

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
TOTAL				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 தொழில்நுட்பமும் / 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.	GE23327	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 Structural 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 (2 weeks)	PC	0	0	2	2	1
9.	GE23427	Soft Skills – II	EEC	0	0	2	2	1
TOTAL				18	1	10	29	24
(* Two weeks at the end of Semester IV)								

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 Structural Elements	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
6.	CE23632	Design Thinking for innovation in Civil Engineering	BS	1	0	2	3	2
LABORATORY COURSES								
8.	CE23622	Internship*	EEC	0	0	2	2	1
9.	GE23627	Problem Solving Techniques	EEC	0	0	2	2	1
TOTAL				16	1	8	25	21
(* Two weeks at the end of Semester V)								

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
TOTAL				12	0	12	24	18

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		2		14	2	3		21
VII		2		8	2	6		18
VIII					6	6		12
Total	5	24	15	80	12	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 - Cartography	CE23F11 - Intelligent Transport System
CE23A12 - Maintenance, Repair and Rehabilitation of Structures	CE23B12 - Industrial Wastewater Treatment	CE23C12 - Sustainable Construction and Lean Construction	CE23D12 - Ground Improvement Techniques	CE23E12 - Remote Sensing	CE23F12 - Design of Pavements
CE23A13 - Design of Bridges	CE23B13 - Air and Noise Pollution Control Engineering	CE23C13 - Characterization of Materials	CE23D13 - Geoenvironmental Engineering	CE23E13 - Geographic Information System	CE23F13 - Smart cities
CE23A14 - Prestressed Concrete Structures	CE23B14 - Solid and Hazardous Waste Management	CE23C14 - Structural Health Monitoring	CE23D14 - Geosynthetic Engineering	CE23E14 - Global Navigational Satellite System	CE23F14 - Urban Planning and Development
CE23A15 - Smart Materials and Structures	CE23B15 - Environmental and Social Impact Assessment	CE23C15 - Energy Efficient Buildings	CE23D15 - Soil exploration and field testing	CE23E15 - Hydrographic Surveying	CE23F15 - Transport Management System
CE23A16 - Pre-Engineered/Pre-Fabricated 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	CE23D17 - Machine Foundation	CE23E17 - RS and GIS applications in Water Resources Engineering	CE23F17 - Traffic Engineering

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	மொழி மற்றும் இலக்கியம்	3
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழிக் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.		
அலகு II	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.		
அலகு III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.		
அலகு IV	தமிழர்களின் திணைக் கோட்பாடுகள்	3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.		
அலகு V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.		
Total Contact Hours: 15		

TEXT-CUM-REFERENCE BOOKS:
தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
கணினித் தமிழ் - முனைவர் இல. சந்திரம். (விகடன் பிரசுரம்).
கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
பொருறை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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 10 th 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	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO 2	3	2	-	1	-	-	-	-	-	-	1	1	1	-	-
CO 3	2	2	-	-	-	-	-	-	-	-	1	1	-	-	-
CO 4	3	3	1	-	-	-	-	-	-	-	1	1	1	-	-
CO 5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2.6	2.2	1	1	-	-	-	-	-	-	1	1	1	-	-

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 their use 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: At the end of this course the students 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, 5 th 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	1	-	-	-	-	2	-	1	2	2	3	2	3	2	1
CO 2	2	2	2	-	-	2	2	2	2	2	2	2	-	3	1
CO 3	1	2	1	2	1	2	2	2	2	2	2	3	2	2	1
CO 4	2	3	2	2	3	3	2	1	2	2	3	3	-	3	1
CO 5	1	-	-	-	-	2	-	1	2	2	3	2	3	2	1
Average	1.40	2.33	1.67	2.00	2.00	2.20	2.00	1.40	2.00	2.00	2.60	2.40	2.67	2.40	1.00

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. Fully panelled double leaf door – Fully panelled single leaf door – Flush door – Fully panelled window with grill – Partly glazed and panelled window – Lean –to- roof – King post roof truss – Steel roof truss – Rain water harvesting.		
UNIT-II	BUILDING COMPONENTS	12
Types of Structures - Foundation and its types – Bricks, Blocks & Bonds – Beam-Column Joint – Lintel-cum-Sunshade – 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 of a 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:
To comprehend to draw the basic building components.
To draw the building structural member and symbols used.
To visualize and prepare Isometric & Perspective view and free hand sketch.
To draw the building as per Necessity for Approval.
To 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	-	-	-	-	-	-	-	-	1	-	2	-	-	-
CO 2	2	-	-	-	-	-	-	-	-	1	-	2	-	-	-
CO 3	2	-	-	-	-	-	-	-	-	1	-	2	-	-	-
CO 4	2	-	-	-	-	-	-	-	-	1	-	2	-	-	-
CO 5	2	-	-	-	-	-	-	-	-	1	-	2	-	-	-
Average	2	-	-	-	-	-	-	-	-	1	-	2	-	-	-

