

**CARE**   
**COLLEGE OF ENGINEERING**  
**(An Autonomous Institution)**

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade

#27, Thayanur, Tiruchirappalli - 620009

**Regulations 2024**

**Undergraduate Degree**

**B.E. / B. Tech./B.Des.**

**Full Time Programmes**

**Curriculum and Syllabus**

**CARE COLLEGE OF ENGINEERING:: TIRUCHIRAPPALLI 620 009**  
**(AN AUTONOMOUS INSTITUTION)**  
**REGULATION 2024**  
**CURRICULUM AND SYLLABUS FOR FIRST YEAR**  
**CHOICE BASED CREDIT SYSTEM**  
**B.E. CIVIL ENGINEERING**

**SEMESTER I**

S. No	Course Code	Course Title	Category	Periods per week			No of Contact Periods	Credits
				L	T	P		
<b>THEORY COURSES</b>								
1	U24MA111	Matrices and Calculus	BSC	3	1	0	4	4
2	U24GE111	Problem solving using Python	ESC	3	0	0	3	3
3	U24HS111	Heritage of Tamils	HSMC	1	0	0	1	1
<b>THEORY CUM PRACTICAL COURSES</b>								
4	U24HS123	Communicative English for Engineers	HSMC	3	0	2	5	4
5	U24PH113	Engineering Physics	BSC	3	0	2	5	4
6	U24CY113	Engineering Chemistry	BSC	3	0	2	5	4
<b>PRACTICAL COURSES</b>								
7	U24GE122	Problem solving using Python Laboratory	ESC	0	0	4	4	2
<b>TOTAL</b>				<b>16</b>	<b>1</b>	<b>10</b>	<b>27</b>	<b>22</b>

**SEMESTER II**

S. No	Course Code	Course Title	Category	Periods per week			No of Contact Periods	Credits
				L	T	P		
<b>THEORY COURSES</b>								
1	U24MA211	Statistics and Numerical Methods	BSC	3	1	0	4	4
2	U24CE211	Engineering Graphics	ESC	2	0	4	6	4
3	U24CE221	Engineering Mechanics	ESC	3	0	0	3	3
4	U24EE211	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
5	U24HS211	Tamils and Technology	HSMC	1	0	0	1	1
<b>THEORY CUM PRACTICAL COURSES</b>								
6	U24HS223	Technical English for Engineers	HSMC	2	0	2	4	3
<b>PRACTICAL COURSES</b>								
7	U24CE232	Engineering Practices for Civil and Mechanical Engineers	ESC	0	0	4	4	2
8	U24EE222	Basic Electrical and Electronics Engineering Laboratory	ESC	0	0	4	4	2
9	U24EM212	Professional Development	EEC	0	0	2	2	1
<b>TOTAL</b>				<b>14</b>	<b>1</b>	<b>16</b>	<b>31</b>	<b>23</b>

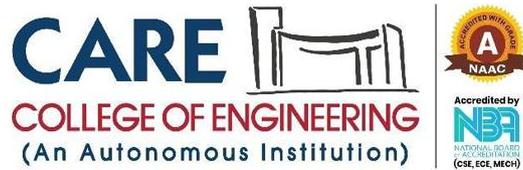


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 Accredited by NAAC with 'A' Grade & NBA (CSE, ECE, MECH)  
 #27, Thayanur, Tiruchirappalli - 620009

**Department of Civil Engineering**

**Regulation 2024 Third Semester Curriculum**

Sl. No	Course Code	Course Name	Category	No. of periods/week			Total Periods	Credits
				L	T	P		
1	U24MA311	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2	U24CE311	Strength of Materials	PCC	3	0	0	3	3
3	U24CE321	Concrete Technology	PCC	3	0	0	3	3
4	U24CE331	Fluid Mechanics	PCC	3	0	0	3	3
5	U24CE341	Construction Materials and Technology	PCC	3	0	0	3	3
6	U24CE353	Surveying and Levelling	PCC	3	0	2	5	4
7	U24CE362	Material Testing Laboratory	PCC	0	0	4	4	2
8	U24EM312	Design Thinking and Innovation	EEC	0	0	2	2	1
			<b>Total</b>	<b>18</b>	<b>1</b>	<b>8</b>	<b>27</b>	<b>23</b>



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### Department of Civil Engineering

### R2024 Fourth Semester – Curriculum

S. No	Course Code	Course Title	Category	Periods per week			No of Contact Periods	Credits
				L	T	P		
1	U24CE411	Structural Analysis	PCC	3	1	0	4	4
2	U24CE421	Water Supply Engineering	PCC	3	0	0	3	3
3	U24CE431	Soil Mechanics	PCC	3	0	0	3	3
4	U24CE441	Hydrology and Water Resources Engineering	PCC	3	0	0	3	3
5	U24EM411	Aptitude and Reasoning – I	EEC	1	0	0	1	1
6	U24CE453	Hydraulics and Hydraulic Machinery	PCC	3	0	2	5	4
7	U24CE463	Highway and Railway Engineering	PCC	2	0	2	4	3
8	U24CE472	Soil Mechanics Laboratory	PCC	0	0	4	4	2
9	U24EM422	Soft skill and Personality Development – I	EEC	0	0	2	2	1
			<b>Total</b>	<b>18</b>	<b>1</b>	<b>10</b>	<b>29</b>	<b>24</b>



U24MA111

**MATRICES AND CALCULUS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Course Objectives:**

- To develop the use of matrix algebra techniques those are needed to engineers for practical applications.
- To familiarize the students with differential calculus.
- To introduce the methods of solving linear and nonlinear ordinary differential equations.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.

**UNIT I MATRICES**

**9+3**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane

**UNIT II DIFFERENTIAL CALCULUS**

**9+3**

Functions of single variable – Limit of the function- Continuity and Differentiability - Mean value Theorems - Partial derivatives - Total derivative - Taylor series (in one and two variables) - Maxima and Minima (in one and two variables).

**UNIT III ORDINARY DIFFERENTIAL EQUATION**

**9+3**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

**UNIT IV INTEGRAL CALCULUS**

**9+3**

Evaluation of definite and improper integrals - Change of order of integration - Double integrals in polar coordinates - Area enclosed by plane curves - Triple integrals.

**UNIT V VECTOR CALCULUS**

**9+3**

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

**TOTAL: 60 PERIODS**

**Text Books**

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 44<sup>th</sup> Edition, New Delhi, 2015.
2. Erwin Kreyszig, E, "Advanced Engineering Mathematics", John Wiley and Sons, 10<sup>th</sup> Edition, New Delhi, 2016

**Reference Books**

1. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10<sup>th</sup> Edition, 2016
2. Jain. R.K. and Iyengar. S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5<sup>th</sup> Edition, 2016.
3. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.

<b>Course Outcomes: At the end of the course, the students will be able to</b>														
<b>CO</b>	<b>Course Outcome Statement</b>												<b>Knowledge level</b>	
CO1	Apply the matrix algebra methods for solving practical problems.												Applying	
CO2	Apply differential calculus tools in solving various Engineering problems.												Applying	
CO3	Apply various techniques in solving differential equations.												Applying	
CO4	Apply double and triple integration techniques in solving areas and volumes.												Applying	
CO5	Evaluate of line, surface and volume integrals using Gauss, Stokes and Green's Theorems.												Applying	
<b>CO-PO/PSO Mapping</b>														
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	3						2	2		3		
<b>CO2</b>	3	3	3						2	2		3		
<b>CO3</b>	3	3	3						2	2		3		
<b>CO4</b>	3	3	3						2	2		3		
<b>CO5</b>	3	3	3						2	2		3		
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>3</b>						<b>2</b>	<b>2</b>		<b>3</b>		

**U24GE111**

**PROBLEM SOLVING USING PYTHON**

**L T P C**  
**3 0 0 3**

**Course Objectives:**

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

**UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING**

**9**

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

**UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS**

**9**

Python interpreter and interactive mode, debugging; values and types: int, float, Boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

**UNIT III CONTROL FLOW, FUNCTIONS, STRINGS**

**9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

**UNIT IV LISTS, TUPLES, DICTIONARIES**

**9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

**UNIT V FILES, MODULES, PACKAGES**

**9**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file,

Voter's age validation, Marks range validation (0-100).

**TOTAL: 45 PERIODS**

### Text Books

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

### Reference Books

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. <https://www.python.org/>
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

<b>Course Outcomes: At the end of the course, the students will be able to</b>														
<b>CO</b>	<b>Course Outcome Statement</b>												<b>Knowledge level</b>	
CO1	Develop algorithmic solutions to simple computational problems.												Applying	
CO2	Write simple python programs using the basic data types, expressions and Statements.												Applying	
CO3	Write simple Python programs using conditionals and loops for solving problems and decompose a Python program into functions.												Applying	
CO4	Represent compound data types using Python lists, tuples, dictionaries etc.												Applying	
CO5	Read and write data from/to files in Python programs.												Applying	
<b>CO-PO/PSO Mapping</b>														
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	2	2	1	2	1			2	3	3	2			
<b>CO2</b>	2	2	1	2	1			2	3	3	2			
<b>CO3</b>	2	2	1	2	1			2	3	3	2			
<b>CO4</b>	2	2	1	3	1			2	3	3	2			
<b>CO5</b>	2	2	1	3	1			2	3	3	2			
<b>Avg.</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>			<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>			

U24HS111

**தமிழர் மரபு / HERITAGE OF TAMILS**

**L T P C**  
**1 0 0 1**

### Course Objectives:

- Recognize Tamil literature and its significance in Tamil culture.
- Introduce the Tamils' rich artistic and cultural legacy.
- Familiarize the different types of folk and martial arts that are unique to Tamil Nadu.
- Acquaint the concept of Thinaï in Tamil literature and culture.
- Comprehend the significance of Tamil in developing Indian culture.

### UNIT I LANGUAGE AND LITERATURE

**3**

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

**UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3**

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

**UNIT III FOLK AND MARTIAL ARTS 3**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

**UNIT IV THINAI CONCEPT OF TAMILS 3**

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

**UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3**

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

**TOTAL: 15 PERIODS****Text Books**

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
5. 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).
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
8. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Describe the various types of Tamil Literature.	Understanding
CO2	Discuss about Tamil Arts and Sculpture.	Understanding
CO3	Explain the Tamil Folks and Martial Arts.	Understanding
CO4	Summarize the Thinaï Concepts of Tamil.	Understanding
CO5	Review the contribution of Tamil Culture to Indian Culture and National Movements.	Understanding

<b>CO-PO/PSO Mapping</b>														
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
CO1						2		2	2	3				
CO2						2		2	2	3				
CO3						2		2	2	3				
CO4						2		2	2	3				
CO5						2		2	2	3				
<b>Avg.</b>						<b>2</b>		<b>2</b>	<b>2</b>	<b>3</b>				

**Course Objectives:**

To improve the communicative competence of learners

- To learn to use basic grammatical structures in suitable contexts.
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text.
- To help learners use language effectively in both informal and professional contexts.
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.

**UNIT I INTRODUCTION TO EFFECTIVE COMMUNICATION****1**

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

**UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION****8**

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh / Yes or No / and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

**UNIT II NARRATION AND SUMMATION****9**

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing; Short Report on an event (field trip etc.) Grammar - Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes & suffixes); Synonyms and Antonyms. Phrasal verbs.

**UNIT III DESCRIPTION OF A PROCESS / PRODUCT****9**

Reading - Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

**UNIT IV CLASSIFICATION AND RECOMMENDATIONS****9**

Reading - Newspaper articles; Journal reports -and Non-Verbal Communication (tables, pie charts etc.). Writing - Note-making / Note-taking (\*Study skills to be taught, not tested); Writing recommendations; Transferring information from non-verbal (chart, graph etc., to verbal mode) Grammar - Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.

**UNIT V EXPRESSION****9**

Reading - Reading editorials; and Opinion Blogs; Writing - Essay Writing (Descriptive or narrative), Dialogue-writing. Grammar - Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions - Content vs Function words.

