



VELAMMAL COLLEGE OF ENGINEERING & TECHNOLOGY, MADURAI-625009

(Autonomous)

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

[CHOICE BASED CREDIT SYSTEM]

REGULATIONS 2025

CURRICULUM FOR SEMESTERS I TO IV



SEMESTER – I

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	IP25C01	Induction Programme (Common to all B.E./B.Tech. Programmes)	MC	-	-	-	-
<b>THEORY COURSES</b>							
2.	EN25C01	Technical English (Common to all B.E./B.Tech. Programmes)	HSMC	3	0	0	3
3.	MA25C02	Applied Mathematics for Engineers (Common to B.E. Civil, CSE, EEE and B.Tech. IT Programmes)	BSC	3	1	0	4
4.	PH25C01	Engineering Physics (Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)	BSC	3	0	0	3
5.	CH25C01	Engineering Chemistry (Common to all B.E./B.Tech. Programmes)	BSC	3	0	0	3
6.	CS25C01	Problem Solving using C Programming (Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)	ESC	3	0	0	3
7.	ME25101	Basic Civil and Mechanical Engineering	ESC	3	0	0	3
8.	TA25C01	Heritage of Tamils / தமிழர் மரபு (Common to all B.E./B.Tech. Programmes)	HSMC	1	0	0	1
<b>PRACTICAL COURSES</b>							
9.	CS25C02	Programming in C Laboratory (Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)	ESC	0	0	4	2
10.	PC25C01	Physics and Chemistry Laboratory (Common to all B.E./B.Tech. Programmes)	BSC	0	0	4	2
<b>TOTAL</b>							<b>24</b>

**SEMESTER – II**

<b>S. No.</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY COURSES</b>							
1.	MA25203	Analytical and Probabilistic Methods	BSC	3	1	0	4
2.	PH25203	Physics for Electrical Engineering	BSC	3	0	0	3
3.	CH25C02	Environmental Science <i>(Common to all B.E./B.Tech. Programmes)</i>	BSC	2	0	0	2
4.	EE25204	Electric Circuit Analysis	PCC	3	1	0	4
5.	TA25C02	Tamils and Technology / தமிழ்நரும் தொழில்நுட்பமும் <i>(Common to all B.E./B.Tech. Programmes)</i>	HSMC	1	0	0	1
<b>THEORY WITH PRACTICAL COURSES</b>							
6.	EN25C02	English proficiency and soft skills <i>(Common to B.E. Civil, CSE, EEE, CSE(CS), EE(VLSI), B.Tech. IT, AI&amp;DS Programmes, CSBS and AIML)</i>	HSMC	2	0	2	3
7.	ME25C01	Engineering Graphics and Design <i>(Common to B.E. CSE, CSE(CS), EEE, EE(VLSI), Mech, and B.Tech. IT, AI&amp;DS Programmes)</i>	ESC	2	0	2	3
<b>PRACTICAL COURSES</b>							
8.	EM25C01	Engineering Practices Laboratory <i>(Common to B.E. Civil, CSE, CSE(CS), EEE, EE(VLSI), Mech and B.Tech. IT Programmes)</i>	ESC	0	0	4	2
9.	EE25206	Electric Circuits Laboratory	PCC	0	0	4	2
<b>TOTAL</b>							<b>24</b>

**SEMESTER – III**

S.No.	Course Code	Course Title	Category	L	T	P	C
<b>THEORY COURSES</b>							
1.	MA25302	Transform Techniques and its Applications	BSC	3	1	0	4
2.	EE25301	Electromagnetic Theory	PCC	3	0	0	3
3.	EE25302	Digital Logic Circuits	PCC	3	0	0	3
4.	EE25303	DC Machines and Transformers	PCC	3	0	0	3
5.	EE25304	Electronic Devices and Circuits	PCC	3	0	0	3
<b>THEORY WITH PRACTICAL COURSE</b>							
6.	EE25305	Measurements and Instrumentation	PCC	2	0	2	3
<b>PRACTICAL COURSES</b>							
7.	EE25306	DC Machines and Transformers Laboratory	PCC	0	0	3	1.5
8.	EE25307	Electronic Devices and Digital Laboratory	PCC	0	0	3	1.5
<b>Total Credits</b>							<b>22</b>

**SEMESTER – IV**

S.No.	Course Code	Course Title	Category	L	T	P	C
<b>THEORY COURSES</b>							
1.	MA25404	Statistics and Numerical Methods	BSC	3	1	0	4
2.	EE25401	Generation, Transmission and Distribution of Electrical Energy	PCC	3	0	0	3
3.	EE25402	AC Machines	PCC	3	0	0	3
4.	EE25403	Control Systems	PCC	3	0	0	3
5.	EE25404	Integrated Circuits	PCC	3	0	0	3
<b>THEORY WITH PRACTICAL COURSE</b>							
6.	CS25C13	Data Structures and Algorithms	ESC	3	0	2	4
<b>PRACTICAL COURSES</b>							
7.	EE25405	AC Machines Laboratory	PCC	0	0	3	1.5
8.	EE25406	Integrated Circuits and Control Systems Laboratory	PCC	0	0	3	1.5
<b>Total Credits</b>							<b>23</b>



CHOICE BASED CREDIT SYSTEM (CBCS)

B.E. - ELECTRICAL AND ELECTRONICS ENGINEERING

SYLLABUS FOR SEMESTERS I TO IV

SEMESTER - I

IP25C01	INDUCTION PROGRAMME <i>(Common to all B.E./B.Tech. Programmes)</i>	L	T	P	C
		-	-	-	-
<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><b>The induction programme has been introduced by AICTE with the following objective:</b>                      “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 fulfil his/her responsibility as an engineer, as a citizen and as 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><b>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.</b></p> <p><b>(i) Physical Activity</b>                      This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.</p> <p><b>(ii) Creative Arts</b>                      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>                      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</p>					

be through do's and don't's, 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.

**REFERENCE:**

Guide to Induction program from AICTE

EN25C01	TECHNICAL ENGLISH <i>(Common to all B.E./B.Tech. Programmes)</i>			
	L	T	P	C
	3	0	0	3
<b>COURSE OBJECTIVES:</b>				
The course enables the students to:				
<ul style="list-style-type: none"> <li>Recognize and interpret listening cues for enhancing comprehending skills in spoken interactions</li> <li>Develop confidence in expressing ideas clearly in speaking situations.</li> <li>Understand and apply vocabulary effectively while summarizing written content.</li> <li>Build the ability to plan and structure coherent written compositions</li> <li>Encourage articulation to support personal viewpoints in diverse formats</li> </ul>				
<b>UNIT I</b>	<b>INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION</b>			<b>9</b>
<b>Listening</b> – Pronunciation, Stress, Syllable, Listening for general information and specific details - Listening and filling a form; <b>Speaking</b> - Self Introduction, asking for information to fill details in a form; <b>Reading</b> - Comprehension Passages - Skimming Scanning and intensive & extensive reading; <b>Writing</b> - Writing emails / letters (formal & informal - requisition, Complaint); <b>Grammar</b> - Parts of Speech (Nouns, Pronouns, Verbs, Adverbs, Adjectives, Prepositions, Conjunctions, Interjections), Kinds of Sentences; <b>Vocabulary</b> - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).				
<b>UNIT II</b>	<b>NARRATION AND SUMMATION</b>			<b>9</b>
<b>Listening</b> - Listening short talks/ podcast/ stories / event narration, documentaries and say true or false <b>Speaking</b> - Narrating personal experiences/events, summarizing of documentaries/podcasts; <b>Reading</b> - Reading biographies, travelogues & technical blogs; <b>Writing</b> -- Paragraph writing, Short Report on an event (Industrial visits etc.); <b>Grammar</b> - Question types: Framing “WH” Questions & Yes or No Questions and Tenses; <b>Vocabulary</b> - Word forms (prefixes & suffixes), Antonyms, Phrasal verbs.				
<b>UNIT III</b>	<b>DESCRIPTION OF A PROCESS / PRODUCT</b>			<b>9</b>
<b>Listening</b> - Listening to advertisements about products and process descriptions and summarize them: <b>Speaking</b> - Giving instruction to use the product; Presenting a product; <b>Reading</b> - Reading advertisements, gadget reviews; user manuals; <b>Writing</b> - Writing definitions; instructions; and Product /Process description; <b>Grammar</b> - Tenses, Subject - Verb Agreement; <b>Vocabulary</b> - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words)				
<b>UNIT IV</b>	<b>CLASSIFICATION AND RECOMMENDATIONS</b>			<b>9</b>
<b>Listening</b> - Listening to TED Talks; differentiate instructions and recommendations; <b>Speaking</b> – Short Talk; Mini presentations and making recommendations; <b>Reading</b> - Newspaper articles - interviews, Non Verbal Communication (infographics, tables, pie charts etc) to understand and classify information <b>Writing</b> - Writing recommendations; Transferring information from non -verbal (chart, graph etc, to verbal mode) <b>Grammar</b> - Articles, Degrees of comparison; <b>Vocabulary</b> - Collocations; Fixed / Semi fixed expressions.				
<b>UNIT V</b>	<b>EXPRESSIONS</b>			<b>9</b>
<b>Listening</b> - Listening to debates/ discussions; different viewpoints on an issue; and panel discussions; <b>Speaking</b> - Group discussions, Debates, and Expressing opinions through				

Simulations & Role-play; **Reading** - Reading editorials; and Opinion Blogs; **Writing** - Essay Writing (Descriptive or narrative); **Grammar** -Phrases & Clauses, Simple, Compound & Complex Sentences; **Vocabulary** - Connotations- Content vs. Function words.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, learners will be able to:

CO1: Identify listening cues and respond appropriately in real-time communication.

CO2: Deliver spoken messages clearly and appropriately in varied contexts.

CO3: Use new vocabulary in context and summarize main ideas from texts.

CO4: Create and organize clear written compositions.

CO5: Express and justify opinions through oral, written, and digital formats.

**TEXT BOOKS:**

1. Shoba. K N.& Lourdes Joavani Rayen. “Communication Skills”, New Delhi, Cambridge University Press, 2021
2. Board of Editors, Fluency in English-A Course book for Undergraduate Engineers and Technologists. Orient Blackswan Pvt Ltd, Hyderabad: 2018
3. Jawahar, Jewelcy & Rathna.P. Communicative English Workbook. VRB Publishers Pvt Ltd. Chennai. 2018.

**REFERENCES:**

1. Department of English. Mindscapes English for Technologists and Engineers. Orient Black swan Ltd, Hyderabad: 2012
2. Verma, Shalini. Technical Communication for Engineers. Vikas Publishing House Pvt Ltd. New Delhi. 2015
3. Rizvi, Ashraf.M. Effective Technical Communication. MCGraw Hill Education Pvt Ltd. New Delhi. 2016.
4. Leech Geoffrey and Svartvik Jan. A Communicative Grammar of English. Third Edition, Routledge, New York. 2013

**WEB SOURCES:**

1. [www.esl.org](http://www.esl.org)
2. [elt.oup.com/learning resources](http://elt.oup.com/learning resources)
3. [a4esl.org](http://a4esl.org)

MA25C02	APPLIED MATHEMATICS FOR ENGINEERS (Common to B.E. Civil, CSE, EEE and B.Tech. IT Programmes )	L	T	P	C	
		3	1	0	4	
<b>COURSE OBJECTIVES:</b>						
<ul style="list-style-type: none"> <li>To establish the matrix concepts in Engineering applications.</li> <li>To explain the concept of different types of differentiation involved in differential calculus.</li> <li>To make use of the concept of functions of several variables and partial derivatives in various fields of Engineering.</li> <li>To prepare the student to use mathematical tools in evaluating multiple integrals and its applications.</li> <li>To obtain a solution of ordinary differential equations that model engineering problems.</li> </ul>						
<b>UNIT I</b>	<b>MATRICES</b>					<b>12</b>
Characteristic equation – Eigen values and Eigenvectors of a real matrix – Properties of Eigen values and Eigenvectors – Cayley - Hamilton theorem - Diagonalization of matrices by orthogonal transformation – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms –Applications of matrices : Principal Component Analysis, Stretching of elastic membrane.						
<b>UNIT II</b>	<b>DIFFERENTIAL CALCULUS</b>					<b>12</b>
Differentiation – Implicit differentiation – Logarithmic differentiation – Applications: Maxima and minima of functions of one variable, Radius of curvature - Centre of curvature – Circle of curvature.						
<b>UNIT III</b>	<b>FUNCTIONS OF SEVERAL VARIABLES</b>					<b>12</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>12</b>
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Double integrals –Area enclosed by plane curves – Triple integrals – Volume of solids.						
<b>UNIT V</b>	<b>ORDINARY DIFFERENTIAL EQUATIONS</b>					<b>12</b>
Linear equations of second order with constant and variable coefficients–Homogeneous equations of Euler type – Equations reducible to homogeneous form –Variation of parameters–Simultaneous first order differential equation with constant coefficients.						
<b>TOTAL: 60 PERIODS</b>						
<b>OUTCOMES:</b>						
At the end of the course, learners will be able to:						
CO1: Apply the matrix algebra for Eigen value related application problems.						
CO2: Apply differential calculus tools in solving various Engineering problems						
CO3: Explain the concepts about functions of more than one variable.						
CO4: Solve the practical problems of finding area and volume using multiple integrals.						
CO5: Apply ordinary differential equations to model real world problems.						

**TEXT BOOKS:**

1. Grewal.B.S. "Higher Engineering Mathematics", 44<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2018.
2. Bali N.P and Manish Goyal "A Text Book of Engineering Mathematics",9<sup>th</sup> Edition Lakshmi Publications Pvt., Ltd., New Delhi, 2016
3. Kreyszig.E, "Advanced Engineering Mathematics", 10<sup>th</sup> Edition, John Wiley and Sons, New Delhi, 2016

**REFERENCES:**

1. James Stewart, "Calculus: Early Transcendentals", 9<sup>th</sup> Edition, Cengage Learning, 8<sup>th</sup> edition New Delhi, 2015
2. Ramana. B.V., "Higher Engineering Mathematics", 6<sup>th</sup> Edition, McGraw Hill Education Pvt. Ltd, New Delhi, 2010.
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", 5<sup>th</sup> Edition, Narosa Publications, New Delhi, 2016.