Prepared by Name and signature	Approved by Name and Signature
MR.MAHAMOOD UL HASAN.N,AP(SS)/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”. Dhanpat Rai 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	-	-	-	-	-	-	-	-	-	1	1	-
CO 2	3	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO 3	3	3	2	-	-	-	-	-	-	-	-	1	1	1	-
CO 4	3	2	2	-	-	-	-	-	-	-	-	1	-	-	-
CO 5	3	3	2	-	-	-	-	-	-	-	-	1	1	1	-
Average	3	2.6	1.8	-	-	-	-	-	-	-	-	1	1	1	-

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:	
<input type="checkbox"/>	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.
<input type="checkbox"/>	Able to perform wood working carpentry activities like sawing, planning, cutting, etc. while having clear understanding of the joints in roofs, doors, windows and furniture.
<input type="checkbox"/>	Able to produce joints like L joint, T joint, Lap joint, Butt joint, etc. through arc welding process while acquiring in depth knowledge in the principle of operation of welding and other accessories
<input type="checkbox"/>	Able to perform operations like Turning, Step turning, Taper turning, etc. in lathe and Drilling operation in drilling machine
<input type="checkbox"/>	Able to 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	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
CO 2	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
CO 3	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
CO 4	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
CO 5	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
Average	1	1	1	0	0	2	1	0	2	0	0	2	0	2	1

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
<p>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.</p>						

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
<p>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.</p>		
UNIT-II	WATER POLLUTION AND ITS MANAGEMENT	9
<p>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.</p>		
UNIT-III	SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT	9
<p>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.</p>		
UNIT-IV	SUSTAINABLE DEVELOPMENT	9
<p>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.</p>		
UNIT-V	ENVIRONMENTAL MANAGEMENT AND LEGISLATION	9
<p>Environmental Management systems - ISO 14000 series- Environmental audit-Environmental Impact Assessment-life cycle assessment- human health risk assessment - Environmental Laws and Policy- Objectives - Polluter pays principle, Precautionary principle - The Environment (Protection) Act 1986 - Role of Information technology in environment and human health.</p>		
Total Contact Hours:45		

Course Outcomes:
On completion of the course, the students 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
<ul style="list-style-type: none"> ● 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/

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DEPARTMENT OF CHEMISTRY	

SEMESTER II

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

அலகு I	நெசவு மற்றும் பாணைத் தொழில்நுட்பம்	3
சங்க காலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பண்டங்களில் கீறல் குறியீடுகள்.		
அலகு II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.		
அலகு III	உற்பத்தித் தொழில் நுட்பம்	3
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.		
அலகு IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	3
அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கல்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.		
அலகு V	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	3
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.		
Total Contact Hours: 15		
Text Book(s):		
தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).		
கணிணித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).		
கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)		
பொருறை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)		
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 EQUATION AND COMPLEX VARIABLES	BS	3	1	0	4
<p align="center">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</p>						

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 parallelepipeds.		
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 and produce 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; multiple integrals; 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, 4 th 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	2	1	-	-	-	-	-	-	-	-	1	1	-	-
CO 2	3	2	1	-	-	-	-	-	-	-	-	1	1	-	-
CO 3	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO 4	2	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO 5	3	2	1	-	-	-	-	-	-	-	-	1	1	-	-
Average	2.8	2	1	-	-	-	-	-	-	-	-	1	1	-	-

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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 and moments
CO2	Study about the rigid body in equilibrium and to analyze the problems in engineering systems using the concept of static equilibrium
CO3	Determine the properties of surfaces and solids by means of finding centroid , centre of gravity and 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 of friction 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”, 12 th Edition, McGraw-Hill Publishing company, New Delhi (2018).