**TOTAL: 45 PERIODS****Sl. No. Practical - List of experiments:**

- 1 Listening comprehension
- 2 Telephone conversation & Introductions (listening & speaking)
- 3 Mock Interviews
- 4 Narrating personal experiences
- 5 Short Oral Presentations
- 6 Advertising a product
- 7 Situational conversation - 3 in a team

**Sl. No. Practical – List of experiments:**

- 8 Creating educational videos
- 9 Group discussion
- 10 ICT based presentations

**TOTAL: 30 PERIODS****Text Books**

1. Communication Book, Portfolio Penguin, 2018. Authored by Mikael Krogerus, Roman Tschäppeler. ISBN-13: 978-0241982280.
2. Communicative English for Engineers and Professionals, Pearson Education India, 2010. Authored by Bhatnagar Nitin, ISBN: 9788131732045, 8131732045
3. English for Science & Technology, Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Jovani, Department of English, Anna University.

**Reference Books**

1. Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN: 0070264244, 2008.
3. How to win at Interviews & Group Discussions, Abhishek Publications, 2014. Authored by D.S. Cheema, ISBN: 9788182475175, 8182475171.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Explain different points of view during discussions.	Applying
CO2	Prepare for formal ICT based presentations and video creation.	Applying
CO3	Construct English sentences in both formal and informal contexts.	Applying
CO4	Interpret technical texts, audio materials and visual representation.	Understanding
CO5	Write letters, definitions, descriptions, narrations and essays on various topics.	Applying

<b>CO-PO/PSO Mapping</b>														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	2	3		3		
<b>Avg.</b>								<b>1</b>	<b>2</b>	<b>3</b>		<b>3</b>		

**U24PH113****ENGINEERING PHYSICS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**Course Objectives:**

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves, optics and its applications.
- To introduce the basics knowledge of lasers and fibre optics.
- Equipping the students to successfully understand the importance of quantum mechanics.
- To make the students understand the basics of crystal structure and its importance in studying materials properties.

**UNIT I MECHANICS****9**

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM

Rotation of rigid bodies: Rotational kinematics – Theorems of M.I. – moment of inertia of continuous bodies – torque – rotational dynamics of rigid bodies — gyroscope - torsional pendulum – double pendulum

## UNIT II ELECTROMAGNETIC WAVES AND OPTICS

9

Maxwell's equations - wave equation; Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - Producing electromagnetic waves - Cell-phone reception. Reflection and refraction of light waves - interference –Michelson interferometer –Theory of air wedge and experiment.

## UNIT III LASERS AND FIBRE OPTICS

9

Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO<sub>2</sub> laser, semiconductor laser –Basic applications of lasers in industry. Fiber optics: Principle, Numerical aperture and acceptance angle –types of optical fibers (material, refractive index, mode)- fibre optic communication- losses associated with optical fibers- fibre optic sensors: pressure and displacement- medical endoscope.

## UNIT IV QUANTUM MECHANICS

9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization – particle in a infinite potential well: 1D- particle in a infinite potential well:2D and 3D Boxes (Qualitative).

## UNIT V CRYSTAL PHYSICS

9

Crystal structures: Crystal structures: BCC, FCC and HCP – crystal imperfections- edge and screw dislocations – grain and twin boundaries - Burgers vector and elastic strain energy- Slip systems, plastic deformation of materials and Miller indices –distance between successive planes – crystalline and non-crystalline material.

**TOTAL: 45 PERIODS**

### Sl. No. Practical – List of experiments (Any Seven experiments)

- 1 Determination of rigidity modulus – Torsion pendulum
- 2 Determination of Young's modulus by non-uniform bending method
- 3 Determination of wavelength using Laser.
- 4 Determination of Numerical aperture and acceptance angle in an optical fiber.
- 5 Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
- 6 Determination of thickness of a thin wire – Air wedge method
- 7 Determination of band gap of a semiconductor
- 8 Determination of Young's modulus by uniform bending method.
- 9 Compact disc- Determination of width of the groove using laser.
- 10 Simple harmonic oscillations of cantilever.
- 11 Spectrometer - Determination of wavelength of Mercury Spectrum using diffraction grating.
- 12 Michelson's interferometer -Determine the wave length of monochromatic light.
- 13 Melde's Experiment - Determine the Frequency of a tuning fork.

**TOTAL: 30 PERIODS**

### Text Books

1. D. Kleppner and R. Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. E.M. Purcell and D.J. Morin, Electricity and Magnetism, Cambridge Univ. Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

### Reference Books

1. Gaur R K and Gupta S L, "Engineering Physics", Dhanpat Rai Publications, 2018.
2. Charles Kittel, "Introduction to Solid State Physics", Wiley India Pvt. Ltd, 7th ed., 2017.
3. D. K. Mynbaev and Lowell L. Scheiner, Fiber Optic Communication Technology, 2011, 1st Edition, Pearson, USA.

Course Outcomes: At the end of the course, the students will be able to														
CO	Course Outcome Statement												Knowledge level	
CO1	Apply the principles of mechanics to solve problems.												Applying	
CO2	Apply the knowledge of the Maxwell's equations for electromagnetic waves and optics.												Applying	
CO3	Apply the knowledge on the concepts of laser and their applications in fiber optics.												Applying	
CO4	Apply quantum mechanical principles towards the formation of energy bands.												Applying	
CO5	Describe the basics of crystals, their structures and defects.												Understanding	
CO-PO/PSO Mapping														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2		2			1	2	2		3		
CO2	3	3	2		2			1	2	2		3		
CO3	3	3	2		2			1	2	2		3		
CO4	3	3	2		2			1	2	2		3		
CO5	3	3	2		2			1	2	2		3		
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>2</b>		<b>2</b>			<b>1</b>	<b>2</b>	<b>2</b>		<b>3</b>		

U24CY113

ENGINEERING CHEMISTRY

L T P C  
3 0 2 4

### Course Objectives:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

### UNIT I WATER AND ITS TREATMENT

9

**Water:** Sources and impurities, Water quality parameters - color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic.

**Municipal water treatment:** primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water-Reverse Osmosis.

**Boiler troubles** - Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming.

**Treatment of boiler feed water:** Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

### UNIT II NANOCHEMISTRY

9

Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic);

**Types of nanomaterials:** Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. **Preparation of nanomaterials:** sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. **Applications of nanomaterials** in medicine, agriculture, energy, electronics and catalysis.

### UNIT III PHASE RULE AND COMPOSITES

9

**Phase rule:** Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.

**Composites:** Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). **Nano Composites:** Properties and applications of Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

**UNIT IV FUELS AND COMBUSTION****9**

**Fuels:** Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel.

**Combustion of fuels:** Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method.

**UNIT V ENERGY SOURCES AND STORAGE DEVICES****9**

**Nuclear energy:** light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of Silicon (si) Solar cell, Wind energy, Geo thermal energy.

**Batteries:** Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion battery; Electric vehicles - working principles; Fuel cells: H<sub>2</sub>-O<sub>2</sub> fuel cell, microbial fuel cell; Super capacitors: Storage principle, types and examples.

**TOTAL: 45 PERIODS****Sl. List of experiments****No.**

- 1 Determination of types and amount of alkalinity in a water sample. - Split the first experiment into two.
- 2 Determination of total, temporary & permanent hardness of water by EDTA method.
- 3 Determination of DO content of water sample by Winkler's method.
- 4 Determination of chloride content of water sample by Argentometric method.
- 5 Determination of strength of given hydrochloric acid using pH meter.
6. Determination of strength of acids in a mixture of acids using conductivity meter.
7. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
8. Conductometric titration of strong acid vs strong base.
9. Estimation of iron content of the given solution using potentiometer.
10. Estimation of sodium /potassium present in water using a flame photometer.

**TOTAL: 30 PERIODS****Text Books:**

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.

**Reference Books:**

1. Mary Francisca. L.J, Engineering Chemistry-I, 1, 2004.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Describe the water treatment processes and calculate the quality parameters of different types in Water Samples and Apply the appropriate method to find the PH, conductance and potential values of various solutions	Understanding
CO2	Apply the concepts of nano science in Engineering Applications.	Applying
CO3	Apply the knowledge of phase rule and composites for material selection requirements	Applying
CO4	Identify the types of fuels and calculate the calorific value, explosive range for engineering processes.	Understanding
CO5	Apply suitable energy resources for Engineering sectors.	Applying

CO-PO/PSO Mapping														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					1			1	2		2		
CO2	3					1			1	2		2		
CO3	3					1			1	2		2		
CO4	3					1			1	2		2		
CO5	3					1			1	2		2		
<b>Avg.</b>	<b>3</b>					<b>1</b>			<b>1</b>	<b>2</b>		<b>2</b>		

**U24GE122 PROBLEM SOLVING USING PYTHON LABORATORY**

**L T P C**  
**0 0 4 2**

**Course Objectives:**

- To learn about Variables, Operators available and how to write loops and decision statements in Python.
- To learn and Implement programs using non recursive and recursive functions.
- To Learn and execute a program using different Data Types - String, List, advance List, Dictionary, Tuple, Sets, Python Modules and packages.
- To learn how to read and write files in Python and also learn to use exception handling in Python applications for error handling.
- To build a mini project using fundamental programming constructs like variables, conditional logic, looping, and function and other required modules.

**Sl. No. Practical – List of experiments**

- 1 Environment Setup and execute Basic Exercise to learn about Variables, Operators available in python.
- 2 Execute programs using Python Control Flow -Python Loops and Control Statements
- 3 Implement programs using String and array in python.
- 4 Write functions and pass arguments [Non-Recursive, Recursive] in Python
- 5 Execute program to learn different Data Types in python- String, List, advance List, Dictionary, Tuple, Sets
- 6 Learn and execute programs using Python Modules and packages.
- 7 Execute program using Python Directory and Files Management.
- 8 Implement program to learn about python exception handling
- 9 Mini project [ Group project- demo and presentation]

**TOTAL: 60 PERIODS**

**Text Books**

1. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.
2. Karl Beecher, “Computational Thinking: A Beginner’s Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.

**Reference Books**

1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data“, Third Edition, MIT Press , 2021
4. Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.
5. <https://www.python.org/>
6. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Understand and make use of Variables, Operators available and how to writeloops and decision statements in Python.	Applying
CO2	Execute programs to implement non recursive and recursive functions in python.	Applying
CO3	Write Python Programs using core data structures like array, string, Lists, Set, Dictionaries and use Tuples.	Applying
CO4	Use and carry out examples to handle File Systems and exception handling in Python.	Applying
CO5	Deconstruct exemplary applications in Python.	Analysing

<b>CO-PO/PSO Mapping</b>														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	1			2	1	2	2		2	2
CO2	2	2	1	2	1			2	1	2	2		2	2
CO3	2	2	1	2	1			2	1	2	2		2	2
CO4	2	2	1	3	1			2	1	2	2		2	2
CO5	2	2	1	3	1	1	1	2	1	3	2	1	2	2
<b>Avg.</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>

**U24MA211 STATISTICS AND NUMERICAL METHODS**

**L T P C**  
**3 1 0 4**

**Course Objectives:**

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and gives procedure for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

**UNIT I TESTING OF HYPOTHESIS**

**9+3**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F-distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

**UNIT II DESIGN OF EXPERIMENTS**

**9+3**

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design.

**UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**

**9+3**

Solution of algebraic and transcendental equations - - Fixed point iteration method - Newton Raphson method - Solution of linear system of equations - Gauss elimination method –Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method.

**UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION**

**9+3**

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

**UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3**

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

**TOTAL: 60 PERIODS****Text Books**

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 44<sup>th</sup> Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8<sup>th</sup> Edition, 2015.

**Reference Books**

1. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4<sup>th</sup> Edition, 2012.
2. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12<sup>th</sup> Edition 2020.
3. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8<sup>th</sup> Edition, 2014.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Apply the concept of testing of hypothesis for small and large samples in real life problems.	Applying
CO2	Apply the basic concepts of classifications of design of experiments in the engineering field.	Applying
CO3	Determine the numerical solution of algebraic, transcendental and system of linear equations.	Applying
CO4	Apply appropriate numerical methods to solve the interpolation with equal and unequal intervals.	Applying
CO5	Determine the solution of ordinary differential equation of first order by Euler, Taylor and Runge-Kutta methods.	Applying

<b>CO-PO/PSO Mapping</b>														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3						2	2		3		
CO2	3	3	3						2	2		3		
CO3	3	3	3						2	2		3		
CO4	3	3	3						2	2		3		
CO5	3	3	3						2	2		3		
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>3</b>						<b>2</b>	<b>2</b>		<b>3</b>		

**U24CE211****ENGINEERING GRAPHICS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>4</b>	<b>4</b>

**Course Objective:**

The main learning objective of this course is to prepare the students for:

- Drawing engineering curves.
- Drawing projection of points, lines and plane surfaces.
- Drawing orthographic projection of solids and freehand sketches.
- Drawing projection of sectioned solids and development of surfaces.
- Drawing isometric and perspective projections of simple solids.