PH25C01	ENGINEERING PHYSICS			L	T	P	C
	<i>Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&amp;DS Programmes)</i>			3	0	0	3
<b>COURSE OBJECTIVES:</b>							
<ul style="list-style-type: none"> <li>To illustrate the effective understanding of mechanics.</li> <li>To gain knowledge on oscillations and thermal physics.</li> <li>To explain the working of laser and its applications.</li> <li>To outline the importance of quantum mechanics.</li> <li>To understand crystal structures and its applications.</li> </ul>							
<b>UNIT I</b>	<b>MECHANICS OF MATERIALS</b>						<b>9</b>
Rigid body – Centre of mass: 1D & 3D – Elasticity –Hooke’s law - Poisson’s ratio - stress-strain diagram for ductile and brittle materials(basic) – Uses - Bending of beams – Cantilever - Simply supported beams - uniform and non-uniform bending - Young’s modulus determination - I shaped girders.							
<b>UNIT II</b>	<b>OSCILLATIONS AND THERMAL PHYSICS</b>						<b>9</b>
Simple harmonic motion - Torsional pendulum –Introduction to Damped and Forced oscillations – Shock absorber – Resonance - Introduction to conduction, convection and radiation - Thermal expansion – Expansion joints – Bimetallic strip – Seebeck effect – thermocouple.							
<b>UNIT III</b>	<b>LASERS</b>						<b>9</b>
Laser – characteristics – spontaneous and stimulated emission - population – inversion - Metastable states - CO <sub>2</sub> laser, Semiconductor laser - Industrial and medical applications - Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic communication.							
<b>UNIT IV</b>	<b>QUANTUM MECHANICS</b>						<b>9</b>
Black body radiation (Qualitative) – Planck’s hypothesis - Matter waves – de Broglie hypothesis - Electron microscope – Uncertainty Principle – The Schrodinger Wave equation (time-independent and time-dependent) – Physical significance of wave function - Degenerate energy states - Barrier penetration and quantum tunneling - Tunneling microscope.							
<b>UNIT V</b>	<b>CRYSTAL PHYSICS</b>						<b>9</b>
Crystal Bonding – Ionic – covalent – metallic and van der Waal’s molecular bonding - Introduction to Crystal systems (unit cell, Bravais lattices, Miller indices) - Crystal structures - atomic packing density of BCC, FCC and HCP structures - crystal imperfections - point defects - edge and screw dislocations – grain boundaries. X-ray diffractometer.							
<b>TOTAL: 45 PERIODS</b>							
<b>OUTCOMES:</b>							
At the end of the course, learners will be able to:							
CO1: Understand the basic properties of materials							
CO2: Express the knowledge based on applications of oscillations and thermal Physics.							
CO3: Know the basics of optics, lasers and its applications							
CO4: Demonstrate the importance of quantum physics.							
CO5: Apply the significance of crystal physics.							

**TEXT BOOKS:**

1. Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2013.
2. D. Halliday, R. Resnick and J. Walker, Principles of Physics. John Wiley & Sons, 10th Edition, 2015.
3. N. Garcia, A. Damask and S. Schwarz, Physics for Computer Science Students, Springer-Verlag, 2012.
4. Alan Giambattista, Betty McCarthy Richardson and Robert C. Richardson, College Physics, McGraw-Hill Higher Education, 2012.

**REFERENCES:**

1. R. Wolfson, Essential University Physics. Volume 1 & 2. Pearson, 2016.
2. D. Kleppner and R. Kolenkow. An Introduction to Mechanics, McGraw Hill Education, 2017.
3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications. Springer, 2012.

CH25C01	ENGINEERING CHEMISTRY			
	L	T	P	C
	<i>(Common to all B.E. / B.Tech. Programmes)</i>			
	3	0	0	3
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• To inculcate the sound understanding of water quality parameters and water treatment techniques.</li> <li>• To acquire basic principles and preparatory methods of nanomaterials.</li> <li>• To describe the characteristics, applications of polymeric materials and composites.</li> <li>• To illustrate the operating principles in electrochemistry and working processes and applications of storage devices.</li> <li>• To use appropriate synthetic fuels and fuel additives for better combustion characteristics.</li> </ul>				
<b>UNIT I</b>	<b>WATER AND ITS TREATMENT</b>			<b>9</b>
<b>Water:</b> Sources and impurities, <b>Water quality parameters:</b> Definition and significance of colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. <b>Municipal water treatment:</b> primary treatment and disinfection (UV, Ozonation, break-point chlorination). <b>Boiler troubles:</b> Scale and sludge, boiler corrosion, caustic embrittlement, priming & foaming. <b>Treatment of boiler feed water:</b> Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and external treatment – Ion exchange demineralization and zeolite process. <b>Desalination of brackish water:</b> Reverse Osmosis (RO) method.				
<b>UNIT II</b>	<b>NANOCHEMISTRY</b>			<b>9</b>
<b>Basics:</b> Distinction between molecules, nanomaterials and bulk materials; <b>Size-dependent properties</b> (optical, electrical, mechanical and magnetic). <b>Preparation of nanomaterials:</b> sol-gel, solvothermal, laser ablation, chemical vapour deposition, and electrochemical deposition. <b>Applications</b> of nanomaterials. <b>Sensors:</b> Basic components, types and applications. Chemiresistive sensors - environmental monitoring – CO <sub>2</sub> sensor.				
<b>UNIT III</b>	<b>POLYMERS AND COMPOSITES</b>			<b>9</b>
<b>Polymers:</b> Classification, functionality of monomers, Types of polymerizations, free radical				

mechanism, degree of polymerization, weight and number average molecular weights (definition only). <b>Engineering Plastics</b> - Properties and types. <b>Composites:</b> Definition & need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and reinforcement (fiber, particulates, flakes and whiskers). <b>Properties and applications:</b> Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites.		
<b>UNIT IV</b>	<b>ELECTROCHEMICAL POWER SOURCES</b>	<b>9</b>
<b>Electrochemical cells</b> – EMF, electrode potential, dependence of emf on electrolyte concentration – Nernst equation. Electrochemical series and its applications. <b>Batteries:</b> Types of batteries, primary battery - dry cell, secondary battery - lead acid battery, Zn-Carbon, and lithium-ion-battery; <b>Fuel cells:</b> H <sub>2</sub> -O <sub>2</sub> fuel cell, <b>Supercapacitors:</b> Storage principle, types and examples. <b>Electric vehicles</b> - working principles		
<b>UNIT V</b>	<b>FUELS AND COMBUSTION</b>	<b>9</b>
<b>Fuels:</b> Introduction, classification of fuels; <b>Coal and coke:</b> Analysis of coal (proximate and ultimate), Carbonization, and manufacture of metallurgical coke (Otto Hoffmann method). <b>Petroleum and Diesel:</b> Manufacture of synthetic petrol (Bergius process), knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel. <b>Combustion of fuels:</b> Introduction, calorific value - higher and lower calorific values, Theoretical calculation of calorific value; <b>Ignition temperature:</b> spontaneous ignition temperature, Explosive range; <b>Flue gas analysis</b> - ORSAT Method. CO <sub>2</sub> emission and carbon foot print.		
<b>TOTAL: 45 PERIODS</b>		
<b>OUTCOMES:</b> At the end of the course, learners will be able to:		
<b>CO1:</b> Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water. <b>CO2:</b> Describe the basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications. <b>CO3:</b> Apply the knowledge of polymers and composites for material selection requirements. <b>CO4:</b> Illustrate the basics of electrochemistry and apply them for suitable applications in energy sectors. <b>CO5:</b> Utilize different fuels and predict their performance and combustion characteristics.		
<b>TEXT BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. P. C. Jain and Monica Jain, “Engineering Chemistry”, 17<sup>th</sup> Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.</li> <li>2. B. Sivasankar, “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.</li> <li>3. S.S. Dara, “A text book of Engineering Chemistry”, 12<sup>th</sup> Edition, S. Chand Publishing, 2018.</li> </ol>		
<b>REFERENCES:</b>		

1. B. S. Murty, P. Shankar, Baldev Raj, B.B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-II M Series in Metallurgy and Materials Science, 2018.
2. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", 2<sup>nd</sup> Edition, Cambridge University Press, Delhi, 2019.
3. V. R. Gowarikar, N.V. Viswanathan and Jayadev Sreedhar, "Polymer Science", New Age International (P) Ltd., 2015.

CS25C01	<b>PROBLEM SOLVING USING C PROGRAMMING</b> (Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To understand the constructs of C Programming.</li> <li>• To apply conditional and looping constructs in C Programming to manage program execution flow.</li> <li>• To develop applications that effectively use arrays and strings for data storage and manipulation</li> <li>• To develop modular applications using functions and pointers.</li> <li>• To design and implement applications using structures and unions for efficient handling of complex data types.</li> </ul>					
<b>UNIT-I</b>	<b>INTRODUCTION</b>				<b>7</b>
Evolution of Programming Languages - Programming Paradigms: Structured programming - Object Oriented programming - Functional programming -Algorithms - Pseudo code and Flowchart - Structure of C Program - Compilation Process - Preprocessor Directives - C Tokens.					
<b>UNIT-II</b>	<b>CONTROL FLOW STATEMENTS</b>				<b>9</b>
Expressions – I/O Statements - Operators: Precedence and Associativity - Decision Making Statements: if -else if ladder, Nested if, Switch statements - Iterative Statements: For, While, Do while statements - Break, Continue Statements					
<b>UNIT-III</b>	<b>ARRAYS AND STRINGS</b>				<b>9</b>
Arrays: Declaration, Initialization – One Dimensional Array – Multi Dimensional Arrays - String: String Operations - Sorting: Selection Sort - Searching: Linear and Binary Search.					
<b>UNIT-IV</b>	<b>FUNCTIONS AND POINTERS</b>				<b>11</b>
Modular Programming: Function Prototype, Function Definition, Function Call, Built-in Functions: String Functions and Math Functions - User Defined Functions – Recursion - Pointers: Pointer Operators, Pointer Arithmetic, Arrays and Pointers, Array of Pointers - Parameter Passing: Pass by Value and Pass by Reference.					
<b>UNIT-V</b>	<b>STRUCTURES AND UNION</b>				<b>9</b>
Structure: Defining and Processing a Structure - Nested Structures - Passing Structure to Functions -Array of Structure – Self referential Structure- Pointer to Structure - Union - Dynamic Memory Allocation - File Processing.					
<b>TOTAL: 45 PERIODS</b>					
<b>OUTCOMES:</b>					
At the end of the course, learners will be able to:					

CO1: Demonstrate the constructs of C Programming (K2-Understand)		
CO2: Build applications using Conditional and Looping constructs in C (K3-Apply)		
CO3: Design applications using Arrays and Strings in C (K3-Apply)		
CO4: Make use of Functions and Pointers and develop applications (K3-Apply)		
CO5: Make use of Structure and Union to design applications (K3-Apply)		
<b>TEXT BOOKS:</b>		
1. Reema Thareja, "Programming in C", 3rd edition, Oxford University Press, 2023.		
2. Deitel.H.M, Deitel.P.J, "C: How to Program", Pearson, 9th Edition, New Delhi, 2022.		
3. Pradip Dey, Manas Ghosh, "Programming in C", Oxford University, New Delhi, 2018		
<b>REFERENCES:</b>		
1. Gottfried B, "Programming with C", McGraw Hill, 4 <sup>th</sup> Edition, Noida, 2018		
2. Herbert Schildt, "C: The Complete Reference", McGraw Hill, 4th Edition, Noida, 2017		
3. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015.		
<i>Suggested activities for assignment/Self Study</i>		
1. Design and develop flowchart for real time applications like ticket reservation system, Electricity Billing, Retail shop billing etc using online tools such as Smart draw, Luci, Canva etc.,	K3	CO1
2. Programming/Code Debugging using online programming platforms like Hacker rank, Leet code, Code Chef	K3	CO2, CO3, CO4, CO5

<b>ME25101</b>	<b>BASIC CIVIL AND MECHANICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To introduce students to the fundamental principles of civil and mechanical engineering.</li> <li>To familiarize students with the properties of materials used in the civil and mechanical applications</li> <li>To teach the concept of materials and different manufacturing processes.</li> <li>To explain the component of power plant units and detailed explanation to IC engines their working principles.</li> <li>To foster the concept of Refrigeration &amp; Air-conditioning system.</li> </ul>					
<b>UNIT I</b>	<b>OVERVIEW OF CIVIL ENGINEERING</b>				<b>9</b>
Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Build-up area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.					
<b>UNIT II</b>	<b>CIVIL ENGINEERING MATERIALS AND BUILDING COMPONENTS</b>				<b>9</b>
Civil Engineering Materials: Bricks – Stones – Cement – Steel, Thermal and Acoustic Insulating Materials, Water Proofing Materials. Modern uses of Gypsum, Foundations:					

Types of foundations - Bearing capacity and settlement – Beams – Columns-Basics of Green Buildings.		
<b>UNIT III</b>	<b>MATERIALS AND MANUFACTURING PROCESSES</b>	<b>9</b>
Materials for engineering components, stress, strain, Factor of safety. Casting, Metal forming - forging, rolling, extrusion, drawing, Metal joining – Resistance Arc welding, types and Gas welding, MIG Welding.		
<b>UNIT IV</b>	<b>INTERNAL COMBUSTION ENGINES AND POWER PLANTS</b>	<b>9</b>
Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines-Concept of Hybrid Engine.		
<b>UNIT V</b>	<b>REFRIGERATION AND AIR CONDITIONING SYSTEM</b>	<b>9</b>
Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner-Centralised Air conditioning System.		
<b>TOTAL: 45 PERIODS</b>		
<b>OUTCOMES:</b>		
At the end of the course, learners will be able to:		
CO1: Interpret the Profession of Civil and Mechanical Engineering		
CO2: Summarize the planning of materials used for construction of building and its process		
CO3: Relate the different Manufacturing Processes to optimize the product.		
CO4: Demonstrate the Working Principles of Power Plant and IC Engine		
CO5: Categorize the components of refrigeration and air conditioning systems		
<b>TEXT BOOKS:</b>		
1. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, 2 <sup>nd</sup> edition Tata Mcgraw Hill, New Delhi 2024.		
2. Venugopal K and Dr. V. Prabhu Raja “Basic Civil and Mechanical Engineering”, 2 <sup>nd</sup> Edition Anuradha Publishers, Kumbakonam 2019.		
3. Shantha Kumar SRJ., “Basic Mechanical Engineering”, 2 <sup>nd</sup> edition Hi-tech Publications, Mayiladuthurai, 2020.		
4. G. R. Nagpal, ” Basic Mechanical Engineering” 2nd edition published by Khanna Publishers in 2020.		
<b>REFERENCES:</b>		
1. S. S Bhavikatty “ Basic Civil Engineering”, 2 <sup>nd</sup> edition, New Age International Publishers, 2022		
2. 2.Ramamrutham S., “Basic Civil Engineering”, 2 <sup>nd</sup> edition, Dhanpat Rai Publishing Co. (P) Ltd. 2020.		
3. Seetharaman S., “Basic Civil Engineering”, 1 <sup>st</sup> edition, Anuradha Agencies, 2020		
4. Mathur, Mehta & Tewari “Elements of Mechanical Engineering”, 2 <sup>nd</sup> edition, Dhanpath Rai & Sons, 2020		

TA25C01	HERITAGE OF TAMILS / தமிழர்மரபு (Common to all B.E./B.Tech. Programmes)				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 carmaking - - 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, Leatherpuppetry, 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. தமிழகவரலாறு மக்களும் பண்பாடும் கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)</li> <li>2. கணினித்தமிழ்முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).</li> <li>3. கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)</li> <li>4. பொருளுற 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> <li>7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).</li> </ol>								

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.