2	Rajasekaran S and Sankarasubramanian G., “Engineering Mechanics Statics and Dynamics”, 3 rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
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Reference Books(s) / Web links:	
1	Meriam J.L. and Kraige L.G., “Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, 7 th Edition, Wiley India, 2018.
2	Hibbeler, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 14 th Edition, Pearson Education 2017.
3	Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics” 4 th Edition, 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	1	2	-	-	1	-	2	1	3	2	3	-	3
CO 2	3	3	1	2	-	-	1	-	2	1	3	2	3	-	3
CO 3	3	3	1	2	-	-	1	-	1	1	3	2	3	-	3
CO 4	3	3	1	2	-	-	1	-	3	1	3	2	3	-	3
CO 5	3	3	1	2	-	-	1	-	3	1	3	2	3	-	3
Average	3	3	1	2	0	0	1	0	2.2	1	3	2	3	0	3

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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
<p>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.</p>		
UNIT-II	PHASE RULE AND THERMAL ANALYSIS	9
<p>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.</p>		
UNIT-III	POLYMERS AND COMPOSITES	9
<p>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.</p>		
UNIT-IV	FUELS AND ENERGY STORAGE DEVICES	9
<p>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 (H₂-O₂) fuel cell, proton exchange membrane and solid oxide fuel cells.</p>		
UNIT-V	NANOMATERIALS AND LUBRICANTS	9
<p>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 MoS₂).</p>		
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/1k8g7fGRJ0DI8FPbjQYg4I5jS1U9qIXnJ>

CY23233	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	1	-	-	1	2	-	-	-	-	1	2	1	-
CO 2	3	1	1	-	-	-	-	-	-	-	-	1	1	1	-
CO 3	2	1	2	-	-	-	-	-	-	-	-	1	2	1	-
CO 4	2	1	1	-	-	-	-	-	-	-	-	1	1	1	-
CO 5	3	1	2	-	-	1	1	-	-	-	-	1	2	1	-
Average	2.4	1	1.4	-	-	0.4	0.6	-	-	-	-	1	1.6	1	-

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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 Edition, 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", Elsevier, 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 Gabel, “Basic Electrical Engineering”, McGraw Hill Education(India) Private Limited, 2009
6	D P Kothari and IJ 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 K Ω , 100 Ω 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- 1k Ω , 470K Ω , 1M Ω 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- 100k Ω , 1k Ω 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.	John V Gutttag, 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 development and 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
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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	3	-	-	-	3	-	-	3	3	3	-	3	2	-	2
CO 2	3	-	-	-	3	-	-	3	3	3	-	3	2	-	2
CO 3	3	-	-	-	3	-	-	3	3	3	-	3	2	-	2
CO 4	3	-	-	-	3	-	-	3	3	3	-	3	2	-	2
CO 5	3	-	-	-	3	-	-	3	3	3	-	3	2	-	2
Average	3	-	-	-	3	-	-	3	3	3	-	3	2	-	2

Prepared by Name and signature MR.M.MANOHARAN, AP/CIVIL	Approved by Name and Signature
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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
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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
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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
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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 ALL FACULTY DEPARTMENT OF ENGLISH	Approved by Name and Signature
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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:							
<ul style="list-style-type: none"> 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							
<ul style="list-style-type: none"> 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

Prepared by Name and signature	Approved by Name and Signature
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- Indian 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. 21 st ed 2013.
P K Agarwal and K N Chaturvedi ,PrabhatPrakashan, New Delhi, 1 st 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.2 nd ed, 2014.
Bipan Chandra, History of Modern India, Orient Black Swan, 2009.

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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 assess the stresses and strains in deformable bodies						
To illustrate bending and shear in determinate beams						
To evaluate the stresses in beams						
To evaluate the deflection and deformation in shafts and springs due to torsion						
To analyze plane trusses, thin cylinders and shells						
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 FORCE AND BENDING MOMENTS IN 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.						
UNIT-III	STRESSES IN BEAMS					9
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-IV	DEFLECTION OF BEAMS AND TORSION					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. 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-V	THEORIES OF FAILURE AND CYLINDERS					9
Theories of failure- Strain energy and distortion energy theories – application in analysis of stress, load carrying capacity – thin cylinders -thick cylinders – Compound cylinders - shells under internal pressure.						
Total Contact Hours						: 45
Course Outcomes:						
Assess the stresses and strains in deformable bodies.						
Illustrate bending and shear in determinate Beams.						
Evaluate the stresses and deformation in shafts and springs.						
Compute the slope and deflection of beams for different loading conditions						
Analyze the plane trusses, stresses in thin cylinders and shells.						
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	1	1	1	1	1	2	1	2	3	3	3	2
CO 2	3	3	2	1	1	1	1	1	2	1	2	3	3	3	2
CO 3	3	3	2	1	1	1	1	1	2	1	2	3	3	3	2
CO 4	3	3	2	1	1	1	1	1	2	1	2	3	3	3	2
CO 5	3	3	2	1	1	1	1	1	2	1	2	3	3	3	2
Average	3	3	2	1	1	1	1	1	2	1	2	3	3	3	2