**UNIT I PLANE CURVES**

6+12

Basic Geometrical constructions, Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid, Epicycloid and Hypocycloid - construction of involutes of square, circle and polygon - Drawing of tangents and normal to the above curves.

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE**

6+12

Orthographic projection- Principles-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (square, circle and polygon) - Inclined to H.P & V.P.

### UNIT III PROJECTION OF SOLIDS AND FREEHAND SKETCHING

6+12

Projection of simple solids like prisms, pyramids, cylinders, cones when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles -Representation of Three Dimensional objects - Layout of views-Freehand sketching of multiple views from pictorial views of objects.

### UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

6+12

Sectioning of solids (Prisms, pyramids cylinders and cones) in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other - Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones. (Inclined to H.P or V.P)

### UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

6+12

Principles of isometric projection - isometric scale - isometric projections of simple solids Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple Solids-Prisms, pyramids and cylinders by visual ray method.

**TOTAL: (L=30; P=60) 90 PERIODS**

#### Text Books

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
3. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

#### Reference Books

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

Course Outcomes: At the end of the course, the students will be able to		
CO	Course Outcome Statement	Knowledge level
CO1	Construct the conic curves, cycloids and involutes.	Applying
CO2	Solve problems involving projection of points, lines and plane surfaces	Applying
CO3	Construct projection of simple solids and Free hand sketches	Applying
CO4	Construct projection of simple sectioned solids and development of surfaces	Applying
CO5	Solve problems involving isometric and perspective projections of simple solids.	Applying

CO-PO/PSO Mapping														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2					2	2	3		2	2	2
CO2	3	2	2					2	2	3		2	2	2
CO3	3	2	2					2	2	3		2	2	2
CO4	3	2	2					2	2	3		2	2	2
CO5	3	2	2					2	2	3		2	2	2
<b>Avg.</b>	<b>3</b>	<b>2</b>	<b>2</b>					<b>2</b>	<b>2</b>	<b>3</b>		<b>2</b>	<b>2</b>	<b>2</b>

**Course Objectives:**

- To learn the use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- To introduce the equilibrium of rigid bodies.
- To study and understand the distributed forces, surface, loading on beam and intensity.
- To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy;

**UNIT I STATICS OF PARTICLES****9**

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

**UNIT II UNIT II EQUILIBRIUM OF RIGID BODIES****9**

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force - Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

**UNIT III DISTRIBUTED FORCES****9**

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area Parallel- Axis Theorem Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

**UNIT IV FRICTION****9**

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

**UNIT V UNIT V DYNAMICS OF PARTICLES****9**

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion - Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

**TOTAL: 45 PERIODS****Text Books**

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12<sup>th</sup> Edition, 2019.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

**Reference Books**

1. Borese P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeler, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13<sup>th</sup> edition, Prentice Hall, 2013.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Illustrate the vectorial and scalar representation of forces and moments	Applying
CO2	Analyse the rigid body in equilibrium	Analyzing
CO3	Evaluate the properties of distributed forces	Applying
CO4	Determine the friction and the effects by the laws of friction	Applying
CO5	Calculate dynamic forces exerted in rigid body	Applying

<b>CO-PO/PSO Mapping</b>														
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	2	2					2	2		2		
<b>CO2</b>	3	3	2	2					2	2		2		
<b>CO3</b>	3	3	2	2					2	2		2		
<b>CO4</b>	3	3	2	2					2	2		2		
<b>CO5</b>	3	3	2	2					2	2		2		
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>					<b>2</b>	<b>2</b>		<b>2</b>		

**U24EE211 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**      **L    T    P    C**  
**3    0    0    3**

**Course Objectives:**

To improve the communicative competence of learners

- To understand Basic DC & AC electrical circuits
- To impart knowledge in Basic Electrical wiring & Safety and Protection.
- To understand basic principles of Transformers and Rotating Machines.
- To educate on the fundamental concepts of analog devices & digital electronics.
- To introduce the Working principle of various measuring instruments.

**UNIT I BASIC CONCEPTS OF DC ELECTRIC CIRCUITS: 9**

Basic Terminology, Resistances in series and parallel; Capacitors & Inductors: energy stored. Ohm's Law and Kirchhoff's Laws-Problems; Analysis of DC electric circuits: Mesh current method - Node voltage methods- Numerical problems. Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, power, power factor. solutions of sinusoidally excited R-L-C circuits.

**UNIT II ELECTRICAL WIRING: 9**

Connectors and switches, systems of wiring, domestic wiring installation, sub circuits in domestic wiring, simple control circuit in domestic installation, industrial electrification. SAFETY and PROTECTION: Safety, electric shock, first aid for electric shock and other hazards, safety rules, use of multimeters, grounding, importance of grounding, equipment grounding for safety. Protection-need for earthing , fuses and circuit breakers. Energy Tariff calculation for domestic loads.

**UNIT III ELECTRICAL DC & AC MACHINES: 9**

Constructional features, working principle of DC motor and DC generator, Emf and Voltage equations. Three phase circuit and production of rotating magnetic field. Working principle of induction motor and torque-speed characteristics (concept only). Single-Phase Transformer: Brief idea on constructional parts, classifications, working principle. EMF equation.

**UNIT IV ANALOG & DIGITAL ELECTRONICS 9**

Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor, Thyristors- Types, I-V Characteristics and Applications. Review of number systems-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems).

**UNIT V MEASUREMENTS & INSTRUMENTATION****9**

Transducers; Definitions, Types of transducers and their applications for measurements-Classification of instruments-Types of indicating Instruments - Energy meter - multimeters – Oscilloscopes – three-phase power measurement, instrument transformers (CT and PT), DSO- Block diagram

**TOTAL: 45 PERIODS****Text Books**

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020
2. Sedha R.S., “A text book book of Applied Electronics”, S. Chand & Co., 2008

**Reference Books**

1. S.K. Bhattacharya “Basic Electrical and Electronics Engineering”, Pearson Education, Second Edition, 2017.
2. Fundamentals of Electrical and Electronics Engineering, B. L. Theraja, S. Chand and Company.REPRINT 2013, ISBN 8121926602
3. Del. Toro, “Principles of Electrical Engineering”, Prentice Hall of India
4. A.K. Sawhney, Puneet Sawhney ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2015.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Demonstrate a comprehensive understanding of elementary concepts in DC & AC electrical circuits.	Applying
CO2	Explain the principles and practices of electrical wiring & concepts of safety and protection.	Understanding
CO3	Summarize a comprehensive observation of electrical rotating machines.	Understanding
CO4	Analyze the characteristics, basic concepts of analog & digital electronics.	Analysing
CO5	Classify operating principles of measuring Instruments.	Analysing

<b>CO-PO/PSO Mapping</b>														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1			1			1	3	2	1	
CO2	3	3	2	2			1			1	3	3	2	
CO3	3	3	3	3			1			1	3	3	3	
CO4	3	3	3	3			1			1	3	3	3	
CO5	3	3	3	2			1			1	3	3	3	
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>			<b>1</b>			<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	

**U24HS211**

**தமிழரும் தொழில்நுட்பமும்/  
TAMILS AND TECHNOLOGY**

**L T P C  
1 0 0 1**

**Course Objectives:**

- To facilitate the student to understand weaving and technology of sangam age.
- To create an awareness on structural design of Tamils during sangam age.
- To help students to distinguish between all the levels of manufacturing technology in ancient period.
- To understand the ancient knowledge of agriculture and irrigation technology.
- To enable the students to understand the digitalization of Tamil Language.

**UNIT I WEAVING AND CERAMIC TECHNOLOGY****3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

**UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY****3**

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram -

Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

### UNIT III MANUFACTURING TECHNOLOGY

3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and goldCoins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

### UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoempu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

### UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

**TOTAL: 15 PERIODS**

#### Text Books

1. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S. Singaravelu) (Published by: International Institute of Tamil Studies).
3. Historical Heritage of the Tamils (Dr.S.V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M. Valarmathi) (Published by: International Institute of Tamil Studies).
5. 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).
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K. Pillay) (Published by: The Author).
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
8. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Outcomes: At the end of the course, the students will be able to		
CO	Course Outcome Statement	Knowledge level
CO1	Review the Weaving and Ceramic Technology during Tamil Sangam Age.	Understanding
CO2	Describe the Construction Technology and various Architecture during Tamil Sangam Age.	Understanding
CO3	Discuss the Manufacturing Technology with Archaeological Evidences.	Understanding
CO4	Explain the Agriculture and Irrigation Technology during Tamil Sangam Age.	Understanding
CO5	Describe Tamil Software and Digitalization Tamil Literatures.	Understanding

CO-PO/PSO Mapping														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			2			2		2	1	3				
CO2			2			2		2	1	3				
CO3			2			2		2	1	3				
CO4			2			2		2	1	3				
CO5			2			2		2	1	3				
<b>Avg.</b>			<b>2</b>			<b>2</b>		<b>2</b>	<b>1</b>	<b>3</b>				

**Course Objectives:**

- To engage learners in meaningful language activities to improve their LSRW skills.
- To enhance learners' awareness of general rules of writing for specific audiences.
- To help learners understand the purpose, audience, contexts of different types of writing.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To demonstrate an understanding of job applications and interviews for internship and placements.

**UNIT I MAKING COMPARISONS****6**

Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases.

**UNIT II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING****6**

Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds

**UNIT III PROBLEM SOLVING****6**

Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences

**UNIT IV REPORTING OF EVENTS AND RESEARCH****6**

Reading –Newspaper articles; Writing – Proposal writing - Picture description - Accident Report, Survey Report. Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions.

**UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY****6**

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.

**TOTAL: 30 PERIODS****Sl. No. Practical – List of experiments**

- 1 Role Play Exercises Based on Workplace Contexts
- 2 Understanding lexical items via movie clippings – Individual task
- 3 Discussing news stories
- 4 Dialogues (with cue cards)-Understanding common technology terms
- 5 Pronunciation, Intonation, Stress and Rhythm ( Level 1)
- 6 Pronunciation, Intonation, Stress and Rhythm (Level 2)
- 7 Public Speech: Talking about self in a Professional Setting, Introduction of Speakers, Vote of thanks - 3 in a team
- 8 Writing a short article (Can be compiled as a magazine)
- 9 Verbal ability exercises for competitive examinations
- 10 Visume

**TOTAL: 30 PERIODS****Text Books**

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021 Authored by Dr.Veena Selvam, Dr.Sujatha Priyadarshini, Dr.Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Jovani, Department of English, Anna University.
3. Better English Pronunciation, (2005), J.D.O'Connor, Second Edition, ISBN-13:978-0521682589.

**Reference Books**

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.

2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
3. A Modern Approach to Verbal & Non-Verbal Reasoning - Includes Latest Questions and their Solutions, Revised Edition, R.S.Aggarwal, January 2018.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Articulate English with proper pronunciation, intonation, stress and rhythm.	Applying
CO2	Develop verbal ability skills for attending competitive examinations.	Applying
CO3	Employ speaking and writing skills in professional contexts.	Applying
CO4	Write effective resumes in the context of job search.	Applying
CO5	Interpret the denotative and connotative meanings of technical texts.	Understanding

<b>CO-PO/PSO Mapping</b>														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	2	3		3		
<b>Avg.</b>								<b>1</b>	<b>2</b>	<b>3</b>		<b>3</b>		

**U24CE232**

**ENGINEERING PRACTICES FOR CIVIL AND  
MECHANICAL ENGINEERS**

**L    T    P    C**  
**0    0    4    2**

**Course Objectives:**

- Use suitable tools for making carpentry components and pipe connections for plumbing works.
- Apply the welding techniques to join the structures.
- Performing the basic machining operations using Lathe and drilling machine.
- Apply sheet metal and foundry operations to make household products.
- Demonstrating assembly of a Fridge and household washing machine.

