



**THAMIRABHARANI ENGINEERING COLLEGE**  
(AN AUTONOMOUS INSTITUTION)

**REGULATIONS 2024**  
**B. E. MECHANICAL ENGINEERING**  
**CHOICE BASED CREDIT SYSTEM**  
**CURRICULUM AND SYLLABI FOR SEMESTERS I TO VIII**

**SEMESTER I**

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24IP0101	Induction Programme	-	-	-	-	-	0
<b>THEORY</b>								
2	24HS0101	Professional English I	HSMC	3	0	0	3	3
3	24MA0101	Matrices and Calculus	BSC	3	1	0	4	4
4	24PH0101	Engineering Physics I	BSC	3	0	0	3	3
5	24CY0101	Engineering Chemistry	BSC	3	0	0	3	3
6	24GE0101	Problem Solving and Python Programming	ESC	3	0	0	3	3
7	24GE0102	தமிழ் மரபு / Heritage of Tamils	HSMC	1	0	0	1	1
<b>PRACTICALS</b>								
8	24GE0103	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
9	24BS0101	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
10	24HS0102	English Laboratory I	EEC	0	0	2	2	1
<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	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	24HS0203	Professional English II	HSMC	2	0	0	2	2
2	24MA0202	Ordinary Differential Equations and Transform Techniques	BSC	3	1	0	4	4
3	24PH0202	Engineering Physics II	BSC	3	0	0	3	3
4	24GE0204	Environmental Science and Engineering	BSC	2	0	0	2	2
5	24GE0205	Engineering Graphics	ESC	2	0	4	6	4
6	24GE0206	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
7	24GE0207	தமிழ் தொழில்நுட்பம் Tamil and Technology	HSMC	1	0	0	1	1
<b>PRACTICALS</b>								
8	24GE0208	Basic Electrical and Electronics Engineering Laboratory	ESC	0	0	4	4	2
9	24GE0209	Engineering Practices Laboratory	ESC	0	0	4	4	2
10	24HS0204	English Laboratory II	EEC	0	0	2	2	1
<b>TOTAL</b>				<b>16</b>	<b>1</b>	<b>14</b>	<b>31</b>	<b>24</b>

### SEMESTER iii

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	24MA0303	Numerical Methods	BSC	3	1	0	4	4
2	24ME2301	Engineering Mechanics	ESC	3	0	0	3	3
3	24ME2302	Engineering Materials and Metallurgy	PCC	3	0	0	3	3
4	24ME2303	Manufacturing Processes	PCC	3	0	0	3	3
5	24ME2304	Strength of Materials	PCC	3	0	2	5	4
<b>PRACTICALS</b>								
7	24ME2305	Computer Aided Machine Drawing Laboratory	PCC	0	0	4	4	2
8	24ME2306	Manufacturing Technology Laboratory	PCC	0	0	4	4	2
<b>TOTAL</b>				<b>15</b>	<b>1</b>	<b>10</b>	<b>26</b>	<b>21</b>

### SEMESTER iv

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	24ME2401	Fluid Mechanics and Machinery	PCC	3	1	0	4	4
2	24ME2402	Engineering Thermodynamics	PCC	3	0	0	3	3
3	24ME2403	Hydraulics and Pneumatics	ESC	3	0	0	3	3
4	24ME2404	Automobile Engineering	PCC	3	0	0	3	3
5	24EE3410	Electrical Drives and Control	PCC	3	0	2	5	4
<b>PRACTICALS</b>								
6	24ME2405	Fluid Mechanics and Machinery Laboratory	PCC	0	0	4	4	2
7	24GE0411	Soft Skills I	EEC	0	0	4	4	2
<b>TOTAL</b>				<b>15</b>	<b>1</b>	<b>10</b>	<b>26</b>	<b>21</b>

## SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	24ME2501	Design of Machine Elements	PCC	3	1	0	4	4
2	24ME2502	Thermal Engineering	PCC	3	0	2	5	4
3	24ME2503	Metrology and Measurements	PCC	3	0	0	3	3
4	24ME2504	Theory of Machines	PCC	3	0	2	5	4
5	24HS0505	English for Competitive Examinations	HSMC	3	0	0	3	3
6	24ME25XX	Professional Elective I	PEC	3	0	0	3	3
<b>PRACTICALS</b>								
7	24ME2505	Metrology and Measurements Laboratory	PCC	0	0	4	4	2
<b>TOTAL</b>				<b>18</b>	<b>1</b>	<b>08</b>	<b>27</b>	<b>23</b>

## SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	24ME2601	Heat and Mass Transfer	PCC	3	0	2	5	4
2	24MGC601	Principles of Management	HSMC	3	0	0	3	3
3	24ME2602	Design of Transmission Systems	PCC	3	1	0	4	4
4	24ME26XX	Professional Elective II	PEC	3	0	0	3	3
5	24ME26XX	Professional Elective III	PEC	3	0	0	3	3
6	24OXX6XX	Open Elective I	OEC	3	0	0	3	3
<b>PRACTICALS</b>								
7	24ME2603	CAD/CAM Laboratory	PCC	0	0	4	4	2
8	24GE0613	Soft Skills II	EEC	0	0	4	4	2
<b>TOTAL</b>				<b>18</b>	<b>1</b>	<b>10</b>	<b>29</b>	<b>24</b>

## SEMESTER VII

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	24ME2701	Mechatronics	PCC	3	0	2	5	4
2	24ME2702	Computer Integrated Manufacturing	PCC	3	0	0	3	3
3	24GE0714	Professional Ethics	HSMC	3	0	0	3	3
4	24ME2703	Industrial Engineering Management	HSMC	3	0	0	3	3
5	24ME27XX	Professional Elective IV	PEC	3	0	0	3	3
6	24OXX7XX	Open Elective II	OEC	3	0	0	3	3
<b>PRACTICALS</b>								
7	24ME2704	Simulation and Analysis Laboratory	PCC	0	0	4	4	2
8	24ME2705	Internship	EEC	0	0	0	0	2
<b>TOTAL</b>				<b>18</b>	<b>0</b>	<b>6</b>	<b>24</b>	<b>23</b>

## SEMESTER VIII

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	24ME2801	Project Work	EEC	0	0	20	20	10
<b>TOTAL</b>				<b>0</b>	<b>0</b>	<b>20</b>	<b>20</b>	<b>10</b>

**TOTAL CREDITS: 168**

### PROFESSIONAL ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24ME2506	Value Engineering	PEC	3	0	0	3	3
2	24ME2507	Additive Manufacturing	PEC	3	0	0	3	3
3	24ME2508	CAD/CAM	PEC	3	0	0	3	3
4	24ME2509	Design for Excellence	PEC	3	0	0	3	3
5	24ME2510	Ergonomics in Design	PEC	3	0	0	3	3

### PROFESSIONAL ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24ME2604	Turbo Machines	PEC	3	0	0	3	3
2	24ME2605	Non-traditional Machining Processes	PEC	3	0	0	3	3
3	24ME2606	Industrial Safety	PEC	3	0	0	3	3
4	24ME2607	Thermal Power Engineering	PEC	3	0	0	3	3
5	24ME2608	Design for Manufacturing	PEC	3	0	0	3	3

### PROFESSIONAL ELECTIVE III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24ME2609	Measurements and Controls	PEC	3	0	0	3	3
2	24ME2610	Design Concepts in Engineering	PEC	3	0	0	3	3
3	24ME2611	Power Plant Engineering	PEC	3	0	0	3	3
4	24ME2612	Composite Materials and Mechanics	PEC	3	0	0	3	3
5	24ME2613	Refrigeration and Air Conditioning	PEC	3	0	0	3	3

### PROFESSIONAL ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24ME2706	Advanced Vehicle Engineering	PEC	3	0	0	3	3
2	24ME2707	Advanced Internal Combustion Engineering	PEC	3	0	0	3	3
3	24ME2708	Casting and Welding Processes	PEC	3	0	0	3	3
4	24ME2709	Process Planning and Cost Estimation	PEC	3	0	0	3	3
5	24ME2710	Surface Engineering	PEC	3	0	0	3	3

### OPEN ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24OAD601	Foundations of Artificial Intelligence	OEC	3	0	0	3	3
2	24OAD602	Programming for Data Science	OEC	3	0	0	3	3
3	24OCS601	Software Engineering Fundamentals	OEC	3	0	0	3	3
4	24OCS602	C Programming	OEC	3	0	0	3	3
5	24OEC601	Electronics Engineering	OEC	3	0	0	3	3

### OPEN ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24OAD701	Machine Learning using Python	OEC	3	0	0	3	3
2	24OAD702	Deep Learning and Neural Networks	OEC	3	0	0	3	3
3	24OCS701	IoT Concepts and Applications	OEC	3	0	0	3	3
4	24OCS703	Data Structures and Algorithm	OEC	3	0	0	3	3
5	24OMG701	Management Concepts and Organizational Behavior	OEC	3	0	0	3	3

## SUMMARY

<b>B. E. Mechanical Engineering</b>											
<b>S. No</b>	<b>Subject Area</b>	<b>Credits per Semester</b>								<b>% of Subject Area</b>	<b>Total Credits</b>
		<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>	<b>VII</b>	<b>VIII</b>		
1	HSMC	4	3	-	-	3	3	6	-	11	19
2	BSC	12	9	4	-	-	-	-	-	15	25
3	ESC	5	11	3	3	-	-	-	-	13	22
4	PCC	-	-	14	16	17	10	9	-	39	66
5	PEC	-	-	-	-	3	6	3	-	7	12
6	OEC	-	-	-	-	-	3	3	-	4	6
7	EEC	1	1	-	2	-	2	2	10	11	18
8	Non-Credit/ Mandatory	-	-	-	-	-	-	-	-	0	0
<b>Total</b>		<b>22</b>	<b>24</b>	<b>21</b>	<b>21</b>	<b>23</b>	<b>24</b>	<b>23</b>	<b>10</b>	<b>100</b>	<b>168</b>

## SEMESTER I

24IP0101	INDUCTION PROGRAMME	L	T	P	C
		-	-	-	0
<p>This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.</p> <p>The induction programme has been introduced by AICTE with the following objective:</p> <p>“Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.”</p> <p>Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.</p> <p>The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.</p> <p><b>(i) Physical Activity</b></p> <p>This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.</p> <p><b>(ii) Creative Arts</b></p> <p>Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.</p> <p><b>(iii) Universal Human Values</b></p> <p>This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don't's,</p>					

but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

**(iv) Literary Activity**

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

**(v) Proficiency Modules**

This would address some lacunas that students might have, for example, English, computer familiarity etc.

**(vi) Lectures by Eminent People**

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

**(vii) Visits to Local Area**

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

**(viii) Familiarization to Dept./Branch & Innovations**

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

**(ix) Department Specific Activities**

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

**REFERENCES:**

Guide to Induction program from AICTE

24HS0101	PROFESSIONAL ENGLISH I	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To improve the communicative competence of learners.</li> <li>To learn to use basic grammatic structures in suitable contexts.</li> <li>To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text.</li> <li>To help learners use language effectively in professional contexts.</li> <li>To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.</li> </ul>					
<b>UNIT I</b>	<b>INTRODUCTION TO EFFECTIVE COMMUNICATION</b>	<b>9</b>			
<p>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?</p> <p><b>INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION</b></p> <p>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 &amp; Acronyms (as used in technical contexts).</p>					
<b>UNIT II</b>	<b>NARRATION AND SUMMATION</b>	<b>9</b>			
<p>Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel &amp; 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&amp; suffixes); Synonyms and Antonyms. Phrasal verbs.</p>					
<b>UNIT III</b>	<b>DESCRIPTION OF A PROCESS / PRODUCT</b>	<b>9</b>			
<p>Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present &amp; Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives &amp; sequence words).</p>					
<b>UNIT IV</b>	<b>CLASSIFICATION AND RECOMMENDATIONS</b>	<b>9</b>			
<p>Reading – Newspaper articles; Journal reports and Non Verbal Communication (tables, pie charts) - Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing</p>					

recommendations; Transferring information from non-verbal (chart, graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.		
<b>UNIT V</b>	<b>EXPRESSION</b>	<b>9</b>
Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.		
<b>TOTAL: 45 PERIODS</b>		
<b>COURSE OUTCOMES:</b>		
At the end of the course, the students will be able to		
CO1: Use appropriate words in a professional context.		
CO2: Gain understanding of basic grammatical structures and use them in right context.		
CO3: Read and infer the denotative and connotative meanings of technical texts.		
CO4: Read and interpret information presented in tables, charts and other graphic forms.		
CO5: Write definitions, descriptions, narrations and essays on various topics.		
<b>TEXT BOOKS:</b>		
1. “English for Engineers & Technologists”, Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition).		
2. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Jovani, “English for Science & Technology”, Cambridge University Press, Authored by, Department of English, Anna University, 2021.		
<b>REFERENCE BOOKS:</b>		
1. Meenakshi Raman and Sangeeta Sharma, “Technical Communication – Principles and Practices”, Oxford Univ. Press, 2016, New Delhi.		
2. Lakshminarayanan, “A Course Book on Technical English”, Scitech Publications (India) Pvt. Ltd.		
3. Aysha Viswamohan, “English for Technical Communication” (With CD), Mcgraw Hill Education, ISBN: 0070264244.		
4. Kulbhusan Kumar and RS Salaria, “Effective Communication Skill”, Khanna Publishing House.		
5. Dr. V. Chellammal, “Learning to Communicate”, Allied Publishing House, New Delhi, 2003.		
<b>ASSESSMENT PATTERN</b>		
Two internal assessments and an end semester examination to test students’ reading and writing skills along with their grammatical and lexical competence.		

