNIT-V	DEMOLITION	9

Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- Analyze and apply appropriate techniques for substructure construction and dewatering systems, in challenging site conditions.
- Identify the processes involved in construction of tall buildings and large-span structures.
- Acquire the construction of special structures, ensuring proper sequence and methods for stability and functionality.
- Explore retrofitting and strengthening techniques for structural safety
- Analyze and apply demolition techniques carried out for a structure using modern techniques and safety.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom – all units
- Activity Based Learning – unit IV

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Quizzes – all units
- Class Presentation/Discussion – all units

Text Book(s):

1. Jerry Irvine, Advanced Construction Techniques, CA Rocketry, 1984
2. Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992.
3. Peter.H.Emmons, “Concrete repair and maintenance illustrated”, Galgotia Publications Pvt. Ltd., 2001.Press, 2008.

Reference Books(s) / Web links:

1. Robert Wade Brown , Practical foundation engineering hand book, McGraw Hill Publications, 2001.
2. Subir Kumar Sarkar, Subhajit Saraswati., Construction Technology, Oxford University Press, New Delhi, 2008
3. Gahlot. P.S., Sharma Sanjay, “Building Repair and Maintenance Management”, Edition 2005, CVS publication.

CE23C11	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	2	2	1	2	2	1	2	1	2	3	3	2	2
CO 2	3	1	2	2	1	2	2	1	2	1	2	3	3	2	2
CO 3	3	1	2	2	1	2	2	1	2	1	2	3	3	2	2
CO 4	3	1	2	2	1	2	2	1	2	1	2	3	3	2	2
CO 5	3	1	2	2	1	2	2	1	2	1	2	3	3	2	2
Average	**3**	**1**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	**1**	**2**	**3**	**3**	**2**	**2**

Prepared by Name and signature	Approved by Name and Signature
DR.M.UMA MAGUESVARI, PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23C12	SUSTAINABLE AND LEAN CONSTRUCTION	PE	3	0	0	3

Objectives:

- To provide an understanding of sustainability concepts, the carbon cycle, and the role of construction materials like concrete and steel in CO2 emissions, and to explore sustainability in construction practices.
- To introduce the concept of embodied energy in construction materials, the calculation of embodied energy, and the relationship between embodied and operational energy in conditioned buildings, focusing on life cycle energy use.
- To understand energy use control in buildings through codes, sustainable building standards and the role of insulation, thermal properties, and moisture content in energy-efficient building design.
- To gain knowledge on the concepts of lean construction, its importance and to provide an understanding of the Productivity Measurement System (PMS) and the concept of Lean Construction Index (LCI).
- To understand the application of lean tools and the integration of IT/BIM in lean practices for effective project site management.

UNIT-I	INTRODUCTION & MATERIALS USED IN SUSTAINABLE CONSTRUCTION	9

Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO2 contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.

UNIT-II	ENERGY CALCULATIONS	9

Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy and operational energy in conditioned building - Life Cycle energy use.

UNIT-III	GREEN BUILDINGS	9

Control of energy use in building – National Building Code (NBC), ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations – IGBC – USGBC - Features of LEED and TERI – GRIHA ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling - Performance ratings of green buildings - Zero energy building -

UNIT-IV	CORE CONCEPTS IN LEAN CONSTRUCTION	9

Introduction to the concept of Lean; Importance of Lean - Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS)- Introduction to LCI.

UNIT-V	LEAN CONSTRUCTION TOOLS AND TECHNIQUES	9

Sampling/ Work Sampling; Survey/ Foreman delay survey; Gemba walk - Value Stream/ Process Mapping– 5S , Collaborative Planning System (CPS)/ Last Planner System (LPS) – Big Room Approach, IT/BIM and Lean, How to Start Practicing Lean Tools in Project Site.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Evaluate the environmental impact of construction materials, including CO2 contributions, and apply sustainability principles through the use of recycled aggregates, quality control, and durability in construction.
- Calculate embodied energy for construction materials, differentiate between embodied and operational energy, and apply life cycle energy analysis to building design and construction.
- Apply energy control measures, evaluate green building performance ratings, and design zero-energy buildings using relevant codes, standards, and sustainable practices.
- Evaluate and improve productivity in construction projects using lean principles, PMS, and the LCI, ensuring efficient project delivery.
- Apply lean tools like work sampling, value stream mapping, and collaborative planning systems, and integrate IT/BIM for improving efficiency and productivity on construction project sites.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom
- Activity Based Learning
- Seminar

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Case studies
- Assignment
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1.	Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, Wiley Publishers 2016.
2.	Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.
3.	Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
Reference Books(s) / Web links:	
1.	Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques, 2002.
2.	Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site implementation and Assessment of Lean Construction Techniques, Lean Construction Journal, 2005.
3.	Tariq Abdelhamid, "Lean Construction: Concepts, Precepts and Methods", 2014

CE23C12	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	-	1	1	-	2	3	1	1	-	3	1	3	2	3
CO 2	3	1	3	2	1	2	2	-	1	1	2	2	3	2	3
CO 3	2	2	3	1	1	1	1	-	-	-	3	1	3	3	3
CO 4	3	1	3	2	2	1	3	1	1	1	3	2	3	3	3
CO 5	3	1	2	2	2	2	3	1	-	1	3	2	3	3	3
Average	**2.6**	**1.25**	**2.4**	**1.6**	**1.5**	**1.6**	**2.4**	**1**	**1**	**1**	**2.8**	**1.6**	**3**	**2.6**	**3**

Prepared by Name and signature	Approved by Name and Signature
MR.R.MADHAVA PERUMAL, ASSISTANT PROFESSOR/ CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23C13	CHARACTERIZATION OF MATERIALS	PE	3	0	0	3

Objectives:

- To acquire knowledge on the structure properties of construction materials.
- To familiarize calorimetric techniques and X-Ray diffraction method.
- To impart knowledge on thermal analysis techniques and surface area measurement
- To explore microstructural analysis of cementitious systems
- To learn spectroscopy techniques and pore structure features.

UNIT-I	STRUCTURE OF CONSTRUCTION MATERIALS	9

Introduction to characterization and Techniques, Structure properties and effects - concrete, Asphalt, Steel, Polymers and plastics.

UNIT-II	CALORIMETRY AND X-RAY DIFFRACTION	9

Introduction and types of Calorimeters- isothermal, adiabatic and, semi adiabatic, sample preparation, applications of calorimetry - determination of heat of hydration, estimation of activation energy. Introduction to X Rays and crystallography, X Ray Diffraction Crystal Systems, Diffractogram, Qualitative Phase Analysis, Sample Preparation and Application of cements.

UNIT-III	THERMAL ANALYSIS AND SURFACE AREA MEASUREMENT	9

Introduction to Thermal Analysis, Methods of thermal analysis- differential thermal analysis, Application of thermal analysis in construction materials- DTA curves for aggregates, Portland cement paste, Calcium aluminate cement and white cement clinker. Sampling and particle size distribution of cement and SCMs - fly ash, slag, silica fume. Methods of surface area measurements- Blaine air permeability test, Laser diffraction, Gas adsorption theory.

UNIT-IV	SCANNING ELECTRON MICROSCOPE FUNCTIONS AND ANALYSIS	9

Parts, principles and functioning of scanning electron microscope, Preparation of specimen, Analysis of cementitious systems, Application of characterization techniques to assess composite binder.

UNIT-V	SPECTROSCOPY TECHNIQUES, POROSITY AND PORE STRUCTURE	9

Spectroscopy Techniques – Ultraviolet (UV), Infrared (IR) spectroscopy, Fourier transform infrared spectroscopy and Nuclear Magnetic Resonance Spectroscopy (NMR) spectroscopy, Principle of NMR spectroscopy. Introduction, significance of pore distribution, Woking of mercury intrusion porosimeter.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Asses structure-property relationships of the construction materials.
- Perform calorimetric and XRD analyses of cementitious materials.
- Interpret thermal analysis curves and determine surface area of construction materials
- Analyse microstructure of binders and assess their performance.
- Evaluate the characteristics of construction materials using spectroscopy and porosity method.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom – All units
- Activity Based Learning – All units

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Quizzes- all units
- Class Presentation/Discussion – all units

Text Book(s):

1. Karen Scrivener, Ruben Snellings, Barbara Lothenbach, A Practical Guide to microstructural Analysis of cementitious materials, CRC Press, 2017.
2. V. S. Ramachandran and James J. Beaudoin, Eds., Handbook of Analytical Techniques in Concrete Science and Technology, William Andrew Publishing, New York, 2013.
3. William D. Callister, Materials Science and Engineering: An Introduction, Sixth Edition, John Wiley and Sons, 2003.

Reference Books(s) / Web links:

1. D A St. John, A. W. Poole, and I. Sims, Concrete Petrography "A Handbook of Investigative Techniques", Arnold Publishing. London, 1998.
2. Jan Skalny, Editor, Materials Science of Concrete, Volumes I "VII, American Ceramic Society, 1989 - 2005.
3. J. M. Illston and P. L. J. Domone, Construction Materials "Their Nature and Behaviour,Third Edition, Spon Press, 2001.
4. J.F. Young, S. Mindess, R.J. Gray and A. Bentur, The Science and Technology of Civil Engineering Materials, Prentice Hall, 1998

5. https://nptel.ac.in/courses/105106200/

CE23C13	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	2	2	3	1	2	1	1	2	3	2	2
CO 2	3	3	3	3	2	2	3	2	2	1	1	3	3	2	3
CO 3	3	3	3	3	3	2	3	2	2	1	1	3	3	2	3
CO 4	3	3	3	3	3	3	3	2	2	1	1	3	3	2	3
CO 5	3	3	3	3	3	3	3	2	2	1	1	3	3	2	3
Average	**3**	**3**	**3**	**2.8**	**2.6**	**2.4**	**3**	**1.8**	**2**	**1**	**1**	**3**	**3**	**2**	**2.8**

Prepared by Name and signature	Approved by Name and Signature
DR.M.UMA MAGUESVARI, PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23C14	SMART MATERIALS AND STRUCTURES	PE	3	0	0	3

Objectives:

- To study various types of smart materials used in engineering application.
- To study processing of smart materials
- To get familiarized with basics of sensors and its engineering application
- To understand the basics of actuators and its engineering application
- To understand the behaviour of smart structures.

UNIT-I	INTRODUCTION TO MATERIALS USED IN SMART STRUCTURES	9

Characteristics of metals, polymers and ceramics. Introduction to smart materials. Classification of smart materials, Components of a smart System, Applications of smart material.

UNIT-II	SMART MATERIALS	9

Piezoelectric materials, Electro strictive Materials, Magneto strictive materials, Magneto electric materials, Magneto rheological fluids, Electro rheological fluids, Shape Memory materials

UNIT-III	SENSORS	9

Introduction, Conductometric sensors, Capacitive sensors, Piezoelectric sensors, Magnetostrictive sensors, Piezoresistive sensors, Optical sensors, Resonant sensors, semiconductor-based sensors, Acoustic sensors, polymerize sensors, Carbon nanotube sensors

UNIT-IV	ACTUATORS	9

Introduction, Electrostatic transducers, Electromagnetic transducers, Electrodynamic transducers, Piezoelectric transducers, Electro-strictive transducers, Magneto-strictive transducers, Electro thermal actuators, Comparison of actuation, Applications

UNIT-V	SMART STRUCTURES	9

Smart Structures: Types of Smart Structures, Potential Feasibility of Smart Structures, Key Elements of Smart Structures, Applications of Smart Structures.Beam Modeling: Beam Modeling with induced strain Rate effects.

	Total Contact Hours	:	45

Course Outcomes:

On completion of the course, the students will be able to

- Perceive various smart material and its importance in engineering application.
- Know various processing technics of smart materials
- Analyze use of various sensors as smart material as sensors
- Analyze use of various actuators as smart material as actuators.
- Design simple models for smart structures & materials.

Text Book (s):

1. Smart Material Systems and MEMS: Design and Development Methodologies, V. K. Varadan, K. J. Vinoy, S. Gopalakrishnan, John Wiley and Sons, England, 2006.
2. Smart Structures and Materials, Brain Culshaw, Artech House, London, 1996.

Reference Book (s) / Web links:

1. Smart Structures: Analysis and Design - A. V. Srinivasan, Cambridge University Press, Cambridge; New York, 2001 (ISBN: 0521650267).
2. Smart Structures and Materials - B. Culshaw, Artech House, Boston, 1996 (ISBN :0890066817).
3. https://nptel.ac.in/courses/112104173/
4. https://nptel.ac.in/courses/112104251/

CE23C14	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	1	-	1	1	1	3	3	3	2	3	3	2	2
CO 2	1	1	1	-	1	1	1	3	3	3	2	3	3	2	2
CO 3	2	3	2	2	1	1	1	3	1	1	1	3	3	-	3
CO 4	1	2	1	1	1	1	1	3	3	3	2	3	3	2	2
CO 5	2	2	1	1	1	1	1	3	1	1	1	3	3	-	3
Average	**1.4**	**1.8**	**1.2**	**1.3**	**1**	**1**	**1**	**3**	**2.2**	**2.2**	**1.6**	**3**	**3**	**2**	**2.4**

Prepared by Name and signature	Approved by Name and Signature
DR.S.GEETHA, PROFESSOR & HEAD /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23C15	ENERGY EFFICIENT BUILDINGS	PE	3	0	0	3

Objectives:

- To introduce the concepts of green buildings and their relevance in the Indian context, including energy efficiency, pollution reduction, and low-energy design.
- To explore renewable energy sources and passive strategies for building ventilation, with a focus on solar energy, wind energy, and natural ventilation systems.
- To understand heating and cooling techniques in buildings, including passive and mechanical methods, insulation, and energy-efficient design.
- To examine day lighting and artificial lighting, including calculation methods and the use of advanced lighting systems.
- To provide knowledge of energy assessment tools and compliance procedures, including LEED, GRIHA, and sustainable architecture principles.