**CIVIL ENGINEERING PRACTICES**

**Plumbing Works**

Demonstrating basic plumbing operations

- 1 Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in households.
- 2 Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

**Carpentry Works**

Demonstrating basic carpentry operations

- 1 Making a T-Joint
- 2 Making wooden furniture using carpentry operations

**MECHANICAL ENGINEERING PRACTICES**

**Welding**

Demonstrating basic welding operations

- 1 Preparation of butt joint and lap joints by Shielded metal arc welding.
- 2 Studying on Gas welding practice

**Basic Machining**

- 1 Making (simple) Turning on mild steel rod using Lathe machine
- 2 Making (simple) Drilling on mild steel plate using drilling machine

**Sheet metal Work**

Demonstrating basic sheet metal operations

1 Model Making of a square Tray

**Foundry Work**

Demonstrating basic foundry operations.

1 Model Making of a computer Mouse

**Assembly Work:**

Demonstrating basic assembly operations

1 Study on Assembling a Fridge.

2 Study on Assembling a household washing machine

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household woodwork.	Applying
CO2	Apply weld techniques to join structures using arc welding	Applying
CO3	Practice simple machining work	Applying
CO4	Apply sheet metal and foundry operations to make household products.	Applying
CO5	Demonstrate assembling of a Fridge and household washing machine	Applying

<b>CO-PO/PSO Mapping</b>														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2	2	2	2				3	3	2
CO2	3	3			2	2	2	2				3	3	2
CO3	3	3			2	2	2	2				3	3	2
CO4	3	3			2	2	2	2				3	3	2
CO5	3	3			2	2	2	2				3	3	2
<b>Avg.</b>	<b>3</b>	<b>3</b>			<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>				<b>3</b>	<b>3</b>	<b>2</b>

**U24EE222**

**BASIC ELECTRICAL AND ELECTRONICS  
ENGINEERING LABORATORY**

**L T P C  
0 0 4 2**

**Course Objectives:**

To improve the communicative competence of learners

- To provide hands-on experience in the operation and testing of basic electrical circuits and components.
- To familiarize students with laboratory equipment and techniques commonly used in electrical engineering
- To promote teamwork, communication, and problem-solving abilities through collaborative laboratory activities and projects.

<b>Sl. No.</b>	<b>List of experiments:</b>
1	To identify and understand the use of different electronic and electrical instruments.
2	Load test on separately excited DC generator
3	Load test on DC shunt motor.
4	Load test on Single phase Transformer
5	Load test on Induction motor
6	Verification of Circuit Laws
7	Three-phase Power measurement with two wattmeter methods.
8	Study of half wave and Full-wave (Bridge) rectifiers with and without capacitor filter circuit.
9	Realization of basic logic gates: Truth table verification of OR, AND, NOT, NOT and NAND logic gates
10	Study of CRO and measurement of AC signals
11	Characteristics of LVDT
<b>TOTAL: 60 PERIODS</b>	

### Text Books

1. "Basic Electrical and Electronics Engineering Laboratory Manual" Author: S. K. Bhattacharya, Debabrata Chattopadhyay Publisher: Prentice Hall India Learning Private Limited Sedha R.S., "A text book book of Applied Electronics", S. Chand & Co., 2008.

### Reference Books

1. "Introduction to Electrical Engineering Laboratory Experiments" Author: Anthony J. Hayter, David T. Hayt Publisher: Wiley.
2. "Electrical Engineering Laboratory Experiments" Author: Allen M. Agarwal, Dr. S. T. Kamala, Dr. S. Jayalakshmi Publisher: New Age International Del. Toro, "Principles of Electrical Engineering", Prentice Hall of India.
3. "Fundamentals of Electric Circuits Laboratory Manual" Author: Charles K. Alexander, Matthew N. O. Sadiku Publisher: McGraw-Hill Education.

<b>Course Outcomes: At the end of the course, the students will be able to</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge level</b>
CO1	Identify and use common electrical components.	Understanding
CO2	Analyze the basic characteristics of transformers and electrical machines.	Applying
CO3	Demonstrate a thorough understanding of basic electrical principles, including Ohm's Law, Kirchoff's laws	Analysing
CO4	Distinguish of using laboratory equipment such as oscilloscopes, multimeters, LVDT	Analysing
CO5	Practice teamwork and communication skills through collaborative laboratory exercises	Applying

<b>CO-PO/PSO Mapping</b>														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3					2		2		1
CO2	3	2	3	3	3					2		2		1
CO3	3	2	3	3	3					2		2		1
CO4	3	2	3	3	3					2		2		1
CO5	3	2	3	3	3					2		2		1
<b>Avg.</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>					<b>2</b>		<b>2</b>		<b>1</b>

U24EM212

PROFESSIONAL DEVELOPMENT

L T P C  
0 0 2 1

### Course Objectives:

- To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.
- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered
- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations

<b>Sl. No</b>	<b>List of exercises</b>
1	<b>MS WORD: (10 Periods)</b> Create and format a document Working with tables Working with Bullets and Lists Working with styles, shapes, smart art, charts

	<p>Inserting objects, charts and importing objects from other office tools</p> <p>Creating and Using document templates</p> <p>Inserting equations, symbols and special characters</p> <p>Working with Table of contents and References, citations</p> <p>Insert and review comments</p> <p>Create bookmarks, hyperlinks, endnotes footnote</p> <p>Viewing document in different modes</p> <p>Working with document protection and security</p> <p>Inspect document for accessibility</p>
2	<p><b>MS EXCEL: 10 Periods</b></p> <p>Create worksheets, insert and format data</p> <p>Work with different types of data: text, currency, date, numeric etc.</p> <p>Split, validate, consolidate, Convert data</p> <p>Sort and filter data</p> <p>Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)</p> <p>Work with Lookup and reference formulae</p> <p>Create and Work with different types of charts</p> <p>Use pivot tables to summarize and analyse data</p> <p>Perform data analysis using own formulae and functions</p> <p>Combine data from multiple worksheets using own formulae and built-in functions to generate results</p> <p>Export data and sheets to other file formats</p> <p>Working with macros</p> <p>Protecting data and Securing the workbook</p>
3	<p><b>MS POWERPOINT: 10 Periods</b></p> <p>Select slide templates, layout and themes</p> <p>Formatting slide content and using bullets and numbering</p> <p>Insert and format images, smart art, tables, charts</p> <p>Using Slide master, notes and handout master</p> <p>Working with animation and transitions</p> <p>Organize and Group slides</p> <p>Import or create and use media objects: audio, video, animation</p> <p>Perform slideshow recording and Record narration and create presentable videos</p>
<b>Total: 30 Hours</b>	

<b>Course Outcomes: At the end of the course, the students will be able</b>		
<b>CO</b>	<b>Course Outcome Statement</b>	<b>Knowledge Level</b>
CO1	Create quality documents, by structuring and organizing content for their day to day technical and academic requirements using MS Word	Applying
CO2	Perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding using MS Excel	Applying
CO3	Create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects using MS Power Point	Applying
CO4	Prepare an effective report using MS word and MS Excell on any subject content	Applying
CO5	Present the report using MS Power Point	Applying

<b>CO-PO/PSO Mapping</b>														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									2	2		2		
CO2									2	2		2		
CO3									2	2		2		
CO4									2	2		2		
CO5									2	2		2		
<b>Avg.</b>									<b>2</b>	<b>2</b>		<b>2</b>		

**Department of Civil Engineering  
R2024 Third Semester Syllabus**

<b>U24MA311</b>	<b>TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>(Common to B.E. Mechanical Engineering)</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Course Objectives:**

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

**UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3**

Formation of partial differential equations–Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types–Lagrange’s linear equation–Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

**UNIT II FOURIER SERIES 9+3**

Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval’s identity – Harmonic analysis.

**UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3**

Classification of PDE – Method of separation of variables - Fourier series solutions of one-dimensional wave equation–One dimensional equation of heat conduction –Steady state solution of two-dimensional equation of heat conduction (Cartesian coordinates only).

**UNIT IV FOURIER TRANSFORMS 9+3**

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

**UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3**

Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

**TOTAL: 60 PERIODS**

**Text Books**

1. Grewal B.S., “Higher Engineering Mathematics”, 44<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2019.

2. Kreyszig E, "Advanced Engineering Mathematics ", 10<sup>th</sup> Edition, John Wiley, New Delhi, India, 2022.
3. Veerarajan .T “ Transforms and Partial Differential Equation” 3rd Edition McGraw Hill Education
4. Mercy Merlin . R "Transforms and Partial Differential Equation" Charulatha Publication Private limited

**Reference Books**

1. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S. Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics",10<sup>th</sup>Edition, Laxmi Publications Pvt. Ltd, 2021.
3. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi, 2016.

**Course Outcomes**

CO	At the end of the course, the students will be able to	Knowledge level
CO1	Apply the concept of partial differential equation to solve the problems.	Applying
CO2	Determine the Fourier coefficients in the Fourier series expansion of the specified function of various complex problems in engineering.	Applying
CO3	Apply the Fourier series techniques in solving one and two dimensional heat flow problems.	Applying
CO4	Solve the problems in Fourier Transforms.	Applying
CO5	Solve partial differential equations using Z transform techniques.	Applying

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3					2	2		3
CO2	3	3	3					2	2		3
CO3	3	3	3					2	2		3
CO4	3	3	3					2	2		3
CO5	3	3	3					2	2		3
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>3</b>					<b>2</b>	<b>2</b>		<b>3</b>

**CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

**U24CE311**

**Strength of Materials**

**L T P C**  
**3 0 0 3**

**Course Objective:**

- To understand the concepts of stress, strain, and torsion in materials to evaluate their mechanical behavior.
- To analyze determinate beams and shear stress distribution and their structural implications.
- To study the behavior of columns, indeterminate beams, deflection analysis, and strain energy principles.
- To apply failure theories and truss analysis for efficient and safe structural design.

**Unit 1 Fundamental Concepts of Stress, Strain and Torsion (9)**

Stress & strain - Hooke's law, elastic constants - relation between elastic constants - Analysis of bars - thermal stresses - elongation of a composite bar due to temperature - Principal planes and Principal stresses - two-dimensional stress systems - Torsion on circular shafts.

**Unit 2 Determinate Beams and Shear Stress Distribution (9)**

Types of beams, supports and loads - concept and significance of shear force and bending moment - shear force and bending moment diagram for cantilever, simply supported and overhanging beams - simple bending theory - shear stress distribution for rectangular and I section.

**Unit 3 Behaviour of Columns and Indeterminate Beams (9)**

Axial load combined bending and axial load - Euler's theory of long column – limitations – long columns under eccentric loading - Rankine, Gordon's formula - Shear force and bending moment diagram for Propped cantilever beam, continuous beam and fixed beam - Stresses in beams.

**Unit 4 Deflection of Beams and Strain Energy (9)**

Double integration method - Macaulay's method - Moment area method - Conjugate beam method for simply supported and cantilever beams - problems in finding slope & deflection of beams. Strain energy - Maxwell's law of reciprocal deflection.

**Unit 5 Theorem of Failures and Analysis of Trusses (9)**

Theories of failure - maximum principal stress theory - maximum principal strain theory - maximum shear stress theory - strain energy theory - shear strain energy theory - problems in finding factor of safety - Analysis of simple trusses - method of joints and tension coefficient

**Total : 45 Periods**

**Text Books**

- 1 Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2022.
- 2 Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
- 3 Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
- 4 Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016

**Reference Books**

- 1 Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2017
- 2 Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2021
- 3 Egor. P.Popov, Engineering Mechanics of Solids, Prentice Hall of India, Second Edition New Delhi 2015
- 4 William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2017

**Course Outcomes**

CO	At the end of the course, the students will be able to	Knowledge Level
CO1	Apply the fundamental concepts of stress, strain, and torsion to analyze various materials under various loading conditions.	Applying
CO2	Construct shear force and bending moment diagrams for determinate beams and determine the shear stress distribution	Applying
CO3	Determine the behavior and stability of columns and indeterminate beams under different loading conditions	Applying
CO4	Calculate beam deflections and apply strain energy principles.	Applying
CO5	Apply failure theories and determine forces in trusses	Applying

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2				2	2		2	3	2
CO2	3	3	2	2				2	2		2	3	2
CO3	3	3	2	2				2	2		2	3	2
CO4	3	3	2	2				2	2		2	2	2
CO5	3	3	2	2				2	2		2	3	2
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>				<b>2</b>	<b>2</b>		<b>2</b>	<b>2.8</b>	<b>2</b>

**CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

U24CE321

Concrete Technology

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objective:**

- To study the properties of concrete making materials.
- To have better knowledge about the chemical and mineral admixtures in concrete.
- To familiarize with the IS method of mix design as per the latest code .
- To understand the fresh and hardened properties of concrete and to know the importance and applications of special concretes

**UNIT I: CONSTITUENT MATERIALS** **9**

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

**UNIT II: CHEMICAL AND MINERAL ADMIXTURES** **9**

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

**UNIT III: PROPORTIONING OF CONCRETE MIX** **9**

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

**UNIT IV: FRESH AND HARDENED PROPERTIES OF CONCRETE** **9**

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

**UNIT V: SPECIAL CONCRETES** **9**

Light weight concretes - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete- self compacting concrete - Geopolymer Concrete – Green concrete.