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
2	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
3	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
4	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
5	2	3	3	3	-	3	3	3	2	3	-	3	-	-	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

24MA0101	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To develop the use of matrix algebra techniques that is needed by engineers for practical applications.</li> <li>To familiarize the students with differential calculus.</li> <li>To familiarize the student with functions of several variables. This is needed in many branches of engineering.</li> <li>To make the students understand various techniques of integration.</li> <li>To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.</li> </ul>					
<b>UNIT I</b>	<b>MATRICES</b>				<b>9+3</b>
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.					
<b>UNIT II</b>	<b>DIFFERENTIAL CALCULUS</b>				<b>9+3</b>
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications: Maxima and Minima of functions of one variable.					
<b>UNIT III</b>	<b>FUNCTIONS OF SEVERAL VARIABLES</b>				<b>9+3</b>
Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange’s method of undetermined multipliers					
<b>UNIT IV</b>	<b>INTEGRAL CALCULUS</b>				<b>9+3</b>
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.					
<b>UNIT V</b>	<b>MULTIPLE INTEGRALS</b>				<b>9+3</b>
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications: Moments and centres of mass, moment of inertia.					
<b>TOTAL: 60 PERIODS</b>					

**COURSE OUTCOMES:**

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

- CO1: Use the matrix algebra methods for solving practical problems.
- CO2: Apply differential calculus tools in solving various application problems.
- CO3: Able to use differential calculus ideas on several variable functions.
- CO4: Apply different methods of integration in solving practical problems.
- CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.

**TEXT BOOKS:**

1. Kreyszig.E, “Advanced Engineering Mathematics”, John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, “Calculus: Early Transcendentals”, Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

**REFERENCE BOOKS:**

1. Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016.
2. Bali. N., Goyal. M. and Watkins. C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
3. Jain. R.K. and Iyengar. S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5th Edition, 2016.
4. Narayanan. S. and Manicavachagom Pillai. T. K. “Calculus”, Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Srimantha Pal and Bhunia. S.C, "Engineering Mathematics", Oxford University Press, 2015.
7. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
2	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
3	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
4	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
5	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

24PH0101	ENGINEERING PHYSICS I	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To make the students effectively to achieve an understanding of mechanics.</li> <li>To enable the students to gain knowledge of electromagnetic waves and its applications.</li> <li>To introduce the basics of oscillations, optics and lasers.</li> <li>To equip the students to be successfully understand the importance of quantum physics.</li> <li>To motivate the students towards the applications of quantum mechanics.</li> </ul>					
<b>UNIT I</b>	<b>MECHANICS</b>	<b>9</b>			
<p>Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M.I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.</p>					
<b>UNIT II</b>	<b>ELECTROMAGNETIC WAVES</b>	<b>9</b>			
<p>The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.</p>					
<b>UNIT III</b>	<b>OSCILLATIONS, OPTICS AND LASERS</b>	<b>9</b>			
<p>Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection – interference – Michelson interferometer – Theory of air wedge and experiment. Theory of laser – characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.</p>					
<b>UNIT IV</b>	<b>BASIC QUANTUM MECHANICS</b>	<b>9</b>			
<p>Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.</p>					
<b>UNIT V</b>	<b>APPLIED QUANTUM MECHANICS</b>	<b>9</b>			
<p>The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.</p>					

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

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

- CO1: Understand the importance of mechanics.
- CO2: Express their knowledge in electromagnetic waves.
- CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
- CO4: Understand the importance of quantum physics.
- CO5: Comprehend and apply quantum mechanical principles towards the formation of energy bands.

**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. R. Wolfson. "Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, "Physics" – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K. Thyagarajan and A. Ghatak. "Lasers: Fundamentals and Applications", Laxmi Publications, (Indian Edition), 2019.
4. D. Halliday, R. Resnick and J. Walker. "Principles of Physics", Wiley (Indian Edition), 2015.
5. N. Garcia, A. Damask and S. Schwarz. "Physics for Computer Science Students", Springer-Verlag, 2012.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	1	1	1	-	-	-	-	-	-	-	-	-
2	3	3	2	1	2	1	-	-	-	-	-	-	-	-	-
3	3	3	2	2	2	1	-	-	-	-	-	1	-	-	-
4	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
5	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-

**1 – low, 2 – medium, 3 – high, ‘-’ – no correlation**

24CY0101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To inculcate sound understanding of water quality parameters and water treatment techniques.</li> <li>To impart knowledge on the basic principles and preparatory methods of nanomaterials.</li> <li>To introduce the basic concepts and applications of phase rule and composites.</li> <li>To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.</li> <li>To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.</li> </ul>					
<b>UNIT I</b>	<b>WATER AND ITS TREATMENT</b>	<b>9</b>			
<p>Water: Sources and impurities, Water quality parameters: Definition and significance of-colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride 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 &amp; foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.</p>					
<b>UNIT II</b>	<b>NANOCHEMISTRY</b>	<b>9</b>			
<p>Basics: 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, Nano rod, 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.</p>					
<b>UNIT III</b>	<b>PHASE RULE AND COMPOSITES</b>	<b>9</b>			
<p>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 &amp; Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.</p>					
<b>UNIT IV</b>	<b>FUELS AND COMBUSTION</b>	<b>9</b>			
<p>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</p>					

- 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. CO <sub>2</sub> emission and carbon foot print.		
<b>UNIT V</b>	<b>ENERGY SOURCES AND STORAGE DEVICES</b>	<b>9</b>
Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal 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; Supercapacitors: Storage principle, types and examples.		
<b>TOTAL: 45 PERIODS</b>		
<b>COURSE OUTCOMES:</b>		
At the end of the course, the students will be able to		
CO1: Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.		
CO2: Identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.		
CO3: Apply the knowledge of phase rule and composites for material selection requirements.		
CO4: Understand the importance of quantum physics. Recommend suitable fuels for engineering processes and applications.		
CO5: Recognize different forms of energy resources and apply them for suitable applications in energy sectors.		
<b>TEXT BOOKS:</b>		
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.		
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.		
<b>REFERENCE BOOKS:</b>		
1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.		
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.		
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.		
4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.		

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
2	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-
3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-
5	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

24GE0101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To understand the basics of algorithmic problem solving.</li> <li>To learn to solve problems using Python conditionals and loops.</li> <li>To define Python functions and use function calls to solve problems.</li> <li>To use Python data structures - lists, tuples, dictionaries to represent complex data.</li> <li>To do input/output with files in Python.</li> </ul>					
<b>UNIT I</b>	<b>COMPUTATIONAL THINKING AND PROBLEM SOLVING</b>	<b>9</b>			
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.					
<b>UNIT II</b>	<b>DATA TYPES, EXPRESSIONS, STATEMENTS</b>	<b>9</b>			
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.					
<b>UNIT III</b>	<b>CONTROL FLOW, FUNCTIONS, STRINGS</b>	<b>9</b>			
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.					
<b>UNIT IV</b>	<b>LISTS, TUPLES, DICTIONARIES</b>	<b>9</b>			
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.					
<b>UNIT V</b>	<b>FILES, MODULES, PACKAGES</b>	<b>9</b>			
Files and exception: 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).					
<b>TOTAL: 45 PERIODS</b>					

**COURSE OUTCOMES:**

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

- CO1: Develop algorithmic solutions to simple computational problems.
- CO2: Write simple Python programs using conditionals and looping for solving problems.
- CO3: Decompose a Python program into functions.
- CO4: Represent compound data using Python lists, tuples, dictionaries etc.
- CO5: Read and write data from/to files in Python programs.

**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 Beginners 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. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
3	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
4	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
5	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-

**1 – low, 2 – medium, 3 – high, ‘-’ – no correlation**

24GE0102	தமிழர் மரபு	L	T	P	C
		1	0	0	1
அலகு 1	மொழி மற்றும் இலக்கியம்				3
இந்திய மொழிக் குடும்பங்கள் திராவிட மொழிகள் தமிழ் ஒரு செம்மொழி தமிழ் செவ்விவக்கியங்கள் சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை -சங்க இலக்கியத்தில் பகிர்தல் அறம் திருக்குறளில் மேலாண்மைக் கருத்துக்கள் தமிழ்க் காப்பியங்கள். தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் சிற்றிலக்கியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு					
அலகு 2	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை				3
நடுகல் முதல் நவீன சிற்பங்கள் வரை ஐம்பொன் சிலைகள் பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் தேர் செய்யும் கலை சுடுமண் சிற்பங்கள் நாட்டுப்புறத் தெய்வங்கள் குமரிமுனையில் திருவள்ளூர் சிலை இசைக் கருவிகள் விணை, யாழ், நாதஸ்வரம், மிருதங்கம், பறை, தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு					
அலகு 3	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்				3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம். தமிழர்களின் விளையாட்டுகள்.					
அலகு 4	தமிழர்களின் திணைக் கோட்பாடுகள்				3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் தமிழர்கள் போற்றிய அறக்கோட்பாடு சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும். கல்வியும் சங்ககால நகரங்களும் துறை முகங்களும் சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.					
அலகு 5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு				3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு கல்வெட்டுகள், கையெழுத்துப்படிக்கள் தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.					
<b>TOTAL: 15 PERIODS</b>					

**TEXT CUM REFERENCE BOOKS:**

1. தமிழக வரலாறு மக்களும் பண்பாடும். கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணிணித் தமிழ் முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. 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).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

24GE0102	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1
<b>UNIT I</b>	<b>LANGUAGE AND LITERATURE</b>				<b>3</b>
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.					
<b>UNIT II</b>	<b>HERITAGE- ROCK ART PAINTINGS TO MODERN ART-SCULPTURE</b>				<b>3</b>
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.					
<b>UNIT III</b>	<b>FOLK AND MARTIAL ARTS</b>				<b>3</b>
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.					
<b>UNIT IV</b>	<b>THINAI CONCEPT OF TAMILS</b>				<b>3</b>
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.					
<b>UNIT V</b>	<b>CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE</b>				<b>3</b>
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.					
<b>TOTAL: 15 PERIODS</b>					
<b>TEXT CUM REFERENCE BOOKS:</b>					
<ol style="list-style-type: none"> <li>1. தமிழக வரலாறு மக்களும் பண்பாடும். கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).</li> <li>2. கணினித் தமிழ் முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).</li> <li>3. கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).</li> <li>4. பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).</li> <li>5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB &amp; ESC and RMRL – (in print).</li> <li>6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).</li> </ol>					

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. 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).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

24GE0103	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To understand the problem-solving approaches.</li> <li>• To learn the basic programming constructs in Python.</li> <li>• To practice various computing strategies for Python-based solutions to real world problems.</li> <li>• To use Python data structures - lists, tuples, dictionaries.</li> <li>• To do input/output with files in Python.</li> </ul>					
<b>LIST OF EXPERIMENTS:</b>					
<p>Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.</p> <ol style="list-style-type: none"> <li>1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)</li> <li>2. Python programming using simple statements and expressions. (exchange the values of two variables, circulate the values of n variables, distance between two points)</li> <li>3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)</li> <li>4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list &amp; tuples)</li> <li>5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets &amp; Dictionaries)</li> <li>6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)</li> <li>7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)</li> <li>8. Implementing programs using written modules and Python Standard Libraries. (pandas, numpy. Matplotlib, scipy)</li> <li>9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)</li> <li>10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter’s age validity, student mark range validation)</li> <li>11. Exploring Pygame tool.</li> <li>12. Developing a game activity using Pygame like bouncing ball, car race etc.</li> </ol>					
<b>TOTAL: 60 PERIODS</b>					

**COURSE OUTCOMES:**

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

- CO1: Develop algorithmic solutions to simple computational problems.
- CO2: Implement programs in Python using conditionals and loops for solving problems.
- CO3: Deploy functions to decompose a Python program.
- CO4: Process compound data using Python data structures.
- CO5: Utilize Python packages in developing software applications.

**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. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	-	-	-	-	-	3	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
3	3	2	-	2	2	-	-	-	-	-	1	-	3	-	-
4	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
5	2	-	-	-	2	-	-	-	-	-	1	-	2	-	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

<b>24BS0101</b>	<b>PHYSICS AND CHEMISTRY 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>
<b>PHYSICS LABORATORY</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>(Any Seven Experiments)</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To learn the proper use of various kinds of physics laboratory equipment.</li> <li>• To learn how data can be collected, presented and interpreted in a clear and concise manner.</li> <li>• To learn problem solving skills related to physics principles and interpretation of experimental data.</li> <li>• To determine error in experimental measurements and techniques used to minimize such error.</li> <li>• To make the student as an active participant in each part of all lab exercises.</li> </ul>					
<b>LIST OF EXPERIMENTS:</b>					
<ol style="list-style-type: none"> <li>1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.</li> <li>2. Simple harmonic oscillations of cantilever.</li> <li>3. Non-uniform bending - Determination of Young's modulus.</li> <li>4. Uniform bending – Determination of Young's modulus.</li> <li>5. Laser- Determination of the wave length of the laser using grating.</li> <li>6. Air wedge - Determination of thickness of a thin sheet/wire.</li> <li>7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle. b) Compact disc- Determination of width of the groove using laser.</li> <li>8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.</li> <li>9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.</li> <li>10. Post office box -Determination of Band gap of a semiconductor.</li> <li>11. Photoelectric effect.</li> <li>12. Michelson Interferometer.</li> <li>13. Melde's string experiment.</li> <li>14. Experiment with lattice dynamics kit.</li> </ol>					
<b>TOTAL: 30 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course, the students will be able to					
CO1: Understand the functioning of various physics laboratory equipment.					
CO2: Use graphical models to analyze laboratory data.					
CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.					
CO4: Access, process and analyze scientific information.					
CO5: Solve problems individually and collaboratively.					