UNIT-I **GREEN BUILDINGS, ENERGY AND ENVIRONMENT** **9**

Green Buildings within the Indian Context, Types of Energy, Energy Efficiency and Rebound Effect, Pollution, Better Buildings, Reducing energy consumption, Low energy design.

UNIT-II **RENEWABLE ENERGY SOURCES AND VENTILATION** **9**

Solar energy, Passive Solar Heating, Passive Solar collection, Wind and other renewables. A passive solar strategy: Direct gain - Trombe wall, convective air loop, Photovoltaic's, Climate and Energy, Macro and Microclimate - Indian Examples. Natural ventilation and forced ventilation in commercial buildings, passive cooling, modeling air flow and ventilation.

UNIT-III **HEATING AND COOLING** **9**

Building Form Surface area and Fabric Heat Loss, utilizing natural energy, Internal Planning, Grouping of buildings – Robin's Spatial Proportion – Orientation of building –Heat transmission through buildings –Thermal properties of building materials –Insulation - Cooling buildings, passive cooling, and mechanical cooling – Measurement of heating and cooling loads.

UNIT-IV **DAY LIGHTING AND ARTIFICIAL LIGHTING** **9**

Illumination requirements - Concepts of daylight factors and day lighting, daylight assessment, sky dome - sun path diagram, sky exposure angle, sun protection, shading coefficient, visualizing day lighting: Source-Path-Target and apparent size, luminance calculation, penetration and spread of sky component, artificial lighting, efficacy, Radiant barriers - new light sources –luminaries - light shelves - Supplementary artificial lighting design.

UNIT-V **ENERGYASSESSMENT AND COMPLIANCES PROCEDURES** **9**

Energy awareness, monitoring energy consumption, Building Environmental Assessment environmental criteria – embodied energy of building materials - assessment methods - assessment tools (e.g. GRIHA, LEED) - Ecohomes - Sustainable architecture and urban design – principles of environmental architecture.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Explain the key components and types of energy used in green building design, and evaluate strategies to reduce energy consumption.
- Analyze renewable energy sources and passive ventilation techniques for sustainable building design, with examples from the Indian context.
- Assess the importance of building orientation, insulation, and thermal properties in managing heating and cooling loads in buildings.
- Design effective day lighting strategies and artificial lighting systems that optimize energy efficiency.
- Implement energy assessment procedures and use tools like GRIHA and LEED to assess and improve building environmental performance.

SUGGESTED ACTIVITIES

- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Quizzes
- Class Presentation/Discussion

Text Book(s):
1. Satyajit Ghosh and Abhinav Dhaka (2015), Green Structures: Energy Efficient Buildings.
2. Lal Jayamaha (2006), Energy-Efficient Building Systems: Green Strategies for Operation and Maintenance, McGraw Hill Professional.
Reference Books(s) / Web links:
1. Charles Eley (2016), Design Professional's Guide to Zero Net Energy Buildings, Island Press.
2. Ian M. Shapiro (2016), Energy Audits and Improvements for Commercial Buildings, John Wiley & Sons.
3. Moncef Krarti (2016), Energy Audit of Building Systems: An Engineering Approach, Second Edition.
4. EngHwa Yap., (2017), Energy Efficient Building, Published by InTech.,Crotia.

CE23C15	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	3	1	1	2	1	2	2	3	1	2	1	2	2
CO 2	2	2	3	2	3	2	2	2	2	3	1	2	1	2	2
CO 3	2	2	3	2	3	2	2	2	2	3	1	2	1	2	2
CO 4	2	2	3	2	3	2	2	2	2	3	1	2	1	2	2
CO 5	2	2	3	2	3	2	2	2	3	3	1	2	1	2	2
Average	**2**	**2**	**3**	**1.8**	**2.6**	**2**	**1.8**	**2**	**2.2**	**3**	**1**	**2**	**1**	**2**	**2**

Prepared by Name and signature	Approved by Name and Signature
MRS.A.J.JEYA ARTHI, ASSISTANT PROFESSOR (SS) /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23C16	SAFETY IN CONSTRUCTION	PE	3	0	0	3

Objectives:

- To know the causes of accidents related to construction activities and human factors associated with these accident
- To understand the safety norms while doing various construction operations as per codal provisions.
- To acquire knowledge about the working principles of various construction machinery
- To gain knowledge in health hazards and safety in demolition work
- To get familiarized about the codes of practice and acts related to safety.

UNIT-I	INTRODUCTION	9

Introduction to construction industry and safety issues in construction-Human factors in construction safety management- Roles of various groups and stake-holders in ensuring safety in construction industry -Framing of contract conditions on safety and related matters –Relevance of ergonomics in construction safety.

UNIT-II	SAFETY IN CONSTRUCTION OPERATIONS	9

Safety in various construction operations - Excavation and filling - Under- water works - Underpinning & Shoring - Ladders & Scaffolds - Tunnelling - Blasting - Dismantling - Confined space Temporary Structures - noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Effects of air pollution in Industry, air pollution episodes; Emission factors inventory and predictive equations. Familiarization with relevant Indian Standards and the National Building Code provisions on construction safety.

UNIT-III	CONSTRUCTION MACHINERY	9

Safety in material handling and equipment's-Safety in storage & stacking of construction materials. Safety in the use of construction equipment/vehicles - excavators, graders and dozers - cranes - hoists & lifts - other lifting gears˜ wire ropes - chain-pulley blocks - mixers - conveyors- pneumatic and hydraulic tools in construction. Safety in temporary power supply and fire safety at construction site.

UNIT-IV	SAFETY IN DEMOLITION WORK	9

Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision ,safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods–Case studies in construction sites against the fire accidents.

UNIT-V	CONSTRUCTION ACT AND CODE OF PRACTICES	9

Contract Labour (R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages. Building & Other Construction Work (RE & CS) Act, 1996 and Central Rules, 1998: Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, 79 General Safety, Health & Welfare provisions. Code of Practices - -Preventive measures against Hazards at work places Part1 & 2.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Visualize the safety issues at different stages of construction activity.
- Develop safety guidelines and understand safety requirements for various construction operations.
- Implement safety practices in material handling and the operation of construction equipment.
- Apply relevant standards and regulations for safe construction and demolition activities.
- Interpret and assimilate construction acts and codal practises responsible to enhance construction safety.

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning
- Case Studies

SUGGESTED EVALUATION METHODS

- Assignments
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Hudson,R., ‘Construction hazard and Safety Handbook, ButterWorth’s,1985.
2. Raymond Elliot Levitt, Nancy Morse Samelson,“ConstructionSafetyManagement,McGrawHill,London,1987
3. Fulman,J.B., ConstructionSafety,Security & Loss Prevention, John WileyandSons,1979.

Reference Books(s) / Web links:

1. Jonathan D.Sime, “Safety in the Build Environment”, London, 1988.
2. Davies,V. J., and Tomasin,K.(1996).Construction safety hand book.Thomas Telford Publishing ,London.

3. Ratay,R.T.(1996).Handbook of temporary structures in construction(2nd edn.).McGrawHill,London.
4. Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act,1996 and Central Rules.

CE23C16	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	1	1	2	2	1	1	1	1	2	3	1	2
CO 2	2	3	3	2	2	3	2	1	2	1	1	2	2	2	3
CO 3	3	2	2	1	2	2	2	2	2	1	2	2	3	3	3
CO 4	2	2	3	2	1	2	3	3	1	2	2	2	2	1	2
CO 5	2	2	2	2	2	3	2	3	2	2	3	3	1	2	3
Average	**2.4**	**2.2**	**2.4**	**1.6**	**1.6**	**2.4**	**2.2**	**2**	**1.6**	**1.4**	**1.8**	**2.2**	**2.2**	**1.8**	**2.6**

Prepared by Name and signature	Approved by Name and Signature
MR.M.MANOHARAN, ASSISTANT PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23C17	PROJECT MANAGEMENT FOR CIVIL ENGINEERS	PE	3	0	0	3

Objectives:

- To realize the concept of Project management and its features.
- To gain knowledge about organizing the project.
- To understand the concepts of proper utilization of labour, material and equipment.
- To get familiarized with the various types of Project management in construction.
- To acquire knowledge about the planning and scheduling process in project management.

UNIT-I PROJECT MANAGEMENT **9**

Project Management – Concept of a Project – Characteristic features - tools and techniques for project management – role of project managers. Development of project plan and objectives – programming – scheduling – project organization – organization and project team – role of communication in project management – controlling systems.

UNIT-II ORGANIZING FOR PROJECT MANAGEMENT **9**

Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team.

UNIT-III LABOUR, MATERIAL AND EQUIPMENT UTILIZATION **9**

Labour Productivity - Factors Affecting Job-Site Productivity - Labour Relations in Construction - Problems in Collective Bargaining - Materials Management - Material Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment - Choice of Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks.

UNIT-IV TYPES OF PROJECT MANAGEMENT **9**

Project Scope Management - Project Time Management - Project Cost Management - Project Resource Management - Project Quality Management - Project Risk Management – Project Procurement Management – Project safety management – Personnel management.

UNIT-V WORKING SYSTEMS **9**

Working systems – Characteristics – class of systems – design of systems – work break down system (WBS) – project execution plan – project procedure manual – sub systems of project management- monitoring of projects - networks - Gantt Chart - CPM – PERT – Line of Balance – Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost tradeoffs – Introduction to application software. (Primavera and MS Projects).

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- Comprehend the fundamentals, tools, and techniques of project management.
- Apply strategic planning and risk management principles in project organization.
- Evaluate labor, material, and equipment productivity to improve project efficiency.
- Demonstrate knowledge of project time, cost, risk, and resource management techniques.
- Prepare the plan and schedule for projects using advanced techniques and softwares.

SUGGESTED ACTIVITIES

- Problem solving sessions
- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. K.K.Chitkara, ‘Construction Project Management’, McGraw Hill, 2008.
2. Frederick E. Gould, “Construction Project Management”, Went worth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
3. Choudhury, S “Project Management”, Tata McGraw-Hill Publishing company New Delhi 2008.

Reference Books(s) / Web links:

1. P.K.Joy, ‘Total Project Management’, Laxmi Publications Pvt Ltd.
2. Prasanna Chandra, “Project Planning, Analysis, Selection, Implementation and review”, TataMcgraw Hill ,2009.
3. Sengutha .B, Guha .H, “Construction Management and Planning”, Tata Mc Graw Hill, 2001.

CE23C17	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	2	1	1	1	2	2	1	2	2	2	1
CO 2	2	3	3	2	2	3	2	1	2	1	2	2	3	2	2
CO 3	3	3	3	2	3	2	1	1	3	2	2	2	3	3	2
CO 4	2	2	3	2	2	3	3	2	2	2	3	3	2	3	3
CO 5	3	2	2	3	3	2	2	1	3	3	3	3	3	3	2
Average	**2.6**	**2.4**	**2.6**	**2.2**	**2.4**	**2.2**	**1.8**	**1.2**	**2.4**	**2**	**2.2**	**2.4**	**2.6**	**2.6**	**2**

Prepared by Name and signature	Approved by Name and Signature
MR.M.MANOHARAN, ASSISTANT PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23D11	ANALYSIS OF DEEP FOUNDATION	PE	3	0	0	3

Objectives:

- To understand foundation functions, types, selection criteria, and factors influencing pile material choices.
- To learn pile load capacity, behavior, and settlement in soils and rocks using static methods, IS code, and API guidelines.
- To assess pile load capacity, driving processes, stresses, and field measurements using dynamic formulas and wave equation analysis.
- To study the behavior, capacity, and settlement of pile groups and pile-raft foundations, considering spacing, arrangement, and installation effects.
- To familiarize the calculation of lateral and uplift resistance of piles using IS 2911, Broms charts, p-y curves, and field testing.

UNIT-I	DEEP FOUNDATIONS & TYPES	9

Functions and requisites of a foundation - Different types - Choice of foundation type – Types of deep foundation – Types of pile foundations - Factor governing choice of type of pile –- different materials of pile - choice of pile materials.

UNIT-II	ANAYSIS OF PILES BY STATIC FORMULAE	9

Load carrying capacity of piles by static formulae - Introduction: IS code method - API method - Piles in cohesive and cohesion less soils – Piles in layered cohesive and cohesion less soils – Settlement of single pile – Piles bearing on rock.

UNIT-III	ANAYSIS OF PILES BY DYNAMIC FORMULAE	9

Load carrying capacity of piles by dynamic formulae: Introduction - Pile driving formulae - selection of pile hammers - Determination of temporary elastic compression - Driving stresses in piles - Field measurement - Wave equation analysis.