**Total Periods: 45****Text Books**

- 1 Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2017.
- 2 Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2021

**Reference Books**

- 1 Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 2019
- 2 Gambhir.M.L.Concrete Technology,Fifth Edition, McGraw Hill Education,2017.
- 3 Job Thomas., Concrete Technology, Cengage learning India Private Ltd, New Delhi, 2015.
- 4 IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi.

**Course Outcomes**

CO	At the end of the course, the students will be able to	Knowledge Level
CO1	Describe the requirements of cement, aggregates and water for concrete	Understanding
CO2	Differentiate suitable admixtures for enhancing the properties of concrete	Understanding
CO3	Design concrete mixes as per IS method of mix design	Applying
CO4	Determine the properties of concrete at a fresh and hardened state.	Applying
CO5	Discuss the importance of special concrete for specific requirements.	Understanding

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	-	-	-	-	2	2	-	2	2	2
CO2	3	3	-	-	-	-	-	2	2	-	2	2	2
CO3	3	3	3	3	-	-	-	2	2	-	2	2	2
CO4	3	3	-	-	-	-	-	2	2	-	2	2	2
CO5	3	3	-	-	-	-	-	2	2	-	3	2	2
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>2</b>

**CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

**U24CE331****Fluid Mechanics**

L	T	P	C
3	0	0	3

**Course Objective:**

- To introduce the students about properties and behaviour of the fluids under static conditions and to impart basic knowledge of the dynamics of fluids through the control volume approach and to expose to the applications of the conservation laws to a) flow measurements
- Flow through pipes (both laminar and turbulent) and
- Forces on pipe bends with an exposure to the significance of boundary layer theory and its applications

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

Scope of fluid mechanics – Definitions of a fluid – Methods of analysis – Continuum hypothesis – System and Control volume approach – Reynold’s transportation theorem – Fluid properties – Fluid statics – Manometry – Forces on plane and curved surfaces – Buoyancy and floatation – Stability of floating bodies.

**UNIT II BASIC CONCEPTS OF FLUID FLOW 9**

Kinematics: Classification of flows – Streamline, streak-line and path-lines – Stream function and velocity potentials – Flow nets; Dynamics : Application of control volume to continuity, energy and momentum – Euler’s equation of motion along a streamline – Bernoulli’s equation – Applications to velocity and discharge measurements – Linear momentum equation – Application to Pipe bends – Moment of momentum equation.

**UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9**

Fundamental dimensions – Dimensional homogeneity – Rayleigh’s method and Buckingham Pi theorem – Dimensionless parameters – Similitude and model studies – Distorted and undistorted models.

**UNIT IV INCOMPRESSIBLE VISCOUS FLOW 9**

Reynolds experiment – Laminar flow in pipes and between parallel plates – Development of laminar and turbulent flows in pipes – Darcy-Weisbach equation – Moody diagram – Major and minor losses of flow in pipes – Total energy line – Hydraulic grade line – Siphon – Pipes in series and parallel – Equivalent pipes.

**UNIT V BOUNDARY LAYERS 9**

Definition of boundary layers – Laminar and turbulent boundary layers – Displacement, momentum and energy thickness – Momentum integral equation – Applications – Separation of boundary layer – Drag and Lift forces.

**Total Periods: 45****Text Books**

- 1 Bansal R.K, “A Text Book of Fluid Mechanics and Hydraulic Machines” Lakshmi Publications, New Delhi, 11th Edition 2023
- 2 Modi P.N and Seth S.M, “Hydraulics and Fluid Mechanics Including Hydraulic Machines” Standard Book House” New Delhi, 22nd Edition 2019
- 3 Streeter, V.L. Wylie, E. B. and Bedford K.W, Fluid Mechanics. (9th Ed.) Tata McGraw Hill, New Delhi, 1998.
- 4 Chandramouli P N, Applied Hydraulic Engineering, Yes Dee Publisher, 2017

**Reference Books**

- 1 Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2015.
- 2 Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 19th edition, 2013.
- 3 Subramanya K., Flow in open channels, Tata McGraw Hill, New Delhi, 2019.

**Course Outcomes**

CO	At the end of the course, the students will be able to	Knowledge Level
CO1	Differentiate between solid and fluid properties and its behaviour in static conditions.	Understanding
CO2	Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.	Applying
CO3	Correlate the parameters in the given fluid phenomenon and to predict the performance of prototypes by model studies.	Applying
CO4	Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.	Applying
CO5	Explain the concept of boundary layer and its application to find the drag force exerted by the fluid on the flat solid surface.	Applying

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2				2	2		2	3	2
CO2	3	2	2	2				2	2		2	3	2
CO3	3	3	3	2				2	2		2	3	2
CO4	3	3	3	2				2	2		2	3	2
CO5	3	3	3	2				2	2		2	3	2
<b>Avg.</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>				<b>2</b>	<b>2</b>		<b>2</b>	<b>3</b>	<b>2</b>

**CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

**U24CE341****Construction Materials and Technology**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objective:**

- To understand the properties, selection criteria, and applications of traditional and modern building materials.
- To gain knowledge of various construction practices, service requirements, and structural components essential for building design.
- To explore the selection and utilization of construction equipment for efficient material handling and structural execution.
- To understand the role of sustainable and advanced materials in enhancing construction durability, energy efficiency, and environmental impact.

**UNIT I STONES - BRICKS - CONCRETE BLOCKS – LIME 9**

Stone as building material – Criteria for selection – Tests on stones – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive strength – Water Absorption – Efflorescence – Lime – Preparation of lime mortar – Concrete hollow blocks – Lightweight concrete blocks.

## UNIT II BUILDING MATERIALS AND THEIR APPLICATIONS 9

Timber – Market forms – Plywood – Veneer – False ceiling materials – Steel – Mechanical treatment – Aluminum – Uses – Market forms – Glass – Ceramics – Refractories – Composite Materials – Types and applications – FRP – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

## UNIT III CONSTRUCTION PRACTICES & SERVICE REQUIREMENTS 9

Types of Foundations – Shallow and Deep Foundations – Stone Masonry – Brick Masonry – Plastering and Pointing – Cavity Walls – Diaphragm Walls – Formwork – Centering and Shuttering – Shoring – Scaffolding – Underpinning – Roofing – Flooring – Joints in concrete – Contraction/Construction/Expansion joints – Fire Protection – Thermal Insulation – Ventilation and Air conditioning – Acoustics and Sound Insulation – Damp Proofing.

## UNIT IV CONSTRUCTION EQUIPMENTS 9

Selection of equipment for earthwork excavation, concreting, material handling and erection of structures – Dewatering and pumping equipment.

## UNIT V MODERN AND SUSTAINABLE MATERIALS 9

Acoustic and Thermal Insulation Materials-Cork, sheep wool, straw panels, and aerogel-based insulations. –Nano Materials in Construction-Nanoparticles, Nano coatings, and their role in enhancing material properties.– 3D Printing in Construction- Additive manufacturing, printable materials, and sustainability benefits- Carbon-Sequestering Materials-Carbon-negative concrete, CO<sub>2</sub>-absorbing bricks, and their role in sustainability.– Bacteria-based self-healing concrete, - Green roofs, cool roofs –waste based materials, and recycled plastics in construction.

**Total Periods:45**

### Text Books

- 1 Varghese.P.C, Building Materials, Second Edition PHI Learning Ltd., 2015.
- 2 Arora S.P and Bindra S.P Building construction, Dhanpat Rai and sons, 2022.
- 3 Punmia ,B.C Building construction , Laxmi publication (p) ltd.,2023

### Reference Books

- 1 Varghese.P.C, Building Construction, Second Edition PHI Learning ltd., 2016
- 2 Peurifoy R.L., Schexnayder,C.J., Shapira A., Schmitt.R., Construction Planning Equipment and Methods, Tata McGraw-hill, 2024.
- 3 Srinath L.S.,PERT and CPM -Principles and applications, Affiliated East West Press 2023

### Course Outcomes

CO	At the end of the course, the students will be able to	Knowledge Level
CO1	Describe the good quality brick, stone and blocks for construction.	Understanding
CO2	Summarize the market forms of timber, steel, aluminum and applications of various composite materials.	Understanding
CO3	Explain the best construction and service practices such as thermal insulations and air conditioning of the building	Understanding
CO4	Differentiate the various equipment for construction works conditioning of building	Understanding
CO5	Discuss the modern and sustainable construction materials	Understanding

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2						2	2		2	3	3
CO2	3	2						2	2		2	3	3
CO3	3	2						2	2		2	3	3
CO4	3	3						2	2		2	3	3
CO5	3	3						2	2		2	3	3
<b>Avg.</b>	<b>3</b>	<b>2</b>						<b>2</b>	<b>2</b>		<b>2</b>	<b>3</b>	<b>3</b>

**CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

**U24CE353****Surveying and Levelling**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

Course Objective:

- To understand the fundamentals of surveying and the application of its practices.
- To identify the suitable method of surveying for various measurement processes in civil engineering.
- To apply appropriate surveying methods in field measurements for accurate data collection.
- To perform integrated laboratory experiments to gain practical exposure to surveying procedures and measuring practices.

**UNIT I FUNDAMENTALS OF SURVEYING AND MEASUREMENT OF ANGLES 9**

Surveying: Definition, Principles and Classifications - Bearings and Azimuth - Conventional tools for angle measurement: Compass Traversing, Open Traverse, Closed Traverse, Theodolite: Repetition and Reiteration - Error Correction: Local Attraction, Law of Weights, Most Probable value.

**UNIT II MEASUREMENT OF ELEVATION 9**

Levelling: Definition, Datum, Benchmarks, Classifications – Curvature and Refraction - Contouring - Conventional tools for levelling: Dumpy level and Tilting level, Rise and Fall method, Height of Collimation method - Trigonometric Levelling: Single plane and Double plane.

**UNIT III MEASUREMENT OF DISTANCE 9**

Conventional methods of Distance measurements: Chaining and Ranging, Tape - Heights and distances – Tacheometric surveying – Stadia Tacheometry – Tangential Tacheometry – Trigonometric levelling – Single Plane method – Double Plane method

**UNIT IV CONTROL SURVEYING AND ADJUSTMENT 9**

Horizontal and vertical control – Methods – Triangulation – Traversing – Trilateration – Concepts of measurements and errors – Error propagation and Linearization – Adjustment methods - Least square methods – Angles, lengths and levelling network.

**UNIT V MODERN SURVEYING 9**

Total Station: Digital Theodolite, EDM, Electronic field book – Advantages – Parts and accessories – Working principle – Observables – Errors - COGO functions – Field procedure and applications - GPS: Advantages – System components – Signal structure – Selective availability and anti-spoofing receiver components and antenna – Planning and data acquisition – Data processing – Errors in GPS – Field procedure and applications.