**Rubrics:****(i) CIA**

Description	Marks
Pre Lab Test	10
Observation	30
Post Lab Test	10
Record	25
Model exam	25
<b>Total</b>	<b>100</b>
<b>CIA = 6(x) / 10</b>	

\*x- Student CIA total marks

**(ii) ESE**

Description	Marks
Aim/Apparatus required	10
Formula	10
Figure/Circuit diagram/Model graph	10
Tabulations/Observation	30
Calculations	20
Result	10
Viva voce	10
<b>Total</b>	<b>100</b>
<b>ESE = 4(x) / 10</b>	

\*x- Student ESE total marks

**CO – PO – PSO MAPPING:**

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>1</b>	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
<b>2</b>	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
<b>3</b>	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
<b>4</b>	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
<b>5</b>	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-

**1 – low, 2 – medium, 3 – high, ‘-’ – no correlation**

<b>CHEMISTRY LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>(Any Seven Experiments)</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To inculcate experimental skills to test basic understanding of water quality parameters such as acidity, alkalinity, hardness, DO, chloride and copper.</li> <li>• To induce the students to familiarize with electroanalytical techniques such as pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.</li> <li>• To demonstrate the analysis of metals and alloys.</li> <li>• To demonstrate the synthesis of nano particles.</li> </ul>				
<b>LIST OF EXPERIMENTS:</b>				
<ol style="list-style-type: none"> <li>1. Preparation of Na<sub>2</sub>CO<sub>3</sub> as a primary standard and estimation of acidity of a water sample using the primary standard.</li> <li>2. Determination of total, temporary &amp; permanent hardness of water by EDTA method.</li> <li>3. Determination of DO content of water sample by Winkler's method.</li> <li>4. Determination of chloride content of water sample by Argentometric method.</li> <li>5. Estimation of copper content of the given solution by Iodometry.</li> <li>6. Determination of strength of given hydrochloric acid using pH meter.</li> <li>7. Determination of strength of acids in a mixture of acids using conductivity meter.</li> <li>8. Estimation of iron content of the given solution using potentiometer.</li> <li>9. Estimation of sodium /potassium present in water using flame photometer.</li> <li>10. Preparation of nanoparticles (TiO<sub>2</sub>/ZnO/CuO) by Sol-Gel method.</li> <li>11. Corrosion experiments – weight loss method.</li> <li>12. Proximate analysis of Coal.</li> </ol>				
<b>TOTAL: 30 PERIODS</b>				
<b>COURSE OUTCOMES:</b>				
At the end of the course, the students will be able to				
CO1: Analyze the quality of water samples with respect to their acidity, hardness and DO.				
CO2: Determine the amount of metal ions through volumetric and spectroscopic techniques.				
CO3: Analyze and determine the composition of coal and demonstrate the corrosion.				
CO4: Learn simple method of synthesis nanoparticles.				
CO5: Quantitatively analysis the impurities in solution by Electro analytical techniques.				

**Rubrics:****(i) CIA**

Description	Marks
Pre Lab Test	10
Observation	30
Post Lab Test	10
Record	25
Model exam	25
<b>Total</b>	<b>100</b>
<b>CIA = 6(x) / 10</b>	

\*x- Student CIA total marks

**(ii) ESE**

Description	Marks
Aim/Apparatus required	10
Formula	10
Figure/Circuit diagram/Model graph	10
Tabulations/Observation	30
Calculations	20
Result	10
Viva voce	10
<b>Total</b>	<b>100</b>
<b>ESE = 4(x) / 10</b>	

\*x- Student ESE total marks

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>1</b>	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
<b>2</b>	3	1	2	-	-	1	2	-	-	-	-	1	-	-	-
<b>3</b>	3	2	1	1	-	-	1	-	-	-	-	-	-	-	-
<b>4</b>	2	1	2	-	-	2	2	-	-	-	-	-	-	-	-
<b>5</b>	2	1	2	-	1	2	2	-	-	-	-	1	-	-	-

**1 – low, 2 – medium, 3 – high, ‘-‘ – no correlation**

24HS0102	ENGLISH LABORATORY I	L	T	P	C
		0	0	2	1
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To improve the communicative competence of learners.</li> <li>To help learners use language effectively in academic /work contexts.</li> <li>To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.</li> <li>To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.</li> <li>To use language efficiently in expressing their opinions via various media.</li> </ul>					
<b>UNIT I</b>	<b>INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION</b>	<b>6</b>			
Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions (filling out a bank application for example).					
<b>UNIT II</b>	<b>NARRATION AND SUMMATION</b>	<b>6</b>			
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / Events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings- engaging in small talk- describing requirements and abilities.					
<b>UNIT III</b>	<b>DESCRIPTION OF A PROCESS / PRODUCT</b>	<b>6</b>			
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities (large & small)-talking about precautions.					
<b>UNIT IV</b>	<b>CLASSIFICATION AND RECOMMENDATIONS</b>	<b>6</b>			
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.					
<b>UNIT V</b>	<b>EXPRESSION</b>	<b>6</b>			
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes.					
<b>TOTAL: 30 PERIODS</b>					

**COURSE OUTCOMES:**

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

CO1: Listen to and comprehend general as well as complex academic information.

CO2: Listen to and understand different points of view in a discussion.

CO3: Speak fluently and accurately in formal and informal communicative contexts.

CO4: Describe products and processes and explain their uses and purposes clearly and accurately.

CO5: Express their opinions effectively in both formal and informal discussions.

**ASSESSMENT PATTERN**

1. One online / app based assessment to test listening /speaking.
2. End Semester ONLY listening and speaking will be conducted online.
3. Proficiency certification is given on successful completion of listening and speaking internal test and end semester exam.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>1</b>	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
<b>2</b>	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
<b>3</b>	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
<b>4</b>	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
<b>5</b>	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-

**1 – low, 2 – medium, 3 – high, ‘-’ – no correlation**

## SEMESTER II

24HS0203	PROFESSIONAL ENGLISH II	L	T	P	C
		2	0	0	2
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To engage learners in meaningful language activities to improve their reading and writing skills.</li> <li>• To learn various reading strategies and apply in comprehending documents in professional context.</li> <li>• To help learners understand the purpose, audience, contexts of different types of writing.</li> <li>• To develop analytical thinking skills for problem solving in communicative contexts.</li> <li>• To demonstrate an understanding of job applications and interviews for internship and placements.</li> </ul>					
<b>UNIT I</b>	<b>MAKING COMPARISONS</b>	<b>6</b>			
Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases.					
<b>UNIT II</b>	<b>EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING</b>	<b>6</b>			
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.					
<b>UNIT III</b>	<b>PROBLEM SOLVING</b>	<b>6</b>			
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.					
<b>UNIT IV</b>	<b>REPORTING OF EVENTS AND RESEARCH</b>	<b>6</b>			
Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions.					
<b>UNIT V</b>	<b>THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY</b>	<b>6</b>			
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.					
<b>TOTAL: 30 PERIODS</b>					

**COURSE OUTCOMES:**

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

CO1: Compare and contrast products and ideas in technical texts.

CO2: Identify and report cause and effects in events, industrial processes through technical texts.

CO3: Analyze problems in order to arrive at feasible solutions and communicate them in the written format.

CO4: Present their ideas and opinions in a planned and logical manner.

CO5: Draft effective resumes in the context of job search.

**TEXT BOOKS:**

1. “English for Engineers & Technologists”, Orient Blackswan Private Ltd, Department of English, Anna University, 2020.
2. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN.Shoba, and Dr. Lourdes Jovani, “English for Science & Technology”, Department of English, Anna University, Cambridge University Press 2021.

**REFERENCE BOOKS:**

1. Raman. Meenakshi and Sharma Sangeeta, “Professional English”, Oxford university press, New Delhi, 2019.
2. V.N. Arora and Laxmi Chandra, “Improve Your Writing ed.,” Oxford Univ. Press, New Delhi, 2001.
3. Dr. V. Chellammal, “Learning to Communicate”, Allied Publishers, New Delhi, 2003.
4. Prof. R.C. Sharma & Krishna Mohan, “Business Correspondence and Report Writing”, Tata McGrawHill & Co. Ltd., New Delhi, 2001.
5. Krishna Mohan and Meera Bannerji, “Developing Communication Skills”, Macmillan India Ltd. Delhi, 1990.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
2	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
3	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
4	3	3	3	3	2	3	3	3	3	3	3	3	-	-	-
5	-	-	-	-	-	-	-	-	-	3	3	3	-	-	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

24MA0202	ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES	L	T	P	C
		3	1	0	4
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To acquaint the students with differential equations which are significantly used in engineering problems.</li> <li>To make the students to understand the vector calculus techniques.</li> <li>To develop the analytic solutions for partial differential equations used in engineering by Fourier series.</li> <li>To acquaint the student with Fourier, transform techniques used in wide variety of situations in which the functions used are not periodic.</li> <li>To develop Z-transform techniques in solving difference equations.</li> </ul>					
<b>UNIT I</b>	<b>ORDINARY DIFFERENTIAL EQUATIONS</b>	<b>9+3</b>			
Higher order linear differential equation with constant coefficient - Method of variation of parameters -Homogeneous equations of Euler–Cauchy and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.					
<b>UNIT II</b>	<b>VECTOR CALCULUS</b>	<b>9+3</b>			
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 theorem.					
<b>UNIT III</b>	<b>FOURIER SERIES</b>	<b>9+3</b>			
Dirichlet’s conditions–General Fourier series–Odd and even functions – Half-range Sine and Cosine series – Parseval’s identity – Computation of harmonics.					
<b>UNIT IV</b>	<b>FOURIER TRANSFORMS</b>	<b>9+3</b>			
Fourier integral theorem – Fourier transform pair - Fourier sine and cosine transforms – Properties – Transform of elementary functions – Inverse Fourier Transforms - Convolution theorem (without proof) – Parseval’s identity.					
<b>UNIT V</b>	<b>Z–TRANSFORM AND DIFFERENCE EQUATIONS</b>	<b>9+3</b>			
Z-transform – Properties of Z-transform – Initial and final value theorem - Inverse Z-transform – Evaluation of Inverse Z transform using partial fraction method and convolution theorem– Formation of difference equations–Solution of difference equations using Z - transform.					
<b>TOTAL: 60 PERIODS</b>					

**COURSE OUTCOMES:**

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

CO1: Solve higher order ordinary differential equations which arise in engineering applications.

CO2: Understand the concept of Vector calculus.

CO3: Apply Fourier series techniques in engineering applications.

CO4: Understand the Fourier transforms techniques in solving engineering problems.

CO5: Understand the Z-transforms techniques in solving difference equations.

**TEXT BOOKS:**

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 45th Edition, New Delhi, 2020.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Pvt Ltd., New Delhi, 2018.

**REFERENCE BOOKS:**

1. N. P. Bali and Manish Goyal, "A textbook of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
2. Greenberg M. D., "Advanced Engineering Mathematics", Pearson Education 2nd Edition, 5th Reprint, Delhi, 2009.
3. Jain R. K. and Iyengar S. R. K., "Advanced Engineering Mathematics", Narosa Publications, 5th Edition, New Delhi, 2017.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.
5. Ramana B. V. "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	3	1	2	-	-	2	1	1	3	-	-	-
2	3	3	2	3	1	2	-	-	2	1	1	3	-	-	-
3	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-
4	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-
5	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

24PH0202	ENGINEERING PHYSICS II	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To understand the fundamentals of elasticity, stress-strain relationships, and material deformation under various forces.</li> <li>To enable the students to gain knowledge in conductor and semiconductor physics.</li> <li>To impart knowledge on the magnetic properties of materials.</li> <li>To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications.</li> <li>To instill an understanding of the significance of nanostructures, quantum confinement, and their resulting applications in nanodevices.</li> </ul>					
<b>UNIT I</b>	<b>PROPERTIES OF MATTER</b>	<b>9</b>			
Elasticity- Hooke's law- Relationship between three moduli of elasticity (qualitative) - Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength. Torsional stress and deformations - twisting couple - bending of beams. Bending moment - cantilever: theory and experiment. Uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.					
<b>UNIT II</b>	<b>CONDUCTING AND SEMICONDUCTING MATERIALS</b>	<b>9</b>			
Classical free electron theory of metals – Expression for electrical conductivity-Thermal conductivity expression – Wiedemann-Franz law –Quantum free electron theory - Postulates-Fermi-Dirac Statistics –Density of energy states. Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors – Carrier concentration in N-type & P-type semiconductors.					
<b>UNIT III</b>	<b>MAGNETIC PROPERTIES OF MATERIALS</b>	<b>9</b>			
Origin of magnetic moment - magnetic permeability and susceptibility–Magnetic material classification: diamagnetism– paramagnetism–ferromagnetism–Domain theory - Hysteresis curve – Soft and Hard magnetic materials – antiferromagnetism – ferrimagnetism - Magnetic principle in computer data storage –Magnetic hard disc (GMR sensor).					
<b>UNIT IV</b>	<b>OPTICAL PROPERTIES OF MATERIALS</b>	<b>9</b>			
Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain. Optical processes in quantum wells – Optoelectronic devices: light detectors and solar cells – light emitting diode – optical processes in organic semiconductor devices – excitonic state – Electro-optics and nonlinear optics: Modulators and switching devices – plasmonics.					
<b>UNIT V</b>	<b>NANOELECTRONIC DEVICES</b>	<b>9</b>			
Introduction – quantum confinement – quantum structures: quantum wells, wires and dots – Tunneling – Single electron phenomena: Coulomb blockade – resonant-tunneling diode – single electron transistor –quantum states – classical bits – quantum bits or qubits – photo processes –					

spintronics – carbon nanotubes: Properties and applications.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

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

CO1: Analyze and apply elasticity concepts to real-world structural and material applications.