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MR.S.PREMKUMAR,AP(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 momentum thickness – 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:
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 parallel
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 Private Limited, 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,AP/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 acquire knowledge of building materials, process of concreting and testing methods
To learn the construction practices and various stages involved during construction of building and materials.
To acquire knowledge on various techniques involved in the construction of foundation for complicated structures.
To acquire the knowledge of construction of super structures construction practices and the equipment used for their implementation
To gain knowledge of equipment used in the construction of various buildings.

UNIT-I	CONCRETE TECHNOLOGY	9
Concrete – Mix and Grades of concrete - manufacturing of concrete – Batching – mixing – transporting – placing – compaction of concrete – curing and finishing - Testing of fresh and hardened concrete – quality of concrete – Extreme Weather Concreting – Under water concreting - Ready Mix Concrete - - Non-destructive testing – Mix design – 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 – scaffolding – 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	9
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:
Use the basics of concrete manufacturing methods and their implementation in the construction.
Assess with different forms of construction practices and their application.
Get familiarized with the substructure construction and its implementation.
Get familiarized with the superstructure construction and its implementation.
Assess the various equipment used for construction and the advantages of using it.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic Seminars Flipped classroom Case studies Activity Based Learning
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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	2	1	-	2	-	1	-	3	3	2	-	3	2	2	3
CO 2	2	2	1	2	-	3	1	3	3	2	1	3	2	2	2
CO 3	2	2	3	3	2	3	1	3	3	2	1	3	3	3	3
CO 4	2	2	3	3	2	3	1	3	3	2	1	3	3	3	3
CO 5	2	1	2	1	2	1	1	1	3	2	1	3	1	2	2
Average	2	1.60	2.25	2.20	2	2.20	1	2.60	3	2	1	3	2.20	2.40	2.60

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Mr.R.MADHAVAPERUMAL, AP/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	ADVANCED SURVEYING					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.						
Advance Surveying – 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

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Mrs.M.GOUTHAM PRIYA, AP/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.

<p>SUGGESTED ACTIVITIES Problem solving sessions Activity Based Learning Test of hypothesis and ANOVA using online calculator.</p>
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<p>SUGGESTED EVALUATION METHODS Problem solving in Tutorial sessions Assignment problems Quizzes and class test Discussion in classroom</p>
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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", 11th Edition, 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:						
<input type="checkbox"/>	To acquire knowledge on the quality of bricks through various laboratory tests.					
<input type="checkbox"/>	To determine various tests of cement and aggregates through various laboratory tests.					
<input type="checkbox"/>	To know the quality of concrete and the materials used in the construction and to understand the testing methods of Non Destructive tests.					
<input type="checkbox"/>	To conduct all standardized tests to assess the quality of bitumen.					
<input type="checkbox"/>	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						
<input type="checkbox"/>	Analyze the quality of bricks through laboratory tests.					
<input type="checkbox"/>	Evaluate the tests of cement and aggregates through laboratory tests.					
<input type="checkbox"/>	Analyze the quality of concrete and methods of Non Destructive tests.					
<input type="checkbox"/>	Compute the standardized tests to assess the quality of bitumen.					

<input type="checkbox"/>	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 for concrete.

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.	50ml density bottle	2 No's

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

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MS. A. J. JEYA ARTHI, AP/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:						
<input type="checkbox"/>	To understand the relationship of the data collected for decision making.					
<input type="checkbox"/>	To know the concept of principal components, factor analysis and cluster analysis for profiling and interpreting the data collected.					
<input type="checkbox"/>	Lay the foundation of machine learning and its practical applications and prepare students for real-time problem-solving in data science.					
<input type="checkbox"/>	Develop self-learning algorithms using training data to classify or predict the outcome of future datasets.					
<input type="checkbox"/>	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:						
<input type="checkbox"/>	Develop a sound understanding of current, modern computational statistical approaches and their application to a variety of datasets.					
<input type="checkbox"/>	Analyze and perform an evaluation of learning algorithms and model selection.					
<input type="checkbox"/>	Compare the strengths and weaknesses of many popular machine learning approaches.					
<input type="checkbox"/>	Appreciate the underlying mathematical relationships within and across machine learning algorithms and the paradigms of supervised and unsupervised learning.					
<input type="checkbox"/>	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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<p style="text-align: center;">DEPARTMENT OF COMPUTER SCIENCE ENGINEERING</p>	