**Total Periods: 45**

**S. No**

**List of Experiments**

- 1 Compass Traversing – Measuring Bearings & arriving included angles
- 2 Measurements of angles by using Theodolite
- 3 Fly levelling using Dumpy level
- 4 Check levelling using Dumpy level
- 5 Determination of elevation of an object using single plane method when base is Accessible/inaccessible.
- 6 Determination of Tacheometric Constants
- 7 Heights and distances by stadia Tacheometry
- 8 Heights and distances by Tangential Tacheometry
- 9 Recording and Setting out of levels using Total Station
- 10 Determination of Distance and angles using Total Station
- 11 Construction survey practices - Area and Volume Calculation using Total Station
- 12 Data Acquisition of Position and Elevation using GPS Survey

**Total Periods: 45 + 30**

**Text Books**

- 1 Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.
- 2 T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.
- 3 R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.

**Reference Books**

- 1 S. K. Roy, Fundamentals of Surveying, Second Edition, Prentice Hall of India 2010
- 2 K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.
- 3 C. Venkatramaiah, Textbook of Surveying, Universities Press, Second Edition, 2011.

**Course Outcomes**

<b>CO</b>	<b>At the end of the course, the students will be able to</b>	<b>Knowledge Level</b>
CO1	Determine angles using tools like theodolites and compasses and correct errors using surveying principles and techniques	Applying
CO2	Compute terrain levels and ground features using the levelling methods and considering curvature and refraction.	Applying
CO3	Solve complex distance and height measurements in fieldwork implementing Theodolite Surveying concepts.	Applying
CO4	Establish horizontal and vertical control using triangulation, traversing, and adjustment methods.	Applying
CO5	Operate modern surveying instruments like Total Stations and GPS for field procedures and error evaluation.	Applying

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	2	-	-	2	2		2	3	2
CO2	3	2	2	2	2	-	-	2	2		2	3	2
CO3	3	2	2	2	2	-	-	2	2		2	3	2
CO4	3	2	2	2	2	-	-	2	2		2	3	3
CO5	3	2	2	2	2	-	-	2	2		2	3	3
<b>Avg.</b>	3	2	2	2	2	-	-	2	2		2	3	2.4

**CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

<b>U24CE362</b>	<b>MATERIAL TESTING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**Course Objective:**

- To evaluate the fundamental properties of cement for its suitability in construction.
- To analyze the strength and durability characteristics of metals for engineering applications.
- To assess the quality and performance of aggregates for use in construction projects.
- To examine the structural reliability of bricks and concrete for various building applications.

**S. No****List of Experiments**

- I TESTS ON METALS
- Tension test on steel rod
  - Torsion test on mild steel rod
  - Deflection test on metal beam
  - Double shear test on metal
  - Impact test on metal specimen (Izod and Charpy)
  - Hardness test on metals (Rockwell and Brinell Hardness Tests)
  - Compression test on helical spring
  - Deflection test on carriage spring
- II TESTS ON CEMENT
- Determination of fineness of cement
  - Determination of consistency of cement
  - Determination of specific gravity of cement
  - Determination of initial and final setting time of cement
- III TESTS ON FINE AGGREGATE
- Determination of specific gravity of fine aggregate
  - Determination of grading of fine aggregate
- IV TESTS ON COARSE AGGREGATE
- Determination of elongation index of coarse aggregate
  - Determination of flakiness index of coarse aggregate
  - Determination of aggregate crushing value of coarse aggregate
- V TESTS ON BRICKS
- Determination of compressive strength of bricks
  - Determination of water absorption and efflorescence of bricks
- VI TESTS ON CONCRETE
- Determination of slump of concrete
  - Determination of compressive strength of concrete

**TOTAL: 60 PERIODS**

**Course Outcomes**

CO	At the end of the course, the students will be able to	Knowledge Level
CO1	Determine the different mechanical properties of Metals	Applying
CO2	Determine the physical properties of cement	Applying
CO3	Articulate the different physical properties of fine and coarse aggregate.	Applying
CO4	Perform the different physical properties of brick	Applying
CO5	Determine the properties of fresh and hardened concrete.	Applying

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	2			2	2		2	2	2
CO2	2	2	2	2	2			2	2		2	3	2
CO3	2	2	2	2	2			2	2		2	3	2
CO4	2	2	2	2	2			2	2		2	3	2
CO5	2	2	2	2	2			2	2		2	3	2
Avg.	2	2	2	2	2			2	2		2	2.8	2

**CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

<b>U24EM312</b>	<b>DESIGN THINKING AND INNOVATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>(Common to B.E. Civil, CSE and Mechanical and B./Tech. AIDS in Third Semester and B.E. ECE in Fifth Semester)</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Course Objective:**

- Empathizing with users to uncover their real problems and desires.
- Promoting out-of-the-box thinking to develop unique and effective solutions.
- Using prototyping, testing, and refining ideas to ensure the best outcome.
- Testing assumptions early to prevent costly mistakes and enhance decision-making.
- Creating innovative products, services, or processes that improve market competitiveness.

SI No	List of Exercises	No of periods
1	Design Thinking – models – Why design thinking? Case Studies. Innovation – 7Cs of Innovation. Identify a case study.	4
2	Empathize – tools - customer Journey map – case studies – Empathize the identified case study	4
3	Analyze – tools, multi-whys, case study, conflict of interest. Analyze the identified case study	4
4	Ideate and solve – brainstorming – TRIZ method, trial and error method – Solve the identified case study	4

5	Prototype/process and test – tools and methods – create a prototype for the identified case study	4
6	Iterate to improve the prototype/process – revisit the methods to improve the prototype.	8
7	Submit the report and final prototype/process of the case study.	2
<b>Total Periods</b>		<b>30</b>

**Text Books**

- 1 Pavan Soni, Design your thinking, Penguin Random House India Pvt, Ltd., India, 2022
- 2 Don Norman, The Design of everyday things, Basic Books, New York, 2013

**Reference Books**

- 1 B.K. Chakravarthy, Janaki Krishnamoorthi, Innovation by Design Lessons from Post Box Design & Development, Springer, New Delhi 2013
- 2 Balaramadurai, Karmic Design Thinking, 2020
- 3 Design by Innovation NPTEL Course B.K. Chakravarthy IIT Bombay  
<https://nptel.ac.in/courses/107101086>
- 4 Design Thinking and Innovation NPTEL Course Ravi Poovaiah, IIT Bombay  
[https://onlinecourses.swamyam2.ac.in/aic23\\_gel17/preview](https://onlinecourses.swamyam2.ac.in/aic23_gel17/preview)
- 5 Design Thinking A Premier NPTEL Course, Prof. Ashwin Mahalingam, Prof. Bala Ramadurai, IIT Madras [https://onlinecourses.nptel.ac.in/noc22\\_mg32/preview](https://onlinecourses.nptel.ac.in/noc22_mg32/preview)

**Course Outcomes**

CO	At the end of the course, the students will be able to	Knowledge Level
CO1	Apply the tools to empathize the identified case study	Applying
CO2	Analyze the data and information to conceptualize the solution for the case study	Analyzing
CO3	Ideate and solve the case study using appropriate tools	Applying
CO4	Create a prototype/process of the case study	Creating
CO5	Iterate to improvise the prototype/process of the case study	Analyzing

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2			2	2	2	2	2	2	2	2	
CO2	2	2			2	2	2	2	2	2	2	2	
CO3	2	2			2	2	2	2	2	2	2	2	
CO4	2	2			2	2	2	2	2	2	2		3
CO5	2	2			2	2	2	2	2	2	2		3
Average	2	2			2	2	2	2	2	2	2	2	3

**CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

**B.E. Civil Engineering  
Fourth Semester Syllabus**

U24CE411	STRUCTURAL ANALYSIS	L	T	P	C
		3	1	0	4
<b>COURSE OBJECTIVE:</b>					
<ul style="list-style-type: none"> <li>• To analyse determinate and indeterminate structures using classical and matrix methods and the method of drawing influence lines.</li> <li>• To analyse Arches and suspension bridges.</li> </ul>					
<b>UNIT I SLOPE DEFLECTION METHOD</b>					<b>12</b>
Kinematic Indeterminacy - Analysis of Continuous Beams and Rigid Frames - Support Settlements - Symmetric Frames with Symmetric and Skew-Symmetric Loading.					
<b>UNIT II MOMENT DISTRIBUTION METHOD</b>					<b>12</b>
Stiffness - Distribution and Carry over Factors - Analysis of Continuous Beams- Plane Rigid Frames with and Without Sway					
<b>UNIT III INFLUENCE LINES FOR DETERMINATE AND INDETERMINATE BEAMS</b>					<b>12</b>
Concept Of Influence Lines - Influence Lines for Reactions in Statically Determinate Structures - Influence Lines for Shear Force and Bending Moment - Application of Müller Breslau's Principle - Influence Lines for Support Reactions, Shear Forces, And Bending Moments in Indeterminate Beams					
<b>UNIT IV MATRIX ANALYSIS OF STRUCTURES</b>					<b>12</b>
Analysis of Indeterminate Continuous Beams, Pin-Connected Planar Frameworks, and Rigidly Connected Planar Frames Using the Direct Flexibility Method and the Stiffness Method					
<b>UNIT V ARCHES AND SUSPENSION BRIDGES</b>					<b>12</b>
Arches - Eddy's Theorem – Analysis of Three-Hinged, Two-Hinged and Fixed Arches – Parabolic and Circular. Analysis of Suspension Bridges – Suspension Bridges with Three Hinged and Two Hinged Stiffening Girders					

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1	Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, Theory of Structures, Laxmi Publications, New Delhi, 2017.
2	Bhavikatti, S.S, Structural Analysis, Vol.1, & 2, Vikas Publishing House Pvt.Ltd. New Delhi, 2020.

**REFERENCES:**

1	Reddy, C.S., Basic Structural Analysis, Tata McGraw-Hill, New Delhi, 2019.
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2	Ghali, A., Neville, M., and Brown, T.G., Structural Analysis: A Unified Classical and Matrix Approach, CRC Press, 2021.
3	Wang, C.K., Intermediate Structural Analysis, McGraw-Hill Book Company, 2017.

**COURSE OUTCOMES:**

At the end of the course, the student will be able to		
CO	Course Outcome Statement	Knowledge Level
CO1	Analyse continuous beams and rigid frames using slope deflection method	Applying
CO2	Apply moment distribution method for solving indeterminate structures	Applying
CO3	Construct and interpret influence lines for determinate and indeterminate beams	Applying
CO4	Solve the structural systems using matrix flexibility and stiffness matrix method	Applying
CO5	Analyse structural behaviour of arches and suspension bridges	Applying

**COs - PO's & PSO's MAPPING:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	2	-	-	-	2	2	2	2	3	2
CO2	3	2	3	2	-	-	-	2	2	2	2	3	2
CO3	3	2	3	2	-	-	-	2	2	2	2	3	2
CO4	3	2	3	2	-	-	-	2	2	2	2	3	2
CO5	3	2	3	2	-	-	-	2	2	2	2	3	2
Avg.	3	2	3	2	-	-	-	2	2	2	2	3	2

For CO-PO/PSO Mapping: 3 – Substantial (High), 2– Moderate(Medium), 1– Slight (Low)



<b>U24CE421</b>	<b>WATER SUPPLY ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objective:**

- To introduce students about various components and design of water supply scheme, water treatment methods, water storage distribution system and design of intake structures.

**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.

**UNIT II CONVEYANCE FROM THE SOURCE****9**

Water supply - intake structures - Functions; Pipes and conduits for water - 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 and pipe materials.

**UNIT III WATER TREATMENT****9**

Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, sedimentation, aerators of flash mixers, Coagulation and flocculation - Clarifloccuator - sand filters - filtration - reverse osmosis - water treatment practices in urban & rural areas.

**UNIT IV ADVANCED WATER TREATMENT****9**

Water softening - Desalination - R.O. Plant - demineralization - Adsorption - Ion exchange Membrane Systems - Iron and Manganese removal - Disinfection, Chlorination - action, factors influencing, free chlorination, combined chlorination, ozonation, UV radiation, Defluoridation - MBR process - Recent advances

**UNIT V WATER DISTRIBUTION AND SUPPLY****9**

Requirements of water distribution - Components - Selection of pipe material - Service reservoirs - Functions - Network design - Economics - Analysis of distribution networks - Computer applications - Appurtenances - Leak detection - Water supply system in buildings - House service connection - Fixtures and fittings, systems of plumbing and types of plumbing.