CO2: Acquire knowledge on basics of conductor and semiconductor physics and its applications in various devices.

CO3: Illustrate the optical properties and their applications to optical devices.

CO4: Get knowledge on magnetic properties of materials and their applications in data storage.

CO5: Understand and apply quantum concepts and nanostructures in modern electronic and material technologies.

**TEXT BOOKS:**

1. S. O Pillai, “Solid State Physics”, 10th edition, NEW AGE International Publishers, 2022.
2. Hilmi Unlu and Norman. “Progress in Nano scale and Low-Dimensional Materials and Devices”, Springer International Publishers.
3. Jasprit Singh, ”Semiconductor Devices: Basic Principles”, Wiley (Indian Edition), 2007.
4. Arumugam M, “Engineering Physics”, Anuradha Publishers, 2010.
5. Parag K. Lala, “Quantum Computing: A Beginner's Introduction”, McGraw-Hill Education (Indian Edition), 2020.

**REFERENCE BOOKS:**

1. Charles Kittel, “Introduction to Solid State Physics” Wiley India Edition, 2019.
2. Senthil Kumar G. “Engineering Physics” VRB Publications, 2023.
3. Mani P. “Engineering Physics” Dhanam Publications, 2023.

**CO – PO – PSO MAPPING:**

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	3	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	1	2	1	1	-	-	-	-	-	-	-	-	-
4	3	-	2	1	3	-	1	-	-	-	-	-	-	-	-	-
5	3	2	2	2	2	1	2	-	-	-	-	2	-	-	-	-

**1 – low, 2 – medium, 3 – high, ‘-’ – no correlation**

24GE0204	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		2	0	0	2
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To introduce the basic concepts of environment, ecosystems and their functions.</li> <li>To acquire the knowledge about biodiversity and emphasize on the biodiversity of India and its conservation.</li> <li>To gain the knowledge about the different types of waste, how to handle them and their environmental impact.</li> <li>To learn about the causes effects and control measures of various pollutions and know the individual role in it.</li> <li>To learn how environmental issues, such as pollution, climate change and global warming to relate sustainable development.</li> </ul>					
<b>UNIT I</b>	<b>ECOSYSTEMS</b>				<b>6</b>
Concept of an ecosystem (Abiotic and biotic environment) - structure and function of an ecosystem–Producers-Consumers and decomposers. Energy flow in the ecosystem, (Nutrient cycle in the ecosystem) - Ecological succession - Food Chain - food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystems, Forest ecosystem, Grass land ecosystem, Desert ecosystems aquatic ecosystems [ponds, streams, lakes, rivers, ocean estuaries].					
<b>UNIT II</b>	<b>BIODIVERSITY</b>				<b>6</b>
Introduction to biodiversity-genetic, species and ecosystem diversity- value of biodiversity - consumptive use- productive use –social, ethical, aesthetic and option values. India as a mega-diversity nation – hot-spots of biodiversity –threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.					
<b>UNIT III</b>	<b>WASTE MANAGEMENT</b>				<b>6</b>
Municipal solid waste management: Sources, characteristics, collection and transportation, waste processing and disposal (including reuse options, biological methods, energy recovery processes and land filling) Hazardous waste management: Characteristics, generation, fate of materials in the environment, treatment and disposal Management of biomedical waste, plastic waste and E-waste: Sources, generation and characteristics; Waste management practices including storage, collection and transfer					
<b>UNIT IV</b>	<b>ENVIRONMENTAL POLLUTION</b>				<b>6</b>
Definition a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution d) Noise pollution-Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in pollution control. Flood Case study					
<b>UNIT V</b>	<b>SOCIAL ISSUES AND THE ENVIRONMENT</b>				<b>6</b>
From unsustainable to sustainable development – urban problems related to energy water					

conservation, rain water harvesting, watershed management- resettlement and rehabilitation of people; its problem and concerns. Issues and possible solutions: Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

**TOTAL: 30 PERIODS**

**COURSE OUTCOMES:**

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

- CO1: Recognize and understand the functions of environment, ecosystems.
- CO2: Know the bio diversity and their values and conservation.
- CO3: Learn about proper waste disposal and minimize waste.
- CO4: Understand the causes, effects of pollution and how to control it.
- CO5: Understand the relationship between environment and society.

**TEXT BOOKS:**

1. Anubha Kaushik and C. P. Kaushiks “Perspectives in Environmental Studies”, 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2016.
3. John Pichtel, “Waste management practices”, 2nd edition, Dev publication.
4. Allen, D. T. and Shonnard, D. R., “Sustainability Engineering: Concepts, Design and Case Studies”, Prentice Hall.
5. Bradley. A.S, Adebayo, A.O, and Maria, P. “Engineering applications in sustainable design and development”, Cengage learning.
6. Dr. Ashutosh Tripathi, “Environment and social issues”, publication in 2019.
7. Mackenthun, K. M., “Basic Concepts in Environmental Management”, Lewis Publication, London, 1998.

**REFERENCE BOOKS:**

1. R. K. Trivedi, “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media. edition, 2010.
2. Cunningham,W. P. Cooper and T.H.Gorhani, Environmental Encyclopedia’, Jaico Publ., House, Mumbai, 2001.
3. Yung Tse Hung, Lawrence K wang and Nazih K shammass, “Handbook of Environment and waste management”, volume 2.
4. Rajagopalan, R, “Environmental Studies From Crisisto Cure”, Oxford University Press, Third Edition, 2015.
5. Erach Bharucha, “Textbook of Environmental Studies for Undergraduate Courses”, Orient Blackswan Pvt.Ltd. 2013.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
2	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
3	3	2	-	-	-	3	3	-	-	-	-	2	-	-	-
4	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
5	3	2	1	-	-	2	2	-	-	-	-	1	-	-	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

24GE0205	ENGINEERING GRAPHICS	L	T	P	C
		2	0	4	4
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To draw engineering curves.</li> <li>• To draw freehand sketch of simple objects.</li> <li>• To draw orthographic projection of solids and section of solids.</li> <li>• To draw development of solids.</li> <li>• To draw isometric and perspective projections of simple solids.</li> </ul>					
<b>UNIT I</b>	<b>PLANE CURVES AND FREEHAND SKETCHING</b>	<b>6+12</b>			
Basic Geometrical constructions, Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves - ortho graphic projection - principles - principle planes-first angle projection-projection of points.					
<b>UNIT II</b>	<b>PROJECTION OF POINTS, LINES AND PLANE SURFACE</b>	<b>6+12</b>			
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 and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.					
<b>UNIT III</b>	<b>PROJECTION OF SOLIDS</b>	<b>6+12</b>			
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids 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.					
<b>UNIT IV</b>	<b>PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES</b>	<b>6+12</b>			
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the 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.					
<b>UNIT V</b>	<b>ISOMETRIC AND PERSPECTIVE PROJECTIONS</b>	<b>6+12</b>			
Principles of isometric projection - isometric scale - isometric projections of simple solids and truncated 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.					
<b>TOTAL: 90 PERIODS</b>					

**COURSE OUTCOMES:**

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

- CO1: Use BIS conventions and specifications for engineering drawing.
- CO2: Construct the conic curves, involutes and cycloid.
- CO3: Solve practical problems involving projection of lines.
- CO4: Draw the orthographic, isometric and perspective projections of simple solids.
- CO5: Draw the development of simple solids.

**TEXT BOOKS:**

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015.

**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.
5. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson Education India, 2nd Edition, 2009.
6. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
2	3	1	2	-	2	-	-	-	-	3	-	2	2	2	--
3	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
4	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
5	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

24GE0206	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To introduce the basics of electric circuits and analysis.</li> <li>To impart knowledge in the basics of working principles and application of electrical machines.</li> <li>To introduce semiconductor diodes characteristics.</li> <li>To educate on the fundamental concepts of transistors.</li> <li>To introduce the basics of power system.</li> </ul>					
<b>UNIT I</b>	<b>INTRODUCTION TO DC &amp; AC CIRCUITS</b>	<b>9</b>			
DC Circuits: Electrical Parameters – Ohm’s Law - Kirchhoff’s Laws –Independent and Dependent Sources –Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power.					
<b>UNIT II</b>	<b>BASIC CONCEPTS OF ELECTRICAL MACHINES</b>	<b>9</b>			
Faraday’s Law - working principle and applications of Transformer – DC motor – types and applications – AC motor, types & applications.					
<b>UNIT III</b>	<b>SEMICONDUCTOR DIODES</b>	<b>9</b>			
Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode –application of diode – half wave and full wave rectifier - Zener diode and its characteristics – applications.					
<b>UNIT IV</b>	<b>TRANSISTORS</b>	<b>9</b>			
Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – working of FET & UJT.					
<b>UNIT V</b>	<b>BASICS OF POWER SYSTEM</b>	<b>9</b>			
Power system structure – Generation, Transmission and Distribution - earthing – methods of earthing, protective devices – switch fuse unit – Miniature circuit breaker – types, safety precaution and First Aid.					
<b>TOTAL: 45 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course, the students will be able to					
CO1: Compute the electric circuit parameters for simple problems.					
CO2: Explain the working principle and applications of electrical machines.					
CO3: Analyze the characteristics of semiconductors.					
CO4: Explain the basic concepts of transistors.					
CO5: Explain the basic power system structure and protection schemes.					

**TEXT BOOKS:**

1. Kothari DP and I. J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020.
2. S. Salaivahanan, “Digital Electronics”, McGraw Hill Education (India) Private Limited, 18<sup>th</sup> Sept 2018.
3. Sedha R. S., “A textbook book of Applied Electronics”, S. Chand & Co., 2008.
4. V K Mehta and Rohit Mehta, “Principles of Electrical Machines”, S Chand and Company limited, second edition, 2019.

**REFERENCE BOOKS:**

1. Kothari DP and I.J Nagrath, “Basic Electrical Engineering”, Fourth Edition, McGraw Hill Education, 2019.
2. Thomas L. Floyd, “Digital Fundamentals”, 11th Edition, Pearson Education, 2017.
3. Albert Malvino, David Bates, “Electronic Principles”, McGraw Hill Education; 7th edition, 2017.
4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum‘Outline Series, McGraw Hill, 2002.
5. H.S. Kalsi, “Electronic Instrumentation”, Tata McGraw-Hill, New Delhi, 2010.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
2	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
3	2	1	1	-	-	-	-	1	-	-	-	2	-	-	1
4	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
5	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

24GE0207	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1
அலகு 1	நெசவு மற்றும் பானைத் தொழில்நுட்பம்				3
சங்க காலத்தில் நெசவுத் தொழில் பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.					
அலகு 2	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்				3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் மாமல்லபுரம் சிற்பங்களும், கோவில்களும் சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் நாயக்கர் காலக் கோயில்கள் மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள். பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ- சாரோசெனிக் கட்டிடக் கலை.					
அலகு 3	உற்பத்தித் தொழில் நுட்பம்				3
கப்பல் கட்டும் கலை உலோகவியல் -இரும்புத் தொழிற்சாலை இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் எலும்புத்துண்டுகள் தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.					
அலகு 4	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்				3
அணை, ஏரி, குளங்கள், மதகு சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் கால்நடை பராமரிப்பு கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு- மீன்வளம் முத்து மற்றும் முத்துக்குளித்தல் பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.					
அலகு 5	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்				3
அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் -தமிழ் மின் நூலகம் இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.					
<b>TOTAL: 15 PERIODS</b>					

**TEXT CUM REFERENCE BOOKS:**

1. தமிழக வரலாறு மக்களும் பண்பாடும். கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணிணித் தமிழ் முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. 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).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

24GE0207	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1
<b>UNIT I</b>	<b>WEAVING AND CERAMIC TECHNOLOGY</b>				<b>3</b>
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.					
<b>UNIT II</b>	<b>DESIGN AND CONSTRUCTION TECHNOLOGY</b>				<b>3</b>
Designing and Structural construction House; Designs in household materials during Sang am 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.					
<b>UNIT III</b>	<b>MANUFACTURING TECHNOLOGY</b>				<b>3</b>
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins 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.					
<b>UNIT IV</b>	<b>AGRICULTURE AND IRRIGATION TECHNOLOGY</b>				<b>3</b>
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu 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.					
<b>UNIT V</b>	<b>SCIENTIFIC TAMIL &amp; TAMIL COMPUTING</b>				<b>3</b>
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.					
<b>TOTAL: 15 PERIODS</b>					
<b>TEXT CUM REFERENCE BOOKS:</b>					
<ol style="list-style-type: none"> <li>1. தமிழக வரலாறு மக்களும் பண்பாடும். கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).</li> <li>2. கணிணித் தமிழ் முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).</li> <li>3. கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).</li> <li>4. பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).</li> <li>5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB &amp; ESC and RMRL – (in print).</li> <li>6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).</li> </ol>					

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. 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).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