UNIT-IV	PILE GROUPS AND SETTLEMENT	9

Group action in piled foundations: Introduction - Minimum spacing of piles - group efficiency - Estimation of group bearing capacity –negative skin friction- Effect of pile arrangement - Effect on pile groups of installation methods - precaution against heave effect in pile group - Settlement of pile group – Evaluation of differential settlement in pile group – I Pile-raft foundations.

UNIT-V	LATERAL RESISTANCE OF PILES	9

Pile subjected to lateral load: Introduction – Uplift and Lateral resistance of single pile - IS 2911 method for lateral resistance of pile - Broms charts for lateral load analysis – Elastic analysis - p-y curves, use of p-y curves - improving lateral resistance of piles - field integrity test on piles.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- choose the appropriate foundation type based on the soil conditions.
- calculate the load carrying capacity of pile foundation by static formula and settlements.
- calculate the load carrying capacity of pile foundation by dynamic formula.
- analyzing the behavior, design considerations, and settlement characteristics of pile groups.
- analysis the piles under lateral loads.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. J. E. Bowles, “Foundation Analysis and Design”, McGraw Hill, 1996.
2. Poulos H.G, Tall Building Foundation Design (1st Edition), CRC Press, London, 2017.
3. M. J. Tomlinson, “Pile Design and Construction Practice (6th Edition)”, CRC Press, 2014.
Reference Books(s) / Web links:
1. Barajas M. Das., “Principles of Foundation Engineering”, Thomson Asia Pvt Ltd, 1987.
2. P. C. Varghese, “Foundation Engineering”, Prentice-Hall of India, New Delhi, 2005.

CE23D11	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	1	2	1	2	1	1	1	1	1	1	3	1	1
CO 2	2	3	3	2	1	1	1	1	1	1	1	1	3	2	1
CO 3	2	3	3	2	1	1	1	1	1	1	1	1	3	2	1
CO 4	2	3	3	2	1	1	1	1	1	1	1	1	3	2	1
CO 5	2	3	3	2	1	1	1	1	1	1	1	1	3	2	1
Average	**1.8**	**2.6**	**2.6**	**2**	**1**	**1.2**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**1.8**	**1**

Prepared by Name and signature	Approved by Name and Signature
MR.M.AMMAIAPPAN, ASSISTANT PROFESSOR (SS)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23D12	GROUND IMPROVEMENT TECHNIQUES	PE	3	0	0	3

Objectives:

- To understand the behavior of problematic soils and apply appropriate ground improvement techniques to address geotechnical challenges in foundation engineering.
- To understand dewatering techniques and seepage analysis for designing solutions to control groundwater in geotechnical engineering applications.
- To study in-situ compaction and densification techniques for cohesionless and cohesive soils, along with their applications, installation methods, and limitations.
- To understand the concepts, mechanisms, and applications of earth reinforcement and the functional roles of geotextiles in geotechnical engineering.
- To study various grouting techniques, materials, and their applications for soil stabilization, including equipment, injection methods, and monitoring processes.

UNIT-I	PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES	9

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT-II	DEWATERING	9

Dewatering Techniques – Well points – Vacuum and electroosmotic methods – Seepage analysis for two dimensional flows for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

UNIT-III	INSITU COMPACTION TREATMENT OF COHESIONLESS AND COHESIVE SOILS	9

Insitu densification of cohesionless soils – Shallow and deep compaction – Dynamic compaction – Vibroflotation, Sand compaction piles and deep compaction. Consolidation of cohesive soils – Preloading with sand drains and fabric drains, Stabilization of soft clay ground using stone columns and Lime piles - Installation techniques – Relative merits of above methods and their limitations.

UNIT-IV	EARTH REINFORCEMENT	9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications.

UNIT-V	GROUTING TECHNIQUES	9

Types of grouts – Grouting equipment and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Analyze geotechnical problems in problematic soils (alluvial, lateritic, and black cotton soils) and select suitable ground improvement techniques based on soil conditions.
- Apply appropriate dewatering techniques and perform seepage analysis for fully and partially penetrated slots in homogeneous soil deposits.
- Select and apply appropriate in-situ compaction techniques for cohesionless and cohesive soils, considering their relative merits, limitations, and installation methods.
- Illustrate the concepts of earth reinforcement, types of reinforcement materials, and the functions of geotextiles in various geotechnical applications.
- Identify suitable grouting techniques and materials for soil stabilization, and explain the processes involved in grout injection and monitoring.

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Purushothama Raj. P, "Ground Improvement Techniques", Lakshmi Publications, 2nd Edition, 2016.
2. Koerner, R.M. "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill, 1994

Reference Books(s) / Web links:

1. Moseley, M.P., "Ground Improvement" Blockie Academic and Professional, Chapman and Hall, Glassgow, 1998.
2. Moseley, M.P and Kirsch. K., 'Ground Improvement", Spon Press, Taylor and Francis Group, London, 2nd Edition, 2004.
3. Jones C.J.F.P. "Earth Reinforcement and Soil Structure", Thomas Telford Publishing, 1996.

4.	Winterkorn, H.F. and Fang, H.Y. “Foundation Engineering Hand Book”. Van Nostrand Reinhold, 1994.
5.	Das, B.M., “Principles of Foundation Engineering” (seventh edition), Cengage learning, 2010.
6.	Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India Pvt. Ltd. New Delhi, 2011.
7.	Koerner, R.M., “Designing with Geosynthetics” (Sixth Edition), Xlibris Corporation, U.S.A 2012.
8.	Nihar Ranjan Patra, “Ground Improvement Techniques”, Vikas Publishing House, First Edition, 2012.
9.	Mittal.S, “An Introduction to Ground Improvement Engineering”, Medtech Publisher, First Edition, 2013.
10.	https://nptel.ac.in/courses/105/108/105108075/
11.	http://www.gpcet.ac.in/wp-content/uploads/2018/08/GIT_UNIT-1.pdf
12.	http://www.gpcet.ac.in/wp-content/uploads/2018/08/GIT_UNIT-2.pdf
13.	https://www.terrearmeeindia.com/our-business/retain/
14.	https://theconstructor.org/building/geotextiles-types-functions-uses/1163/
15.	https://www.slideshare.net/astraeaeos/grouting-48976072
16.	IS Code 9759: 1981 (Reaffirmed 1998) “Guidelines for Dewatering During Construction”, Bureau of Indian Standards, New Delhi.
17.	IS Code 15284 (Part 1): 2003 “Design and Construction for Ground Improvement – Guidelines” (Stone Column), Bureau of Indian Standards, New Delhi.

CE23D12	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	1	1	1	1	1	2	3	3	2	3
CO 2	3	3	2	2	1	1	2	1	1	1	2	3	3	2	2
CO 3	2	2	3	3	2	1	2	1	2	2	3	3	3	3	2
CO 4	2	2	2	2	2	1	1	1	1	2	2	3	3	2	3
CO 5	2	2	2	2	1	1	2	1	2	2	2	3	3	2	2
Average	**2.4**	**2.4**	**2.2**	**2.2**	**1.4**	**1**	**1.6**	**1**	**1.4**	**1.6**	**2.2**	**3**	**3**	**2.2**	**2.4**

Prepared by Name and signature	Approved by Name and Signature
MRS.S. MUTHU LAKSHMI, ASSISTANT PROFESSOR (SG)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23D13	GEO-ENVIRONMENTAL ENGINEERING	PE	3	0	0	3

Objectives:

- To provide students with a comprehensive understanding of soil pollution, including its sources, types of contaminants, and the environmental impact of soil contamination.
- To equip students with knowledge of soil properties, contaminant retention behavior, and the mechanisms governing contaminant transport in both saturated and unsaturated soil systems.
- To develop students' understanding of site investigation methods, including soil sampling, handling, and characterization, along with the application of non-destructive techniques for subsurface exploration.
- To provide students with knowledge of the need for soil remediation and familiarize them with various physical, chemical, and biological techniques used to restore contaminated soils.
- To introduce students to the principles and applications of containment systems for pollution control, including techniques like grout curtains, ground freezing, and soil liners, with emphasis on environmental case studies.

UNIT-I	SOIL POLLUTION	9

Basic concepts related to soil pollution - Sources of pollution - industrial, mining, agricultural and municipal; types of contaminants - Impact of contamination

UNIT-II	SOIL PROPERTIES AND CONTAMINANT TRANSPORT	9

Physical and chemical properties of soil - Retention behaviour - governing factors, sorption characteristics - isotherms. Contaminant transport- saturated and unsaturated flow, pore size distribution characteristics.

UNIT-III	SITE INVESTIGATION	9

Site investigation - Soil sampling - sample handling, transportation, characterization, preservation and storage. Non-destructive techniques - electromagnetic, thermal and seismic.

UNIT-IV	SOIL REMEDIATION	9

Soil remediation - need and approach, Techniques - soil washing, permeable reactive barriers, solidification, vacuum extraction, electro-kinetic remediation, thermal desorption. Bioremediation – phytoremediation - soil fracturing.

UNIT-V	CONTAINMENT SYSTEMS	9

Containment systems and basic principles – carbon dioxide sequestration, Grout curtains, Ground freezing, Compacted soil liners, Geosynthetic clay liners. Case studies on polluted sites and issues related to environment.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Identify the major sources and types of soil pollutants, analyze their impacts on the environment, and propose appropriate mitigation measures.
- Analyze the physical and chemical properties of soil, evaluate contaminant retention using sorption isotherms, and assess contaminant transport under varying flow conditions.
- Conduct soil sampling, apply proper handling and preservation methods, and utilize non-destructive techniques like electromagnetic, thermal, and seismic methods for site investigation.
- Evaluate the need for soil remediation, compare and select appropriate remediation techniques such as soil washing, electro-kinetic remediation, and bioremediation, including phytoremediation and soil fracturing, for effective soil restoration.
- Illustrate the principles of various containment systems, evaluate their suitability for polluted site management, and analyze environmental case studies to propose effective containment solutions.

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Fang H.Y., Ronald.C.Chaney, “Introduction to Environmental Geotechnology (2nd Edition)”, CRC Press, 2016.
2. Rowe R.K., "Geotechnical and Geoenvironmental Engineering Handbook" Kluwer Academic Publications, London, 2000

Reference Books(s) / Web links:

1. Sarsby.R.W., “Environmental Geotechnics (2nd Edition)”, ICE Publishing, 2012.
2. Reddi L.N. and Inyang, H. I., "Geoenvironmental Engineering, Principles and Applications" Marcel Dekker Inc. New York, 2000.

3. Yong, R. N., "Geoenvironmental Engineering, Contaminated Soils, Pollutant Fate, and Mitigation" CRC Press, New York, 2001.
4. Sharma H.D. and Reddy K.R., "Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies" John Wiley & Sons, Inc., USA, 2004.

CE23D13	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	2	3	1	2	1	1	2	3	2	3
CO 2	3	3	2	3	2	1	3	2	1	2	1	2	3	3	2
CO 3	2	2	1	3	3	2	3	2	3	3	2	3	2	2	3
CO 4	2	2	3	3	3	1	3	1	2	2	2	3	3	3	3
CO 5	3	2	3	3	2	2	3	2	2	1	3	3	3	3	2
Average	**2.6**	**2.4**	**2.2**	**2.8**	**2.2**	**1.6**	**3**	**1.6**	**2**	**1.8**	**1.8**	**2.6**	**2.8**	**2.6**	**2.6**

Prepared by Name and signature	Approved by Name and Signature
MRS.S. MUTHU LAKSHMI, ASSISTANT PROFESSOR (SG)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23D14	GEOSYNTHETIC ENGINEERING	PE	3	0	0	3

Objectives:

- To impart knowledge on the types, functions, manufacturing processes, and applications of geosynthetics, along with their role in sustainable design and construction systems.
- To provide a comprehensive understanding of the physical, mechanical, hydraulic, and endurance properties of geosynthetics and their significance in geotechnical engineering applications.
- To introduce the concepts, mechanisms, and design principles of reinforced earth walls, including various types of facing elements, construction procedures, and cost considerations.
- To provide knowledge on the design, modeling, and construction of reinforced slopes, including basal reinforced embankments and techniques for widening existing road embankments using geosynthetics.
- To equip students with the knowledge and skills to apply geosynthetics in ground improvement techniques, including the design and performance evaluation of prefabricated vertical drains, encased stone columns, and geocell/geofoam systems.

UNIT-I	**GEOSYNTHETICS**	**9**

Geosynthetics - Different types of Geosynthetics, functions, applications, raw materials used, manufacturing, system, Design and sustainability.

UNIT-II	**PROPERTIES OF GEOSYNTHETICS**	**9**

Various properties of Geosynthetics - physical properties, mechanical properties, hydraulic properties & endurance properties

UNIT-III	**REINFORCED EARTH WALLS**	**9**

Background of reinforced earth - mechanism and concepts, Basics of reinforced earth wall design - Different types of facing elements, construction procedure, cost, design of Geosynthetics wrap around faced wall, geogrid reinforced soil walls, geocell wall, gabion wall.

UNIT-IV	**REINFORCED SLOPES**	**9**

Model for single and multi-layer reinforced slopes, guidelines for design of reinforced slopes, Design of basal reinforced embankment, placement of Geosynthetics, construction procedure, widening of existing road embankments.