**TOTAL: 45 PERIODS****Text Books:**

1	Garg S.K "Water Supply Engineering", Khanna Publishers, 34th Edition, New Delhi 2015
2	Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2016.



3	Duggal K.N., "Elements of Environmental Engineering" S. Chand and Co. Ltd., New Delhi, 2014.
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**Reference Books:**

1	Punmia B.C, Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi 2016.
2	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.
3	Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999

**Course Outcomes:**

At the end of the course, the students will be able to		
CO	Course Outcome Statement	Knowledge Level
CO1	Determine the quantity of water and analyse its quality parameters.	Applying
CO2	Differentiate various intake structures and select suitable pipe material for water conveyance	Understanding
CO3	Design various units of conventional water treatment plants.	Applying
CO4	Discuss the various advanced treatment systems and knowledge about the recent advances in water treatment process	Understanding
CO5	Plan and design a water distribution system for a building/city.	Applying

**COs - PO's & PSO's MAPPING:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	1	-	-	-	1	2	-	-	-	-
CO2	3	2	-	1	-	-	-	1	2	-	-	-	-
CO3	3	3	2	-	-	3	2	2	2	-	2	3	2
CO4	3	1	-	-	2	3	3	2	2	-	2	3	2
CO5	3	2	-	2	2	3	3	2	2	2	2	3	2
Avg.	3	2	2	1.33	2	3	2.67	1.6	2	2	2	3	2

**For CO-PO/PSO Mapping:** 3 – Substantial (High), 2– Moderate(Medium), 1– Slight (Low)



U24CE431	SOIL MECHANICS	L	T	P	C
		3	0	0	3

**Course Objective:**

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
- To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils.
- To impart knowledge on design features of both finite and infinite slopes.

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

Formation of soil - Soil description - Particle - Size shape and colour - Composition of gravel, sand, silt, clay particles - Particle behaviour - Soil structure - Phase relationship - Index - Significance - BIS classification system - Unified classification system properties - Compaction of soils - Theory, Laboratory and field tests - Field Compaction methods - Factors influencing compaction of soils

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

Soil - water - Static pressure in water - Effective stress concepts in soils - Capillary phenomena - Permeability interaction - Hydraulic conductivity - Darcy's law - Determination of Hydraulic Conductivity - Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer - Factors influencing permeability of soils - Seepage - Two dimensional flow - Laplace's equation - Introduction to flow nets - Simple problems. (Sheet pile and weir).

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

Stress distribution in homogeneous and isotropic medium - Boussinesq theory - (Point load, Line load and udl) Use of New marks influence chart - 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 cohesion less soils - Mohr - Coulomb failure theory - Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests - Pore pressure parameters - Cyclic mobility - Liquefaction.

**UNIT V SLOPE STABILITY****9**

Stability Analysis - Infinite slopes and finite slopes - Total stress analysis for saturated clay - Friction circle method - Use of stability number - Method of slices - Fellenious and Bishop's method - Slope protection measures.

**TOTAL: 45 PERIODS**

**Text Books:**

1	Dr.Arora,K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers Distributors, New Delhi,2022
2	Murthy, V.N.S, “Soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd., New Delhi,2021
3	Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2021.

**Reference Books:**

1	Gopal Ranjan and Rao, A.S.R., “Basic and Applied Soil Mechanics”, New Age International (P) Limited, Publishers New Delhi (India),2022
2	Braja M. Das, “Fundamentals of Geotechnical Engineering”, Fourth Edition, Cengage Learning, New Delhi,2021

**Course Outcomes:**

At the end of the course, the students will be able to		
CO	Course Outcome Statement	Knowledge Level
CO1	Classify the different types of soil & identify their index properties.	Understanding
CO2	Differentiate the flow of water through cohesive and cohesionless soils.	Understanding
CO3	Determine the stress distribution for different loadings and also gain knowledge on different settlement & compaction parameters	Applying
CO4	Describe the different tests for identifying shear strength of soils based on different parameters.	Understanding
CO5	Determine the stability of slopes based on different soil parameters.	Applying

**COs - PO's & PSO's MAPPING:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2	-	2	1	1	1	2	2	2	3
CO2	3	2	1	1	-	2	1	1	1	2	2	2	3
CO3	3	2	3	3	-	2	1	1	1	2	2	2	3
CO4	3	2	1	1	-	2	1	1	1	2	2	2	3
CO5	3	2	1	1	-	2	1	1	1	2	2	2	3
Avg.	3	2	2	2	-	2	1	1	1	2	2	2	3

For CO-PO/PSO Mapping: 3 – Substantial (High), 2– Moderate(Medium), 1– Slight (Low)



U24CE441	<b>HYDROLOGY AND WATER RESOURCES ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To introduce the student to the concept of hydrological aspects of water availability and requirements and should be able to quantify, control and regulate the water resources.</li> </ul>					

<b>UNIT I PRECIPITATION AND ABSTRACTIONS</b>	<b>9</b>
Hydrological cycle - Meteorological measurements - Types and forms of precipitation - Rain gauges - Spatial analysis of rainfall data using Thiessen polygon and Iso-hyetal methods - Interception - Evaporation: Measurement, Evaporation suppression methods - Infiltration: Horton's equation - Double ring infiltrometer - Infiltration indices.	
<b>UNIT II RUNOFF</b>	<b>9</b>
Catchment: Definition, Morphological characteristics - Factors affecting runoff - Run off estimation using Strange's table and empirical methods - SCS-CN method - Stage discharge relationship - Flow measurements - Hydrograph - Unit Hydrograph - IUH.	
<b>UNIT III HYDROLOGICAL EXTREMES</b>	<b>9</b>
Natural Disasters - Frequency analysis - Flood estimation - Flood management - Definitions of drought: Meteorological, Hydrological, Agricultural and Integrated - IMD method - NDVI analysis - Drought Prone Area Programme (DPAP).	
<b>UNIT IV RESERVOIRS</b>	<b>9</b>
Classification of reservoirs - Site selection - General principles of design - Spillways - Elevation - Area - Capacity curve - Storage estimation - Sedimentation - Life of reservoirs - Rule curve	
<b>UNIT V GROUNDWATER &amp; MANAGEMENT</b>	<b>9</b>
Origin - Classification and types - Properties of aquifers - Governing equations - Steady and unsteady flow - Artificial recharge - RWH in rural and urban areas	

**TOTAL: 45 PERIODS**

**Text Books:**

1	Subramanya .K. "Engineering Hydrology", 5th Edition, McGraw Hill, New Delhi 2022.
2	Jayarami Reddy .P. "Hydrology", 3rd Edition, Laxmi Publications, New Delhi 2022.
3	R.K.Sharma & T.K. Sharma, "Hydrology and Water Resources Engineering", 5 th Edition, Dhanapati Rai Publications, New Delhi 2021



**Reference Books:**

1	Raghunath .H.M., "Hydrology: Principles, Analysis, Design", New Age International Publishers, 3rd Edition, New Delhi 2021.
2	Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill, New Delhi 2021.
3	David Keith Todd and Larry W. Mays, "Groundwater Hydrology", 3rd Third Edition, John Wiley & Sons, New Delhi 2022.

**Course Outcomes:**

At the end of the course, the students will be able to		
CO	Course Outcome Statement	Knowledge Level
CO1	Describe the various hydrological parameters	Understanding
CO2	Apply the technique for developing hydrographs for estimating the peak runoff from different catchment areas	Applying
CO3	Estimate the peak floods and also gain knowledge in Flood management & drought	Applying
CO4	Classify the different reservoirs & spillways and also to gain knowledge on the design principles of both reservoirs & spillways.	Understanding
CO5	Describe the different features of groundwater & Aquifers	Understanding

**COs - PO's & PSO's MAPPING:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	-	2	-	2	2	-	2	2	3
CO2	2	2	2	1	-	2	-	3	2	-	2	2	3
CO3	2	2	2	2	-	3	-	2	2	-	2	2	3
CO4	2	2	2	1	-	3	2	2	2	-	3	2	3
CO5	2	2	2	1	-	3	2	2	2	-	2	2	3
Avg.	2	2	2	1	-	2	2	2	2	-	2	2	3

For CO-PO/PSO Mapping: 3 – Substantial (High), 2– Moderate(Medium), 1– Slight (Low)



U24EM411	APTITUDE AND REASONING – I	L	T	P	C
		1	0	0	1

**Course Objective:**

- Enhance analytical and logical reasoning skills to solve problems efficiently.
- Strengthen understanding of basic arithmetic, algebra, geometry, and data interpretation.
- Train students to approach problems systematically and apply suitable techniques.
- Foster quick thinking and reduce error rates through practice and time-bound exercises.

**Syllabus**

<b>Quantitative aptitude</b> <ul style="list-style-type: none"> <li>• Numbers: Number series, arithmetic progression, geometric progression</li> <li>• HCF and LCM: Highest common factor – split method, division method, Least Common Multiples – prime factor method, division method.</li> <li>• Simplification – BODMAS rule</li> <li>• Average and Percentage</li> <li>• Simple and Compound Interest</li> <li>• Profit, loss and discounts</li> <li>• Ratio and proportion: Ratio – compound ratio, inverse ratio. Proportion – direct proportion, inverse proportion</li> <li>• Mixture and alligation: Mixture, alligation, mean concentration</li> <li>• Problems based on ages</li> <li>• Partnerships: Simple partnership, compound partnership</li> </ul>	20
<b>Reasoning:</b> <ul style="list-style-type: none"> <li>• Number series and letter series</li> <li>• Odd one out</li> <li>• Coding and decoding</li> <li>• Missing characters/numbers and analogies</li> <li>• Blood relations problems</li> <li>• Direction sense tests</li> <li>• Sequencing and ranking test</li> </ul>	10

**References**

1	R.V. Praveen, “Quantitative Aptitude and Reasoning”, 3rd Edition , Eastern Economy Edition, PHI Learning, New Delhi, 2016
2	Dr. R.S. Aggarwal, “ Quantitative Aptitude”, S Chand Publishing, New Delhi 2017
3	Dr. R.S. Aggarwal, “A Modern Approach to Verbal & Non-Verbal Reasoning”, S Chand Publishing, New Delhi 2017
4	<a href="https://www.indiabix.com/">https://www.indiabix.com/</a>
5	<a href="https://www.geeksforgeeks.org/">https://www.geeksforgeeks.org/</a>
6	<a href="https://faceprep.in/">https://faceprep.in/</a>
7	<a href="https://prepinsta.com/">https://prepinsta.com/</a>
8	<a href="https://www.javatpoint.com/">https://www.javatpoint.com/</a>



**Course Outcomes**

At the end of the course, the students will be able to		
CO	Course Outcome Statement	Knowledge Level
CO1	Solve quantitative aptitude problems involving arithmetic, algebra, percentages, ratios, etc., using logical approaches.	Applying
CO2	Analyze problems and apply reasoning strategies such as deduction, inference, and pattern recognition.	Analysing
CO3	Solve problems in simple and compound interest, profit, loss and discount	Applying
CO4	Solve problems based on ages and partnership	Applying
CO5	Demonstrate improved performance in time-bound aptitude tests through consistent practice.	Applying

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1								2	1		2		
CO2								2	1		2		
CO3								2	1		2		
CO4								2	1		2		
CO5								2	1		2		
Avg.								2	1		2		

**For CO-PO/PSO Mapping: 3 – Substantial (High), 2– Moderate(Medium), 1– Slight (Low)**



<b>U24CE453</b>	<b>HYDRAULICS AND HYDRAULIC MACHINERY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**Course Objective:**

- To impart basic knowledge to the students about the open channel flows with analysis of uniform flow, gradually varied flow and rapidly varied flow and to expose them to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, Centrifugal and Reciprocating pumps.
- To provide hands-on experience in calibration of flow meters, performance characteristics of pumps and turbines.

**UNIT UNIFORM FLOW****9**

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Sub-critical, Super critical and Critical flow - Velocity distribution in open channel - Steady uniform flow: Chezy's equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

**UNIT II VARIED FLOWS****9**

Dynamic equations of gradually varied - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method – Change in Grades.

**UNIT III RAPIDLY VARIED FLOWS****9**

Application of the momentum equation for RVF - Hydraulic jumps - Types -Energy dissipation – Positive and Negative surges.