CS25C02	<b>PROGRAMMING IN C LABORATORY</b> (Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)	L	T	P	C
		0	0	4	2

**COURSE OBJECTIVES:**

- To describe the basics of algorithmic problem solving
- To develop programs in C using basic constructs.
- To develop programs in C using arrays and strings
- To develop applications in C using functions.
- To develop applications in C using Pointers, Structures and Union

**LIST OF EXPERIMENTS:**

**Exercise 1: Basics of C programming**

- a. Identification and solving of simple real life or scientific or technical problems, and developing flow charts and Pseudo code for the same (Electricity Billing, Retail shop billing)
- b. Write a program to print sample strings like “hello world”, “Welcome to C Programming” with different formats using escape sequences.
- c. Write a Program to print different data types in ‘C’ and their ranges.
- d. Write a Program to initialize, assignment & printing variables of different data types.

**Exercise 2: Operators**

- a. Write a Program to demonstrate arithmetic, logical and relational operators.
- b. Write a Program to demonstrate pre increment and post increment (++a, a++), pre decrement and post decrement (--a, a--).
- c. Write a Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notation.
- d. Write a Program to calculate simple interest.
- e. Write a Program to convert temperature from Fahrenheit –Centigrade and vice-versa.

**Exercise 3: Control Statements**

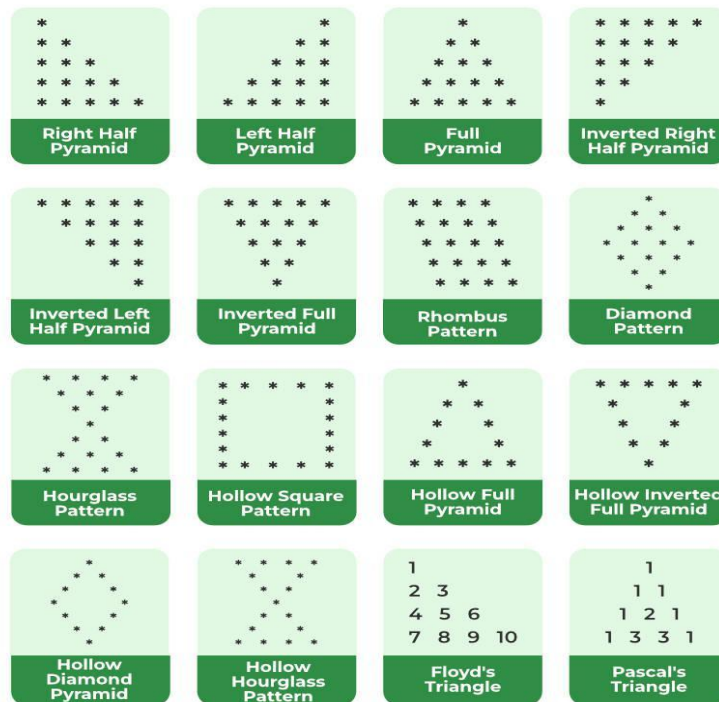
- a. Write a Program to read marks of a student in six subjects and print whether pass or Fail. (Using if-else).
- b. Write a Program to calculate roots of quadratic equation.
- c. Write a Program to calculate electricity bill. Read starting and ending meter reading. The charges are as follows.

Usage Slab (in Units)	Rate per unit (Rs)
Upto 400	4.80
401-500	6.45
500-600	8.55
601-800	9.65
800-1000	10.70
>1000	11.80

- d. Write a Program to perform arithmetic operations using case control statement.
- e. Write a Program to display names of days in a Week using case control statement.

**Exercise 4: Looping operations**

- a. Write a program to calculate sum of individual digits of a given number.
- b. Write a program to check whether given number is palindrome or not.
- c. Write a program to print prime numbers in the given range.
- d. Write a program to print the Fibonacci series for given ‘N’ value.



e. Write a program to print the following formats.

**Exercise 5: 1-D and 2-D arrays**

- Write a program to store 10 elements in a 1-D array and print sum of the array, maximum and minimum element in an array.
- Write a program to count no. of positive numbers, negative numbers and zeros in an array.
- Write a program to count all subsets of given array with sum equal to given sum.
- Write a program to search an element using linear search algorithm.
- Write a program to sort the given elements using bubble sort algorithm.
- Write a program to perform matrix addition, subtraction and multiplication.

**Exercise 6: Strings**

- Write a program to perform various string manipulations using built-in functions.
- Write a program to verify the given string is palindrome or not.
- Write a program to Check if two strings are anagrams of each other.
- Write a program to concatenate two strings using arrays.
- Write a program to print the given strings in ascending order.

**Exercise 7: Non recursive and recursive functions**

- Write an application to simulate basic calculator ( +, -, \*, /) using functions.
- Write a program to find nth Fibonacci number using recursive and non-recursive number.
- Write a program to find factorial of a number using recursive and non-recursive number.
- Write a program to swap two numbers using Call by Value and Call by Reference.

**Exercise 8: Pointers**

- Write a program to illustrate Pointers to array, strings, Pointers to Pointers, Array of Pointers
- Write a program to sort an array using pointers.
- Write a program to perform matrix multiplication using pointers.

**Exercise 9: Structures and Union**

- Write a program to create structure for an account holder in a bank with following Fields: name, account number, address, balance and display the details of 'n' account holders.
- Write a program to find total marks of individual student and average marks for 'n' students using structures.
- Write a program to illustrate the functions of union.

**Mini project****TOTAL :60 PERIODS****OUTCOMES:**

At the end of the course, learners will be able to:

CO1: Develop algorithmic solutions to simple computational Problems using flow chart and Pseudo code

CO2: Develop simple applications using basic C components.

CO3: Solve applications adopting array and string concepts in C.

CO4: Construct and implement applications in C using functions and pointers.

CO5: Make use of Structures and Union concepts to prepare applications in C.

**List of Equipment's:****Laboratory Hardware / Software Requirements:**

Sl. No.	Description of Equipment/Software	Quantity required
1	INTEL based desktop PC with min 8GB RAM, 17'' or higher TFT Monitor , Keyboard and Mouse	32 per batch
2	Windows 10 or higher operating system	32 per batch
3	Turbo C Compiler or GCC Compiler	32 per batch

<b>PC25C01</b>	<b>PHYSICS AND CHEMISTRY LABORATORY</b> <i>(Common to all B.E. / B.Tech. Programmes)</i>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**COURSE OBJECTIVES:**

- To explain the proper use of various kinds of laboratory equipment.
- To extend how data can be collected, presented and interpreted in a clear and concise manner.
- To infer problem solving skills and interpretation of experimental data.
- To summarize error in experimental measurements and techniques used to minimize such error.
- To translate the student as an active participant in each part of all lab exercises.

**LIST OF EXPERIMENTS: PHYSICS LABORATORY**

- Laser- Determination of the wavelength of the laser using grating.
- Photoelectric effect – Determination of Planck's constant.
- Hall effect – determination of Hall parameters.
- Optical fibre -Determination of Numerical aperture and acceptance angle.
  - Compact disc- Determination of width of the groove using the laser.

5. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.

**LIST OF EXPERIMENTS: CHEMISTRY LABORATORY (Any 7 experiments)**

1. Determination of chloride content of water sample by Argentometric method.
2. Determination of total hardness of water by EDTA method.
3. Determination of strength of acids in a mixture of acids using conductivity meter.
4. Conductometric titration of strong acid against strong base.
5. Determination of DO content of water sample by Winkler's method.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Estimation of iron content of the given solution using potentiometer.
8. Conductometric titration of barium chloride against sodium sulphate. (precipitation titration)
9. Preparation of nanoparticles (TiO<sub>2</sub>/ZnO/CuO) by Sol-Gel method.
10. Determination of types and amount of alkalinity in water sample.

**TOTAL : 60 PERIODS**

**OUTCOMES:**

At the end of the course, learners will be able to:

**CO1:** Apply the knowledge, to gain hands-on experience with laboratory equipment.

**CO2:** Relate the graphical models to interpret the laboratory data.

**CO3:** Interpret quantitative reasoning and describing physical reality.

**CO4:** Apply the principle and process to access the scientific information.

**CO5:** Translate students to solve problems individually and collaboratively.

**REFERENCES:**

1. "Physics Laboratory Manual", Department of Physics, Velammal College of Engineering & Technology, Madurai (2021)
2. P. Mani, "Physics Laboratory", Dhanam Publications, Third Edition 2021.
3. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, "Vogel's Textbook of Quantitative Chemical Analysis" 2009.

\*Each class is divided in to two batches (30 students / batch) and each batch will perform their experiments alternatively per week in physics and chemistry laboratory.

**List of Equipment's:**

<b>Laboratory Requirements (PHYSICS)</b>		
<b>Sl. No.</b>	<b>Description of Equipment</b>	<b>Required numbers (for batch of 30 students)</b>
1.	Torsional Pendulum, stop clock, suspension metallic wire: two different thickness, two identical cylindrical mass, screw gauge, wooden scale	5
2.	Simple harmonic oscillations of cantilever: 1 meter wooden scale, G-clamp, weight hanger with slotted weights, Vernier calliper, Screw gauge, stop clock	5
3.	He-Ne/Diode laser (red), Green diode laser, Grating, Screen, Iron stand (3 Nos), 1m wooden scale, thread.	5

<b>Laboratory Requirements (CHEMISTRY)</b>		
<b>Sl. No.</b>	<b>Description of Equipment</b>	<b>Required numbers (for batch of 30 students)</b>
1.	PH meter	15 nos.
2.	Conductivity meter	15 nos.
3.	Potentiometer	15 nos.
4.	Electronic Balance (Two digit)	2 no.
5.	Hotplate with temperature controller	4 nos.
6.	Hot Air Oven	1 no.
7.	Muffle furnace	1 no.
8.	Magnetic stirrer	4 nos.
9.	Ball milling	1 no.
10.	Desicator	2 nos.

4.	Diode laser (green or red), fiber optic cable, movable arrangement with a screen for measuring spot size (zig), meter scale, stand	5
5	Diode laser (green or red), iron stand, compact disc, 1m-wooden scale, screen, stand	5
6.	Photoelectric effect apparatus with necessary accessories, tungsten-halogen lamp, Cesium-type vacuum photodiode.	5
7	Hall effect Apparatus and Kit	5
8.	Spectrometer	6
9.	Circular Disc - Torsion Pendulum	5
10.	Photoelectric effect apparatus	2
11.	Mercury Vapour Lamp	2
12.	Diode Laser	5

## SEMESTER – II

MA25203	ANALYTICAL AND PROBABILISTIC METHODS	L	T	P	C
		3	1	0	4
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To extend and formalize the knowledge of the theory of probability</li> <li>• To recognize and apply the algebraic and geometric properties of vectors and vector functions</li> <li>• To identify an effective mathematical method for finding the solutions of partial differential equations.</li> <li>• To learn the basic concepts of analytic functions of a complex variable.</li> <li>• To apply a suitable complex integration methods to evaluate the given integral.</li> </ul>					
<b>UNIT I</b>	<b>PROBABILITY</b>				<b>12</b>
Introduction-Sample Spaces and Events-Axioms of Probability-Conditional Probabilities-Random variables, Discrete and Continuous distributions, Binomial, Poisson, Geometric, Uniform, Normal distribution.					
<b>UNIT II</b>	<b>VECTOR CALCULUS</b>				<b>12</b>
Gradient , Divergence and Curl – Directional derivation – Irrotational and solenoidal vector fields – Integration Review (simple problems only)-Vector integration – Greens theorem in a plane , Gauss Divergence theorem and Stoke’s theorem (excluding proof) – Simple applications involving cubes and rectangular parallelepiped.					
<b>UNIT III</b>	<b>PARTIAL DIFFERENTIAL EQUATIONS</b>				<b>12</b>
Formation of partial differential equations – Solutions of standard types of first order PDE : Type- I, Type- II, Type- III, Type- IV– Lagrange’s linear equations – Linear partial differential equations of second and higher order with constant coefficients of homogeneous type.					
<b>UNIT IV</b>	<b>ANALYTIC FUNCTIONS</b>				<b>12</b>
Analytic functions – Properties of Analytic function- Construction of analytic function – Conformal mapping – Bilinear transformation – Definition and simple problems- Mapping by function : $w = c + z, az, \frac{1}{z}, z^2,$					
<b>UNIT V</b>	<b>COMPLEX INTEGRATION</b>				<b>12</b>
Complex Integration – Cauchy’s integral theorem and integral formula (excluding proof)- Taylor series and Laurent’s series –Residues – Cauchy’s residue Theorem (excluding proof) – Application of Residue theorem to evaluate real integrals around unit circle and semi-circle (excluding poles on the real axis).					
<b>TOTAL: 60 PERIODS</b>					
<b>OUTCOMES:</b>					
At the end of the course, learners will be able to:					
CO1: Apply the basic concepts of probability and random variables in real life.					
CO2: Apply the concept of vector calculus which naturally arises in many engineering Problems.					
CO3: Solve the Partial Differential Equations by using various techniques.					
CO4: Construct an analytic function using its properties.					
CO5: Apply complex integration techniques to evaluate some of the real integrals.					

**TEXT BOOKS:**

1. Kreyszig Erwin, "Advanced Engineering Mathematics ", 10<sup>th</sup> Edition, John Wiley and Sons, New Delhi, 2016.
2. JAY.L. Devore, "Probability and Statistics for Engineering and the Science", 9<sup>th</sup> Edition, Cengage Learning, Oct-2020.
3. Johnson, R.A., Miller, I and Freund J, "Probability and Statistics for Engineers", 9<sup>th</sup> Edition, Pearson Education, Asia, Jan-2020.

**REFERENCES:**

1. James Stewart, " Calculus: Early Transcendentals", Eighth Edition, Cengage Learning New Delhi, 2015.
2. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14<sup>th</sup> Edition, Pearson Education, 2018.
3. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", 2<sup>nd</sup> Edition, Academic Press, 2014.

<b>PH25C03</b>	<b>PHYSICS FOR ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To infer the electrical properties of materials.
- To understand the basics of semiconductor physics.
- To summarize the knowledge on the physics of semiconductors, determination of charge carriers and device applications.
- To illustrate different optical properties of materials, optical displays and applications.
- To translate the significance of nanostructures, quantum confinement in nanodevice applications.

**UNIT I | ELECTRONIC STATES | 9**

Quantum free electron theory - Fermi distribution and energy – Density of states - Dynamics of electrons in periodic potential – Electron in a periodic potential – Energy bands in solids –Conductors – Semiconductors – Insulators – tight binding approximation – Electron effective mass – the concept of hole - properties of conduction and valence bands.

**UNIT II | CARRIERS AND DOPING | 9**

Intrinsic concentration – intrinsic Fermi level – n and p type doping – density of carriers in extrinsic semiconductors and their temperature dependence – extrinsic semiconductor Fermi energy level – degenerate and non-degenerate semiconductors – Direct and indirect band gap semiconductors - band-gap engineering.

**UNIT III | SEMICONDUCTORS AND DISPLAY DEVICES | 9**

Semiconductors: Hall Effect - Schottky junction - Ohmic contacts – Schottky diode - optical absorption and solar cell– LED construction and working (White LED's – organic LEDs ) – Laser diode - LCD construction and working.