24GE0208	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY												L	T	P	C
													0	0	4	2
<b>OBJECTIVES:</b>																
<ul style="list-style-type: none"> <li>To train the students in conducting load tests on electrical machines.</li> <li>To gain practical experience in experimentally obtaining the characteristics of electronics devices and rectifiers.</li> </ul>																
<b>LIST OF EXPERIMENTS:</b>																
<ol style="list-style-type: none"> <li>Verification of ohms and Kirchhoff's Laws.</li> <li>Study of starter.</li> <li>Speed control on DC Shunt Motor.</li> <li>Load test on DC Series Motor.</li> <li>Load test on Single Phase Transformer.</li> <li>Load Test on Single Phase Induction Motor.</li> <li>Characteristics of PN Diodes.</li> <li>Characteristics of BJT.</li> <li>Characteristics of Zener Diodes.</li> <li>Half wave and Full Wave rectifiers.</li> </ol>																
<b>TOTAL: 60 PERIODS</b>																
<b>COURSE OUTCOMES:</b>																
At the end of the course, the students will be able to																
CO1: Construct the circuit with appropriate connections for the given DC machine/transformer.																
CO2: Acquire hands on experience of conducting various tests on induction motors and obtaining their performance indices using standard analytical as well as graphical methods.																
CO3: Analyse the characteristics of PN diodes and BJT experimentally.																
CO4: Analyse the characteristics of half-wave and full-wave rectifier with and without filters experimentally.																
CO5: Understand DC motor starters.																
<b>CO – PO – PSO MAPPING:</b>																
CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	3	3	2	1	1	-	-	2	2	-	-	-	-	-	1	
2	3	3	2	1	1	-	-	2	2	-	-	-	-	-	1	
3	3	3	2	1	1	-	-	2	2	-	-	-	-	-	1	
4	3	3	2	1	1	-	-	2	2	-	-	-	-	-	1	
5	3	3	2	1	1	-	-	2	2	-	-	-	-	-	1	
<b>1 – low, 2 – medium, 3 – high, ‘-’ – no correlation</b>																

24GE0209	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2
<b>OBJECTIVES:</b>					
The main learning objective of this course is to provide hands on training to the students in:					
<ul style="list-style-type: none"> <li>• Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.</li> <li>• Wiring various electrical joints in common household electrical wire work.</li> <li>• Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.</li> <li>• Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.</li> </ul>					
<b>GROUP – A (CIVIL &amp; ELECTRICAL)</b>					
<b>PART I</b>	<b>CIVIL ENGINEERING PRACTICES</b>	<b>15</b>			
<b>PLUMBING WORK:</b>					
<ul style="list-style-type: none"> <li>a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.</li> <li>b) Preparing plumbing line sketches.</li> <li>c) Laying pipe connection to the suction side of a pump</li> <li>d) Laying pipe connection to the delivery side of a pump.</li> <li>e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.</li> </ul>					
<b>WOOD WORK:</b>					
<ul style="list-style-type: none"> <li>a) Sawing</li> <li>b) Planning</li> <li>c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.</li> </ul>					
<b>WOOD WORK STUDY:</b>					
<ul style="list-style-type: none"> <li>a) Studying joints in door panels and wooden furniture.</li> <li>b) Studying common industrial trusses using models.</li> </ul>					
<b>PART II</b>	<b>ELECTRICAL ENGINEERING PRACTICES</b>	<b>15</b>			
<ul style="list-style-type: none"> <li>a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket.</li> <li>b) Staircase wiring.</li> <li>c) Fluorescent Lamp wiring with introduction to CFL and LED types.</li> <li>d) Energy meter wiring and related calculations/ calibration.</li> <li>e) Study of Iron Box wiring and assembly.</li> <li>f) Study of Fan Regulator. (Resistor type and Electronic type using Diac/Triac/quadrac)</li> </ul>					

g) Study of emergency lamp wiring/Water heater.		
<b>GROUP – B (MECHANICAL AND ELECTRONICS)</b>		
<b>PART III</b>	<b>MECHANICAL ENGINEERING PRACTICES</b>	<b>15</b>
<p><b>WELDING WORK:</b></p> <p>a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. b) Practicing gas welding.</p> <p><b>BASIC MACHINING WORK:</b></p> <p>a) (simple)Turning. b) (simple)Drilling. c) (simple)Tapping.</p> <p><b>ASSEMBLY WORK:</b></p> <p>a) Assembling a centrifugal pump. b) Assembling a household mixer. c) Assembling an air conditioner.</p> <p><b>SHEET METAL WORK:</b></p> <p>a) Making of a square tray</p> <p><b>FOUNDRY WORK:</b></p> <p>a) Demonstrating basic foundry operations</p>		
<b>PART IV</b>	<b>ELECTRONIC ENGINEERING PRACTICES</b>	<b>15</b>
<p><b>SOLDERING WORK:</b></p> <p>a) Soldering simple electronic circuits and checking continuity.</p> <p><b>ELECTRONIC ASSEMBLY AND TESTING WORK:</b></p> <p>a) Assembling and testing electronic components on a small PCB</p> <p><b>ELECTRONIC EQUIPMENT STUDY:</b></p> <p>a) Study an elements of smart phone. b) Assembly and dismantle of LED TV. c) Assembly and dismantle of computer/ laptop.</p>		
<b>TOTAL: 60 PERIODS</b>		

**COURSE OUTCOMES:**

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

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 wood work.

CO2: Wire various electrical joints in common household electrical wire work.

CO3: Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipment's; Make a tray out of metal sheet using sheet metal work.

CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

CO5: Apply safety protocols and use personal protective equipment (PPE) effectively in all engineering practices.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
2	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
3	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
4	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
5	3	-	-	-	1	2	2	3	-	-	-	2	2	1	1

**1 – low, 2 – medium, 3 – high, ‘-’ – no correlation**

24HS0204	ENGLISH LABORATORY II	L	T	P	C
		0	0	2	1
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.</li> <li>To analyses concepts and problems and make effective presentations explaining them clearly and precisely.</li> <li>To be able to communicate effectively through formal and informal writing.</li> <li>To be able to use appropriate language structures to write emails, reports and essays.</li> <li>To give instructions and recommendations that are clear and relevant to the context.</li> </ul>					
<b>UNIT I</b>					<b>6</b>
Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition discussing progress toward goals-talking about experiences- talking about events in life- discussing past events-Writing: writing emails ( formal & semi-formal).					
<b>UNIT II</b>					<b>6</b>
Speaking: discussing news stories-talking about frequency-talking about travel problems-discussing travel procedures- talking about travel problems- making arrangements-describing arrangements discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.					
<b>UNIT III</b>					<b>6</b>
Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios- talking about purchasing-discussing advantages and disadvantages- making comparisons- discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios Writing: short essays and reports-formal/semi-formal letters.					
<b>UNIT IV</b>					<b>6</b>
Speaking: discussing the natural environment-describing systems-describing position and movement- explaining rules-(example- discussing rental arrangements) - understanding technical instructions-Writing: writing instructions-writing a short article.					
<b>UNIT V</b>					<b>6</b>
Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions- Writing: job application (Cover letter + Curriculum vitae)-writing recommendations.					
<b>TOTAL: 30 PERIODS</b>					

**COURSE OUTCOMES:**

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

CO1: Speak effectively in group discussions held in a formal/semi-formal contexts.

CO2: Discuss, analyses and present concepts and problems from various perspectives to arrive at suitable solutions.

CO3: Write emails, letters and effective job applications.

CO4: Write critical reports to convey data and information with clarity and precision.

CO5: Give appropriate instructions and recommendations for safe execution of tasks.

**REFERENCE BOOKS:**

1. Butterfield Jeff, "Soft Skills for Everyone", Cengage Learning: New Delhi, 2015.
2. "Interact English Lab Manual for Undergraduate Students", Orient Blackswan: Hyderabad, 2016.
3. E. Suresh Kumar et al., "Communication for Professional Success", Orient Blackswan: Hyderabad, 2015.
4. Raman, Meenakshi and Sangeeta Sharma, "Professional Communication", Oxford University Press: Oxford, 2014,
5. S. Hariharan et al., "Soft Skills", MJP Publishers: Chennai, 2010.

**CO – PO – PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3	3	3	1	3	3	3	3	3	3	3	-	-	-
2	2	3	3	3	1	3	3	3	3	3	3	3	-	-	-
3	2	2	3	3	1	3	3	3	3	3	3	3	-	-	-
4	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
5	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-

1 – low, 2 – medium, 3 – high, ‘-’ – no correlation

### SEMESTER III

24MA0303	NUMERICAL METHODS	L	T	P	C
		3	1	0	4
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To introduce the basic concepts of solving algebraic and transcendental equations.</li> <li>• To introduce the numerical techniques of interpolation in various intervals in real life situations.</li> <li>• To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.</li> <li>• To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.</li> <li>• To understand the knowledge of various techniques and methods of solving various types of partial differential equations.</li> </ul>					
<b>UNIT I</b>	<b>SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS</b>				<b>12</b>
Solution of algebraic and transcendental equations - Newton Raphson Method - Solution of linear system of equations - Gauss elimination method - Gauss Jordan method- Iterative methods of Gauss Jacobi and Gauss Seidel - Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.					
<b>UNIT II</b>	<b>INTERPOLATION AND APPROXIMATION</b>				<b>12</b>
Interpolation with unequal intervals - Lagrange's interpolation - Newton's divided difference interpolation - Interpolation with equal intervals - Newton's forward and backward difference formulae.					
<b>UNIT III</b>	<b>NUMERICAL DIFFERENTIATION AND INTEGRATION</b>				<b>12</b>
Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule - Romberg's Method Evaluation of double integrals by Trapezoidal and Simpson's 1/3rules.					
<b>UNIT IV</b>	<b>INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS</b>				<b>12</b>
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.					
<b>UNIT V</b>	<b>BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL</b>				<b>12</b>
Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain - One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods.					
<b>TOTAL : 60 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course the students will be able to					
CO1: Understand the basic concepts and techniques of solving algebraic and transcendental equations.					

- CO2: Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- CO3: Apply the numerical techniques of differentiation and integration for engineering problems.
- CO4: Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- CO5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

**TEXT BOOKS:**

1. Burden R. L and Faires J. D, "Numerical Analysis", 9<sup>th</sup> Edition, Cengage Learning, 2016.
2. Grewal B. S., and Grewal J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10<sup>th</sup> Edition, New Delhi, 2015.

**REFERENCE BOOKS:**

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis, Pearson Education", Asia, New Delhi, 2007.
2. Gerald C. F. and Wheatley P. O, "Applied Numerical Analysis, Pearson Education", Asia, 6<sup>th</sup> Edition, New Delhi, 2006.
3. Mathews J. H, "Numerical Methods for Mathematics, Science and Engineering", 2<sup>nd</sup> Edition, Prentice Hall, 1992.
4. Sankara Rao. K, "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3<sup>rd</sup> Edition, New Delhi, 2007.
5. Sastry. S. S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5<sup>th</sup> Edition, 2015.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
2	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
3	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
4	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
5	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

24ME2301	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To learn the use scalar and vector analytical techniques for analyzing forces in statically.</li> <li>To introduce the equilibrium of rigid bodies, vector methods and free body diagram.</li> <li>To study and understand the distributed forces, surface, loading on beam and intensity.</li> <li>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.</li> <li>To develop basic dynamics concepts - force, momentum, work and energy.</li> </ul>					
<b>UNIT I</b>	<b>STATICS OF PARTICLES</b>	<b>9</b>			
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.					
<b>UNIT II</b>	<b>EQUILIBRIUM OF RIGID BODIES</b>	<b>9</b>			
Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force - Couple system - Reactions at Supports and Connections.					
<b>UNIT III</b>	<b>DISTRIBUTED FORCES</b>	<b>9</b>			
Centroids of lines and areas - Symmetrical and Unsymmetrical shapes. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area, Polar Moment of Inertia, Parallel Axis Theorem, Moments of Inertia of Composite Areas.					
<b>UNIT IV</b>	<b>FRICITION</b>	<b>9</b>			
The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.					
<b>UNIT V</b>	<b>DYNAMICS OF PARTICLES</b>	<b>9</b>			
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.					
<b>TOTAL: 45 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course the students will be able to					
CO1: Illustrate the vector and scalar representation of forces and moments.					
CO2: Analyze the rigid body in equilibrium.					
CO3: Evaluate the properties of distributed forces.					
CO4: Determine the friction and the effects by the laws of friction.					
CO5: Calculate dynamic forces exerted in rigid body.					
<b>TEXT BOOKS:</b>					
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., 12thEdition, 2019.					

2.Vela Murali, “Engineering Mechanics-Statics and Dynamics”, Oxford University Press, 2018.

**REFERENCE BOOKS:**

1. Boreasi P and Schmidt J, Engineering Mechanics: “Statics and Dynamics, Cengage learning”, 2008.
2. Hibbeler, R. C., “Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics”, 13<sup>th</sup> edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering “Mechanics - Statics and Dynamics”, 4<sup>th</sup> Edition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, “Engineering Mechanics: Statics and Engineering Mechanics: Dynamics”, 7<sup>th</sup> edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, “Engineering Mechanics”, 5<sup>th</sup> Edition, McGraw Hill Higher Education, 2013.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	1	2	-	-	-	-	-	-	2	3	3
2	2	3	2	2	1	2	-	-	-	-	-	-	2	3	3
3	3	3	2	3	1	2	-	-	-	-	-	-	2	3	3
4	3	3	2	3	1	2	-	-	-	-	-	-	2	3	3
5	2	3	2	3	1	2	-	-	-	-	-	-	2	3	3

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

24ME2302	ENGINEERING MATERIALS AND METALLURGY	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To learn the constructing the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.</li> <li>To learn selecting and applying various heat treatment processes and its microstructure.</li> <li>To illustrate the different types of ferrous and non-ferrous alloys and their uses in engineering field.</li> <li>To illustrate the different polymer, ceramics and composites and their uses in engineering field.</li> <li>To learn the various testing procedures and failure mechanism in engineering field.</li> </ul>					
<b>UNIT I</b>	<b>CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS</b>				<b>9</b>
Constitution of alloys - Solid solutions, substitutional and interstitial - phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron - Iron carbide equilibrium diagram. Classification of steel and cast-Iron microstructure, properties and application.					
<b>UNIT II</b>	<b>HEAT TREATMENT</b>				<b>9</b>
Definition - Full annealing, stress relief, recrystallisation and spheroidising -normalizing, hardening and tempering of steel. Isothermal transformation diagrams - cooling curves superimposed on I.T. diagram- continuous-CCT diagram - Austempering, Martempering - Hardenability, Jominy end quench test -case hardening, carburizing, Nitriding, cyaniding, carbonitriding - Flame and Induction hardening - Vacuum and Plasma hardening.					
<b>UNIT III</b>	<b>FERROUS AND NON-FERROUS METALS</b>				<b>9</b>
Effect of alloying additions on steel (Mn, Si, Cr, Mo, Ni, V,Ti& W) – stainless and tool steels – HSLA - Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and its alloys – Brass, Bronze and Cupronickel – Aluminium and its alloys; Al-Cu – precipitation strengthening treatment – Titanium alloys, Mg-alloys, Ni-based super alloys – shape memory alloys- Properties and Applications.					
<b>UNIT IV</b>	<b>NON-METALLIC MATERIALS</b>				<b>9</b>
Polymers - types of polymers, commodity and engineering polymers - Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PAI, PPO, PPS, PEEK, PTFE, Thermoset polymers -Nylon, Engineering Ceramics - Properties and applications of Al <sub>2</sub> O <sub>3</sub> , SiC, Si <sub>3</sub> N <sub>4</sub> , PSZ and SIALON - intermetallics- Composites- Matrix and reinforcement Materials- applications of Composites - Nano composites.					
<b>UNIT V</b>	<b>MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS</b>				<b>9</b>
Mechanisms of plastic deformation, slip and twinning - Types of fracture - fracture mechanics- Griffith's theory- Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Micro and nano-hardness tests, Impact test izod and charpy, fatigue and creep failure mechanisms.					
<b>TOTAL : 45 PERIODS</b>					

**COURSE OUTCOMES:**

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

CO1: Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.