**UNIT IV TURBINES****9**

Turbines - Classification - Impulse turbine – Pelton wheel - Reaction turbines - Francis turbine - Kaplan turbine - Draft tube - Cavitation - Performance of turbine - Specific speed - Runaway speed – Minimum Speed to start the pump.

**UNIT V PUMPS****9**

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitation's in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Indicator diagrams and its variations - Air vessels - Savings in work done.

**TOTAL: 45 PERIODS****List of Experiments:**

<b>Sl. No</b>	<b>List of Experiments</b>
1	Flow measurement in pipe using Rotameter
2	Flow measurement in pipe using orifice meter
3	Flow measurement in pipe using venturi meter



4	Flow measurement in open channel using notches
5	Flow measurement - Bernoulli's experiment
6	Determination of frictional loss in pipes.
7	Determination of minor losses in pipes
8	Determination of metacentric height of a floating bodies
9	Characteristics of Pelton wheel turbine
10	Characteristics of Francis turbine
11	Characteristics of Centrifugal pump
12	Characteristics of Gear pump
13	Characteristics of Reciprocating pump
14	Characteristics of Submersible pump
<b>Total Periods: 45 + 30</b>	

**Text Books:**

1	Bansal R.K, "A Text Book of Fluid Mechanics and Hydraulic Machines" Lakshmi Publications, New Delhi, 10th Edition 2019
2	Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics Including Hydraulic Machines" Standard Book House" New Delhi, 22nd Edition 2019
3	Streeter, V.L. Wylie, E. B. and Bedford K.W, Fluid Mechanics. (9th Ed.) Tata McGraw Hill, New Delhi, 1998.
4	Chandramouli P N, Applied Hydraulic Engineering, Yes Dee Publisher, New Delhi, 2017

**Reference Books:**

1	VenTe Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.
2	Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 19th edition, 2013.
3	Subramanya K., Flow in open channels, Tata McGraw Hill, New Delhi, 2019.

**Course Outcomes:**

CO	At the end of the course, the students will be able to	Knowledge Level
CO1	Describe the basics of open channel flow, its classification and analysis of uniform flow in steady state conditions with specific energy concept and its application	Applying



CO2	Analyse steady gradually varied flow, water surface profiles and its length calculation using direct and standard step methods with change in water surface profiles due to change in grades.	Applying
CO3	Derive the relationship among the sequent depths of steady rapidly varied flow and estimating energy loss in hydraulic jump with exposure to positive and negative surges.	Applying
CO4	Design turbines and explain the working principle	Applying
CO5	Differentiate pumps and explain the working principle with characteristic curves and design centrifugal and reciprocating pumps.	Applying

**COs - PO's & PSO's MAPPING:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	-	-	-	1	2	2	1	2	3	2
CO2	3	2	2	-	-	-	1	2	2	1	2	3	2
CO3	3	3	3	2	1	-	2	2	2	1	2	3	2
CO4	3	3	3	3	1	-	2	2	2	2	2	3	2
CO5	3	3	3	3	1	-	2	2	2	2	2	3	2
<b>Avg.</b>	<b>3</b>	<b>2.6</b>	<b>2.6</b>	<b>2.67</b>	<b>1</b>	<b>-</b>	<b>1.6</b>	<b>2</b>	<b>2</b>	<b>1.4</b>	<b>2</b>	<b>3</b>	<b>2</b>

**For CO-PO/PSO Mapping:** 3 – Substantial (High), 2– Moderate(Medium), 1– Slight (Low)



U24CE463	HIGHWAY AND RAILWAY ENGINEERING	L	T	P	C
		2	0	2	3

**Course Objective:**

- To give an overview about the highway and railway engineering with respect to planning, design, construction and maintenance as per IRC standards, specifications and methods
- To learn the principles and procedures of testing of materials used in the construction of highways.

**UNIT I HIGHWAY ENGINEERING****6**

Classification of highways - Institutions for Highway planning, design and construction at different levels - factors influencing highway alignment - Typical cross sections of Urban and Rural roads - Engineering surveys for alignment - Conventional and Modern method

**UNIT II DESIGN OF HIGHWAY ELEMENTS****6**

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****6**

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****6**

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 (Problems) - Railway drainage Level Crossings Signalling.

**UNIT V RAILWAY TRACK CONSTRUCTION MAINTENANCE AND OPERATION****6**

Points and Crossings - Design of Turnouts, Working Principle-Track Circuiting - Construction & Maintenance - Conventional, Modern methods and Materials, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance - Role of Indian Railways in National Development - Railways for Urban Transportation - LRT & MRTS Feasibility study, Planning and construction

**TOTAL: 30 PERIODS****List of Experiments:**

Sl. No	List of Experiments
1	Specific gravity determination of the coarse aggregate sample



2	Determination of abrasion value of the coarse aggregate sample
3	Determination of water absorption capacity of the coarse aggregate sample.
4	Specific gravity determination of the bitumen/asphalt sample
5	Determination of consistency of the bituminous material
6	Viscosity determination of bituminous binder
7	Determination of softening point of the asphalt/bitumen sample
8	Determination of ductility value of the bitumen sample
9	Estimation of loss of bitumen on heating
10	Determination of optimum binder content by Marshall method
11	Determination of stripping value of the bituminous mix Demonstration
12	Determination of bitumen content in the bituminous mix by cold solvent extraction method
<b>Total Periods: 30 + 30</b>	

**Text Books:**

1	Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nem Chand Publishers, 2014
2	Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai,2010
3	Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 6th edition Delhi, 2015
4	C. Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels., Universities Press (India) Private Limited, Hyderabad, 2015

**Reference Books :**

1	Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC:37-2012
2	Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, ( Third Revision), IRC:58-2012



3	Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Ninth Impression, South Asia,2012
4	IRC-37–2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi
5	Saxena Subhash, C. and Satyapal Arora, A Course in Railway Engineering, Dhanapat Rai and Sons, Delhi, 1998.

**Course Outcomes:**

CO	At the end of the course, the students will be able to	Knowledge Level
CO1	Gain knowledge on planning a highway according to the principles and standards adopted by various institutions in India.	Understanding
CO2	Design the geometric features of the road network and components of pavement.	Applying
CO3	Test the highway materials and construction practice methods and know its properties and able to perform pavement evaluation and management	Applying
CO4	Discuss the different methods of route alignment and design elements in railway planning and constructions.	Understanding
CO5	Describe the different construction techniques and maintenance of track laying and railway stations	Understanding

**COs - PO's & PSO's MAPPING:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	2	-	3	1	3	-	-	-	-	3
CO2	3	3	3	2	2	-	2	3	2	-	2	3	2
CO3	3	3	2	2	2	3	3	3	-	-	3	3	2
CO4	3	-	-	-	-	3	-	3	-	1	-	-	3
CO5	3	-	3	-	2	-	-	-	2	-	-	2	-
Avg.	3	3	2.67	2	2	3	2	3	2	1	2.5	2.67	2.5

**For CO-PO/PSO Mapping:** 3 – Substantial (High), 2– Moderate(Medium), 1– Slight (Low)



U24CE472	SOIL MECHANICS LABORATORY	L	T	P	C
		0	0	4	2

**Course Objective:**

- To familiarize the students to determine the Various Index properties of soil and also helps the students in Identifying the compaction characters, Strength and Prediction of Various Engineering properties of Soil.

### List of experiments

<b>I</b>	<b>DETERMINATION OF INDEX PROPERTIES</b>
1	Specific gravity of soil solids
2	Grain size distribution – Sieve analysis
3	Grain size distribution – Hydrometer analysis
4	Liquid limit and Plastic limit tests
5	Shrinkage limit tests
<b>II</b>	<b>DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS</b>
6	Field density Test (Core cutter & Sand replacement method)
7	Determination of moisture – density relationship using standard proctor compaction test.
<b>III</b>	<b>DETERMINATION OF ENGINEERING PROPERTIES OF SOIL</b>
8	Permeability determination (constant head and falling head methods)
9	One dimensional consolidation test (Determination of co-efficient of consolidation only)
10	Direct shear test in cohesion less soil
11	Unconfined compression test in cohesive soil
12	Laboratory vane shear test in cohesive soil
13	Tri-axial compression test in cohesion less soil (Demonstration only)
14	California Bearing Ratio Test
<b>IV</b>	<b>TEST ON GEO SYNTHESIS (DEMONSTRATION ONLY)</b>
15	Determination of tensile strength and Interfacial friction angle
16	Determination of apparent opening sizes and permeability
<b>TOTAL: 60 PERIODS</b>	

### Text Books:

- Dr.Arora, K. R., “Soil Mechanics and Foundation Engineering”, Standard Publishers Distributors, New Delhi,2021

### Reference Books:

- Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2021
- Braja M.Das., “Soil Mechanics: Laboratory Manual”, Oxford University Press, eighth edition, 2022.
- Soil Engineering Laboratory Instruction Manual” published by Engineering College Cooperative Society, Anna University, Chennai, 2021.



**Course Outcomes**

CO	Course Outcome Statement	Knowledge Level
CO1	Determine the different Index properties of soil	Applying
CO2	Determine the density and compaction characteristics for various types of soils.	Applying
CO3	Perform the tests to identify the flow of water through different soil mediums.	Applying
CO4	Articulate the rate of compression & settlement in soil	Applying
CO5	Determine the shear strength parameters of soil for both drained and undrained conditions	Applying

**COs - PO's & PSO's MAPPING:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	3	2	1	-	-	-	2	-	-	3	2
CO2	2	2	3	2	1	-	-	-	2	-	-	3	2
CO3	2	2	3	2	1	-	-	-	2	-	-	3	2
CO4	2	2	3	2	1	-	-	-	2	-	-	3	2
CO5	2	2	3	2	1	-	-	-	2	-	-	3	2
<b>Avg.</b>	2	2	3	2	1	-	-	-	2	-	-	3	2

**For CO-PO/PSO Mapping:** 3 – Substantial (High), 2– Moderate(Medium), 1– Slight (Low)



<b>U24EM422</b>	<b>SOFT SKILLS AND PERSONALITY DEVELOPMENT – I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>Course Objective:</b>					
<ul style="list-style-type: none"> <li>To understand and interpret human perception and behavior, enhancing interpersonal awareness.</li> <li>To enhance self-management, including habit formation, stress regulation, and personal productivity</li> <li>Develop conflict-resolution skills, aiming for win-win outcomes through structured strategies.</li> <li>Strengthen communication abilities—active listening, telephone etiquette, and overcoming listening barriers.</li> </ul>					

**List of Exercises**

<b>Sl. No.</b>	<b>List of Exercises</b>
1	Introduction: A New Approach to Learning, Planning and Goal-Setting
2	Human Perceptions: Understanding People
3	Aiming for Excellence: Developing Potential and Self-Actualisation
4	Self-Management Skills- Time management & Self-motivation
5	Self-Management Skills- Stress management & Adaptability
6	Conflict Resolution Skills
7	Using The Zeigarnik Effect for Productivity and Personal Growth, Forming Habits of Success
8	Communication: Significance of Listening, Active Listening, Barriers to Active Listening
9	Telephone Communication: Basic Telephone Skills, Advanced Telephone Skills , Essential Telephone Skills
10	Profile Building
<b>Total Periods: 30</b>	

**Text Books**

1	Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.
2	Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.

**Reference Books**

1	Klaus, Peggy, Jane Rohman & Molly Hamaker. The Hard Truth about Soft Skills. London: HarperCollins E-books, 2007.
2	Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.



**Course Outcomes**

At the end of the course, the students will be able to		
CO	Course Outcome Statement	Knowledge Level
CO1	Develop an actionable growth plan aligning self-development with objectives.	Applying
CO2	Analyze the habit loop; design personal interventions to break bad habits.	Analysing
CO3	Analyze examples of interpersonal conflict, propose dual solutions using conflict-model frameworks.	Analysing
CO4	Apply stress-management strategies: reframing, planning, relaxation exercises.	Applying
CO5	Apply techniques to rectify the barriers in active listening	Applying

**CO-PO/PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1								1	2		2		
CO2								1	2		2		
CO3								1	2		2		
CO4								1	2		2		
CO5								1	2		2		
Avg.								1	2		2		

**For CO-PO/PSO Mapping:** 3 – Substantial (High), 2 – Moderate (Medium), 1 – Slight (Low)