**UNIT IV | MAGNETIC AND OPTICAL DATA STORAGE TECHNIQUES | 9**

Introduction–Ferromagnetic materials – Ferrites - Soft and Hard magnetic materials – GMR sensors - magnetic disk memories – Principle of magnetic recording – Materials for magnetic data storage - Optical data storage capacity of CD– advantages of CD –DVD – Blu-ray DVD - holographic storage.

<b>UNIT V</b>	<b>NANODEVICES</b>	<b>9</b>
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Introduction - quantum confinement – quantum structures: quantum wells, wires and dots  
 Semiconductor nanodevices: - Tunneling: Single electron phenomena - Single Electron Transistor (SET) - Resonant Tunnelling Transistor (RTT) - Microelectromechanical systems (MEMS) - Nanoelectromechanical systems (NEMS).

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end of the course, learners will be able to:

**CO1:** Understand the basics of electronic states and energy band structure formation

**CO2:** Recognize the importance of carrier concentration and doping in semiconductors.

**CO3:** Explain semiconductor junction and display devices

**CO4:** Explore the magnetic and optical data storage devices

**CO5:** Implement the essential principles behind quantum structures and nanodevices.

**TEXT BOOKS:**

1. R.F.Pierret,“Semiconductor Device Fundamentals”, First Edition (Indian Edition) Pearson, 2006.
2. Jasprit Singh, “Semiconductor Devices Basic Principles”, First Edition (Indian Edition), Wiley, 2007.
3. Dr. Jaysukh Markna, Tulshi Shiyani, Nanodevices: Principle and Applications, Munich, GRIN Verlag , First Edition, 2018

**REFERENCES:**

1. Umesh Mishra and Jasprit Singh. Semiconductor Device Physics and Design. Springer, , First Edition ,2008.
2. S.O. Kasap,“Principles of Electronic Materials and Devices”, Fourth Edition (Indian Edition), McGraw-Hill Education, 2020.
3. Wilson,J and Hawkes, J.F.B, Optoelectronics, Prentice Hall, Second Edition, 2002

CH25C02	ENVIRONMENTAL SCIENCE (Common to all B.E. / B.Tech. Programmes)	L	T	P	C
		2	0	0	2
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To appreciate the structure and function of an ecosystem and biodiversity</li> <li>To realize the environmental impacts of natural resources.</li> <li>To recognize causes, effects and control measures of different types of pollution.</li> <li>To comprehend the importance of disaster management, environmental ethics and values.</li> <li>To appreciate the relevance of the environment by evaluating its impact on the surrounding environment and its functions.</li> </ul>					
<b>UNIT-I</b>	<b>ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY</b>	<b>6</b>			
Definition, scope and importance of environment – need for public awareness - ecosystem-general structure and function of an ecosystem- ecological succession-biodiversity-types-values of biodiversity- endangered and endemic species-red data book- hot spots of biodiversity-criteria- hot spots in India-threats to biodiversity(man-animal conflicts, habitat loss, poaching) - case studies - conservation of biodiversity- in-situ and ex-situ conservation – case studies for conservation of biodiversity in Mudumalai.					
<b>UNIT-II</b>	<b>NATURAL RESOURCES AND ITS ENVIRONMENTAL IMPACTS</b>	<b>6</b>			
Natural resources-forest resource-ecological functions – causes, effects and control measures of deforestation-water resource-sources-conflict over water-dams benefits and problems-food resource-overgrazing- impacts of over grazing- impacts of modern agriculture- <b>Energy Resources:</b> Growing energy needs, renewable and nonrenewable energy sources, use of alternative energy sources, - wind mills and solar panels- case studies.					
<b>UNIT III</b>	<b>ENVIRONMENTAL POLLUTION AND CONTROL</b>	<b>6</b>			
Air pollution-causes, effects and control methods - water pollution- causes, effects-waste water treatment-soil pollution-causes, effects-solid waste management - causes, effects and management - <b>E- waste:</b> composition and generation of E-waste pollutants, hazardous properties, Effects of pollutant on human health and environment, domestic E- waste disposal, Basic principles of E waste management, Component of E-waste management. Pollution control acts - air, water- wildlife - E- waste management rules - case studies - role of an individual in control of pollution.					
<b>UNIT IV</b>	<b>DISASTER MANAGEMENT AND ENVIRONMENTAL ETHICS</b>	<b>6</b>			
Disaster management-causes, effects and management of- flood, landslide, earthquake and tsunami-case studies- environmental ethics - value education-traditional value systems in India-water conservation-rain water harvesting-watershed management.					
<b>UNIT V</b>	<b>SUSTAINABLE MANAGEMENT AND PRACTICES</b>	<b>6</b>			
Social issues - climate change - causes, effects and control measures - global warming - causes, effects and control measures - Acid rain - causes, effects and control measures - ozone layer depletion - causes, effects and control measures - nuclear accident and holocausts – Sustainability - concept, needs and challenges - economic, social and aspects of sustainability - from unsustainability to sustainability - EIA - Sustainable development – goals, target - green buildings - ISO 14000 series.					
<b>TOTAL: 30 PERIODS</b>					

<b>OUTCOMES:</b> At the end of the course, learners will be able to:
<b>CO1:</b> Elucidate the concept, structure and function of an ecosystem and biodiversity. <b>CO2:</b> Demonstrate the environmental impressions of natural resources. <b>CO3:</b> Illustrate the appropriate management approach for pollution control. <b>CO4:</b> Practice the proper way of managing disaster with environmental ethics. <b>CO5:</b> Assess the impact of the environment on humans, and consider its roles and worth.
<b>TEXT BOOKS:</b>
1. Kaushik, and C. P. Kaushik. “Environmental Science and Engineering”, 6 <sup>th</sup> Edition, New Age International, 2018. 2. S. K. Garg and K. Garg, Ecological and Environmental studies, Khanna Publishers, 2015. 3. Wright and Nebel, Environmental science towards a sustainable future, 12 <sup>th</sup> Edition, Prentice Hall of India Ltd, 2015.
<b>REFERENCES:</b>
1. Erach Bharucha, “Text book of Environmental studies for Undergraduate courses”, 3 <sup>rd</sup> Edition, UGC, 2021. 2. P. Ravi, and Agrahari, Environmental ecology, Biodiversity, climatic change & Disaster management, 1 <sup>st</sup> Edition, McGraw Hill, 2020 3. Benney Joseph, “Environmental Science and Engineering”, 1 <sup>st</sup> Edition, McGraw Hill Education (India) Pvt Ltd, New Delhi, 2017.

EE25204	ELECTRIC CIRCUIT ANALYSIS	L	T	P	C
		3	1	0	4
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To explain the electric circuits and its analysis.</li> <li>To interpret circuit equations using network theorems.</li> <li>To illustrate transient response in R, RL and &amp; RLC circuits.</li> <li>To outline the measurement of power in three phase circuits</li> <li>To explain the concepts of resonance and two port networks.</li> </ul>					
<b>UNIT I</b>	<b>BASIC CIRCUITS ANALYSIS</b>	<b>12</b>			
Resistive elements - Ohm’s Law Resistors in series and parallel circuits – Kirchhoff’s laws – Mesh current and node voltage - methods of analysis.					
<b>UNIT II</b>	<b>NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS</b>	<b>12</b>			
Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin’s and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem-Power Division Theorem.					
<b>UNIT III</b>	<b>TRANSIENT RESPONSE ANALYSIS</b>	<b>12</b>			
Introduction to Laplace transform - R, L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and AC. sinusoidal input.					
<b>UNIT IV</b>	<b>THREE PHASE CIRCUITS</b>	<b>12</b>			
AC. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy - Analysis of three phase 3-wire and 3 phase 4-wire circuits with star and delta connected loads - balanced and unbalanced – phasor diagram of voltages and currents –					

power measurement in three phase circuits.					
<b>UNIT V</b>	<b>RESONANCE AND TWO PORT NETWORKS</b>				<b>12</b>
Resonance – concepts - Series and parallel resonance – resonant frequency – Quality factor and Bandwidth –Two port networks - Impedance and admittance parameters – Hybrid and transmission parameters.					
<b>TOTAL: 60 PERIODS</b>					
<b>OUTCOMES:</b>					
At the end of the course, learners will be able to:					
CO1: <b>Develop</b> mesh and nodal equations for electric circuits.					
CO2: <b>Apply</b> network reduction techniques for linear and nonlinear circuits.					
CO3: <b>Solve</b> network parameters and transient response for DC and AC circuits.					
CO4: <b>Make use of</b> three phase balanced and unbalanced circuit connections for calculation of power and power factor.					
CO5: <b>Solve</b> the frequency response of RLC circuits and two port networks					
<b>TEXT BOOKS:</b>					
1. Charles K. Alexander, Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, 2 <sup>nd</sup> Edition, McGraw Hill, 2013.					
2. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, 8 <sup>th</sup> edition, McGraw Hill, New Delhi,					
3. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, 5 <sup>th</sup> Edition, McGraw Hill, 2015.					
4. Nageswara Rao T, “Circuit Theory”, 5 <sup>th</sup> Edition, A.R Publications, 2017.					
<b>REFERENCES:</b>					
1. Chakrabarti A, “Circuits Theory (Analysis and synthesis), 5 <sup>th</sup> Edition, Dhanpath Rai & Sons, New Delhi, 2018.					
2. Allan H. Robbins, Wilhelm C. Miller, “Circuit Analysis Theory and Practice”, 5 <sup>th</sup> Edition, Cengage Learning India, 2013.					
3. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum’s series, 7 <sup>th</sup> Edition, McGraw- Hill, New Delhi, 2017.					
4. M E Van Valkenburg, “Network Analysis”, 3 <sup>rd</sup> Edition, Prentice-Hall of India Pvt Ltd, New Delhi, 2019.					
5. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” 1 <sup>st</sup> Edition, Prentice-Hall of India Pvt Ltd., New Delhi, 2015.					
6. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7 <sup>th</sup> Edition, John Wiley & Sons, Inc. 2015.					
7. Jegatheesan, R., “Analysis of Electric Circuits,” 2 <sup>nd</sup> Edition, McGraw Hill, 2018.					

<b>TA25C02</b>	<b>TAMILS AND TECHNOLOGY /</b> <b>தமிழரும் தொழில்நுட்பமும்</b> <i>(Common to all B.E./B.Tech. Programmes)</i>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<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 Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage					

Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period		
<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 beads - 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. கணினித்தமிழ் முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).</li> <li>3. கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)</li> <li>4. பொருளை 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> <li>7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).</li> <li>8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)</li> <li>9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology &amp; Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)</li> <li>10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)</li> <li>11. Porunai Civilization (Jointly Published by: Department of Archaeology &amp; Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)</li> <li>12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.</li> </ol>		

EN25C02	ENGLISH PROFICIENCY AND SOFT SKILLS (Common to B.E. Civil, CSE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes) (Theory with Practical)	L	T	P	C
		2	0	2	3
<b>COURSE OBJECTIVES:</b>					
The course enables the students to					
<ul style="list-style-type: none"> <li>Strengthen LSRW (Listening, Speaking, Reading, Writing) competencies in English.</li> <li>Demonstrate effective communication skills in meeting academic requirements.</li> <li>Integrate and interpret graphical data in logical writing using verbal reasoning.</li> <li>Produce formal writings for effective internal and external communication.</li> <li>Present and adapt concepts according to the target audience, fostering essential soft skills.</li> </ul>					
<b>UNIT I</b>	<b>INTRODUCTION TO COMMUNICATION PROFICIENCY</b>	<b>6</b>			
<b>Listening:</b> Listening to native speaker's Telephone Conversations; <b>Speaking:</b> Sharing Childhood Experiences, dialogues (Informal & Formal), Talking about Favorite Personalities; <b>Reading:</b> Technical texts from - Newspapers /websites, Job Advertisements - Telephone Phrases; <b>Writing:</b> Statements - Issue based writing instructions - Checklist; <b>Grammar:</b> Error Spotting; <b>Vocabulary:</b> Misspelt Words; <b>Soft Skills:</b> Leadership Skills					
<b>UNIT II</b>	<b>TECHNICAL TALKS AND TEAM DYNAMICS</b>	<b>6</b>			
<b>Listening:</b> Listening to Technical Talks, Scientific Lectures and Short Conversations; <b>Speaking:</b> Career choice, describing recent innovation in Technology; <b>Reading:</b> Speed reading - Identifying the various transitions in a text - Paragraphing; <b>Writing:</b> Precis writing - Letter of Enquiry, Quotation, Order, Claim and Adjustment Letters- Response to complaints; <b>Grammar:</b> Numerical Adjectives, Active & Passive Voice, Use of Impersonal Passive form; <b>Vocabulary:</b> Idioms & Phrases, Jumbled sentences; <b>Soft Skills:</b> Teamwork					
<b>UNIT III</b>	<b>CAREER INSIGHTS AND DECISION MAKING</b>	<b>6</b>			
<b>Listening:</b> Job Interviews, Interview Skills, FAQs - Sports Commentaries/Animated stories/Anecdotes / Event narration; <b>Speaking:</b> Interviewing Celebrities and Entrepreneurs; <b>Reading:</b> Short stories - Critical reading; <b>Writing:</b> Cover Letter & Resume, Project Proposal writing; writing using AI tools <b>Grammar:</b> Embedded sentences; <b>Vocabulary:</b> Foreign words used in English( from other languages); <b>Soft Skills:</b> Decision Making					
<b>UNIT IV</b>	<b>PROFESSIONAL WRITING AND ANALYTICAL SKILLS</b>	<b>6</b>			
<b>Listening:</b> TED Talks; <b>Speaking:</b> Presentation Skills; <b>Reading:</b> Developing analytical skills - Company profiles; <b>Writing:</b> Writing Statement of Purpose (SOP)-Emails, Memos, Notices and Circulars, Internship Application Letters; <b>Grammar:</b> Punctuation, If Conditionals; <b>Vocabulary:</b> Adjectives - Verbal reasoning; <b>Soft Skills:</b> Time Management					
<b>UNIT V</b>	<b>ART OF REPORTING AND PANEL DISCUSSIONS</b>	<b>6</b>			
<b>Listening:</b> Model debate and reviewing the performance of each participant - Panel discussion; <b>Speaking:</b> Group communication-Discussing social issues, current affairs and debate; <b>Reading:</b> Fitting sentences in a paragraph - Cause and Effect Essays, Technical papers and case studies; <b>Writing:</b> Accident Report and Feasibility Report, Minutes of the Meeting; <b>Grammar:</b> Cause and Effect expressions , Reported speech; <b>Vocabulary:</b> Verbal Analogies; <b>Soft Skills:</b> Conflict Resolution					