CO2: Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.

CO3: Clarify the effect of alloying elements on ferrous and non-ferrous metals.

CO4: Summarize the properties and applications of non-metallic materials.

CO5: Explain the testing of mechanical properties.

**TEXT BOOKS:**

1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials" Prentice Hall of India Private Limited, 9th edition, 2018.
2. Sydney H. Avner, "Introduction to Physical Metallurgy", McGraw Hill Book Company, 1994.

**REFERENCE BOOKS :**

1. Alavudeen, N. Venkateshwaran, and J. T. Winowlin Jappes, "A Textbook of Engineering Materials and Metallurgy", Laxmi Publications, 2006.
2. Amandeep Singh Wadhwa, and Harvinder Singh Dhaliwal, "A Textbook of Engineering Material and Metallurgy", University Sciences Press, 2008.
3. G.S. Upadhyay and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt.Ltd, New Delhi, 2020.
4. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd. 6th edition, 2019.
5. Williams D Callister, "Material Science and Engineering" Wiley India Pvt. Ltd, 2nd edition Re print 2019.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	3	2	-	-	-	-	-	-	-	2	2	1	3
2	3	1	3	1	-	2	-	1	-	-	-	2	2	1	3
3	3	1	3	-	-	-	-	-	-	-	-	2	2	1	3
4	3	1	3	-	-	-	2	-	-	-	-	2	2	1	3
5	3	1	3	2	2	-	-	-	-	-	-	2	2	1	3

1 - low, 2 - medium, 3 - high, '-' - no correlation

24ME2303	MANUFACTURING PROCESSES	L	T	P	C	
		3	0	0	3	
<b>OBJECTIVES:</b>						
<ul style="list-style-type: none"> <li>To illustrate the working principles of various metal casting processes.</li> <li>To learn and apply the working principles of various metal joining processes.</li> <li>To analyze the working principles of bulk deformation of metals.</li> <li>To learn the working principles of sheet metal forming process.</li> <li>To study and practice the working principles of plastics molding. Testing procedures and failure mechanism in engineering field.</li> </ul>						
<b>UNIT I</b>	<b>METAL CASTING PROCESSES</b>					<b>9</b>
Sand Casting - Sand Mould - Type of patterns - Pattern Materials - Molding sand Properties and testing - Cores - Molding machines - Types and applications- Melting furnaces - Principle of special casting processes- Shell, investment - Ceramic mould - Pressure die casting - low pressure, gravity- Tilt pouring, high pressure die casting- Centrifugal Casting - CO2 casting -- Defects in Sand casting process-remedies.						
<b>UNIT II</b>	<b>METAL JOINING PROCESSES</b>					<b>9</b>
Fusion welding processes - Oxy fuel welding - Filler and Flux materials--Arc welding, Electrodes, Coating and specifications - Gas Tungsten arc welding -Gas metal arc welding - Submerged arc welding - Electro slag welding- Plasma arc welding -- Resistance welding Processes -Electron beam welding -Laser beam Welding Friction welding - Friction stir welding - Diffusion welding - Thermit Welding, Weld defects - inspection &remedies - Brazing - soldering - Adhesive bonding.						
<b>UNIT III</b>	<b>BULK DEFORMATION PROCESSES</b>					<b>9</b>
Hot working and cold working of metals - Forging processes - Open, impression and closed die forging - cold forging- Characteristics of the processes - Typical forging operations - rolling of metals - Types of Rolling - Flat strip rolling - shape rolling operations - Defects in rolled parts - Principle of rod and wire drawing - Tube drawing - Principles of Extrusion - Types - Hot and Cold extrusion. Introduction to shaping operations.						
<b>UNIT IV</b>	<b>SHEET METAL PROCESSES</b>					<b>9</b>
Sheet metal characteristics - Typical shearing, bending and drawing operations - Stretch forming operations Formability of sheet metal - Test methods -special forming processes - Working principle and applications Hydro forming - Rubber pad forming - Metal spinning - Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming - Micro forming - Incremental forming.						
<b>UNIT V</b>	<b>MANUFACTURE OF PLASTIC COMPONENTS</b>					<b>9</b>
Types and characteristics of plastics - Molding of thermoplastics & Thermosetting polymers- working principles and typical applications - injection molding - Plunger and screw machines - Compression molding, Transfer Molding - Typical industrial applications - introduction to blow molding - Rotational molding - Film blowing - Extrusion - Thermoforming - Bonding of Thermoplastics- duff moulding.						
<b>TOTAL : 45 PERIODS</b>						

**COURSE OUTCOMES:**

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

CO1: Explain the principle of different metal casting processes.

CO2: Describe the various metal joining processes.

CO3: Illustrate the different bulk deformation processes.

CO4: Apply the various sheet metal forming process.

CO5: Apply suitable molding technique for manufacturing of plastics components.

**TEXT BOOKS:**

1. Kalpakjian.S, “Manufacturing Engineering and Technology”, Pearson Education India, 8th Edition, 2022.
2. P. N. Rao “Manufacturing Technology Volume 1” Mc Graw hill Education 5th edition, 2018.

**REFERENCE BOOKS:**

1. Roy. A. Lindberg, “Processes and materials of manufacture”, PHI / Pearson education, 2006.
2. S. Gowri P. Hariharan, A.Suresh Babu, “Manufacturing Technology I”, Pearson Education, 2008.
3. Paul Degarma E, Black J.T and Ronald A. Kosher, Eight Edition, “Materials and Processes, in Manufacturing”, Eight Edition, Prentice - Hall of India, 1997.
4. Hajra Chouldhary S.K and Hajra Choudhury. A. K, “Elements of workshop Technology, volume I and II”, Media promoters and Publishers Private Limited, Mumbai, 1997.
5. Sharma, P.C.,” A TEXT BOOKS of production Technology”, S. Chand and Co. Ltd., 2004.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	-	2	-	-	2	3	1	1	-	-	1	3	3
2	2	3	-	2	-	-	2	3	1	1	-	-	1	3	3
3	3	3	-	2	-	-	2	2	1	1	-	-	1	3	3
4	3	3	-	2	-	-	2	2	1	1	-	-	1	3	3
5	2	3	-	2	-	2	2	2	1	1	-	-	1	3	3

1 - low, 2 - medium, 3 - high, '-' - no correlation

24ME2304	STRENGTH OF MATERIALS	L	T	P	C
		3	0	2	4
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To understand the concepts of stress, strain, principal stresses and principal planes.</li> <li>To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.</li> <li>To determine stresses and deformation in circular shafts and helical spring due to torsion.</li> <li>To compute slopes and deflections in determinate beams by various methods.</li> <li>To study the stresses and deformations induced in thin and thick shells.</li> </ul>					
<b>UNIT I</b>	<b>STRESS, STRAIN AND DEFORMATION OF SOLIDS</b>				<b>9</b>
Rigid bodies and deformable solids - Tension, Compression and Shear Stresses - Deformation of simple and compound bars - Thermal stresses - Elastic constants - Volumetric strains - Stresses on inclined planes - Principal stresses and principal planes - Mohr's circle of stress.					
<b>UNIT II</b>	<b>TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM</b>				<b>9</b>
Beams - Types - Transverse loading on beams - Shear force and Bending moment in beams - Cantilever, simply supported and over hanging beams. Theory of simple bending - Bending stress distribution - Load carrying capacity - Proportioning of sections - Flitched beams - Shear stress distribution.					
<b>UNIT III</b>	<b>TORSION</b>				<b>9</b>
Theory of Torsion - Stresses and Deformations in Solid and Hollow Circular Shafts - Combined bending moment and torsion of shafts - Power transmitted to shaft - Shaft in series and parallel - Closed and Open Coiled helical springs - springs in series and parallel.					
<b>UNIT IV</b>	<b>DEFLECTION OF BEAMS</b>				<b>9</b>
Elastic curve - Governing differential equation - Double integration method - Macaulay's method - Area moment method - Conjugate beam method for computation of slope and deflection of determinant beams.					
<b>UNIT V</b>	<b>THIN CYLINDERS, SPHERES AND THICK CYLINDERS</b>				<b>9</b>
Stresses in thin cylindrical shell due to internal pressure - circumferential and longitudinal stresses - Deformation in thin cylinders - Spherical shells subjected to internal pressure - Deformation in spherical shells - Thick cylinders - Lamé's theory.					
<b>THEORY : 45 PERIODS</b>					
<b>PRACTICAL EXERCISES : 30 PERIODS</b>					
<b>LIST OF EXPERIMENTS</b>					
<ol style="list-style-type: none"> <li>Tension test on a mild steel rod.</li> <li>Double shear test on Mild steel and Aluminium rods.</li> <li>Torsion test on mild steel rod.</li> <li>Impact test on metal specimen.</li> <li>Hardness test on metals - Brinnell and Rockwell Hardness Number.</li> <li>Deflection test on beams.</li> <li>Compression test on helical springs.</li> <li>Strain Measurement using Rosette strain gauge.</li> <li>Effect of hardening- Improvement in hardness and impact resistance of steels.</li> </ol>					

10. Tempering- Improvement Mechanical properties Comparison.

- (i) Unhardened specimen.
- (ii) Quenched Specimen
- (iii) Quenched and tempered specimen.

11. Microscopic Examination of

- (i) Hardened samples
- (ii) Hardened and tempered sample.

**TOTAL: 75 PERIODS**

**COURSE OUTCOMES:**

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

- CO1: Understand the concepts of stress and strain in simple and compound bars, the important of principal stresses and principal planes.
- CO2: Understand the load transferring mechanism in beams and stress distribution due shearing force and bending moment.
- CO3: Apply basic equation of torsion in designing of shafts and helical springs.
- CO4: Calculate slope and deflection in beams using different methods.
- CO5: Analyze thin and thick shells for applied pressures.

**TEXT BOOKS:**

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S. Chand & company Ltd., New Delhi, 7th edition, 2018.
2. Rattan S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2017.

**REFERENCE BOOKS:**

1. Singh. D.K., "Strength of Materials", Ane Books Pvt Ltd., New Delhi, 2021.
2. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
3. Beer. F.P. & Johnston. E.R. "Mechanics of Materials", Tata McGraw Hill, 8th Edition, New Delhi 2019.
4. Vazirani. V.N, Ratwani. M.M, Duggal. S.K "Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1", Khanna Publishers, New Delhi 2014.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	2	3	1	3	2	3	1	3	3	3
2	2	3	3	3	3	2	3	1	3	2	3	1	3	3	3
3	3	3	3	3	3	2	3	1	3	2	3	1	3	3	3
4	3	3	3	3	3	2	3	1	3	2	3	1	3	3	3
5	2	3	3	3	3	2	3	1	3	2	3	1	3	3	3

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

24ME2305	COMPUTER AIDED MACHINE DRAWING LABORATORY	L	T	P	C
		0	0	4	2
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To acquaint the skills and practical experience in handling 2D drafting and 3D modelling software systems, standard drawing practices using fits and tolerances.</li> <li>To prepare assembly drawings both manually and using standard CAD packages.</li> <li>To Preparing standard drawing layout for modeled parts, assemblies with BoM.</li> <li>To draw the standards with fit and tolerances.</li> </ul>					
<b>PART I</b>	<b>DRAWING STANDARDS &amp; FITS AND TOLERANCES</b>	<b>12</b>			
Code of practice for Engineering Drawing, BIS specifications - Welding symbols, riveted joints, keys, fasteners - Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. - Limits, Fits - Tolerance.					
<b>PART II</b>	<b>2D DRAFTING</b>	<b>48</b>			
<p>Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed Drawing.</p> <ol style="list-style-type: none"> <li>Bearings - Bush Bearing,</li> <li>Valves - Safety and Non-return Valves.</li> <li>Couplings - Flange, Oldham's, Muff, Gear couplings.</li> <li>Joints - Universal, Knuckle, Gib &amp; Cotter, Strap, Sleeve &amp; Cotter joints.</li> <li>Engine parts - Piston, Connecting Rod, Crosshead (vertical and horizontal), Stuffing box, multi-plate clutch.</li> <li>Machine Components - Screw Jack, Machine Vice, Lathe Tail Stock, Lathe Chuck, Plummer Block, Vane and Gear pumps.</li> </ol> <p>Total: 20% of classes for theory classes and 80% of classes for practice  Note: 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D CAD software.</p>					
<b>TOTAL : 60 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
<p>At the end of the course the students will be able to</p> <p>CO1: Prepare standard drawing layout for modelled assemblies with BoM.  CO2: Model orthogonal views of machine components.  CO3: Prepare standard drawing layout for modelled parts.  CO4: Prepare assembly drawing manually.  CO5: Draw the standards with fit and tolerances.</p>					
<b>TEXT BOOKS :</b>					
<ol style="list-style-type: none"> <li>Gopalakrishna K. R, "Machine Drawing", 17th Edition, Subhas Stores Books Corner, Bangalore, 2003.</li> <li>N. D. Bhatt and V.M. Panchal, "Machine Drawing", 51st Edition, Charator Publishers, 2022.</li> </ol>					