UNIT-V	**APPLICATION OF GEOSYNTHETICS**	**9**

Consolidation techniques, Development of design chart for prefabricated vertical drains, ground instrumentation and monitoring, Design of encased stone columns, geocell/geofoam systems, bearing capacity of Geosynthetics reinforced soil system; geocell reinforced sand overlaying soft clay.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Analyze and select appropriate geosynthetic materials for various geotechnical and environmental applications, considering functionality, design requirements, and sustainability factors.
- Evaluate and interpret the various properties of geosynthetics to ensure their suitability and performance in diverse engineering applications.
- Design and analyze reinforced earth wall systems using geosynthetics, geogrids, geocells, and gabions, while understanding their construction methodologies and cost implications.
- Design and implement single and multi-layer reinforced slopes, basal reinforced embankments, and road embankment widening projects, adhering to established guidelines and construction procedures.
- Design and analyze geosynthetic-based ground improvement solutions, such as vertical drains, geocell systems, and reinforced soil systems, considering bearing capacity, consolidation, and ground monitoring requirements.

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Koerner, R. M. Designing with Geosynthetics, Prentice Hall, Englewood Cliffs, New Jersey, U.S.A.
2. RRL, DSIR, Soil Mechanics for Road Engineers, HMSO, London, 1995

Reference Books(s) / Web links:

1. P. T. Sherwood, Alternative Materials in Road Construction, Thomas Telford Publication, London, 1997

CE23D14	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2	2	1	3	1	1	1	1	2	3	2	3
CO 2	2	3	2	3	2	1	3	1	1	1	1	2	3	2	2
CO 3	3	3	3	2	2	2	3	1	1	2	1	2	3	2	3
CO 4	3	3	3	2	2	1	3	1	1	1	2	2	3	2	3
CO 5	3	3	3	2	2	1	3	1	1	1	2	3	3	2	3
Average	**2.8**	**3**	**2.8**	**2.2**	**2**	**1.2**	**3**	**1**	**1**	**1.2**	**1.4**	**2.2**	**3**	**2**	**2.8**

Prepared by Name and signature	Approved by Name and Signature
MRS.S. MUTHU LAKSHMI, ASSISTANT PROFESSOR (SG)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23D15	SOIL EXPLORATION AND FIELD TESTING	PE	3	0	0	3

Objectives:

- To remember the various soil investigation techniques.
- To choose the appropriate technique for soil exploration.
- To categories the soil strata using direct and in direct methods.
- To understand the investigated data to design suitable foundation system.
- To determine the earth pressure by various instruments and case studies.

UNIT-I	SOIL EXPLORATION	9

Scope and objectives - planning an exploration program - methods of exploration - exploration for preliminary and detailed design - spacing and depth of bores - data presentation - Geophysical exploration and interpretation - seismic and electrical methods - cross bore hole, single bore hole – up hole -down hole methods.

UNIT-II	METHODS OF BORING	9

Methods of boring and drilling - non-displacement and displacement methods - drilling in difficult subsoil conditions - limitations of various drilling techniques, stabilization of boreholes - bore log report.

UNIT-III	SAMPLING TECHNIQUES	9

Introduction-Sampling Techniques – quality of samples – factors influencing sample quality – representative samples-disturbed and undisturbed soil sampling advanced sampling techniques, offshore sampling, shallow penetration samplers, preservation and handling of samples.

UNIT-IV	FIELD TESTS AND INTERPRETATION	9

Field tests - penetration tests - Field vane shear – In situ shear and bore hole shear test - pressure meter test - dilatometer test - plate load test – monotonic and cyclic; field permeability tests with Procedure – limitations - correction and data interpretation of all methods.

UNIT-V	MEASUREMENTS AND CASE STUDIES	9

Instrumentation in soil engineering, strain gauges, resistance and inductance type, load cells, earth pressure cells, settlement and heave gauges, pore pressure measurements - slope indicators, sensing units, case studies.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- To comprehend the significance of understanding the soil properties at a site conduct a sequential soil exploration according to the site.
- To extract samples as per requirement and perform field and laboratory tests.
- To analyze the practical significance of the results obtained from field and laboratory tests
- To clearly report the conclusions based on the conducted soil exploration and tests.
- To calculate the magnitudes of earth pressures by various instruments.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Bowles, J.E, Physical and Geotechnical Properties of Soil, McGraw-Hill Book Company,1985.
2. Dunnicliff, J. and Green, G.E, Geotechnical Instrumentation for Monitoring Field Performance, John Wiley & Sons, 1982.
3. GopalRanjan and Rao, A.S.R, Basic and Applied Soil Mechanics, Wiley Eastern Limited,1991.

Reference Books(s) / Web links:

1. Bowles, J.E, Foundation Analysis and Design, McGraw-Hill International edition, 1997.
2. Compendium of Indian Standards on Soil Engineering Parts 1 and II 1987 – 1988
3. All related ASTM codes and Eurocode 7 - Part 2.

CE23D15	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	1	3	1	2	1	1	1	1	1	2	2	1	2
CO 2	1	1	1	3	1	2	1	1	1	1	1	2	2	1	2
CO 3	1	1	1	3	1	2	1	1	1	1	1	2	2	1	2
CO 4	1	1	1	3	1	2	1	1	1	1	1	2	2	1	2
CO 5	2	2	2	3	1	2	2	1	1	1	1	2	2	1	2
Average	**1.2**	**1.2**	**1.2**	**3**	**1**	**2**	**1.2**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**2**

Prepared by Name and signature	Approved by Name and Signature
MR.M.AMMAIAPPAN, ASSISTANT PROFESSOR (SS)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23D16	ROCK MECHANICS	PE	3	0	0	3

Objectives:

- To gain knowledge about rock classification and index properties of rock systems
- To analyze the modes of rock failure, stress-strain characteristics and failure criteria of rocks.
- To estimate stresses in rocks.
- To apply rock mechanics principles in engineering applications.
- To acquire knowledge about rock stabilization.

UNIT-I	CLASSIFICATION AND INDEX PROPERTIES OF ROCKS	9

Formation of rocks, Physical properties, Classification of rocks and rock masses, Competent and Incompetent Rock – value of RMR and ratings in field estimation - Mass Rating and Q System. Index properties of rock systems.

UNIT-II	ROCK STRENGTH AND FAILURE CRITERIA	9

Modes of rock failure – Strength of rock – Laboratory measurement of shear, tensile and compressive strength. Stress - strain behaviour of rock under compression – Mohr -Coulomb failure criteria and empirical criteria.

UNIT-III	INITIAL STRESSES AND THEIR MEASUREMENTS	9

Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – measurements of in-situ stresses – Hydraulic fracturing – Flat jack method – Over coring method and Under coring methods – Stress around underground excavations.

UNIT-IV	APPLICATION OF ROCK MECHANICS IN ENGINEERING	9

Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

UNIT-V	ROCK STABILISATION	9

Introduction – Rock support and Rock reinforcement – Principles – active and passive supports – ground response curve – Support reaction curves – Shotcreting – Bolting – Anchoring – Installation methods.

Total Contact Hours: 45

Course Outcomes:

On completion of the course students will be able to

- **C**lassify rocks and rock masses using RMR and Q systems and evaluate their index properties for geotechnical applications.
- Analyze rock strength and failure modes**,** interpret stress-strain behavior under compression, and apply failure criteria, including Mohr-Coulomb and empirical methods, to assess rock stability.
- **E**stimate initial stresses in rocks, analyze the influence of joints on stress distribution, and apply in-situ stress measurement techniques such as hydraulic fracturing and over-coring.
- Apply rock mechanics principles to design and analyze underground openings, rock slopes, foundations, and address mining subsidence issues in engineering projects.
- Analyze rock stabilization techniques and apply principles of rock support, reinforcement, support reaction curves, and shotcreting in engineering practices.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Activity Based Learning – Rock classification activity

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Class Presentation/Discussion
- Quizzes
- Case study analysis – Tunnels, Mining and Landslides

Text Book(s):

1. Goodman, P.E. “Introduction to Rock Mechanics”, John Wiley and Sons, 1999.
2. Ramamurthy. T., “Engineering in Rocks for Slopes, Foundation and Tunnels: (Third Edition), PHI Learning Private Limited, New Delhi, 2014.
3. Brady, B.H.G. and Brown, E.T., Rock mechanics for underground mining (Third Edition), Kluwer Academic Publishers, Dordrecht, 2006

Reference Books(s) / Web links:

1. Brown, E.T. “Rock Characterization Testing and Monitoring”. Pergaman Press 1991.
2. Arogyaswamy, R.N.P., Geotechnical Application in Civil Engineering”, Oxford and IBH, 1991.
3. Stillborg B., “Professional User Handbook for rock Bolting”, Tran Tech Publications, 1996.

CE23D16	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	2	2	1	1	1	2	2	3	2	2
CO 2	3	3	3	3	3	2	3	1	1	1	2	2	3	3	2
CO 3	3	3	2	3	3	2	3	1	1	2	1	2	3	3	2
CO 4	3	3	3	2	3	3	3	2	2	2	2	3	3	3	3
CO 5	3	3	3	2	2	3	3	2	2	2	3	3	3	3	3
Average	**3**	**3**	**2.6**	**2.4**	**2.6**	**2.4**	**2.8**	**1.4**	**1.4**	**1.6**	**2.2**	**2.4**	**3**	**2.8**	**2.4**

Prepared by Name and signature	Approved by Name and Signature
MRS.S.YUGASINI, ASSISTANT PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23D17	MACHINE FOUNDATION	PE	3	0	0	3

Objectives:

- To understand design criteria, vibration limits, and methods for machine foundations.
- To learn design, types, and analysis of framed foundations for impact machines and compressors.
- To familiarize with designing machine foundations, force calculation, and IS code analysis.
- To understand degrees of freedom, soil springs, damping, and block foundation vibrations per IS codes.
- To study vibration isolation methods, including active/passive isolation and machine foundation techniques.

UNIT-I METHODS OF ANALYSIS OF MACHINE FOUNDATION **9**

Criteria for a satisfactory machine foundation - permissible amplitude of vibration for different type of machines - methods of analysis of machine foundations - methods based on linear elastic weightless springs - methods based on linear theory of elasticity (elastic half space theory) - methods based on semi graphical approach.

UNIT-II DESIGN OF MACHINE FOUNDATION **9**

Evaluation of design parameters – Types of Machines and foundations – General requirements – their importance – Analysis and design the framed type machine foundations – Modes of vibration of a rigid foundation- impact machines, Two –Cylinder vertical compressor, Double-acting steam hammer –Codal recommendations – Empirical approach – Barken's method – Bulb of pressure concept – Paw's analogy – Vibration table studies

UNIT-III DESIGN OF RECIPROCATING AND HAMMER FOUNDATION **9**

Foundation of reciprocating machines - design criteria - calculation of induced forces and moments - multi-cylinder engines - numerical example (IS code method) - Foundations subjected to impact loads - design criteria - analysis of vertical vibrations - computation of dynamic forces - design of hammer foundations (IS code method).

UNIT-IV BLOCK FOUNDATION **9**

Degrees of freedom of a block foundation - definition of soil spring constants - nature of damping - geometric and internal damping - determination of soil constants – methods of determination of soil constants in laboratory and field based on IS code provisions - Vertical, sliding, rocking and yawing vibrations of a block foundation - simultaneous rocking, sliding and vertical vibrations of a block foundation.

UNIT-V VIBRATION ISOLATION **9**

Vibration isolation - active and passive isolation - transmissibility - methods of isolation in machine foundations.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- gain knowledge of design criteria, vibration limits, and methods for machine foundations.
- acquire skills in designing and analysing framed foundations for impact machines and compressors.
- develop expertise in designing and evaluating foundations, forces, and vibrations of reciprocating machines using IS codes.
- evaluate the degrees of freedom, soil constants, damping, and vibrations of block foundations using IS code methods.
- acquire knowledge of vibration isolation techniques, including active/passive isolation and machine foundations.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Swami Saran, "Soil Dynamics and Machine Foundation", Galgotia publications Pvt. Ltd., New Delhi 1999.
2. K.G. Bhatia, "Foundations for Industrial Machines: Handbook for Practising Engineers", CRC Press, London, 2009..

Reference Books(s) / Web links:

1. Sreenivasalu and Varadarajan, Handbook of Machine Foundations, Tata McGraw-Hill, 2007.
2. Prakash.S and Puri.V.K, "Foundations for machines", McGraw Hill, 1987.

3. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", wheeler Publishing, New Delhi, 1998.

CE23D17	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	2	2	1	1	1	1	1	1	1	2	3	2	1
CO 2	2	3	3	2	1	1	1	1	1	1	1	2	3	2	1
CO 3	2	3	3	2	1	1	1	1	1	1	1	2	3	2	1
CO 4	2	3	2	2	1	1	1	1	1	1	1	2	3	2	1
CO 5	2	3	2	2	1	1	1	1	1	1	1	2	3	2	1
Average	**2**	**2.8**	**2.4**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**2**	**1**

Prepared by Name and signature	Approved by Name and Signature
MR.M.AMMAIAPPAN, ASSISTANT PROFESSOR (SS) /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23E11	ADVANCED SURVEYING TECHNIQUES	PE	3	0	0	3

Objectives:

- To provide an in-depth understanding of geodetic principles, coordinate systems, and the application of map projections in geospatial analysis.
- To impart knowledge of astronomical concepts and their practical application in determining geographic parameters such as azimuth, latitude, and longitude.
- To equip students with the skills to conduct precise mine and route surveys using specialized techniques and equipment.
- To familiarize students with advanced methods of volume computation and staking out for earthworks projects.
- To develop a solid foundation in error theory, enabling the identification, analysis, and correction of observational errors in survey data.