<b>PRACTICAL COURSE</b>		
<b>Practical Syllabus</b>	<b>INTRA PERSONAL, INTERPERSONAL, ORGANIZATIONAL AND MASS COMMUNICATION</b>	<b>15</b>
<p><b>Listening:</b> Listening to TED Talks and Practice Exercises - Making a Critical Appreciation of Video Content - Answering Cloze Test Based on Listening.</p> <p><b>Speaking:</b> Self-Introduction-Introducing Resource Persons and Chief Guests - Developing Stories Using Picture Prompts - Language Etiquette in Different Situations - Expressing Agreement and Conflict Management and Seeking Information - Expressing Feelings - Affection, Anger, Regret etc. - Team Reviewing and Appraisal on any Social Event, Short Talk on Technical Topics.</p> <p><b>Reading:</b> Making Inference in Reading - Reading Longer Texts with Time Frame - Reading and Interpreting Data using different types of Texts, Magazines and Internet Materials - Editing/Proofreading - Reading Research Papers.</p> <p><b>Writing:</b> Abstract Writing - Mind Mapping and Brainstorming on any Social Event/Issue - Creating a Product Review Blog, Making Powerpoint Presentations (MS Power point &amp; Google Slides) and Creating PPT using AI tools.</p>		
<b>TOTAL: 45 PERIODS</b>		
<b>OUTCOMES:</b>		
At the end of the course, learners will be able to:		
<p><b>CO1:</b> Demonstrate improved LSRW competencies in English.</p> <p><b>CO2:</b> Exhibit enhanced academic communication skills.</p> <p><b>CO3:</b> Integrate graphical data into logical writing.</p> <p><b>CO4:</b> Compose formal documents for communication.</p> <p><b>CO5:</b> Adapt and present concepts to diverse audiences with the usage of soft skills.</p>		
<b>TEXT BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Gangalakshmi, C, Rathika, B, Saranraj, L. Professional English for Engineers. New Delhi: Cengage, 2022.</li> <li>2. Shoba K. N. and Lourdes Joavani Rayen, “Communicative English”, Cambridge University Press, Cambridge, 2021.</li> <li>3. Raymond Murphy, “Intermediate English Grammar”, Cambridge University Press, New Delhi, 2020.</li> </ol>		
<b>REFERENCES:</b>		
<ol style="list-style-type: none"> <li>1. Raman, Meenakshi and Sangeetha Sharma. Communication Skills. New Delhi: OUP, 2018.</li> <li>2. R. C. Sharma Krishna Mohan - Business Correspondence and Report Writing a Practical Approach to Technical Communication - McGraw Hill India (2017).</li> <li>3. Jawahar, Jewelcy &amp; Rathna.P. Communicative English Workbook. VRB Publishers Pvt Ltd. Chennai. 2018.</li> </ol>		

**Website Resources:**

1. Open Online Repositories from Oxford/ Cambridge/ British Council/ Voice of America
2. <https://www.youtube.com/@TEDx>
3. [https://youtu.be/dzR4E49zNLI?si=0RL4C\\_vV1i1Kz2iR](https://youtu.be/dzR4E49zNLI?si=0RL4C_vV1i1Kz2iR)
4. AI tools : [www.magicschool.ai](http://www.magicschool.ai), [www.typeset.io](http://www.typeset.io), [www.gamma.app](http://www.gamma.app), [www.veed.io](http://www.veed.io)

ME25C01	ENGINEERING GRAPHICS AND DESIGN (Common to B.E. CSE, CSE(CS), EEE, EE(VLSI), Mech and B.Tech. IT, AI&DS Programmes)			
	L	T	P	C
	2	0	2	3
<b>COURSE OBJECTIVES:</b>				
<ul style="list-style-type: none"> <li>• Apply fundamental concepts of engineering graphics and orthographic projections using basic 2D CAD software.</li> <li>• Interpret and sketch the projection of simple solids and understand basic 3D CAD modeling techniques.</li> <li>• Create sectional views and develop true shapes of solids through manual sketching and CAD tools.</li> <li>• Apply isometric projection techniques and use basic AR/VR tools to visualize engineering objects.</li> <li>• Sketch orthographic projections and understand the fundamentals of design for 3D printing and additive manufacturing.</li> </ul>				
<b>UNIT I</b>	<b>BASICS OF ENGINEERING GRAPHICS AND VISUALIZATION</b>			<b>9</b>
Introduction to Engineering Graphics: Importance, applications, and tools. Use of Drafting Instruments: Lettering, dimensioning, line types, and scales. Orthographic Projections: Principles, projection of points, straight lines <i>Introduction to CAD Software: Basics of 2D drawing and layout views. Demo on 2D CAD practice – Demo. Introduction to UX/UI in Engineering Design: Overview of the importance of user interface (UI) and user experience (UX) in engineering applications (e.g., dashboards, software interfaces) - Demo</i>				
<b>UNIT II</b>	<b>PROJECTION OF SOLIDS</b>			<b>9</b>
Projection of Solids: Prisms, pyramids, cylinders, cones, with the axis inclined to principal planes. <i>Basic CAD Modelling of Solids: Introduction to simple 3D modelling in CAD tools. Demo on 3D CAD practice – Demo.</i>				
<b>UNIT III</b>	<b>PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES</b>			<b>9</b>
Sectioning of Solids: Sectional views of simple solids with cutting planes inclined to horizontal plane. True Shape of Sectional Views: Obtaining true shape and development of sections.				
<b>UNIT IV</b>	<b>ISOMETRIC PROJECTIONS</b>			<b>9</b>
Isometric Projection: Principles, isometric scale, and isometric views of simple solids like prisms, pyramids, cones and cylinders. <i>Introduction to Visualization Tools: Use of simple AR/VR applications for viewing isometric</i>				

<i>and perspective projections. Demo on AR/VR – Demo.</i>		
<b>UNIT V</b>	<b>ORTHOGRAPHIC PROJECTIONS AND DESIGN APPLICATIONS</b>	<b>9</b>
Freehand Sketching: Sketching orthographic views of simple isometric solids. <i>Design for 3D Printing: Basics of modelling for additive manufacturing. Demo on 3D Printing – Demo.</i>		
<b>TOTAL: 45 PERIODS</b>		
<b>OUTCOMES:</b> At the end of the course, learners will be able to:		
CO1: Construct orthographic projections of points, lines, and simple objects using drafting tools and 2D CAD software.		
CO2: Sketch projections of prisms, pyramids, cylinders, and cones and create basic 3D models using CAD software.		
CO3: Generate sectional views and develop true shapes of simple solids using manual and CAD tools.		
CO4: Create isometric projections and use AR/VR tools for enhanced spatial visualization of engineering objects.		
CO5: Apply freehand sketching to produce orthographic projections and understand basic 3D printing design considerations.		
<b>TEXT BOOKS:</b>		
1. Natarajan K.V., “A text book of Engineering Graphics”, 31 <sup>st</sup> Edition, Dhanalakshmi Publishers, Chennai, 2018.		
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, 15 <sup>th</sup> Edition, New Age International (P) Limited, 2018.		
3. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, 53 <sup>rd</sup> Edition, Charotar Publishing House, 2014.		
<b>REFERENCES:</b>		
1. S.S. Sashikiran., “The 7S Design Framework”, 1 <sup>st</sup> Edition, Notion Press, 2024.		
2. Rajiv Chopra, “Virtual and Augmented Reality” 1 <sup>st</sup> Edition, Khanna Publishing House, 2021.		
3. Sabrie Soloman, “3D Printing & Design”, 1 <sup>st</sup> Edition, Khanna Publishing House, 2020.		

EM25C01	ENGINEERING PRACTICES LABORATORY (Common to B.E. Civil, CSE, CSE(CS), EEE, EE(VLSI), Mech and B.Tech. IT Programmes)	L	T	P	C
		0	0	4	2
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To draw pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.</li> <li>To demonstrate the basic switch board wiring, fluorescent lamp wiring and stair case wiring using various electrical components.</li> <li>To choose various joints in steel plates using arc welding work and machining various simple processes like turning, drilling, tapping in parts</li> <li>To build a tray out of metal sheet using sheet metal work.</li> <li>To develop electronic circuit and testing for soldering and desoldering using PCB board.</li> </ul>					
<b>LIST OF EXPERIMENTS:</b>					
<b>GROUP – A</b>					
<b>PART – I : Civil Engineering Practices</b>					
<b>PLUMBING WORK:</b>					
<ul style="list-style-type: none"> <li>Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household using Power Tools.</li> </ul>					
<b>WOOD WORK:</b>					
<ul style="list-style-type: none"> <li>Planning and Making Dovetail joint.</li> </ul>					
<b>CENTRIFUGAL PUMP:</b>					
<ul style="list-style-type: none"> <li>Assembly and Dismantling of Centrifugal pump.</li> </ul>					
<b>AIR-CONDITIONER:</b>					
<ul style="list-style-type: none"> <li>Trouble shooting of AC</li> </ul>					
<b>MODERN MANUFACTURING:</b>					
<ul style="list-style-type: none"> <li>Laser engraving and 3D printing* - Demo</li> </ul>					
<b>ROBOTICS:</b>					
<ul style="list-style-type: none"> <li>Application of Robot In Automation* - Demo</li> </ul>					
<b>PART – II: Electrical Engineering Practice</b>					
<b>CYCLE I</b>					
<ul style="list-style-type: none"> <li>Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket</li> <li>Staircase wiring</li> <li>Energy meter wiring and related calculations calibration</li> <li>Roof top solar panel connection and EV connection</li> <li>Study of BLDC Fan.</li> </ul>					

<b>GROUP – B</b>	
<b>PART - III: Mechanical Engineering Practices</b>	
<b>WELDING WORK:</b>	
<ul style="list-style-type: none"> <li>• Welding of Butt Joints using arc welding.</li> <li>• Robot welding* (Demo)</li> </ul>	
<b>BASIC MACHINING WORK:</b>	
<ul style="list-style-type: none"> <li>• Facing and Turning*. (Demo)</li> </ul>	
<b>SHEET METAL WORK:</b>	
<ul style="list-style-type: none"> <li>• Making of a rectangular tray</li> </ul>	
<b>AUTOMOBILE:</b>	
<ul style="list-style-type: none"> <li>• Mantling and dismantling of Tyre's for 4 wheeler.</li> <li>• Assembly and disassembly of Bearing.</li> </ul>	
<b>PART- IV: Electronic Engineering Practices</b>	
<b>CYCLE II</b>	
<ul style="list-style-type: none"> <li>• Construction of series and parallel circuits using resistors.</li> <li>• Measurement of resistance to earth of electrical equipment.</li> <li>• Introduction of electronic components (Resistance, Capacitor, Diode, BJT, UJT, SCR, JFET)</li> <li>• Soldering Simple electronic Circuits and Checking Continuity</li> <li>• Generation of Signals (DSO, Function generator).</li> </ul>	
<b>TOTAL: 60 PERIODS</b>	
<b>OUTCOMES:</b>	
At the end of the course, learners will be able to:	
CO1: Build various plumbing joints	
CO2: Develop various carpentry joints.	
CO3: Construct various wiring electrical joints in common household electrical wire work	
CO4: Construct various welded joints, sheet metal and basic machining operations	
CO5: Develop the electronic circuit for soldering	

**List of Equipment's:**

Sl. No.	Description of Equipment	Required numbers (for batch of 30 students)
<b>Part I: Civil Engineering Practices</b>		
<b>(a)</b>	<b>Plumbing Work:</b>	
1)	Pipe Vice	15 Nos.
2)	Die Holder with Die set	15 Nos.
<b>(b)</b>	<b>Wood Work</b>	
1)	Tri Square	15 Nos.
2)	Hand Saw	15 Nos.
3)	Carpentry bench wise	15 Nos.
4)	Firmer Chisel	15 Nos.
5)	Motrin Chisel	15 Nos.
6)	Iron Jack	15 Nos.

7)	Mallet	15 Nos.
8)	Bench hold fastens	15 Nos.
9)	Wooden Bench Hook	15 Nos.
10)	Wood Cutting Machine	2 Nos.
<b>Part II: Electrical Engineering Practice</b>		
1)	Single phase house wiring setup	2 Nos.
2)	Three phase house wiring setup	2 Nos.
3)	Staircase wiring setup	2 Nos.
4)	Energy meter	2 Nos.
5)	Solar Panel	1 No.
6)	EV Module	1 No.
7)	BLDC Fan	1 No.
<b>Part III: Mechanical Engineering Practices</b>		
<b>(a)</b>	<b>Welding Work:</b>	
1)	Arc welding unit	5 Nos.
2)	Gas welding unit	2 Nos.
<b>(b)</b>	<b>Basic Machining Work:</b>	
1)	Lathe Machines	5 Nos.
2)	Drilling Machines	5 Nos.
<b>(c)</b>	<b>Assembly Work:</b>	
1)	Centrifugal pump	2 Nos.
2)	Air-conditioner unit	2 Nos.
3)	Household mixer	2 Nos.
<b>(d)</b>	<b>Sheet Metal Work:</b>	
1)	Steel rule	2 Nos.
2)	Bend snips	5 Nos.
3)	Straight snips	5 Nos.
4)	Scriber	5 Nos.
5)	Divider	5 Nos.
6)	Trammel	5 Nos.
7)	Prick Punches	5 Nos.
8)	Centre punches	5 Nos.
9)	Pliers	5 Nos.
10)	Ball pean hammer	5 Nos.
11)	Raising hammer	5 Nos.
12)	Riverting hammer	5 Nos.
13)	Square free hammer	5 Nos.
14)	Anvil	3 Nos.
15)	Swage block	3 Nos.
16)	Wige gauges	2 Nos.
<b>(e)</b>	<b>Foundry Work</b>	
1)	Cope and Drag Box	5 Nos.
2)	Pattern	5 Nos.
3)	Solid pattern	5 Nos.
4)	Split pattern	5 Nos.
5)	Runner	5 Nos.
6)	Riser	5 Nos.
7)	Sprue	5 Nos.

8)	Sand reamer	5 Nos.
9)	Trowel	5 Nos.
<b>Part IV: Electronic Engineering Practices</b>		
1)	Soldering Iron, Lead	5 Set
2)	Multi meter	5 Nos.
3)	Continuity tester	5 Nos.
4)	Megger	1 No.
5)	DSO	1 No.
6)	Function generator	5 Nos.
7)	Resistors	100 Nos.
	Capacitors	50 Nos.
	Diodes	25 Nos.
	Transistors	25 Nos.