**REFERENCE BOOKS:**

1. K. L. Narayana, P. Kanniah, K.Venkata Reddy, “Machine Drawing”, 15 Edition New Age International Publication.
2. Goutam Pohit and Goutam Ghosh, “Machine Drawing with AutoCAD”, 1st Edition, Pearson Education, 2004 Junnarkar, N.D., “Machine Drawing”, 1st Edition, Pearson Education, 2004.
3. N. Siddeshwar, P. Kanniah, V.V.S. Sastri,” Machine Drawing”, published by Tata McGrawHill,2006.
4. S. Trymbaka Murthy, “A TEXT BOOKS of Computer Aided Machine Drawing”, CBS Publishers, New Delhi,2007.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	-	-	3	-	-	-	3	2	-	3	2	2	2
2	1	2	-	-	3	-	-	-	3	2	-	3	2	2	2
3	1	2	-	-	3	-	-	-	3	2	-	3	2	2	2
4	1	2	-	-	3	-	-	-	3	3	-	3	2	2	2
5	1	3	-	-	3	-	-	-	3	2	-	3	3	2	2

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

24ME2306	MANUFACTURING TECHNOLOGY LABORATORY	L	T	P	C
		0	0	4	2
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To Selecting appropriate tools, equipment's and machines to complete a given job.</li> <li>• To Performing various welding process using GMAW and fabricating gears using gear making machines.</li> <li>• To Performing various machining process such as rolling, drawing, turning, shaping, drilling, milling and analyzing the defects in the cast and machined components.</li> </ul>					
<b>LIST OF EXPERIMENTS</b>					
<ol style="list-style-type: none"> <li>1. Fabricating simple structural shapes using Gas Metal Arc Welding machine.</li> <li>2. Preparing green sand moulds with cast patterns.</li> <li>3. Taper Turning and Eccentric Turning on circular parts using lathe machine.</li> <li>4. Knurling, external and internal thread cutting on circular parts using lathe machine.</li> <li>5. Shaping - Square and Hexagonal Heads on circular parts using shaper machine.</li> <li>6. Drilling and Reaming using vertical drilling machine.</li> <li>7. Milling contours on plates using vertical milling machine.</li> <li>8. Cutting spur and helical gear using milling machine.</li> <li>9. Generating gears using gear hobbing machine.</li> <li>10. Generating gears using gear shaping machine.</li> <li>11. Grinding components using cylindrical and centerless grinding machine.</li> <li>12. Grinding components using surface grinding machine.</li> <li>13. Cutting force calculation using dynamometer in milling machine.</li> <li>14. Cutting force calculation using dynamometer in lathe machine.</li> </ol>					
<b>TOTAL : 60 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course the students will be able to					
CO1: Demonstrate the safety precautions exercised in the mechanical workshop.					
CO2: The students able to make the work piece as per given shape and size using Machining process such as rolling, drawing, turning, shaping, drilling and milling.					
CO3: The students become make the gears using gear making machines					
CO4: Analyze the defects in the cast and machined components.					
CO5: Analyze the materials to join two metals using GMAW.					

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	1	-	2	-	-	1	1	2	2	3
2	-	-	-	-	-	1	-	2	-	-	1	1	2	2	3
3	-	-	-	-	-	1	-	2	-	-	1	1	2	2	3
4	-	-	-	-	-	2	-	2	-	-	1	1	2	2	3
5	-	-	-	-	-	2	-	2	-	-	1	1	2	2	3

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

## SEMESTER IV

24ME2401	FLUID MECHANICS AND MACHINERY	L	T	P	C
		3	1	0	4
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To introduce the students about property of the fluids, behavior of fluids under static conditions.</li> <li>• To impart basic knowledge of the dynamics of fluids and boundary layer concept.</li> <li>• To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends.</li> <li>• To exposure to the significance of boundary layer theory and its thicknesses.</li> <li>• To expose the students to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps.</li> </ul>					
<b>UNIT I</b>	<b>FLUID PROPERTIES AND FLOW CHARACTERISTICS</b>	<b>12</b>			
Properties of fluids - Fluid statics - Pressure Measurements - Buoyancy and floatation - Flow characteristics - Eulerian and Lagrangian approach - Concept of control volume and system - Reynold's transportation theorem - Continuity equation, energy equation and momentum equation - Applications.					
<b>UNIT II</b>	<b>FLOW THROUGH PIPES AND BOUNDARY LAYER</b>	<b>12</b>			
Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor- Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness.					
<b>UNIT III</b>	<b>DIMENSIONAL ANALYSIS AND MODEL STUDIES</b>	<b>12</b>			
. Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem-Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.					
<b>UNIT IV</b>	<b>TURBINES</b>	<b>12</b>			
Impact of jets - Velocity triangles - Theory of roto dynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube Specific speed - Performance curves for turbines - Governing of turbines.					
<b>UNIT V</b>	<b>PUMPS</b>	<b>12</b>			
Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies-Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps.					
<b>TOTAL : 60 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course the students will be able to					
<ul style="list-style-type: none"> <li>CO1: Understand the properties and behaviour in static conditions. Also, to understand the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.</li> <li>CO2: Estimate losses in pipelines for both laminar and turbulent conditions and analysis of</li> </ul>					

pipes connected in series and parallel. Also, to understand the concept of boundary layer and its thickness on the flat solid surface.

CO3: Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.

CO4: Explain the working principles of various turbines and design the various types of turbines.

CO5: Explain the working principles of centrifugal, reciprocating and rotary pumps and design the centrifugal and reciprocating pumps.

**TEXT BOOKS:**

1. Modi P.N. and Seth, S.M. “Hydraulics and Fluid Mechanics”, Standard Book House, New Delhi, 22nd edition (2019).
2. Jain A. K. “Fluid Mechanics including Hydraulic Machines”, Khanna Publishers, New Delhi, 2014.
3. Kumar K. L., “Engineering Fluid Mechanics”, Eurasia Publishing House(p) Ltd, New Delhi, 2016.

**REFERENCE BOOKS:**

1. Fox W.R. and McDonald A.T., “Introduction to Fluid Mechanics”, John-Wiley and Sons, Singapore, 2011.
2. Pani B S, “Fluid Mechanics: A Concise Introduction”, Prentice Hall of India Private Ltd, 2016.
3. Cengel Y A and Cimbala J M, “Fluid Mechanics”, McGraw Hill Education Pvt. Ltd., 2014.
4. S K Som; Gautam Biswas and S Chakraborty, “Introduction to Fluid Mechanics and Fluid Machines”, Tata McGraw Hill Education Pvt. Ltd., 2012.
5. Streeter, V. L. and Wylie E. B., “Fluid Mechanics”, McGraw Hill Publishing Co., 2010.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	1	2	2	1	2	1	1	2	3	2	3
2	3	3	3	2	1	2	2	1	2	1	1	2	3	2	3
3	3	3	3	3	1	2	2	1	2	1	1	2	3	3	3
4	3	3	3	3	1	2	2	1	2	1	1	3	3	2	2
5	3	3	3	3	1	2	2	1	2	1	1	3	3	2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

24ME2402	ENGINEERING THERMODYNAMICS	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To impart knowledge on the basics and application of zeroth and first law of thermodynamics.</li> <li>To impart knowledge on the second law of thermodynamics in analysing the performance of thermal devices.</li> <li>To impart knowledge on availability and applications of second law of thermodynamics.</li> <li>To learn the various properties of steam through steam tables and Mollier chart.</li> <li>To impart knowledge on the macroscopic properties of ideal and real gases.</li> </ul>					
<b>UNIT I</b>	<b>BASICS, ZEROth AND FIRST LAW</b>				<b>9</b>
Review of Basics - Thermodynamic systems, Properties and processes Thermodynamic Equilibrium - Displacement work - P-V diagram. Thermal equilibrium - Zeroth law - Concept of temperature and Temperature Scales. First law - application to closed and open systems - steady and unsteady flow processes.					
<b>UNIT II</b>	<b>SECOND LAW AND ENTROPY</b>				<b>9</b>
Heat Engine - Refrigerator - Heat pump. Statements of second law and their equivalence & corollaries. Carnot cycle - Reversed Carnot cycle - Performance - Clausius inequality. Concept of entropy - T-s diagram - Tds Equations - Entropy change for a pure substance.					
<b>UNIT III</b>	<b>AVAILABILITY AND APPLICATIONS OF II LAW</b>				<b>9</b>
Ideal gases undergoing different processes - principle of increase in entropy. Applications of II Law. High- and low-grade energy. Availability and Irreversibility for open and closed system processes - I and II law Efficiency.					
<b>UNIT IV</b>	<b>PROPERTIES OF PURE SUBSTANCES</b>				<b>9</b>
Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Determination of dryness fraction. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart.					
<b>UNIT V</b>	<b>GAS MIXTURES AND THERMODYNAMIC RELATIONS</b>				<b>9</b>
Properties of Ideal gas, real gas - comparison. Equations of state for ideal and real gases. vander Waal's relation - Reduced properties - Compressibility factor - Principle of Corresponding states - Generalized Compressibility Chart. Maxwell relations - Tds Equations - heat capacities relations - Energy equation, Joule- Thomson experiment - Clausius-Clapeyron equation.					
<b>TOTAL : 45 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course the students will be able to					
CO1: Apply the zeroth and first law of thermodynamics by formulating temperature scales and calculating the property changes in closed and open engineering systems.					
CO2: Apply the second law of thermodynamics in analysing the performance of thermal devices through energy and entropy calculations.					
CO3: Apply the second law of thermodynamics in evaluating the various properties of steam through steam tables and Mollier chart.					
CO4: Gases using gas laws and appropriate thermodynamic relations.					
CO5: Apply the properties of gas mixtures in calculating the properties of gas mixtures and applying various thermodynamic relations to calculate property changes.					

**TEXT BOOKS :**

1. Nag.P.K., “Engineering Thermodynamics”, 6th Edition, Tata McGraw Hill (2017), New Delhi.
2. Natarajan, E., “Engineering Thermodynamics: Fundamentals and Applications”, 2nd Edition (2014), Anuragam Publications, Chennai.

**REFERENCE BOOKS:**

1. Cengel, Y and M. Boles, “Thermodynamics - An Engineering Approach”, Tata McGraw Hill, 9th Edition, 2019.
2. Chattopadhyay, P, “Engineering Thermodynamics”, 2nd Edition Oxford University Press, 2016.
3. Rathakrishnan, E., “Fundamentals of Engineering Thermodynamics”, 2nd Edition, Prentice Hall of India Pvt. Ltd, 2006.
4. Claus Borgnakke and Richard E. Sonntag, “Fundamentals of Thermodynamics”, 10th Edition, Wiley Eastern, 2019.
5. Venkatesh. A, “Basic Engineering Thermodynamics”, Universities Press (India) Limited, 2007.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	1	-	-	-	-	-	-	-	2	-	-	-
2	3	3	2	1	-	-	-	-	-	-	-	2	-	-	-
3	3	3	2	1	-	-	-	-	1	-	1	2	3	-	3
4	3	3	2	1	-	1	-	-	2	-	1	2	3	2	-
5	3	3	2	1	-	1	-	-	2	-	1	2	3	2	3

1 - low, 2 - medium, 3 - high, '-' - no correlation

24ME2403	HYDRAULICS AND PNEUMATICS	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To provide the knowledge on the working principles of fluid power systems.</li> <li>To study the fluids and components used in modern industrial fluid power system.</li> <li>To develop the design, construction and operation of fluid power circuits.</li> <li>To learn the working principles of pneumatic power system and its components.</li> <li>To provide the knowledge of trouble shooting methods in fluid power systems.</li> </ul>					
<b>UNIT I</b>	<b>FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS</b>	<b>9</b>			
Introduction to Fluid power - Advantages and Applications - Fluid power systems - Types of fluids - Properties of fluids and selection - Basics of Hydraulics - Pascal's Law - Principles of flow - Friction loss - Work, Power and Torque- Problems, Sources of Hydraulic power: Pumping Theory-- Pump Classification - Construction, Working- Problems.					
<b>UNIT II</b>	<b>HYDRAULIC ACTUATORS AND CONTROL COMPONENTS</b>	<b>9</b>			
Hydraulic Actuators: Cylinders - Types and construction, Application, Hydraulic cushioning - Rotary Actuators-Hydraulic motors - Control Components: Direction Control, Flow control and pressure control valves- Types, Construction and Operation - Accessories: Reservoirs, Pressure Switches - Filters -types and selection- Applications - Fluid Power ANSI Symbols - Problems.					
<b>UNIT III</b>	<b>HYDRAULIC CIRCUITS AND SYSTEMS</b>	<b>9</b>			
Accumulators, Intensifiers, Industrial hydraulic circuits - Regenerative, Pump Unloading, Double-Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Deceleration circuits, Sizing of hydraulic systems, Hydrostatic transmission, Electro hydraulic circuits, -Servo and Proportional valves - Applications-Mechanical, hydraulic servo systems.					
<b>UNIT IV</b>	<b>PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS</b>	<b>9</b>			
Properties of air -Air preparation and distribution - Filters, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators, Design of Pneumatic circuit - classification- single cylinder and multi cylinder circuits-Cascade method -Integration of fringe circuits, Electro Pneumatic System - Elements- Ladder diagram - timer circuits-Problems, Introduction to fluidics and pneumatic logic circuits.					
<b>UNIT V</b>	<b>TROUBLE SHOOTING AND APPLICATIONS</b>	<b>9</b>			
Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems, Conditioning of hydraulic fluids Design of hydraulic circuits for Drilling, Planning, Shaping, - mobile hydraulics; Design of Pneumatic circuits for metal working, handling, clamping counter and timer circuits. - Low-cost Automation - Hydraulic and Pneumatic power packs, IOT in Hydraulics and pneumatics.					
Note: (Use of standard Design Data Book is permitted in the University examination)					
<b>TOTAL : 45 PERIODS</b>					

**COURSE OUTCOMES:**

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

- CO1: Apply the working principles of fluid power systems and hydraulic pumps.
- CO2: Apply the working principles of hydraulic actuators and control components.
- CO3: Design and develop hydraulic circuits and systems.
- CO4: Apply the working principles of pneumatic circuits and power system and its components.
- CO5: Identify various troubles shooting methods in fluid power systems.