UNIT-I	GEODETIC SURVEYING	9

Geodesy - Figure of earth - Classification - Earth surface - Geodetic reference surfaces - Coordinate systems - Geodetic datum and elements - Map - Scale of map - projection - UTM - Map projection of India - Space Geodesy.

UNIT-II	FIELD ASTRONOMY	9

Introduction - Instruments & purpose, Astronomical terms, Time & conversion of time, Abbreviations, Determination of azimuth, Latitude and longitude.

UNIT-III	MINE AND ROUTE SURVEYING	9

Mine Surveying – Definition of terms, Different underground surveying equipment used for mine surveying - Apply methods of solving mine surveying problems - Reconnaissance - Preliminary Survey - Location or Final Survey.

UNIT-IV	EARTHWORKS	9

Staking out works - Volume Computation - End Area Method - Prismoidal Formula - Prismoidal Correction - Mechanic Hauling - Mass Diagram - Borrow Pits.

UNIT-V	THEORY OF ERRORS	9

Introduction - types of errors – Definitions - Laws of accidental errors - laws of weights - Theory of least squares - Rules for giving weights and distribution of errors to the field observations - Normal Equations Determination of the most probable values of quantities Examples on weighed observations – method of equal shifts - normal equation – correlates.

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- analyze and apply geodetic reference systems and map projections to solve complex geospatial problems effectively.
- demonstrate proficiency in using field astronomy techniques to calculate geographic coordinates with accuracy.
- design the and transportation routes, ensuring optimal accuracy and efficiency.
- effectively apply end-area methods and prismoidal formulas to compute earthwork volumes and prepare mass diagrams for engineering applications.
- apply the theory of least squares and error distribution techniques to derive the most probable values for geodetic observations.

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. "Advanced Surveying: Total Station, GIS, and Remote Sensing" by Satheesh Gopi, R. Sathikumar, and N. Madhu, Second Edition (2017), ISBN: 978-9352860722.
2. "Surveying Vol. II" by Dr. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, Sixteenth Edition (2016), ISBN: 978-8131809822.
3. "Surveying and Levelling Vol. II" by T. P. Kanetkar and S. V. Kulkarni, Edition: Twenty-Fourth Edition (2015), ISBN: 978-8185592876.

Reference Books(s) / Web links:

1. "GPS Satellite Surveying" by Alfred Leick, Lev Rapoport, and Dmitry Tatarnikov, Fourth Edition (2015), ISBN: 978-1118675571.
2. "Remote Sensing and Geographical Information System" by A. M. Chandra and S. K. Ghosh, Second Edition (2006), ISBN: 978-1842652786.
3. "Precision Surveying: The Principles and Geomatics Practice" by John Olusegun Ogundare, First Edition (2015), ISBN: 978-1119102519.

CE23E11	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	3	3	1	2	3	1	2	3	3	3	2
CO 2	3	3	3	3	3	3	1	2	3	1	2	3	3	3	2
CO 3	3	3	3	3	3	3	1	2	3	1	2	3	3	3	2
CO 4	3	3	3	3	3	3	1	2	3	1	2	3	3	3	2
CO 5	3	3	3	3	3	3	1	2	3	1	2	3	3	3	2
Average	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**3**	**3**	**2**

Prepared by Name and signature	Approved by Name and Signature
MRS.M. GOUTHAM PRIYA, ASSISTANT PROFFESSOR (SG)/ CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23E12	HYDROGRAPHIC SURVEYING	PE	3	0	0	3

Objectives:

- To develop the necessary knowledge and concepts of tides and datum practical instrument operational
- To expose them know about sounding and practical instrument operational
- To explain the importance of positioning, navigation and GPS using satellite positioning systems
- To address data processing skills needed for them to confidently accomplish a bathymetric survey in the real world
- To develop students' critical and creative thinking, as well as cooperative attitudes & behaviour of working with others

UNIT-I	INTRODUCTION, TIDES AND DATUMS	9

Overview of hydrographic surveying concepts- bathymetric and nautical charts- Basic tidal theorytidal observations and predictions - common types of recording tide gauges - different vertical datums - Indian tides.

UNIT-II	SOUNDINGS	9

Overview of depth data types- Working principle of echo sounders - characteristics and nature of underwater acoustic signals – transducers - error sources and calibrations- Advanced instrumentation.

UNIT-III	NAVIGATION AND POSITION FIXING	9

Horizontal positioning methods and requirements - concept of line and surface of position - positioning and navigation using satellite positioning systems - differential GPS and Real-time kinematic (RTK)

UNIT-IV	PLANNING AND DATA PROCESSING	9

General considerations for planning of an inshore hydrographic survey - ground and track control - practical soundings in inshore and coastal surveys - data processing and chart compilation - hydrographic software packages for data collection - processing and plotting.

UNIT-V	MARINE ENVIRONMENTAL MEASUREMENTS	9

Methods of measuring and recording of currents - composition of the sea bed - and solids in suspension - Case Studies (The role of the hydrographic surveyor on different marine projects)

Total Contact Hours:45

Course Outcomes:

On completion of the course students will be able to:

- Competent in fundamentals of hydrographic surveying
- Associate the appropriate techniques for different types of survey
- Understand the various options available during the Navigation
- Analyze the data collected from a survey and assess its quality against the project requirements
- Discuss the different roles for a hydrographic surveyor on marine projects

SUGGESTED ACTIVITIES

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. de Jong, C. D., Lachapelle, G., Skone, S. & Elema, I. A. (2002), Hydrography, Delft University Press, The Netherlands.
2. Ingham, A. E. (1992), Hydrography for the Surveyor and Engineer, 3rd Edition revised by Abbott V. J., Blackwell Science.
3. International Hydrographic Organisation (1998), IHO Standards for Hydrographic Surveying (S44), IHB Monaco.

Reference Books(s) / Web links:

1. U.S. Army Corps of Engineers, (2002), Hydrographic Surveying, Document No. EM 1110-2-1003.
2. Loweth, R. P. (1997), Manual of Offshore Surveying for Geoscientists and Engineers Chapman & Hall.
3. Pugh, D. (2004), Changing Sea Levels – Effects of Tides, Weather and Climate, Cambridge University Press.

CE23E12	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	-	-	-	-	-	-	-	-	-	-	-	3	3	3
CO 2	3	-	-	-	-	-	-	3	-	-	-	-	3	3	3
CO 3	3	2	3	3	3		3	3	-	-	-	3	3	3	3
CO 4	3	3	3	3	3	3	3	3		3	3	3	3	3	3
CO 5	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3
Average	**3**	**2.3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Prepared by Name and signature	Approved by Name and Signature
MR.N.MAHAMOOD UL HASAN, ASSISTANT PROFESSOR(SG)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23E13	TOTAL STATION AND GPS SURVEYING	PE	3	0	0	3

Objectives:

- To provide an in-depth understanding of the principles, historical evolution, and comparative advantages of Total Station over conventional surveying methods.
- To familiarize students with the propagation characteristics of electromagnetic waves and their applications in distance measurement and atmospheric corrections.
- To impart knowledge of the working principles and error analysis of electro-optical and microwave systems in Total Station instruments.
- To introduce the fundamental concepts and components of satellite-based positioning systems such as GPS, GNSS, IRNSS, and GAGAN.
- To equip students with the skills to process GPS data, resolve observational ambiguities, and apply advanced surveying methods like differential and kinematic processing.

UNIT-I	FUNDAMENTALS OF TOTAL STATION	9

Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications and applications and comparison with conventional surveying.

UNIT-II	ELECTROMAGNETIC WAVES	9

Classification - applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies- Refractive index (RI) - factors affecting RI-Computation of group for light and near infrared waves at standard and ambient conditions-Computation of RI for microwaves at ambient condition - Reference refractive index-Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index-Second velocity correction Total atmospheric correction- Use of temperature - pressure transducers.

UNIT-III	ELECTRO-OPTICAL AND MICROWAVE SYSTEM	9

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 – Traversing and Trilateration-COGO functions, offsets and stake out-land survey applications.

UNIT-IV	GLOBAL POSITIONING SATELLITE SYSTEM	9

Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion – Kepler‘s Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept –GNSS, IRNSS and GAGAN - Different segments - space, control and user segments - satellite configuration – GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers.

UNIT-V	GPS DATA PROCESSING	9

GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation – downloading the data RINEX Format – Differential data processing – software modules - solutions of cycle slips, ambiguities, Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods -satellite geometry & accuracy measures - applications- long baseline processing- use of different softwares available in the market.

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- demonstrate the ability to explain the operational principles of Total Station and assess its applications in modern surveying practices.
- proficiently compute refractive indices under varying atmospheric conditions and apply velocity corrections in practical surveying scenarios.
- differentiate between electro-optical and microwave systems, execute traversing and trilateration, and maintain Total Station instruments effectively.
- describe satellite configuration, interpret GPS signal structures, and analyze the roles of various system segments in geospatial positioning.
- establish proficiency in using GPS software for data analysis, cycle slip resolution, and long-baseline processing, ensuring accurate geospatial outcomes.

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Continuous Assessment Tests
- Quizzes
- Class Presentation/Discussion
- Assignments

Text Book(s):

1. "Advanced Surveying: Total Station, GPS, GIS & Remote Sensing" by Satheesh Gopi, R. Sathikumar, and N. Madhu, Second Edition (2017), ISBN: 978-9352860722.
2. "Surveying: Theory and Practice" by James M. Anderson and Edward M. Mikhail, Seventh Edition (1998), ISBN: 978-0070159143.
3. "GPS for Land Surveyors" by Jan Van Sickle, Fourth Edition (2015), ISBN: 978-1466583106.

Reference Books(s) / Web links:

1. "Global Positioning System: Theory and Practice" by B. Hofmann-Wellenhof, H. Lichtenegger, and J. Collins, Fifth Edition (2001), ISBN: 978-3211835340.
2. "Adjustment Computations: Spatial Data Analysis" by Charles D. Ghilani, Fifth Edition (2010), ISBN: 978-0470464915.
3. "Introduction to GPS: The Global Positioning System" by Ahmed El-Rabbany, Second Edition (2006), ISBN: 978-1596930162.

CE23E13	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
CO 2	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
CO 3	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
CO 4	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
CO 5	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
Average	**3**	**2**	**2**	**3**	**3**	**3**	**1**	**2**	**2**	**1**	**1**	**2**	**3**	**3**	**1**

Prepared by Name and signature	Approved by Name and Signature
MRS.M. GOUTHAM PRIYA, ASSISTANT PROFFESSOR (SG)/ CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23E14	REMOTE SENSING	PE	3	0	0	3

Objectives:

- To introduce the fundamental principles of remote sensing, emphasizing the interaction of electromagnetic radiation with the Earth's atmosphere and surface.
- To explore the types and characteristics of remote sensing platforms and satellites, including their applications in resource and environmental monitoring.
- To provide insights into sensor types, their working principles, and their significance in capturing spatial, spectral, temporal, and radiometric data.
- To develop skills in interpreting remote sensing images through visual and analytical techniques, employing multidisciplinary concepts and tools.
- To equip students with knowledge of remote sensing data products, their procurement, and the role of ground truthing in data validation.

UNIT-I	INTRODUCTION	9

Remote sensing – history & development, definition, concept and principles - Energy resources, radiation principles, EM Radiation and EM Spectrum - Black body radiation, laws of radiation - Interaction of EMR with atmosphere and earth's surface.

UNIT-II	PLATFORMS	9

Platforms – types and their characteristics - Satellites and their characteristics – geo-stationary and sun-synchronous Earth Resources Satellites -LANDSAT, SPOT, IRS, IKONOS, Meteorological satellites – INSAT, NOAA, GOES.

UNIT-III	SENSORS	9

Sensors – types and their characteristics, across track (whiskbroom) and along track (push broom) scanning Optical mechanical scanners – MSS, TM, LISS, WiFS, PAN Concept of resolution – spatial, spectral, temporal, radiometric Basic concept and principles of thermal, microwave and hyperspectral sensing.

UNIT-IV	IMAGE INTERPRETATION	9

Basic principles, types, steps and elements of image interpretation Techniques of visual interpretation -interpretation keys - Multidate, multispectral and multidisciplinary concepts - Instruments for visual interpretation.

UNIT-V	REMOTE SENSING DATA PRODUCTS	9

Remote sensing data products and their procurement - Ground truth collection – spectral signatures - commonly used ground truth equipment - use of radiometers Display forms – computer printouts, thematic maps, dot density maps

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- elucidate the principles of electromagnetic radiation and analyze its interaction with various environmental components for effective remote sensing applications.
- demonstrate the ability to differentiate between geo-stationary and sun-synchronous satellites and evaluate their roles in remote sensing tasks.
- comprehend the operational principles of various sensors and assess their suitability for thermal, microwave, and hyperspectral sensing.
- establish competence in applying interpretation keys and visual tools to extract meaningful information from multispectral and multitemporal datasets.
- efficiently utilize ground truth equipment and remote sensing data products to create thematic and density maps for practical applications.