EE25206	ELECTRIC CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To analyze various electric circuits using PSpice/MATLAB/P-SIM.</li> <li>To apply basic electric circuit laws in electrical circuits.</li> <li>To experiment basic circuit theorems in electrical networks.</li> <li>To utilize the software for simulation of RL, RC and RLC circuits.</li> <li>To compare the frequency response of series and parallel resonant circuits</li> </ul>					
<b>LIST OF EXPERIMENTS:</b>					
<ol style="list-style-type: none"> <li>Experimental verification of Electric Circuit using Kirchhoff's Voltage Law</li> <li>Experimental verification of Electric Circuit using Kirchhoff's Current Law.</li> <li>Experimental verification of Electric Circuit using Thevenin's Theorem.</li> <li>Experimental verification of Electric Circuit using Norton's Theorem.</li> <li>Experimental verification of Electric Circuit using Superposition Theorem.</li> <li>Experimental verification of Electric Circuit using Maximum power transfer theorem.</li> <li>Experimental validation of R-L Electric Circuits Transients with DC and AC input</li> <li>Experimental validation of R-C Electric Circuits Transients with DC and AC input</li> <li>Experimental validation of R-L-C Electric Circuit Transients with DC and AC input</li> <li>Design of series resonance circuits</li> <li>Design of parallel resonance circuits</li> <li>Measurement of Power in three phase circuits</li> </ol>					
<b>TOTAL: 60 PERIODS</b>					
<b>OUTCOMES:</b>					
At the end of the course, learners will be able to:					
CO1: Apply basic circuit laws for electric circuit parameters calculation					
CO2: Choose circuit theorems for finding electric circuits parameters.					
CO3: Classify the response of R-L, R-C and R-L-C circuits with AC and DC inputs.					
CO4: Analyze the time and frequency response of series and parallel resonance circuits.					
CO5: Demonstrate the power measurement for three phase circuits					

**List of Equipment's:**

<b>Sl. No.</b>	<b>Description of Equipment</b>	<b>Required numbers (for batch of 30 students)</b>
1	10 Nos of PC loaded with Pspice/ Matlab/e-Sim / Scilab/ Equivalent Software Package	Minimum 10 Users
2	Printer	1
3	Regulated Power Supply (0-30V )	10 Nos
4	Function Generator (MHz Range)	5 Nos
5	Oscilloscope (20 MHz)	10 Nos
6	Digital Storage Oscilloscope (20 MHz)	2 Nos
7	AC/DC – Voltmeters of required rating	10 Nos
8	AC/DC -Ammeters of required rating	10 Nos
9	Multimeters	10 Nos
10	Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box	6 Nos each
11	Single Phase Wattmeter of suitable rating	5 Nos
12	Circuit Connection Boards	20 Nos
13	Connecting Wires	Necessary Quantity
14	Three phase star& delta connected load / Single phase load bank of suitable rating	3 Nos
15	Resistors, Inductors, Capacitors of various capacities (Quarter Watt to 10 Watt)	Necessary Quantities

### SEMESTER- III

MA25302	TRANSFORM TECHNIQUES AND ITS APPLICATIONS <i>(B.E. Electrical and Electronics Engineering)</i>	L	T	P	C	
		3	1	0	4	
<b>COURSE OBJECTIVES:</b>						
<ul style="list-style-type: none"> <li>• To apply the various methods for finding the Laplace transform of the given function.</li> <li>• To solve the given ODE problems using Laplace transform in Electrical engineering.</li> <li>• To use Z transform techniques in solving difference equations for discrete time systems.</li> <li>• To explore various Fourier transform techniques used in wide variety of situations.</li> <li>• To develop the ability to apply Fourier transform techniques for solving problems in Electrical Engineering.</li> </ul>						
<b>UNIT I</b>	<b>LAPLACE TRANSFORMS</b>					<b>12</b>
Laplace transform- conditions for existence –Transform of elementary functions –Basic properties – First shifting theorem –Transform of derivatives on $t f(t), f(t)/t$ and periodic functions- Transform of unit step function and impulse functions. Inverse Laplace transform by partial fraction method.						
<b>UNIT II</b>	<b>APPLICATIONS OF LAPLACE TRANSFORMS</b>					<b>12</b>
Convolution theorem (excluding proof)-Initial and final value theorems-Solutions of linear ODE of second order with constant coefficients using Laplace transform techniques-Application problems using Laplace Transform in Electrical Engineering.						
<b>UNIT III</b>	<b>Z- TRANSFORMS</b>					<b>12</b>
Z- Transform – Elementary properties – Inverse Z- Transforms (using partial fractions and residues) – Convolution theorem –Initial value and Final value theorem- Formation of difference equations – Solution of difference equations using Z-transform-Application problems using Z-Transform in Electrical Engineering.						
<b>UNIT IV</b>	<b>FOURIER TRANSFORMS</b>					<b>12</b>
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transform – Properties – Transforms of simple functions – convolution theorem – Parseval’s identity.						
<b>UNIT V</b>	<b>APPLICATIONS OF FOURIER TRANSFORMS</b>					<b>12</b>
Application of Fourier transform to Boundary value problems - Discrete Fourier transform and its properties - Inverse Discrete Fourier transform and its properties - Discrete Time Fourier Transform						

and its properties -Inverse Discrete Time Fourier Transform and its properties -Application problems using Fourier Transform in Electrical Engineering.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

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

CO1: Calculate the Laplace Transform and inverse Laplace Transform of different functions.

CO2: Apply Laplace Transform technique to solve second order differential equations.

CO3: Solve the given difference equations using Z Transform.

CO4: Compute the given integral using Fourier Transform techniques.

CO5: Deduce suitable Fourier transform techniques to evaluate the given integral in wide variety of situations in Electrical Engineering.

**TEXT BOOKS:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics ", 11<sup>th</sup> Edition, John Wiley, India, 2025.
2. B.S.Grewal, "Higher Engineering Mathematics", 45<sup>th</sup> edition, Khanna Publisher, Delhi, 2024.

**REFERENCES:**

1. Peter V.O'Neil, "Advanced Engineering Mathematics", 8<sup>th</sup> Edition, Cengage Learning India Private Limited, Delhi, 2023.
2. R.C. Wylie, and Barrett, L.C., "Advanced Engineering Mathematics ", 6<sup>th</sup> Edition, Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2012.
3. Ramana, B.V. "Higher Engineering Mathematics", 11<sup>th</sup> Reprint, Tata McGraw Hill, New Delhi 2010.

EE25301	ELECTROMAGNETIC THEORY	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To summarize the basic mathematical concepts related to vector fields.</li> <li>To explain the concepts of electrostatic fields, electric flux density, electrical potential, capacitance, energy density and their applications.</li> <li>To infer the concept of magneto static fields, magnetic flux density, vector potential, inductance and its applications.</li> <li>To illustrate different methods of EMF generation and Maxwell's equations of static and time varying field.</li> <li>To interpret the concepts of electromagnetic waves and characterizing parameters</li> </ul>					
<b>UNIT I</b>	<b>COORDINATE SYSTEM AND INTRODUCTION TO ELECTROSTATICS</b>				<b>9</b>
Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Gradient, Divergence, Curl – theorems and applications - Coulomb's Law –Stroke's theorem.					
<b>UNIT II</b>	<b>ELECTROSTATICS AND APPLICATIONS</b>				<b>9</b>
Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications. Electric potential – Electric field and equipotential plots, Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density, Applications.					
<b>UNIT III</b>	<b>MAGNETOSTATICS AND APPLICATIONS</b>				<b>9</b>
Lorentz force, magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Real time Applications (MRI) - Case studies-Electromagnetic Fields in MRI Scanners.					
<b>UNIT IV</b>	<b>MOTIONAL/ TRANSFORMER EMF AND MAXWELL EQUATION OF ELECTRODYNAMIC FIELDS</b>				<b>9</b>
Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory – Applications- Case studies -Mobile Phone Radiation and Human Exposure.					

UNIT V	ELECTROMAGNETIC WAVES AND ITS PROPAGATION	9
Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction. Real time Application (Air traffic control, Weather monitoring, Military defence).		
		<b>TOTAL: 45 PERIODS</b>
<p><b>COURSE OUTCOMES:</b> At the end of the course, learners will be able to</p> <p>CO1: Outline the basic mathematical concepts related to vector fields.</p> <p>CO2: Summarize the basic concepts of electrostatic fields, electrical potential, energy density capacitance and their applications.</p> <p>CO3: Infer the knowledge in magneto static fields, magnetic flux density, vector potential, inductance and its applications.</p> <p>CO4: Classify methods of EMF generation and Maxwell’s equations of electrodynamics fields.</p> <p>CO5: Illustrate the basic concepts of electromagnetic waves and characterizing parameters.</p>		
<p><b>TEXT BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. Mathew N.O. Sadiku, “Principles of Electromagnetics”, 6<sup>th</sup> Edition, Oxford University Press Inc. Asian edition, 2015.</li> <li>2. William H. Hayt and John A. Buck, “Engineering Electromagnetics”, Special Indian Edition, McGraw Hill, 2014.</li> </ol>		
<p><b>REFERENCES</b></p> <ol style="list-style-type: none"> <li>1. V.V.Sarwate, “Electromagnetic fields and waves”, 1<sup>st</sup>Edition, Newage Publishers, 2018</li> <li>2. J.P.Tewari, “Engineering Electromagnetics - Theory, Problems and Applications”, 2<sup>nd</sup> Edition, Khanna Publishers,2013.</li> <li>3. Joseph. A.Edminister, “Schaum’s Outline of Electromagnetics”, 3<sup>rd</sup> Edition (Schaum’s Outline Series), McGraw Hill, 2010.</li> <li>4. S.P.Ghosh, Lipika Datta, “Electromagnetic Field Theory”, 1<sup>st</sup>Edition, McGraw Hill Education(India) Private Limited, 2012.</li> <li>5. Kraus and Fleish, “Electromagnetics with Applications”, McGraw Hill International Editions, 5<sup>th</sup>Edition, 2010.</li> <li>6. K A Gangadhar, “Electromagnetic Field Theory”, 8<sup>th</sup> Edition, Khanna Publishers, 2015.</li> </ol>		

EE25302	DIGITAL LOGIC CIRCUITS	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To summarize the various number systems and digital logic families.</li> <li>To construct combinational logic circuits using K-map.</li> <li>To develop synchronous sequential circuits using flip flops.</li> <li>To produce the asynchronous sequential circuits using flip flops.</li> <li>To perform the hardware functionality using Programmable Logic Devices (PLDs) and Hardware Description Language (HDL) at system level.</li> </ul>					
<b>UNIT I</b>	<b>FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES</b>	<b>9</b>			
Digital signals, digital circuits, Operation of Logic Gates - AND, OR, NOT, NAND, NOR, EX-OR (Exclusive-OR) and EX-NOR (Exclusive-NOR), Boolean algebra, Number systems-binary, signed binary, octal, hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, construction and working of digital logic families, TTL,ECL, RTL, DTL and CMOS logic.					
<b>UNIT II</b>	<b>COMBINATIONAL CIRCUITS</b>	<b>9</b>			
Combinational logic - representation of logic functions-SOP and POS forms, K-map representations-minimization using K maps - simplification and implementation of combinational logic - Adders, Subtractors, Multiplexers and Demultiplexers, Code converters, Encoders and Decoders, Magnitude Comparators – Single bit, Two bit, Four bit, Case Studies: Data Routing in Communication Systems,Real time Applications: Electronic Voting Machines, Elevators.					
<b>UNIT III</b>	<b>SYNCHRONOUS SEQUENTIAL CIRCUITS</b>	<b>9</b>			
Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment ,Case Studies: Processor Instruction Cycle in Computers, Real time Applications: Digital Clock, Vending Machine.					
<b>UNIT IV</b>	<b>ASYNCHRONOUS SEQUENTIAL CIRCUITS</b>	<b>9</b>			
Asynchronous sequential logic circuits - Transition Stability, flow Stability-race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits, Case Studies: Interrupt Handling in Microprocessors, Real time Applications: Keyboard Input System, Fire Alarm System.					
<b>UNIT V</b>	<b>PROGRAMMABLE LOGIC DEVICES AND HARDWARE DESCRIPTION LANGUAGE (HDL)</b>	<b>9</b>			
Introduction to Programmable Logic Devices: Programmable Read Only Memory (PROM) – Programmable Logic Array (PLA) –Programmable Array Logic (PAL)-Field Programmable Gate Array (FPGA). Introduction to Hardware Description Language (HDL): Digital design process flow – Entities - Architecture –Concurrent and Sequential statements - Behavioral, Dataflow, and structural modeling-simple HDL codes,Case Studies: Video and Image Processing Systems, Real time Applications: Industrial Automation, Automotive EUC.					
<b>TOTAL: 45 PERIODS</b>					
<b>COURSE OUTCOMES:</b>					
At the end of the course, learners will be able to					
CO1:Outline the various number systems and different logic families.					

CO2:Construct combinational logic circuits using basic gates and simplification using Karnaugh maps.

CO3:Produce the synchronous sequential circuits using flip flops.

CO4:Develop asynchronous sequential circuits using flip flops.

CO5:Perform the hardware functionality at system level using Programmable Logic Device (PLD) and Hardware Description Language (HDL).

**TEXT BOOK(S):**

1. M. Morris Mano, Michael D. Ciletti, “Digital Design - With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, McGraw Hill,2018.

2. Thomas L. Floyd, “Digital Fundamentals”, 11<sup>th</sup> Edition, Pearson Education, 2017.

3. S. Salivhanan, S. Arivazhagan, “Digital Circuits and Design”, 5<sup>th</sup> Edition, Oxford University Press, 2018.

**REFERENCES:**

1. Leach, Malvino, Saha, “Digital Principles and Applications”, 8<sup>th</sup> Edition, McGraw Hill, 2014.

2. William Keitz, “Digital Electronics-A Practical Approach with VHDL”, 9<sup>th</sup> Edition, Pearson, 2011.

3. Samir Palnitkar, “Verilog HDL- A guide to digital design and synthesis”, 2<sup>nd</sup> Edition, Pearson Education, 2003.

4. Ronald J. Tocci, “Digital Systems”, 10<sup>th</sup> Edition, Pearson education, 2009.

5. Rabaey, “Digital Integrated Circuits: A design perspective”, 2<sup>nd</sup> Edition, Pearson Education, 2016.

EE25303	DC MACHINES AND TRANSFORMERS	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>To illustrate the magnetic-circuit analysis and Electro mechanical Energy Conversion.</li> <li>To describe the DC Generator fundamentals and machine parts</li> <li>To identify the characteristics and speed control of DC motor</li> <li>To obtain the equivalent circuit of Transformers</li> <li>To summarize the connections of three phase transformer</li> </ul>					
<b>UNIT I</b>	<b>ELECTRO MECHANICAL ENERGY CONVERSION</b>				<b>9</b>
Magnetic circuits –types, Laws governing magnetic circuits - Flux linkage-Statically and dynamically induced EMF- Principle of Electro mechanical Energy Conversion-Magnetic losses - Single and Multiple excited system-AC excitation - Introduction to permanent magnets					
<b>UNIT II</b>	<b>DC GENERATOR</b>				<b>9</b>
Construction and Principle of operation of DC generator - EMF equation–Lap and wave windings - Methods of excitation-Circuit model-Characteristics of DC generators – Armature reaction - Commutation - Interpoles, compensating winding- applications of DC generator-Parallel operation of DC generators					
<b>UNIT III</b>	<b>DC MOTOR</b>				<b>9</b>
Construction and Principle of operation of DC motor - types, Starting and speed control of DC Motors – Speed Torque Characteristics of DC Motors - braking –Plugging- dynamic and regenerative braking- Losses and efficiency – Condition for maximum efficiency – Testing of DC motor – Retardation test- Swinburne’s test and Hopkinson’s test-applications of DC Motor.					
<b>UNIT IV</b>	<b>SINGLE PHASE TRANSFORMER</b>				<b>9</b>
Construction – principle of operation- Equivalent circuit-Phasor diagrams-Losses, Testing - efficiency and voltage regulation- Polarity test- Sumpner’s test- Separation of hysteresis and eddy current losses -Inrush current					
<b>UNIT V</b>	<b>THREE PHASE TRANSFORMER</b>				<b>9</b>
Three phase transformers-connections – Scott Connection-Phasing of transformer- Parallel operation of three phase transformers-Auto transformer-Tap changing transformers- Tertiary winding- Instrument transformers-all day efficiency					
					<b>TOTAL: 45 PERIODS</b>

**COURSE OUTCOMES:**

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

CO1:Elaborate the Electro mechanical energy conversion principle

CO2:Determine the performance characteristics of DC generator under various operating conditions

CO3:Identify an appropriate DC motor to control speed for any industrial applications

CO4: Show the performance of single-phase transformer with phasor diagrams

CO5: Classify the testing of various transformers

**TEXT BOOKS:**

1. Nagrath, I.J. and Kothari.D.P., “Electric Machines”, 6<sup>th</sup> Edition, McGraw-Hill Education, 2019.
2. P. S. Bimbhra, “Electrical Machines”,4<sup>th</sup> Edition, Khanna Publishing, 2018.