**TEXT BOOKS :**

1. Anthony Esposito, “Fluid Power with Applications”, Prentice Hall, 2009.
2. James A. Sullivan, “Fluid Power Theory and Applications”, Fourth Edition, Prentice Hall, 1997.

**REFERENCE BOOKS:**

1. Jagadeesha. T., “Pneumatics Concepts, Design and Applications “, Universities Press, 2015.
2. Joshi.P., Pneumatic Control”, Wiley India, 2008.
3. Majumdar, S.R., “Oil Hydraulics Systems - Principles and Maintenance”, TataMcGraw Hill, 2001.
4. Shanmugasundaram.K., “Hydraulic and Pneumatic Controls”. Chand & Co, 2006.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1	1	-	-	-	-	-	-	-	1	2	1	1
2	2	1	1	1	-	-	-	-	-	-	-	1	2	1	1
3	2	1	1	1	-	-	-	-	-	-	-	1	2	1	1
4	2	1	1	1	-	-	-	-	-	-	-	1	2	1	1
5	2	1	1	1	-	-	-	-	-	-	-	1	2	1	1

1 - low, 2 - medium, 3 - high, '-' - no correlation

24ME2404	AUTOMOBILE ENGINEERING	L	T	P	C
		3	0	0	3
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To study the construction and working principle of various parts of an automobile.</li> <li>To study the practice for assembling and dismantling of engine parts and transmission system.</li> <li>To study various transmission systems of automobile.</li> <li>To study about steering, brakes and suspension systems.</li> <li>To study alternative energy sources.</li> </ul>					
<b>UNIT I</b>	<b>VEHICLE STRUCTURE AND ENGINES</b>	<b>9</b>			
Types of automobiles vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines - components-functions and materials, variable valve timing (VVT).					
<b>UNIT II</b>	<b>ENGINE AUXILIARY SYSTEMS</b>	<b>9</b>			
Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).					
<b>UNIT III</b>	<b>TRANSMISSION SYSTEMS</b>	<b>9</b>			
Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Overdrive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differential and rear axle, Hotchkiss Drive and Torque Tube Drive.					
<b>UNIT IV</b>	<b>STEERING, BRAKES AND SUSPENSION SYSTEMS</b>	<b>9</b>			
Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control.					
<b>UNIT V</b>	<b>ALTERNATIVE ENERGY SOURCES</b>	<b>9</b>			
Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required -Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cell Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.					
<b>TOTAL : 45 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course the students will be able to					
CO1: Recognize the various parts of the automobile and their functions and materials.					
CO2: Discuss the engine auxiliary systems and engine emission control.					
CO3: Distinguish the working of different types of transmission systems.					
CO4: Explain the Steering, Brakes and Suspension Systems.					
CO5: Predict possible alternate sources of energy for IC Engines.					

**TEXT BOOKS:**

1. Jain K.K. and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New Delhi, 2002.
2. Kirpal Singh, “Automobile Engineering”, Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 13th Edition 2014.

**REFERENCE BOOKS:**

1. Ganesan V. “Internal Combustion Engines”, Third Edition, Tata McGraw-Hill, 2012.
2. Heinz Heisler, “Advanced Engine Technology,” SAE International Publications USA, 1998.
3. Joseph Heitner, “Automotive Mechanics,” Second Edition, East-West Press, 1999.
4. Martin W, Stockel and Martin T Stockle, “Automotive Mechanics Fundamentals, “The Good heart - Will Cox Company Inc, USA ,1978.
5. Newton, Steeds and Garet, “Motor Vehicles”, Butterworth Publishers,1989.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	2	1	-	-	-	-	1	-	-	1	1	2	1
2	2	1	2	1	-	-	-	-	1	-	-	1	1	2	1
3	2	1	2	1	-	-	-	-	1	-	-	1	1	2	1
4	2	1	2	1	-	-	-	-	1	-	-	1	1	2	1
5	2	1	2	1	-	-	-	-	1	-	-	1	1	2	1

1 - low, 2 - medium, 3 - high, '-' - no correlation

24EE3410	ELECTRICAL DRIVES AND CONTROL	L	T	P	C
		3	0	2	4
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To understand the basic concepts of different types of electrical machines and their performance.</li> <li>To study the different methods of starting D.C. motors and induction motors.</li> <li>To study the conventional and solid-state drives.</li> <li>To study the conventional and solid-state DC drives.</li> <li>To study the conventional and solid-state AC drives.</li> </ul>					
<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>			
Basic Elements-Types of Electric Drives-factors influencing the choice of electrical drives - heating and cooling curves-Loading conditions and classes of duty-Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.					
<b>UNIT II</b>	<b>DRIVE MOTOR CHARACTERISTICS</b>	<b>9</b>			
Mechanical characteristics - Speed-Torque characteristics of various types of load and drive motors -Braking of Electrical motors -DC motors: Shunt, series and compound - single phase and three phase induction motors.					
<b>UNIT III</b>	<b>STARTING METHODS</b>	<b>9</b>			
Types of D.C. Motor starters-Typical control circuits for shunt and series motors-Three phase squirrel cage and slip ring induction motors.					
<b>UNIT IV</b>	<b>CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES</b>	<b>9</b>			
Speed control of DC series and shunt motors-Armature and field control, Ward-Leonard control system-Using controlled rectifiers and DC choppers-applications.					
<b>UNIT V</b>	<b>CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES</b>	<b>9</b>			
Speed control of three phase induction motor - Voltage control, voltage / frequency control, slip power recovery scheme-Using inverters and AC voltage regulators-applications.					
<b>THEORY : 45 PERIODS</b>					
<b>PRACTICAL EXERCISES : 30 PERIODS</b>					
<b>LIST OF EXPERIMENTS</b>					
<ol style="list-style-type: none"> <li>Load test on DC Shunt &amp; DC Series motor.</li> <li>O.C.C &amp; Load characteristics of DC Shunt and DC Series generator.</li> <li>Speed control of DC shunt motor (Armature, Field control).</li> <li>Load test on single phase transformer.</li> <li>O.C &amp; S.C Test on a single phase transformer.</li> <li>Regulation of an alternator by EMF &amp; MMF methods.</li> <li>V curves and inverted V curves of synchronous Motor.</li> <li>Load test on three phase squirrel cage Induction motor.</li> <li>Speed control of three phase slip ring Induction Motor.</li> <li>Study of DC &amp; AC Starters.</li> </ol>					

**COURSE OUTCOMES:**

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

- CO1: Discuss the basic concepts of different types of electrical machines and their Performance.
- CO2: Explain the different methods of starting D.C motors and induction motors.
- CO3: Discuss the conventional and solid-state drives.
- CO4: Describe the conventional and solid-state speed control of D.C. drives.
- CO5: Explain the conventional and solid-state speed control of A.C. drives.

**TEXT BOOKS:**

1. Nagrath .I. J. & Kothari. D. P, “Electrical Machines”, Tata McGraw-Hill, 2006.
2. Vedam Subrahmaniam, “Electric Drives (Concepts and Applications)”, Tata McGraw-Hill, 2010.

**REFERENCE BOOKS:**

1. Partab. H., “Art and Science and Utilization of Electrical Energy”, Dhanpat Rai and Sons, 2017.
2. Pillai.S.K “A First Course on Electric Drives”, Wiley Eastern Limited, 2012.
3. Singh. M.D., K.B.Khanchandani, “Power Electronics”, Tata McGraw-Hill, 2006.
4. “Fundamentals of Electric Drives and Control” by B.R. Gupta and V. Singhal | 1 January 2013.
5. “Advanced Electrical Drives - Analysis Modeling Control”, by Rik De Doncker, Andre Veltman, et al. | 1 January 2014.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1	-	-	-	-	-	1	-	-	-	2	1	1
2	2	1	1	-	-	-	-	-	1	-	-	-	2	1	1
3	2	1	1	-	-	-	-	-	1	-	-	-	2	1	1
4	2	1	1	-	-	-	-	-	1	-	-	-	2	1	1
5	2	1	1	-	-	-	-	-	1	-	-	-	2	1	1

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

24ME2405	FLUID MECHANICS AND MACHINERY LABORATORY	L	T	P	C
		0	0	4	2

**OBJECTIVES:**

- To study the measurement equipment's for flow measurement.
- To verify the principles studied in Fluid Mechanics theory by performing experiments in Lab.

**LIST OF EXPERIMENTS**

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/  
Submergible pump.
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

**TOTAL : 60 PERIODS**

**COURSE OUTCOMES:**

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

- CO1: Use the measurement equipment's for flow measurement.
- CO2: Perform test on different pumps.
- CO3: Perform test on different turbines.
- CO4: Perform test on pipe friction.
- CO5: Perform test on rate of flow of pipe friction.

**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	3	3	1	1	1	3	1	1	2	2	2	1
2	3	2	1	3	3	1	1	1	3	1	1	2	3	2	1
3	3	3	2	3	2	1	1	1	3	1	1	2	3	2	1
4	3	2	3	2	1	1	1	3	1	1	2	3	2	1	3
5	3	2	3	2	1	1	1	3	1	1	2	3	2	1	3

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

24GE0411	SOFT SKILLS I	L	T	P	C
		0	0	4	2
<b>OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To develop students' comprehensive understanding and effective use of English grammar.</li> <li>• To enhance students' analytical and logical thinking abilities.</li> <li>• To make sense of problems, develop strategies to find solutions and persevere in solving them.</li> <li>• To reason, model, and draw conclusion so make decision with mathematical, statistical, and quantitative information.</li> <li>• To understand the fundamental principles of C programming.</li> </ul>					
<b>UNIT I</b>	<b>ENGLISH PHASE I</b>	<b>12</b>			
Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension Ordering.					
<b>UNIT II</b>	<b>LOGICAL REASONING PHASE I</b>	<b>12</b>			
Deductive Reasoning: Coding Deductive Logic, Directional Sense, Blood Relations, Objective Reasoning, Selection Decision Tables, Puzzles.					
<b>UNIT III</b>	<b>QUANTITATIVE REASONING PHASE I</b>	<b>12</b>			
Numbers- HCF & LCM of Numbers - Decimal Fractions - Simplification - Square Roots & Cube Roots - Average - Problems on Numbers - Problems on Ages - Surds & Indices.					
<b>UNIT IV</b>	<b>NUMERACY SKILLS PHASE I</b>	<b>12</b>			
Pipes & Cisterns - Problems on Trains - Boats & Streams - Allegation or Mixture - Simple Interest - Compound Interest -Logarithms - Area -Volume & Surface Areas.					
<b>UNIT V</b>	<b>CODING PROFICIENCY PHASE I</b>	<b>12</b>			
Introduction to C Programming - Operators and Expressions - Control Structures - Functions.					
<b>TOTAL : 60 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course the students will be able to					
CO1: Develop vocabulary for effective communication and reading skills.					
CO2: Build the logical reasoning and quantitative skills.					
CO3: Solve various concepts of number systems and their techniques in solving the HCF, LCM factors and decimals.					
CO4: Solve the problems on pipes and cisterns, simple interest, compound interest, growth and depreciation.					
CO5: Understand the fundamental principles of structured programming and apply them to write efficient and error - free C programs.					
<b>TEXT BOOKS:</b>					
1. Dr. R. S Aggarwal, "A Modern Approach to Verbal and Non-Verbal Reasoning", Revised Edition, S. Chand Publications.					
2. AbhijitGuha, "Quantitative Aptitude for Competitive Examinations", Fourth Edition, McGraw Hill Publications.					

3. Y. Kanetkar, “Let Us C”, 16<sup>th</sup>ed., BPB Publications, 2016.
4. R.Gopalan & V. Rajagopalan, “English for Competitive Examinations”, Second Edition, Shorff Publishers.Y. Kanetkar, “Let Us C”, 16<sup>th</sup> ed., BPB Publications, 2016.
5. R. Gopalan & V. Rajagopalan, “English for Competitive Examinations”, Second Edition, Shorff Publishers.

**REFERENCE BOOKS:**

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**CO - PO - PSO MAPPING:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	-	-	3	-	-	-	-	-	2	-	2	-	-	-
2	2	1	-	-	2	-	-	2	-	2	-	2	-	-	-
3	3	1	-	-	-	-	-	-	-	-	-	2	-	-	-
4	3	1	-	-	-	-	-	-	-	-	-	2	-	-	-
5	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-

**1 - low, 2 - medium, 3 - high, '-' - no correlation**