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 determine deflection of beams and trusses using Energy principles.							
To illustrate the bending moment and shear force of indeterminate beams.							
To evaluate the failure of columns.							
To determine the principal stress and principal strain using theories of failures.							
To assess the unsymmetrical bending in beam sections and stresses in curved beams.							
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	INDETERMINATE BEAMS					9	
Analysis of propped cantilever and fixed beams-fixed end moments and reactions – Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.							
UNIT-III	THEORY OF COLUMN					9	
Column and strut – Classification of columns - Slenderness ratio – Buckling load and factor - Effective length – Various end conditions - Euler’s theory, assumptions, formula and limitations - Rankine’s formula – Crippling load and Safe load.							
UNIT-IV	STATE OF STRESS IN 2D AND 3D					9	
Principal stress - Principal strain – shear stress- 2 D State of Stress – 2 D Normal and Shear Stresses on any plane – Mohr's circle -Determination of principal stresses and principal planes in three dimensions.							
UNIT-V	ADVANCED TOPICS					9	
Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula.							
					Total Contact Hours		: 45
Course Outcomes:							
Determine deflection of beams and trusses using Energy principles.							
Illustrate the bending moment and shear force in indeterminate beams							
Evaluate the failure of columns							
Determine the principal stress and principal strain using various theories of failures							
Assess the unsymmetrical bending in beam sections and stresses in curved beams.							
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	1	1	1	1	1	1	2	1	2	3	3	1	1
CO 2	3	3	2	1	1	1	1	1	2	1	2	3	3	1	1
CO 3	3	3	2	1	1	1	1	1	2	1	2	3	3	1	1
CO 4	3	3	1	2	1	1	1	1	2	1	2	3	3	1	1
CO 5	3	3	2	3	1	1	1	1	2	1	2	3	3	1	1
Average	3	3	1.6	1.6	1	1	1	1	2	1	2	3	3	1	1

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MR.S.PREM KUMAR,AP(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 acquire knowledge on open channel flow and its characteristics.
To identify different component in the head work, Canal escapes and its use
To analyze the gradually varied flow and its profiles.
To analyze the rapidly varying flow.
To compute the characteristics of Centrifugal pumps and Pelton wheel

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: At the end of the course the students will be able to
Acquire knowledge on open channel flow and its characteristics.
Identify different component in the head work, Canal escapes and its use
Analyse the gradually varied flow and its profiles.
Analyse the rapidly varying flow.
Compute the characteristics of Centrifugal pumps and Pelton wheel

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

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DR.M.UMA MAGUESVARI,AoP/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:
To estimate water demand, forecast future population, comprehend water characteristics & water quality standards.
To design water transmission pipes, to understand laying, jointing and testing of pipes, appurtenances and pumps.
To design treatment units like aerator of flash mixer, clariflocculator, plate and tube settler, pulsator clarifier, sand filter and disinfection units.
To estimate the quantity of water softener & disinfectant and to incorporate suitable advanced treatment methods based on the given water.
To 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):
Garg S.K. 'Water Supply Engineering, Environmental Engineering, Vol.I', Khanna Publishers, New Delhi, 2022.
Dr. B.C. Punmia, B.C. Ashok Jain and Arun Jain, Water Supply Engineering, Environmental Engineering-I, Laxmi Publications (P) Ltd., New Delhi, 2016
Dr. P.N. Modi, Water Supply Engineering, Environmental Engineering-I, Standard Book House, Rajsons Publications Pvt Ltd, Delhi, 2018.

Reference Books(s) / Web links:
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.
Warren Viessman Jr, Mark J. Hammer, Water Supply and Pollution Control, Pearson Publisher, 7th Edition
Peavy, Rowe, Tchobanoglous, "Environmental Engineering", McGraw Hill Publishers, New Delhi, 1995.