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Continuous Assessment Tests
- Quizzes
- Class Presentation/Discussion
- Assignments

Text Book(s):

1. Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications
2. Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
3. Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag

Reference Books(s) / Web links:

1. Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall.

2. Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
3. Sabbins, F.F., 1985: Remote Sensing Principles and interpretation. W.H.Freeman and company
4. Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press

CE23E14	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
CO 2	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
CO 3	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
CO 4	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
CO 5	3	2	2	3	3	3	1	2	2	1	1	2	3	3	1
Average	**3**	**2**	**2**	**3**	**3**	**3**	**1**	**2**	**2**	**1**	**1**	**2**	**3**	**3**	**1**

Prepared by Name and signature	Approved by Name and Signature
MRS.M. GOUTHAM PRIYA, ASSISTANT PROFFESSOR (SG)/ CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23E15	CARTOGRAPHY AND GIS	PE	3	0	0	3

Objectives:

- To explore the fundamentals of Cartography such as cartographic principles, map types, functions, scales, and projections, ensuring accurate map creation and interpretation.
- To master the skills necessary for effective map design and production, emphasizing layout principles, symbolization, color theory, and map printing techniques.
- To develop proficiency with Geographic Information Systems (GIS), covering its components, data models, and the historical context, enabling effective utilization of GIS in various applications.
- To enhance skills required for data input and topology in GIS, including the use of scanners, digitizers, data transformation, and integration techniques.
- To ensure high data quality for assessing and ensuring the quality of GIS data and producing effective outputs using GIS tools and data, including map compilation and the creation of charts and graphs.

UNIT-I ELEMENTS OF CARTOGRAPHY **9**

Definition of Cartography – Maps – Functions – Uses and Types of Maps – Map Scales and Contents – Map Projections – Shape, Distance, Area and Direction Properties – Perspective and mathematical Projections – Indian Maps and Projections – Map Co-ordinate System – UTM and UPS References.

UNIT-II MAP DESIGN AND PRODUCTION **9**

Elements of a Map – Map Layout Principles – Map Design Fundamentals – Symbols and Conventional Signs – Graded and Ungraded Symbols – Color Theory – Colours and Patterns in Symbolization – Map Lettering – Map Production – Map Printing – Colours and Visualization – Map Reproduction – Map Generalization – Geometric Transformations – Bilinear and Affine Transformations

UNIT-III FUNDAMENTALS OF GIS **9**

Introduction to GIS – Definitions – History of GIS – Components of a GIS – Hardware, Software, Data, People, Methods – Introduction to data quality – Types of data – Spatial, Attribute data – types of attributes – scales/levels of measurements – spatial data models – Raster Data Structures – Raster Data Compression – Vector Data Structures – Raster Vs Vector Models – TIN and GRID data models

UNIT-IV DATA INPUT AND TOPOLOGY **9**

Scanner – Raster Data Input – Raster Data File Formats – Georeferencing– Vector Data Input – Digitizer– Datum Projection and Reprojection – Coordinate Transformation – Topology - Adjacency, Connectivity and containment – Topological Consistency – Non topological file formats – Attribute Data Linking – Linking External Databases – GPS Data Integration – Raster to Vector and Vector to Raster Conversion.

UNIT-V DATA QUALITY AND OUTPUT **9**

Assessment of Data Quality - Basic Aspects - Completeness, Logical Consistency, Positional Accuracy, Temporal Accuracy, Thematic Accuracy and Lineage – Metadata – GIS Standards – Interoperability – OGC - Spatial Data Infrastructure – Data Output – Map Compilation – Chart / Graphs.

Total Contact Hours:45

Course Outcomes:

- applying various map scales, projections, and coordinate systems, understanding the implications of each for map accuracy and utility.
- demonstrate the ability to design maps that effectively communicate information through the appropriate use of layout, symbols, colors, and patterns.
- possess a robust understanding of GIS, including its components and data models, capable of applying this knowledge to solve real-world problems.
- incorporate techniques for data input, including scanning and digitizing, understand topological concepts, and be able to perform complex spatial analyses and transformations.
- assess data quality across multiple dimensions, manage metadata, adhere to GIS standards, and produce high-quality graphical outputs of spatial data.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Continuous Assessment Tests
- Quizzes
- Class Presentation/Discussion
- Assignments

Text Book(s):

1. Arthur H. Robinson et al, “Elements of Cartography”, 7th Edition, Wiley, 2002

2. Kang – Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, Fourth Edition, 2017.
3. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, “An Introduction to Geographical Information Systems, Pearson Education, Fourth Edition, 2011.
Reference Books(s) / Web links:
1. John Campbell, "Introductory Cartography", Wm. C.BrownPublishers,3rd Edition,2004
2. Chor Pang LO, Albert K. W. Yeung, “Concepts and Techniques of Geographic Information Systems”, Pearson Education, 2nd Edition, November 2016. ISBN: 9789332581883.

CE23E15	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	2	1	1	1	1	1	1	1	1	2	3	2	3
CO 2	3	2	1	1	1	1	1	1	1	1	1	2	3	2	3
CO 3	2	1	1	1	3	1	1	1	1	1	1	2	3	2	2
CO 4	2	1	2	1	2	1	1	1	1	1	1	2	3	2	2
CO 5	2	2	2	1	2	2	1	1	1	1	1	3	3	3	3
Average	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**2**	**2**

Prepared by Name and signature	Approved by Name and Signature
MRS.M.GOUTHAM PRIYA, ASSISTANT PROFESSOR (SG)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23E16	PHOTOGRAMMETRY	PE	3	0	0	3

Objectives:

- To familiarize the principles and execution of aerial photography, including the geometry and specifications of aerial photographs.
- To comprehend the concepts of stereoscopic vision and its applications in height and slope determination using parallax measurements.
- To introduce the methodologies of aerial triangulation, orientation processes, and the creation of orthophotos and mosaics.
- To explore the advanced techniques of digital image processing, feature extraction, and DEM creation for civil engineering applications.
- To provide a comprehensive understanding of UAV systems, their classifications, design considerations, and applications in modern surveying.

UNIT-I	FUNDAMENTALS OF AERIAL PHOTOGRAPHY SYSTEMS	9

Introduction to aerial photography – basic information and specifications of aerial photographs - Planning and execution of photographic flights Aerial cameras – types and their characteristics - Geometry of aerial photographs.

UNIT-II	STEREOSCOPY	9

Stereoscopes, stereoscopic view and its exaggeration – parallax equation – parallax measurement–parallax bar-measurement of heights and determination of slopes- stereoscopic plotting instruments.

UNIT-III	ANALYTICAL PHOTOGRAMMETRY	9

Concepts of orientation-interior, relative and absolute orientation of aerial photographs, Aerial triangulation, Block adjustment, Orthophotos, Kinds of mosaics- controlled, semi-controlled, uncontrolled.

UNIT-IV	DIGITAL PHOTOGRAMMETRY	9

Automatic DTM acquisition from stereo pairs or image blocks, Colour balancing, Digital image enhancement, Feature extraction. DEM Applications in Civil Engineering.

UNIT-V	UNMANNED AIR VEHICLE	9

History of unmanned air vehicle (UAV) development. Classifications and components of UAVs – Design standards and Regulatory aspects – Environment, Budget & Time, Airframe Design & Payload, Flight planning, Mosaicing, Ground control, Feature detection and mapping, Point cloud, 3D Models, DEM generation, Orthophoto generation, UAV Applications.

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- acquire, measure, analyze and interpret aerial photographs
- employ stereoscopic plotting instruments and parallax equations to interpret three-dimensional terrain features.
- design and implement block adjustments and produce controlled mosaics for accurate photogrammetric representation.
- engage digital photogrammetry tools for terrain modeling, color balancing, and enhancing spatial data accuracy.
- perform orientation of photos to generate orthophotos and mosaics using aerial photographs and UAV data and analyze the point cloud data for documentation and archiving of features

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Continuous Assessment Tests
- Quizzes
- Class Presentation/Discussion
- Assignments

Text Book(s):

1. Elements of Photogrammetry with Application in GIS, Wolf P. R., McGraw Hill International Book Company, Fourth Edition, 2014.
2. Photogrammetry, Moffitt, Francis H. & Mikhail, Edward M., Harper and Row Publishers, 1980.
3. Fundamentals of Computational Photogrammetry, Sanjib K Ghosh., Concept Publishing Company, 2005
4. Introduction to UAV Systems, Paul Gerin F & Thomas James Gleason., Wiley Publications, 2012

Reference Books(s) / Web links:
1. Digital Photogrammetry Theory and Applications, Wilfried Linder., Springer 2013
2. Unmanned Aircraft Systems, Reg Austin, Wiley Publications, 2010
3. Aerial Photography and Image Interpretation, Paine D. P., Kiser J. D., John Wiley & Sons, Inc., 2012.
4. Introductory Course in Photogrammetry, Zorn H.C., Sixth Edition, ITC, Netherlands, 1980.
5. https://nptel.ac.in/courses/105/104/105104100/

CE23E16	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	2	2	3	3	1	2	2	1	1	2	3	3	1
CO 2	3	1	2	2	3	3	1	2	2	1	1	2	3	3	1
CO 3	3	1	2	2	3	3	1	2	2	1	1	2	3	3	1
CO 4	3	1	2	2	3	3	1	2	2	1	1	2	3	3	1
CO 5	3	1	2	2	3	3	1	2	2	1	1	2	3	3	1
Average	**3**	**1**	**2**	**2**	**3**	**3**	**1**	**2**	**2**	**1**	**1**	**2**	**3**	**3**	**1**

Prepared by Name and signature	Approved by Name and Signature
MRS.M. GOUTHAM PRIYA, ASSISTANT PROFFESSOR (SG)/ CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23E17	RS AND GIS APPLICATIONS FOR CIVIL ENGINEERS	PE	3	0	0	3

Objectives:

- To provide an advanced understanding of survey techniques and land information systems for effective land resource planning and real estate applications.
- To impart knowledge on monitoring structural deformation and analyzing natural and man-made phenomena affecting structural integrity.
- To examine the impact of environmental factors on soil properties and develop strategies for soil conservation and reclamation using remote sensing and GIS.
- To explore the application of geospatial technologies in urban growth monitoring, transportation planning, and infrastructure development.
- To develop expertise in utilizing advanced geospatial tools for the assessment, planning, and management of water resources and disaster mitigation.

UNIT-I	LAND RESOURCE MANAGEMENT	9

Total Station and GPS Surveys – Topographic and Bathymetric Surveys – Cadastral Information – Soil and Land Use Surveys - Land Information System (LIS) – Real Estate Information System.

UNIT-II	STRUCTURAL STUDIES	9

Deformation studies of deflection - Dam deformation - structural movement - Pavement yield - shifting sand-bank and shoreline – Landslide Risk Analysis.

UNIT-III	SOIL CONSERVATION AND MANAGEMENT	9

Soil survey interpretation and mapping - impact of agricultural and industrial activity on soil properties - soil erosion - factors influencing soil erosion - soil contamination using Hyper spectral Remote Sensing - mining pollution- EMR responses with contaminated soil - modeling soil characteristics using satellite data - soil degradation assessment using Remote Sensing and GIS - Land reclamation studies.

UNIT-IV	URBAN AND TRANSPORTATION MANAGEMENT	9

Monitoring Urban Growth through Remote Sensing - Geo-demographic Analysis – Property Market Analysis Urban Renewal - traffic analysis - accident analysis - site suitability analysis for transport infrastructure –transportation databases: creation and maintenance - Vehicle routing – Highway maintenance system – Intelligent Transportation System.

UNIT-V	WATER RESOURCES PLANNING AND MANAGEMENT	9

Location of storage/diversion works – capacity curve generation – sediment yield - modelling of catchments – Delineation of watershed - Watershed modelling for sustainable development - Rainfall – Runoff modelling –LiDAR Mapping for Urban area –Water quality mapping and monitoring – Flood Risk Zoning - Flood damage assessment – Flood Modelling - Assessment of droughts and mitigation.

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- adeptly employ Total Station and GPS technologies to conduct topographic, bathymetric, and cadastral surveys, integrating them into comprehensive land and real estate information systems.
- assess structural movements, landslide risks, and shoreline shifts, leveraging geospatial tools for detailed deformation studies.
- utilize satellite data and hyperspectral imaging to evaluate soil contamination, model soil characteristics, and assess land degradation for sustainable management practices.
- analyze urban growth, evaluate transport infrastructure suitability, and develop intelligent transportation systems using remote sensing and GIS databases.
- model watershed dynamics, assess flood and drought risks, and apply LiDAR mapping for urban water management and sustainable development strategies.

SUGGESTED ACTIVITIES

- Flipped classroom
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Continuous Assessment Tests
- Quizzes
- Class Presentation/Discussion
- Assignments

Text Book(s):

1. Basudeb Bhatta, 'Remote Sensing and GIS', Second edition, Oxford University Press 2011.

2. Lo.C.P., Albert K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Second edition, PHI Learning Private Limited, Delhi, 2014.