**REFERENCES**

1. P. C. Sen., ‘Principles of Electrical Machines and Power Electronics’, John Wiley & Sons, 1997.
2. Syed A. Nasar, Electric Machines and Power Systems: Volume I, Mcgraw-Hill College; International Edition, January 1995
3. Deshpande M. V., “Electrical Machines” PHI Learning Pvt. Ltd., New Delhi, 2011.
4. P.S. Bimbhra, ‘Electrical Machinery’, Khanna Publishers, 2003.
5. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, “Electric Machinery”, 7<sup>th</sup> Edition, McGraw- Hill Education, 2020.
6. Theraja B.L Theraja A.K., “A Textbook of Electrical Technology, Volume II”, 24<sup>th</sup> Edition, S. Chand Publication, 2018.

<b>EE25304</b>	<b>ELECTRONIC DEVICES AND CIRCUITS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To explain the structure of basic Electronic Devices.
- To infer the operation and applications of Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET).
- To summarize the concept of amplifiers and its biasing.
- To interpret the gain and frequency response of different amplifiers.

<ul style="list-style-type: none"> <li>To demonstrate the working principle of various wave shaping circuits.</li> </ul>		
<b>UNIT I</b>	<b>DIODES, SPECIAL DIODES AND APPLICATIONS</b>	<b>9</b>
PN Junction diode, V-I characteristics, Zener diodes, working principle, Breakdown mechanism- Application- Light Emitting Diode (LED), photo diode-Application of Diodes: Half wave and full wave rectifiers with filter, Clipper and Clamper circuits-Zener Voltage regulator.		
<b>UNIT II</b>	<b>BIPOLAR AND UNIPOLAR JUNCTION TRANSISTOR</b>	<b>9</b>
Bipolar Junction Transistor (BJT) and Uni Junction Transistor (UJT) – Structure, operation and V- I characteristics – Junction Field Effect Transistor (JFET) – Structure, operation and V-I characteristic, Current Equation, Metal Oxide Semiconductor Field Effect Transistor (MOSFET) – Structure, operation and V-I characteristic – Types of MOSFET-Applications of BJT and UJT. Case studies: Audio Amplifier, Automatic Street Light Controller- FET in Mobile Phone Power Management.		
<b>UNIT III</b>	<b>AMPLIFIERS</b>	<b>9</b>
BJT small signal model – biasing – Analysis of Common Emitter (CE), Common Base (CB), Common Collector (CC) amplifiers – Gain and frequency response – MOSFET small signal model – Biasing – Analysis of Common source and source follower – Gain and frequency response-Real time Examples: Radio Frequency (RF) Amplifier, Video Amplifier, Power Amplifier.		
<b>UNIT IV</b>	<b>MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER</b>	<b>9</b>
BIMOS cascade amplifier, Differential amplifier – Common mode and differential mode analysis – Tuned amplifiers – Single tuned amplifier – Gain and frequency response, Power amplifier-Application. Case Studies: Multistage Amplifier in Public Address System and Differential Amplifier in ECG Machine.		
<b>UNIT V</b>	<b>FEEDBACK AMPLIFIERS, OSCILLATORS AND WAVE GENERATING CIRCUITS</b>	<b>9</b>
Advantages of negative feedback – Voltage / current, series and shunt feedback – positive feedback – Condition for oscillations, Phase shift – Wien bridge, Hartley, Colpitt and Crystal Oscillators. Real-Time Examples: Radio Transmitter-Electronic Watch.		
<b>TOTAL: 45 PERIODS</b>		
<b>COURSE OUTCOMES:</b> At the end of the course, learners will be able to CO1: Outline the structure, operation and V- I characteristics of various diodes. CO2: Discuss about the V-I characteristics of Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET). CO3: Identify the transistor application as amplifiers.		

CO4: Infer the operation, characteristics and gain of multistage and differential amplifiers.

CO5: Elaborate the operation of feedback amplifiers with their applications.

**TEXT BOOKS:**

1. David A. Bell, “Electronic devices and circuits”, 5<sup>th</sup> Edition, Prentice Hall of India, 2008.
2. S. Salivahanan, N. Suresh Kumar, “Electronic Devices and Circuits”, 5<sup>th</sup> Edition, Tata McGraw Hill 2022.

**REFERENCES**

1. Adel S. Sedra , Kenneth C. Smith, “Microelectronic Circuits: Theory and Applications”, 7<sup>th</sup> Edition, Oxford press, 2017.
2. Donald A. Neamen, “Electronic Circuit Analysis and Design”, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2003.
3. Dale R. Patrick , Stephen W. Fardo, “Electricity and Electronics Fundamentals”, 2<sup>nd</sup> Edition, The Fairmont Press Inc, 2008.
4. Jacob Millman , Christos Halkias , “Electronic Devices And Circuits”, 5<sup>th</sup> Edition, McGraw Hill India, 2017.
5. Floyd, “Electron Devices”, 9<sup>th</sup> Edition, Pearson, Education, 2012.
6. Robert L. Boylestad, “Electronic Devices and Circuit theory”, 11<sup>th</sup> Edition, Pearson, Education, 2012.

EE25305	MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		2	0	2	3
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To explain the basic functional elements of measurement</li> <li>• To demonstrate various analog and digital instruments</li> <li>• To outline the various passive measurement techniques</li> <li>• To summarize various storage and display devices</li> <li>• To illustrate the operation of transducers and data acquisition systems</li> </ul>					
<b>UNIT I</b>	<b>QUALITIES OF MEASUREMENTS</b>				<b>6</b>
Functional elements of an instrument – Static and dynamic characteristics – Errors in Measurement – Statistical evaluation of measurement data – Standards and calibration.					
<b>UNIT II</b>	<b>ELECTRICAL AND ELECTRONICS INSTRUMENTS</b>				<b>6</b>
Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of Frequency and phase.					
<b>UNIT III</b>	<b>COMPARATIVE METHODS OF MEASUREMENTS</b>				<b>6</b>
D.C potentiometers, D.C and A.C bridges, transformer ratio bridges, self-balancing bridges. Interference and screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference – Grounding techniques.					
<b>UNIT IV</b>	<b>STORAGE AND DISPLAY DEVICES</b>				<b>6</b>
Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.					
<b>UNIT V</b>	<b>TRANSDUCERS AND DATA ACQUISITION SYSTEMS</b>				<b>6</b>
Classification of transducers – Selection of transducers – Resistive, capacitive and inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors-Thermal Imagers. Case study – Data acquisition in plane crash and accidents					
					<b>TOTAL: 30 PERIODS</b>
<b>Laboratory Experiments</b>					
1. Measurement of unknown value of resistance					
2. Measurement of unknown value of inductance					

3. Measurement of unknown value of Capacitance
4. Characteristics of Synchro transmitter and receivers
5. Characteristics of displacement transducer
6. Characteristics of pressure transducer

**TOTAL: 30 PERIODS**

**COURSE OUTCOMES:**

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

CO1: Outline the standards and calibration in measurement system

CO2: Illustrate about the operating principles of Analog and Digital meters.

CO3: Classify the methods of measurements for Resistance, Inductance and Capacitance using bridges.

CO4: Interpret elements of digital storage & display devices.

CO5: Explain the functioning of transducers and data acquisition systems.

**TEXT BOOKS:**

1. A.K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", 6<sup>th</sup> Edition, DhanpatRai and Co, 2019.
2. J. B. Gupta, "A Course in Electronic and Electrical Measurements", 3<sup>rd</sup> Edition, S.K.Kataria and Sons, Delhi, 2020.

**REFERENCES**

1. D.V.S. Murthy, "Transducers and Instrumentation", 3<sup>rd</sup> Edition, Prentice Hall of India Pvt Ltd, 2020.
2. David A Bell, "Electronic Instrumentation & Measurements", 4<sup>th</sup> Edition, Oxford University Press, 2019.
3. Martin Reissland, "Electrical Measurements", 3<sup>rd</sup> Edition, New Age International (P) Ltd., Delhi, 2019.
4. Alan. S. Morris, "Principles of Measurements and Instrumentation", 3<sup>rd</sup> Edition, Prentice Hall of India, 2017.
5. Doebelin E.O. and Manik D.N., "Measurement Systems – Applications and Design", Special Indian 7<sup>th</sup> Edition, McGraw Hill Education Pvt. Ltd., 2018.
6. H.S. Kalsi, "Electronic Instrumentation" 4<sup>th</sup> Edition, McGraw Hill, 2015.

EE25306	DC MACHINES AND TRANSFORMERS LABORATORY	L	T	P	C
		0	0	3	1.5
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To examine the performance characteristics of DC Generator.</li> <li>• To explore the operating characteristics of DC Motor.</li> <li>• To identify the various parameters of DC machines.</li> <li>• To interpret the speed control techniques of DC motors.</li> <li>• To investigate the performance of Transformers at different loading conditions</li> </ul>					
<b>LIST OF EXPERIMENTS</b>					
<ol style="list-style-type: none"> <li>1. Open circuit and load characteristics of DC shunt generator</li> <li>2. Load characteristics of DC compound generator</li> <li>3. Load test on DC shunt motor.</li> <li>4. Load test on DC compound motor.</li> <li>5. Load test on DC series motor.</li> <li>6. Swinburne's test</li> <li>7. Speed control of DC shunt motor.</li> <li>8. Hopkinson's test</li> <li>9. Load test on single-phase transformer and three phase transformers</li> <li>10. Open circuit and short circuit tests on single phase transformer.</li> <li>11. Parallel operation of single phase transformers.</li> <li>12. Separation of no-load losses in single phase transformer.</li> <li>13. Three phase Transformer connections</li> </ol>					
					<b>TOTAL: 45 PERIODS</b>
<b>COURSE OUTCOMES:</b> At the end of the course, learners will be able to					
CO1: Determine the performance of DC machines (shunt, series or compound)					
CO2: Allocate various speed control techniques for DC motors.					
CO3: Predict the performance of DC machines					
CO4: Explore the performance of single-phase transformer					
CO5: Construct the different connections of three-phase transformers.					

EE25307	ELECTRONIC DEVICES AND DIGITAL LABORATORY	L	T	P	C
		0	0	3	1.5
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To perform the behavior of semiconductor devices and its applications.</li> <li>• To develop the VI characteristics of bipolar and unipolar devices.</li> <li>• To experiment combinational and sequential circuits using digital IC.</li> <li>• To investigate synchronous and asynchronous counters.</li> <li>• To construct shift registers.</li> </ul>					
<b>LIST OF EXPERIMENTS</b>					
<ol style="list-style-type: none"> <li>1. Explore the Characteristics of diode and its applications.</li> <li>2. Interpret the Characteristics of current controlled devices and its applications.</li> <li>3. Construct the Characteristics of voltage controlled devices and its applications.</li> <li>4. Examine the Characteristics of Uni Junction Transistor (UJT) and generation of sawtooth waveforms using UJT.</li> <li>5. Compute Boolean logic principles for adder and subtractor circuits.</li> <li>6. Verify the Binary to Gray code converter and Gray to Binary code converters using digital logic techniques.</li> <li>7. Develop the combinational logic circuits of multiplexer and demultiplexer.</li> <li>8. Investigate the parity generator and parity checker circuits using logic gates.</li> <li>9. Experiment on encoding and decoding principles of encoders and decoders.</li> <li>10. Use sequential logic concepts for 3-bit counters.</li> <li>11. Apply shift register principles for 4-bit shift registers.</li> </ol>					
					<b>TOTAL: 45 PERIODS</b>
<b>COURSE OUTCOMES:</b> At the end of the course, learners will be able to					
CO1: Examine the VI characteristics of semiconductor diodes.					
CO2: Develop the VI characteristics of bipolar and unipolar devices.					
CO3: Construct combinational circuits using basic gates.					
CO4: Verify the synchronous and asynchronous counters using JK flip flop.					
CO5: Experiment the concepts of flip-flop for shift register.					

### SEMESTER - IV

MA25404	STATISTICS AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4
<b>COURSE OBJECTIVES:</b> <ul style="list-style-type: none"> <li>• To describe the necessary basic concepts of statistics.</li> <li>• To explain the basic concepts of numerical methods in solving algebraic and transcendental equations.</li> <li>• To determine the interpolation in various intervals by numerical techniques</li> <li>• To use numerical techniques to evaluate the approximation of derivatives and integrals.</li> <li>• To solve ordinary differential equations by various numerical techniques</li> </ul>					
<b>UNIT I</b>	<b>STATISTICS</b>				<b>12</b>
Measures of central tendency – Mean – Median – Mode – Geometric mean and Harmonic mean – Measures of dispersion – range - Quartile deviation – mean deviation and standard deviation – correlation – coefficient of correlation - lines of regression.					
<b>UNIT II</b>	<b>SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS</b>				<b>12</b>
Solution of algebraic and transcendental equations – Methods of False position– Newton Raphson method- Types of Errors approximations-Solution of linear system of equations – Gauss Jordan method – Iterative method-Gauss Seidel - Eigen values of a matrix by Power method .					
<b>UNIT III</b>	<b>INTERPOLATION AND APPROXIMATION</b>				<b>12</b>
Difference Operators-Forward, Backward, Shift operator- Interpolation with equal intervals - Newton’s forward and backward difference formulae-Interpolation with unequal intervals - Lagrange's interpolation – Newton’s divided difference interpolation.					
<b>UNIT IV</b>	<b>NUMERICAL DIFFERENTIATION AND INTEGRATION</b>				<b>12</b>
Approximation of derivatives using interpolation polynomials - Numerical integration using Newton’s Cote’s formula, Trapezoidal, Simpson’s 1/3 rule, 3/8 <sup>th</sup> rule – Two point and three point Gaussian quadrature formulae.					
<b>UNIT V</b>	<b>INITIALVALUE 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>TOTAL: 60 PERIODS</b>

**COURSE OUTCOMES:**

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

CO1: Investigate the various measures of central tendency and measures of dispersion.

CO2: Apply the basic concepts and techniques of solving algebraic and transcendental equations.

CO3: Compute interpolation and error approximations in various intervals by numerical techniques.

CO4: Use suitable numerical techniques to evaluate the approximation of derivatives and integrals.

CO5: Solve the initial value problems in ODE using single step and multi-step methods.