Code Book & Manual:
IS10500:2012 Water Quality Standards, New Delhi 2012.
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 DR.M.SELVAKUMAR,DEAN/CIVIL	Approved by Name and Signature
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Course Code	Course Title (Theory course)	Category	L	T	P	C
CE23414	HIGHWAY AND RAILWAY ENGINEERING	PC	3	0	0	3

Objectives:
To know the significance of highway planning, alignment and road development plan in India.
To apply engineering fundamentals in designing the components for an efficient Highway network.
To understand the basics of engineering to select appropriate methods for construction, evaluation and maintenance of roadways.
To learn the different elements of permanent way.
To understand the concepts of track laying and maintenance.

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 - Design practice for 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:
Plan a highway according to the principles and standards adopted in various intuitions in India.
Design the geometric features of road network and components of pavement.
Test the highway materials and Construction practice methods and know its properties and able to perform pavement evaluation and management
Get familiarized with the different elements of permanent way, construction methods and its geometric design.
Understand the concepts of track laying, construction and maintenance.

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):
Traffic Engineering and Transport Planning, Kadiyali, L.R., Khanna Publishers, 2018, Ninth Edition.
Highway Engineering, Khanna, S.K., Justo C.E.G., and Veeraragavan A., Nem Chand and Bros., Roorkee, India, 2017, Tenth Edition
Highway Materials and Pavement Testing, Khanna, S.K., Justo, C.E.G. and A.Veeraragavan, Nem Chand and Bros,

Roorkee, India, 2013, Fifth Edition.

Reference Books(s) / Web links:
Principles of Pavement Design, Yoder E.J. and M.W. Witzak., Second Edition, John Wiley and Sons, New York, USA, 2012
Transportation Engineering: An Introduction, Jotin Khisty C., and B. Kent Lall., Prentice Hall of India Pvt. Ltd, New Delhi, India, 2002, Third Edition.
Principles of Transportation Engineering, Chakroborty, P. and Animesh Das., Prentice Hall of 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	3	3	2	2	2	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2
CO 3	2	2	2	2	1	1	1	1	1	1	1	1	3	3	2
CO 4	2	2	2	2	1	1	1	1	1	1	1	1	2	1	3
CO 5	2	1	2	1	1	1	1	1	1	1	1	1	1	2	3
Average	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4

Prepared by Name and signature	Approved by Name and Signature
Mr.E.S.KARTHIC,AP/CIVIL	

Course Code	Course Title (Lab Oriented Theory Course)	Category	L	T	P	C	
CE23431	SOIL MECHANICS	PC	3	0	2	4	
Objectives:							
●	To classify the soil based on the soil index properties.						
●	To calculate the effective stress under various field conditions and also understand the soil characteristics due to the presence of water in soil.						
●	To estimate the stress distribution and consolidation settlement in soil.						
●	To evaluate the shear strength parameters of soil using different laboratory tests.						
●	To analyze the slope stability using different methods and also know the different slope protection measures.						
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. — \sqrt{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							
●	Evaluate the different index properties of soil and classify the soil according to IS classification system						
●	Assess the soil condition in the presence of water and calculate the effective stresses and permeability of soil						

●	Compute the vertical pressure using stress distribution concepts and estimate the consolidation settlement of compressible soil
●	Estimate the shear strength parameters of soil using various laboratory tests under different drainage conditions
●	Analyze the slope stability using different methods and propose measures to mitigate slope failures
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, 16 th 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, 3 rd 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, 8 th 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	1	1	1	1	3	1	2

CO 2	3	3	2	2	1	1	1	1	1	1	1	1	1	3	1	2
CO 3	3	3	2	2	1	1	1	1	1	1	1	1	1	3	1	2
CO 4	3	3	2	2	1	1	1	1	1	1	1	1	1	3	1	2
CO 5	3	3	3	2	1	1	2	1	1	1	1	1	1	3	1	2
Average	3	3	2.2	2	1	1	1.2	1	1	1	1	1	1	3	1	2

Prepared by Name and signature	Approved by Name and Signature
MRS.S.MUTHULAKSHMI,AP(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 conduct experiments on the materials to assess their mechanical properties.
To acquire knowledge on the calibration of flow measurement apparatus.
To ensure that the student begin to understand the losses occur in the pipe flow.
To learn the principles behind the pump and turbine operation and its real time application.
To find the various properties of open channel flow.

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

Course Outcomes:
Asses the various properties of mild steel materials under tension, compression, shear and torsion.
Analyze the Impact strength and hardness strength of the material and also investigate strength of materials under stiffness and strain.
Determine the rate of flow under different flow characteristics
Compute the major and minor losses in pipe flow
Determine the performance characteristic of pumps and turbines

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

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