Reference Books(s) / Web links:

1. Andrew N. Rencz, Manual of Remote Sensing: Remote Sensing for Natural Resource Management and Environmental Monitoring, John Wiley & Sons Inc, April 2004
2. Rashed, Tarek; Jürgens, Carsten (Eds.), Remote Sensing of Urban and Suburban Areas, Springer, 1st Edition. 2010.
3. Harvey J. Miller, Shih-Lung Shaw, Geographic Information Systems for Transportation – Principles and Applications, Oxford University Press, 2001.
4. Gert A. Schulitz Edwin T. Engman, Remote Sensing in hydrology and Water Management, Springer - verlag Berlin Heidelberg Germany - 2000.

CE23E17	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	2	3	2	1	1	1	1	2	3	3	2	2
CO 2	3	2	1	2	3	2	1	1	1	1	2	3	3	2	2
CO 3	3	2	1	2	3	2	1	1	1	1	2	3	3	2	2
CO 4	3	2	1	2	3	2	1	1	1	1	2	3	3	2	2
CO 5	3	2	1	2	3	2	1	1	1	1	2	3	3	2	2
Average	**3**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**1**	**1**	**2**	**3**	**3**	**2**	**2**

Prepared by Name and signature	Approved by Name and Signature
MRS.M. GOUTHAM PRIYA, ASSISTANT PROFFESSOR (SG)/ CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23F11	INTELLIGENT TRANSPORT SYSTEM	PE	3	0	0	3

Objectives:

- Provide a comprehensive understanding of Intelligent Transport Systems (ITS) and their role in modern transportation management.
- Introduce students to the architecture and hardware components used in ITS, including sensors, vehicle detection techniques, and communication systems like GPS and GPRS.
- Explore various strategies for intersection management, focusing on advanced technologies like video detection, automatic number plate recognition (ANPR), and integrated traffic control centers.
- Equip students with knowledge of Advanced Transport Management Systems (ATMS), including route guidance systems, dynamic traffic assignment, and data analysis techniques for traffic management.
- Discuss the workings of Advanced Traveler Information Systems (ATIS), including smart route systems, data collection, and the dissemination of real-time information to travelers.

UNIT-I	INTRODUCTION TO INTELLIGENT TRANSPORT SYSTEM	9

Introduction -Definition – Role and Responsibilities – Advanced Traveller Information System – Fleet Oriented ITS Services – Electronic Toll Collection – Critical issues – Security – Safety.

UNIT-II	ITS ARCHITECTUREAND HARDWARE	9

Architecture – ITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques – Dynamic Message Sign – GPRS – GPS – Toll Collection.

UNIT-III	INTERSECTION MANAGEMENT	9

Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management – Control Centre – Junction Management Strategies.

UNIT-IV	ADVANCED TRANSPORT MANAGEMENT SYSTEM	9

ATMS – Route Guidance – Issues – Historical – Current – Predictive Guidance – Data Collection – Analysis – Dynamic Traffic Assignment (DTA) – Components – Algorithm.-Travel Information – Pre Trip and Enroute Methods.

UNIT-V	ADVANCED TRAVELER INFORMATION SYSTEMS	9

Basic ATIS Concepts – Smart Route System – Data Collection – Process – Dissemination to Travelers – Evaluation of Information – Value of Information – Business Opportunities.

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Define and explain the concepts and components of Intelligent Transport Systems (ITS), with a focus on their role in improving traffic flow, safety, and efficiency.
- Assess the architecture and key hardware components of ITS, including vehicle detection techniques, dynamic message signs, GPS, GPRS, and their applications in toll collection and traveler information.
- Apply advanced intersection management strategies using modern technologies like video detection, virtual loops, and ANPR to improve traffic control at junctions.
- Analyze and implement Advanced Transport Management Systems (ATMS), utilizing route guidance systems, predictive traffic models, and dynamic traffic assignment algorithms for effective traffic management.
- Design and evaluate Advanced Traveler Information Systems (ATIS), assessing the value of real-time travel information and understanding its impact on traveler decision-making and business opportunities.

SUGGESTED ACTIVITIES

- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Ghosh, S., Lee, T.S. Intelligent Transportation Systems: New Principles and Architectures, CRC Press, 2010.
2. Mashrur A. Chowdhury, and Adel Sadek, Fundamentals of Intelligent Transportation Systems Planning, Artech House, Inc., 2003.
3. R.P Roess, E.S. Prassas, W.R. McShane. Traffic Engineering, Pearson Educational International, Third Edition, 2004.

Reference Books(s) / Web links:

1.	Intelligent Transport Systems, Intelligent Transportation Primer, Washington, US, 2001.
2.	Henry F.Korth, and Abraham Siberschatz, Data Base System Concepts, McGraw Hill, 1992.
3.	E.Turban, ”Decision Support and Export Systems Management Support Systems", Maxwell Macmillan, 1998.
4.	Sitausu S.Mittra, "Decision Support Systems – Tools and Techniques", John Wiley, New York, 1986.
5.	Cycle W.Halsapple and Andrew B.Winston, "Decision Support Systems – Theory and Application", Springer Verlog, New York, 1987.
6.	https://www.pcb.its.dot.gov/eprimer/default.aspx

CE23F11	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	3	2	2	3	1	1	2	1	2	2	1	3
CO 2	3	3	3	3	2	2	3	1	1	2	1	3	2	2	3
CO 3	3	3	3	2	2	2	3	1	2	2	2	2	2	1	3
CO 4	3	3	3	3	3	2	3	1	2	3	2	3	2	2	3
CO 5	3	3	3	3	3	2	3	1	2	3	2	3	2	2	3
Average	**3**	**2.8**	**2.6**	**2.8**	**2.4**	**2**	**3**	**1**	**1.6**	**2.4**	**1.6**	**2.6**	**2**	**1.6**	**3**

Prepared by Name and signature	Approved by Name and Signature
MRS.A.J.JEYA ARTHI, ASSISTANT PROFESSOR(SS)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23F12	PAVEMENT ENGINEERING	PE	3	0	0	3

Objectives:

- To perceive traffic loading and analyze pavement stresses.
- To apply the knowledge of science and engineering fundamentals in designing flexible pavement. by adopting various design standards
- To explore rigid pavement design principles and IRC standards.
- To acquire knowledge on overlay design and evaluation of Pavements.
- To address the problem statement in construction of pavement and to impart knowledge in stabilization techniques.

UNIT-I	PAVEMENT TYPES AND STRESS DISTRIBUTION	9

Introduction – Classification of pavements, Characteristics of traffic loading, Concept of VDF and Computation of design traffic. 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 Mechanistic 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	DESIGN OF OVERLAYS, PAVEMENT EVALUATION AND MAINTENANCE	9

Overlay design as per Indian Roads Congress guidelines (IRC:81); Overlay design as per AASHTO-1993 guidelines. 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 Contact Hours: 45

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

- Analyze stress and deflections in pavements under repeated loads.
- Design flexible pavements using empirical and theoretical methods.
- Design rigid pavements using the Modified Westergaard approach and IRC guidelines.
- Evaluate pavement distress and design overlays as per IRC and AASHTO.
- Apply stabilization methods, including geosynthetics, for highways and rural roads.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions- Unit II,III,IV
- Flipped classroom – Unit V
- Activity Based Learning – Unit IV and V

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Assignment problems - Unit II,III,IV
- Quizzes – Unit I, IV,V
- Class Presentation/Discussion – all units

Text Book(s):

1. Khanna, S.K. and Justo C.E.G.and Veeraragavan, A, "Highway Engineering", New Chand and Brothers, Revised 10th Edition, 2019.
2. Yoder, R.J. and Witchak M.W. "Principles of Pavement Design", John Wiley 2000.
3. R.Srinivasa Kumar., "Pavement Engineering" Universities Press (India) Private Limited, Hyderabad, 2013.

Reference Books(s) / Web links:

1. Rajib B.Mallick and Tahar El-Korchi, "Pavement Engineering Principles and Practice:, CRC Press, 2009
2. Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khanna tech. Publications, New Delhi, 2015.
3. C.Venkatramaiah., Transportation Engineering-Highway Engineering, Universities Press `(India) Private Limited, Hyderabad, 2015.

Code Book(s):
1. IRC:37-2018, Guidelines for the design of flexible pavements.
2. IRC:58-2015, Guidelines for the design of rigid pavements.
3. Indian Road Congress (IRC), Guidelines and Special Publications of Planning and Design.

CE23F12	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	2	3	2	3	2	1	1	1	1	3	3	2	2
CO 2	3	3	3	3	2	3	2	1	1	1	1	3	3	2	3
CO 3	3	3	3	3	2	3	2	1	1	1	1	3	3	2	3
CO 4	3	3	3	3	2	3	3	1	1	1	1	3	3	2	3
CO 5	3	3	3	3	2	3	3	1	1	1	1	3	3	2	3
Average	**3**	**3**	**2.8**	**2.8**	**2**	**3**	**2.4**	**1**	**1**	**1**	**1**	**3**	**3**	**2**	**2.8**

Prepared by Name and signature	**Approved by Name and Signature**
DR.M.UMA MAGUESVARI, PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23F13	SMART CITIES	PE	3	0	0	3

Objectives:

- To enhance the fundamental knowledge and concepts of Smart Cities.
- To expose them to know about infrastructure, management and environmental projects.
- To improve their visualization of phase Sustainability and Smart planning.
- To introduce the students about application of technologies in smart cities.
- To familiarize students with Planning Scheduling, cost analysis, Procurement and Contracting of smart cities.

UNIT-I	INTRODUCTION	9

Urbanisation, need of focused development, role of Authorities, Smart city, Opportunity and Challenges- Smart infrastructures for city- Smart Cities Mission

UNIT-II	SMART PHYSICAL INFRASTRUCTURE	9

Infrastructure development in Smart Cities - Physical Infrastructure, Land Use - Compact/mixed-use development, Transit oriented development (TOD); Smart City Management-Transportation Unified governance structure (UMTA). Smart public transportation, Smart parking, Intelligent traffic management, Detour management; Low emission vehicles, Electric Mobility - Environmental projects etc

UNIT-III	SUSTAINABILITY AND SMART PLANNING	9

Relationship Between Sustainability and Smart planning - Place making project guidelinesSurveillance, Smart Street Lighting, Intelligent Emergency Services, Intelligent Disaster Forecasting and Management, GIS-based Spatial Decision Support Systems, Smart Communication Services;

UNIT-IV	APPLICATION OF TECHNOLOGIES IN SMART CITIES	9

Role of Technologies in Smart Cities - Integrated Command and Control Center (ICCC), Data Analytics, Data driven strategies implementation in smart cities

UNIT-V	SMART CITIES PROJECT MANAGEMENT	9

Need for project management, Philosophy and concepts; Project phasing and stages; Project organizational structuring: Planning and Scheduling: Project cost analysis; Procurement and Contracting: PPP: Project Monitoring and Evaluation: Risk Management; Case studies.

Total Contact Hours:45

Course Outcomes:

On completion of the course students will be able to

- Understand the basics of Urbanization and the role of smart cities.
- Reap knowledge on implementation of smart physical infrastructure.
- Understand the role of smart planning for sustainable development.
- Comprehend the knowledge of Technologies in Smart City planning
- Reviewing the case studies of smart city projects.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. P Sharma , “Sustainable Smart cities in India, Challenges and Future Perspectives”, Springer Link, 2017
2. Sameer Sharma,“Smart Cities Unbounded- Ideas and Practice of Smart Cities in India”, Bloomsbury India, 2018
3. Binti Singh, ManojParmar, “Smart City in India Urban Laboratory, Paradigm or Trajectory? Routledge India,2019

Reference Books(s) / Web links:

8. Carol L. StimmeL “Building Smart Cities” 1st Edition, Auerbach Publications, India 2015
9. https://smartcities.gov.in/guidelines#block-habikon-content
10. https://smartnet.niua.org/learn/library

CE23F13	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	2	1	3	2	3	1	1	2	2	1	3	3	2
CO 2	3	3	3	2	1	3	3	2	3	1	3	1	3	3	3
CO 3	3	1	3	2	1	1	3	3	2	2	3	2	3	2	3
CO 4	3	2	2	2	3	2	3	2	3	1	3	2	3	2	2
CO 5	2	2	3	3	2	2	2	2	3	3	2	2	2	3	3
Average	**2.8**	**1.8**	**2.6**	**2**	**2**	**2**	**2.8**	**2**	**2.4**	**1.8**	**2.6**	**1.6**	**2.8**	**2.6**	**2.6**

Prepared by Name and signature	Approved by Name and Signature
MR.N.MAHAMOOD UL HASAN, ASSISTANT PROFESSOR (SG) /CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23F14	URBAN PLANNING AND DEVELOPMENT	PE	3	0	0	3

Objectives:

- To acquire urbanization concepts and trends.
- To explore the principles and stages of the urban planning.
- To prepare and assess development plans for urban areas.
- To analyze site characteristics and project formulation techniques.
- To understand urban planning laws and management systems.

UNIT-I	**BASIC ISSUES**	**9**

Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri - urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level

UNIT-II	**PLANNING PROCESS**	**9**

Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Surveys and Questionnaire Design.

UNIT-III	**DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION**	**9**

Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones- Development of small town and smart cities-case studies

UNIT-IV	**PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS**	**9**

Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.

UNIT-V	**LEGISLATION, DEVELOPMENTAND MANAGEMENT OF URBAN SYSTEM**	**9**

Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- Classify urban areas and analyze trends in urbanization at global and local scales.
- Explore the principles, stages and area delineation for urban projects.
- Prepare and evaluate plans for small towns and smart cities.
- Design and implement urban development projects effectively.
- Apply planning laws and collaborate with public and private entities in urban planning.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom – unit II ,III
- Activity Based Learning- unit IV

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Quizzes – all units
- Class Presentation/Discussion – all units

Text Book(s):

1. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2003.
2. George Chadwick, A Systems view of planning, Pergamon press, Oxford 2013.
3. Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi, 2024.

Reference Books(s) / Web links:

1. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai
2. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications, Chennai, 2005
3. Edwin S. Mills and Charles M. Becker, Studies in Urban development, A World Bank publication, 1986
4. CMDA, Second Master Plan for Chennai, Chennai 2008

CE23F14	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	3	2	1	1	1	2	3	3	2	3
CO 2	3	3	3	3	1	3	2	1	1	1	2	3	3	2	3
CO 3	3	3	3	3	1	3	2	1	1	1	3	3	3	2	3
CO 4	3	3	3	3	1	3	2	1	1	1	3	3	3	2	3
CO 5	3	3	2	2	1	3	2	1	1	1	3	3	3	2	3
Average	**3**	**3**	**2.6**	**2.6**	**1**	**3**	**2**	**1**	**1**	**1**	**2.6**	**3**	**3**	**2**	**3**

Prepared by Name and signature	Approved by Name and Signature
DR.M.UMA MAGUESVARI, PROFESSOR/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23F15	TRANSPORT MANAGEMENT SYSTEM	PE	3	0	0	3

Objectives:

- To learn the fundamentals of traffic regulations
- To study the Transport Management functional areas
- To have an overview of system management in traffic study.
- To identify the Local Area Traffic management
- To acquire knowledge of implementation in developing Traffic Administration

UNIT-I TRAFFIC REGUALTIONS **9**

Purpose and Scope, One way streets; reversible lanes and road ways; Turn regulations, Transit and Carpool lanes, Bicycle lanes and Bikeways, Pedestrian only streets, Speed Regulations, Passing and No Passing Regulations; Stop and yield controls.

UNIT-II TRAFFIC MANAGEMENT **9**

Need for Traffic Management, Basic Traffic Management Activities, Traffic Management Strategies and their Co-ordination; Access Management, Congestion Management, Traffic Calming, Evaluation of Traffic Management Systems.

UNIT-III SYSTEM MANAGEMENT **9**

Objectives, Need for TSM Long – Range vs. TSM Planning; TSM Actions, Traffic Management Techniques for improving Vehicular Flows, Preferential Treatment for High Occupancy Modes; Promoting Non- Auto and High Occupancy Vehicles; Transit and Intermediate public Transport service improvements, Demand Management Techniques for Reduced Intermediate Public Transport service improvements, Demand Management Techniques for Reduced Traffic Demand, Staggered Working Hours, Vehicular Restrictions, Intersection management techniques-Signal Progression – Optimization.

UNIT-IV LOCAL AREA TRAFFIC MANAGEMENT **9**

Pedestrian Facilities; Bicycle Facilities; Traffic Planning and Management at Local Level; Individual Sites, Residential Neighbourhoods and local interests, Traffic Effects of Land Use Developments

UNIT-V TRAFFIC ADMINISTRATION **9**

Legislative Authority, Functional Responsibilities; Organization-State Highway Department; Traffic Records; Research Bodies; Citizen Participation; Asset Management.

Total Contact Hours:45

Course Outcomes:

On completion of the course, the students will be able to

- Recognize the traffic characteristics and its various models describing the relationship among traffic stream parameters.
- Comprehend the knowledge on traffic surveys and studies such as ‘Traffic Management’, ‘Basic Traffic Management Activities’, ‘Traffic Management Strategies’ and ‘Access & Congestion Management’
- Acquire knowledge on traffic system management.
- Perceive about different aspects related of Local Area Traffic management.
- Get aware of the traffic administration.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Activity Based Learning

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Institution of Transportation Engineers. Traffic Engineering Hand Book, 4 th ed., Prentice Hall
2. Metropolitan Transportation Planning, John W Dickey, Tata McGraw Hill
3. John Duke, "Fleet Management", McGraw-Hill Co, USA, 1984.

Reference Books(s) / Web links:

1. Kitchin.L.D., "Bus Operation", III edition, Illiffee and Sons Co., London, 1992
2. Government Motor Vehicle Act, Publication on latest act to be used as on date
3. Kadiyali, L. R., Traffic Engineering and Transport Planning,. Khanna Publishers

CE23F15	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	3	2	3	3	2	3	2		3	3	3	3	3
CO 2	3	1	3	2	3	1	3		2	2	3	3	3	3	3
CO 3	3	2	3	2	3	2	3	2	2	2	3	3	3	3	3
CO 4	3	2	3	2	3	2	3		2	2	3	3	3	3	3
CO 5	3	2	3	2	3	1	2	2	2	2	3	3	3	3	3
Average	**3**	**1.6**	**3**	**2**	**3**	**1.8**	**2.6**	**2.3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**

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MR.MAHAMOOD UL HASAN N, ASSISTANT PROFESSOR (SG)/CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23F16	AIRPORT AND HARBOUR ENGINEERING	PE	3	0	0	3

Objectives:

- To provide a comprehensive understanding of the characteristics of air transport, ICAO airport classification and the principles of airport planning
- To impart knowledge on airport classification, planning, design of runway pavements, airport drainage and comparative pavement methods.
- To provide an understanding of runway design principles, including orientation, length calculation, geometric design, zoning, passenger facilities and, air traffic control systems.
- To educate the fundamental concepts of harbor and port engineering, including types of docks, waves, tides, harbor planning, coastal structures, navigational aids, and inland water transport systems.
- To provide knowledge of wave action on coastal structures, shore protection and reclamation methods, Coastal Regulation Zone (CRZ) guidelines, and Environmental Impact Assessment (EIA) processes and methodologies.

UNIT-I	AIRPORT PLANNING	9

Air transport characteristics - airport classification – ICAO - airport planning and air travel demand forecasting. Site selection typical Airport Layouts, Case Studies, parking and Circulation Area.

UNIT-II	AIRPORT COMPONENTS	9

Planning of Airfield Components – Runway, Taxiway, Apron, Hangar- Passenger Terminals- Geometric design of runway and taxiways-Runway pavement Design- Difference between Highway and airport pavements- Introduction to various design methods- Airport drainage.

UNIT-III	AIRPORT DESIGN	9

Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Runway Design – Airport Zones – Passenger Facilities – Runway and Taxiway Markings- Air Traffic Control Tower- Instrumental Landing.

UNIT-IV	SEAPORTS COMPONENTS AND CONSTRUCTION	9

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks- Dry and Floating Dock, Waves and Tides – Planning and Design of Harbors: Harbor Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins Floating Landing Stage – Navigational Aids-Inland Water Transport.

UNIT-V	SEAPORT REGULATIONS AND EIA	9

Wave action on Coastal Structures and Shore Protection and Reclamation – Coastal Regulation Zone, 2011-EIA – methods of impact analysis and its process

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Analyze air transport characteristics, apply ICAO airport classification standards, and design efficient airport layouts through case study evaluations.
- Plan and design airfield components, design the runways and taxiways and differentiate between highway and airport pavements.
- Design runways using wind rose diagrams, calculate basic and actual runway lengths, apply geometric design principles, and implement effective airport zoning, markings.
- Plan and design harbor layouts, terminal facilities, and coastal structures, understand the mechanics of waves and tides, and evaluate navigational aids and inland water transport systems
- Analyze wave impacts on coastal structures, design effective shore protection and reclamation measures, interpret CRZ regulations and apply EIA methods to assess and mitigate environmental impacts in coastal projects.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Flipped classroom
- Quiz, Puzzles
- Seminars
- Videos
- Activity Based Learning

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Quizzes
- Case study based assignments
- Class Presentation/Discussion

Text Book(s):

1. Khanna.S.K, Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee,1994

2. Robert Honjeff and Francis X.Mckelvey, "Planning and Design of Airports", McGraw Hill, New York,1996 2. Richard De Neufille and Amedeo Odoni, "Airport Systems Planning and Design", McGraw Hill, New York,2003
3. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering,Scitech Publications (India), Chennai, 2010

Reference Books(s) / Web links:
1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.
2. S C Rangwala, Airport engineering, Charotar Publications, 2019
3. Harbour, Dock and Tunnel Engineering, R.Srinivasan, Charotar Publications, 2016

CE23F16	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	2	2	1	1	1	2	3	3	2	2
CO 2	3	3	3	2	2	2	2	1	1	1	2	2	3	3	2
CO 3	3	3	2	3	3	2	3	1	1	1	3	2	3	3	3
CO 4	3	3	3	3	3	3	3	2	2	2	2	2	3	3	3
CO 5	2	2	2	3	2	3	3	3	2	2	3	3	3	2	3
Average	**2.8**	**2.8**	**2.6**	**2.6**	**2.4**	**2.4**	**2.6**	**1.6**	**1.4**	**1.4**	**2.4**	**2.4**	**3**	**2.6**	**2.6**

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MR.R.MADHAVA PERUMAL, ASSISTANT PROFESSOR / CIVIL	

Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23F17	TRAFFIC ENGINEERING AND MANAGEMENT	PE	3	0	0	3

Objectives:

- Provide a comprehensive understanding of traffic engineering, including the significance of road characteristics, vehicle and user behavior, and the fundamentals of traffic systems.
- Equip students with the ability to conduct and analyze traffic surveys, including volume, capacity, speed, delay, and pedestrian studies, to assess the effectiveness of traffic systems and safety measures.
- Explore various traffic control methods, such as traffic signs, signals, road markings, and signal coordination, emphasizing their application to improve traffic flow and safety.
- Introduce students to the principles of intersection design, including channelization, rotary design, and grade separation concepts, with a focus on safety and efficiency.
- Teach the application of advanced traffic management techniques, including Traffic System Management (TSM), Travel Demand Management (TDM), and Intelligent Transport Systems (ITS) to optimize traffic flow and reduce congestion.

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.

UNIT-II	TRAFFIC SURVEYS AND ANALYSIS	9

Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Problems.

UNIT-III	TRAFFIC CONTROL	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.

UNIT-IV	GEOMETRIC DESIGN OF INTERSECTIONS	9

Conflicts at Intersections, Classification of Intersections at Grade, - Channelized and Un channelized Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Channelization and Rotary design (Problems), Grade Separators.

UNIT-V	TRAFFIC MANAGEMENT	9

Traffic Management- Traffic System Management (TSM) and 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 Intelligence Transport System (ITS).

Total Contact Hours: 45

Course Outcomes:

On completion of the course, the students will be able to

- Explain the role of traffic engineering in road safety, efficiency, and environmental sustainability, covering key components such as vehicle behavior, road characteristics, and land use.
- Conduct traffic surveys and analyze data to assess road capacity, identify issues like delays and congestion, and suggest effective solutions for improving traffic flow and safety.
- Design and implement traffic control measures, including signals, signs, and markings, to improve traffic management and ensure road safety for all users.
- Develop safe and efficient geometric designs for various types of intersections, addressing issues like traffic flow, safety, and land use, with an understanding of advanced concepts like rotary design and grade separation.
- Use advanced traffic management techniques, including TSM, TDM, and ITS, to solve complex traffic problems, enhance road safety, and improve overall traffic efficiency in urban and rural areas.

SUGGESTED ACTIVITIES

- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Quizzes
- Class Presentation/Discussion

Text Book(s):

1. Kadiyali, L.R.,Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2024.

2. Wolfgang S. Homburger Fundamentals of Traffic Engineering 15th Edition, Institute of Transportation Studies, University of California, Berkely, 2001.

Reference Books(s) / Web links:

1. Subhash C.Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, NewDelhi, 1989.
2. Roger.P.Roess, Elena S.Prassas and Willim R.McShane,"Traffic Engineer", Pearson Educayion India, 2013.
3. James L. Pline (Edr), Traffic Engineering Hand Book, Institute of Transportation Engineers.
4. Nicholas T.Garber, Lester A Hoel, Traffic and Highway Engineering, Revised Second Edition, ITP, California, USA, 1999.
5. Thomas Curinan, An Introduction to Traffic Engineering – A Manual for Data Collection and Analysis, Books Cole, UK, 2001.

CE23F17	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	2	2	2	2	1	2	2	1	2	1	2	2
CO 2	3	2	1	2	2	2	2	1	2	2	1	2	1	2	2
CO 3	3	2	2	3	3	2	2	1	2	2	1	3	1	2	2
CO 4	3	2	2	3	3	2	2	1	2	2	1	3	1	2	2
CO 5	3	2	1	3	3	2	2	1	2	2	1	3	1	2	2
Average	**3**	**2**	**1.4**	**2.6**	**2.6**	**2**	**2**	**1**	**2**	**2**	**1**	**2.6**	**1**	**2**	**2**

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MRS.A.J.JEYA ARTHI, ASSISTANT PROFESSOR (SS) / CIVIL	