**TEXT BOOKS:**

1. Veerarajan.T and Ramachandran T, “Numerical Methods with Programming in C” , 2<sup>nd</sup> edition Tata McGraw Hill Publication Ltd, New Delhi 2007
2. Johnson, R.A., Miller, I and Freund J, “Probability and Statistics for Engineers”, 9<sup>th</sup> Edition, Pearson Education, 2020.

**REFERENCES:**

1. Steven C. Chapra, Raymond P. Canale, “Numerical Methods for Engineers”, 8<sup>th</sup> Edition, McGraw Hill Higher Education, 2021
2. Burden, R.L and Faires, J.D, ”Numerical Analysis”, 9<sup>th</sup> Edition, Cengage Learning, 2016.
3. Joe.D. Hoffman, Steven Frankel, Numerical Methods for Engineers and Scientists” 3<sup>rd</sup> Edition, CRC Press, 2015.

<b>EE25401</b>	<b>GENERATION, TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To summarize the methods of power generation using conventional energy resources
- To infer the characteristics of transmission line parameters.
- To compute the transmission line parameters using nominal T and  $\pi$  methods.
- To outline the types of insulators and cables
- To illustrate A.C and D.C distribution systems.

<b>UNIT I</b>	<b>GENERATION</b>	<b>9</b>
Generation of electrical power by conventional sources of energy- Schematic arrangement, operation, advantages and disadvantages-Thermal, Nuclear, Gas and Diesel - Hydro Electric systems.		
<b>UNIT II</b>	<b>TRANSMISSION LINE PARAMETERS</b>	<b>9</b>
Inductance and Capacitance calculation - Single phase transmission lines - two wire system and composite conductors - Three phase transmission lines – symmetrical and unsymmetrical spacing, transposition of conductors- double circuit line – Bundled conductors - Skin and Proximity effects - Effect of earth on transmission line capacitance.		
<b>UNIT III</b>	<b>PERFORMANCE OF TRANSMISSION LINES</b>	<b>9</b>
Performance characteristics of Short, Medium and Long transmission lines - nominal-T, $\pi$ and rigorous methods – ABCD constants – Power Circle diagram, Ferranti Effect, Sag, Effect of Corona.		
<b>UNIT IV</b>	<b>INSULATORS AND CABLES</b>	<b>9</b>
Overhead line insulators - types of insulators – potential distribution over insulator string – methods of improving string efficiency – case study : testing of insulators - Underground cables - construction and types - single core and multi core cables - capacitance, insulation resistance, electric stresses and dielectric loss – grading of cables - capacitance grading and inter-sheath grading.		
<b>UNIT V</b>	<b>DISTRIBUTION SYSTEMS</b>	<b>9</b>
DC and AC Distribution Systems – Feeders, distributors and service mains - Radial and ring main systems- Calculation of voltage and current in distributors with concentrated and distributed loads - fed at both ends.		
		<b>TOTAL: 45 PERIODS</b>
<b>COURSE OUTCOMES: At the end of the course, learners will be able to:</b>		
CO1: Illustrate the methods of electric power generation using conventional and non-conventional energy sources.		
CO2: Infer the transmission network parameters for various configurations.		
CO3: Solve the performance indices of transmission lines using nominal-T, $\pi$ , rigorous methods and Power circle diagram.		
CO4: Explain the construction of various types of insulators and underground cables.		
CO5: Compute the voltages and currents for a given distribution System.		
<b>TEXT BOOKS:</b>		
1. Bella H. Chudnovsky, “Transmission, distribution, and renewable energy generation power equipment: Aging and Life Extension Techniques”, 2 <sup>nd</sup> Edition , CRC Press, 2020.		

2. V.K.Mehta, Rohit Mehta, “Principles of Power System”, S Chand Publications, 3<sup>rd</sup> edition, 2005.
3. C.L. Wadhwa, “Generation, Distribution and Utilization of Electrical Energy”, New Age International Publishers, 2<sup>nd</sup> Edition, 2006

**REFERENCES:**

1. C.L.Wadhwa, “Electrical Power Systems”, 6<sup>th</sup> Edition, New Age International (P) Ltd., 2010
2. S.L.Uppal, “Electrical Power”1<sup>st</sup> Edition, Khanna Publishers, 1985.
3. B. R. Gupta , “Generation of Electrical Energy ” , S Chand Publications, 3<sup>rd</sup> edition, 2010.
4. S.N. Singh, Electric Power Generation, Transmission and Distribution, Prentice Hall of India, 2<sup>nd</sup> Edition, 2008.

EE25402	AC MACHINES	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To deduce the performance characteristics of synchronous generators.</li> <li>• To explore the operation and performance of three phase induction motor.</li> <li>• To develop starting and speed control techniques in three-phase induction motors.</li> <li>• To predict operation and performance of single phase and fractional power induction motors.</li> <li>• To examine the operation and performance of synchronous motor</li> </ul>					
<b>UNIT I</b>	<b>SYNCHRONOUS GENERATOR</b>	<b>9</b>			
Constructional details – Salient and non-salient types of rotors –Winding factors- EMF equation– Armature reaction –Parallel operation of Alternators - Synchronization and load division- Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF,					
<b>UNIT II</b>	<b>THREE PHASE INDUCTION MOTOR</b>	<b>9</b>			
Constructional details – Types of rotors - Principle of operation – Slip – Torque-Slip characteristics - Condition for maximum torque – Load test- Losses and efficiency- Cogging and crawling - No load and blocked rotor tests - Equivalent circuit - Separation of losses - Circle diagram – Double cage induction motors –Induction generators- Case Study: Effect of harmonics on three-phase induction motor.					

<b>UNIT III</b>	<b>STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR</b>	<b>9</b>
Need for starting – Types of starters – Rotor resistance, Autotransformer and Star- delta starters - Korndorfer starter– Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking-Thyristor based speed control of three phase-induction motor.		
<b>UNIT IV</b>	<b>SINGLE-PHASE INDUCTION MOTORS AND FRACTIONAL POWER MOTORS</b>	<b>9</b>
Constructional details and types of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Shaded pole induction motor - Repulsion motor - Hysteresis motor - AC series motor- Servo motors.		
<b>UNIT V</b>	<b>SYNCHRONOUS MOTOR</b>	<b>9</b>
Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – Natural frequency of oscillations – Damper windings- Synchronous condenser.		
		<b>TOTAL: 45 PERIODS</b>
<p><b>COURSE OUTCOMES:</b> At the end of the course, learners will be able to</p> <p>CO1: Perform the construction and working principle of Synchronous Generator.</p> <p>CO2: Establish the construction and working principle of Three phase Induction Motor</p> <p>CO3: Determine the speed control techniques of three phase induction motors.</p> <p>CO4: Explain the single phase induction motor with construction and working principle.</p> <p>CO5: Express the knowledge on Synchronous motor.</p>		
<p><b>TEXT BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. Nagrath, I.J. and Kothari.D.P., “Electric Machines”, 6<sup>th</sup> Edition, McGraw-Hill Education, 2019.</li> <li>2. P. S. Bimbhra, “Electrical Machines”, 4<sup>th</sup> Edition, ,Khanna Publishing, 2018</li> </ol>		

3. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, “Electric Machinery”, 2<sup>nd</sup> Edition, McGraw Hill publishing Company Ltd, 2003.

4. Theraja B.L., “A Textbook of Electrical Technology”, Volume II, 24<sup>th</sup> Edition, S. Chand Publication, 2018

**REFERENCES**

1. B.R. Gupta, “Fundamental of Electric Machines”, 4<sup>th</sup> Edition, New age International Publishers, 2017.

2. S.K. Bhattacharya, “Electrical Machines”, 4<sup>th</sup> Edition, McGraw - Hill Education, ,2018

3. M. G. Say, “Performance and Design of Alternating Current Machines”, 3<sup>rd</sup> Edition, CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2002.

4. Miller, T.J.E., “Brushless Permanent Magnet and Reluctance Motor Drives”, 1<sup>st</sup> Edition, Clarendon Press, 1989.

<b>EE25403</b>	<b>CONTROL SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To express the transfer function model for physical, mechanical and electrical systems.
- To examine the time response of systems and steady state error analysis.
- To interpret the various frequency response plots in control systems.
- To determine the stability of systems in time and frequency domain.
- To develop the state variable representation of physical systems

<b>UNIT I</b>	<b>MODELING OF LINEAR TIME INVARIANT SYSTEM</b>	<b>9</b>
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Elements and Types of Control Systems - Effect of Feedback Systems - Differential equation of Physical Systems – Mechanical Systems, Electrical Systems, Analogous Systems. Determination of transfer function by block diagram reduction technique and signal flow graph. Real time applications of open loop and closed loop system.

<b>UNIT II</b>	<b>TIME RESPONSE ANALYSIS</b>	<b>9</b>
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Standard test signals - Unit step response of First and Second Order Systems - Time response specifications - Time response specifications of second order systems - steady state error and error constants -Introduction to PI, PD and PID Controllers and its effects (excluding design).Real time applications of time response analysis in control system (Robotics and Industrial Automation)

<b>UNIT III</b>	<b>FREQUENCY RESPONSE ANALYSIS</b>	<b>9</b>
Correlation between time and frequency response - Bode Plot -Experimental determination of transfer function. Introduction to Polar Plots (Inverse Polar Plots excluded) - Mathematical preliminaries - Nyquist Stability criterion - assessment of relative stability: gain margin and phase margin, Real time applications of time frequency response analysis in control system(Power System Stability Analysis)		
<b>UNIT IV</b>	<b>STABILITY ANALYSIS</b>	<b>9</b>
Concepts of stability - Necessary conditions for Stability - Routh-Hurwitz stability criterion - Introduction to Root-Locus Techniques - The root locus concept - Construction of root locus, Effect of adding poles and zeros, Case study in stability analysis (Electric Vehicle motor control)		
<b>UNIT V</b>	<b>STATE VARIABLE ANALYSIS</b>	<b>9</b>
Concept of state variables –State transition matrix –Eigen values – Eigen vectors State models for linear and time invariant Systems – Solution of state and output equation – Concepts of controllability and observability,Case study in state variable analysis(Aircraft Flight Control System)		
		<b>TOTAL: 45 PERIODS</b>
<b>COURSE OUTCOMES:</b> At the end of the course, learners will be able to		
CO1: Compute the transfer function model based on the knowledge of Mathematics, Science and Engineering fundamentals.		
CO2: Interpret the various time domain specifications to assess the system performance.		
CO3: Investigate the frequency domain specifications in control system.		
CO4: Explore the knowledge about various stability techniques to different applications		
CO5: Solve Controllability and observability using state space representation.		
<b>TEXT BOOKS:</b>		
1. Nagarath, I.J. and Gopal, M., “Control Systems Engineering”, 8th edition, New Age International Publishers, 2024.		
2. M.Gopal, “Control System: Principle and design”, 4 <sup>th</sup> Edition, McGraw Hill Education, 2021.		

## REFERENCES

1. Richard C.Dorf and Bishop, R.H., “Modern Control Systems”, 14<sup>th</sup> Edition, Pearson Education, 2022.
2. Dr. S. Panda, S. Padhy, S.R. Das, “Control system Engineering”, 1st edition S.K. Kataria & Sons Educational Publisher, Reprint 2024.
3. Katsuhiko Ogata, “Modern Control Engineering”, 5<sup>th</sup> Edition, Pearson Education, 2021.
4. Benjamin C. Kuo, “Automatic Control Systems”, 10<sup>th</sup> Edition, McGraw Hill Education, 2018.
5. Rames C.Panda and T. Thyagarajan, “An Introduction to Process Modelling Identification and Control of Engineers”, 2<sup>nd</sup> Edition, Narosa Publishing House, 2017.

EE25404	INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To outline the fabrication steps of integrated circuits and characteristics of Op-Amps</li> <li>• To demonstrate the basic applications of Op-Amp based circuits.</li> <li>• To summarize the function of Op-Amp as comparator, wave generator and data converter.</li> <li>• To explain the internal structure of special ICs such as 555 Timers and PLL circuits.</li> <li>• To illustrate the functional blocks and applications of IC voltage regulator</li> </ul>					
<b>UNIT I</b>	<b>INTEGRATED CIRCUIT (IC) FABRICATION AND OPERATIONAL AMPLIFIER CHARACTERISTICS</b>				<b>9</b>
IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, Field Effect Transistors (FETs) and Photo Voltaic (PV) Cell. Ideal Operational amplifier of characteristics-DC characteristics and AC characteristics, differential amplifier; frequency response of Op-Amp. Case Studies: Smartphone Processor Manufacturing, Medical Devices- ECG monitoring devices, Pacemakers					
<b>UNIT II</b>	<b>APPLICATIONS OF OPAMP</b>				<b>9</b>
Basic applications of Op-Amp – Inverting and Non-inverting Amplifiers, summer, differentiator and integrator- Voltage – Current (V/I) and Current –Voltage (I/V) converters, Instrumentation					

amplifier, AD623 Instrumentation Amplifier and its application as load cell weight measurement - Log and Antilog Amplifiers-First and second order active filters.		
<b>UNIT III</b>	<b>COMPARATOR, WAVE GENERATOR AND CONVERTER</b>	<b>9</b>
Comparators, Multivibrators, Waveform generators, Peak detector, Sample and Hold (S&H) circuit- Digital to Analog (D/A) converter, Analog to Digital (A/D) converters using Op-Amps-Applications. Case Studies: Automatic Water Tank System, Temperature Monitoring System.		
<b>UNIT IV</b>	<b>SPECIAL ICs</b>	<b>9</b>
Functional block, characteristics of 555 Timer and its Pulse Width Modulation (PWM) application - IC566 Voltage Controlled Oscillator (VCO) IC565-Phase Locked Loop (PLL), AD633 Analog multiplier IC-Real time applications: Robot vehicles and Conveyor systems.		
<b>UNIT V</b>	<b>IC REGULATORS</b>	<b>9</b>
IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variable voltage regulators, Switching regulator- Switched Mode Power Supply (SMPS)- Real time applications :Solar Power Systems, Mobile Phone Charger.		
<b>TOTAL: 45 PERIODS</b>		
<p><b>COURSE OUTCOMES:</b> At the end of the course, learners will be able to</p> <p>CO1: Discuss the steps involved in IC fabrication and characterization of Op-Amps</p> <p>CO2: Enumerate the basic applications of Op-Amps.</p> <p>CO3: Infer the role of Op-Amp in wave generator, comparator and converter circuit.</p> <p>CO4: Classify special ICs namely Timers and Phase locked Loop (PLL) circuits with their applications.</p> <p>CO5: Compare the role of ICs in voltage regulating circuits.</p>		
<p><b>TEXT BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. D. Roy Choudhary, Sheil B. Jani, “Linear Integrated Circuits”, 5<sup>th</sup> Edition , New Age Publication, 2018.</li> <li>2. S. Salivahanan, “Linear Integrated Circuits”, 2<sup>nd</sup> Edition, Tata McGraw Hill, 2015.</li> </ol>		
<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4<sup>th</sup> Edition, McGraw Hill, 2016.</li> <li>2. David A. Bell, “Operational Amplifiers &amp; Linear ICs”, 3<sup>rd</sup> Edition, Oxford Higher education, 2011.</li> <li>3. G B Clayton, Steve Winder, “Operational Amplifiers”, 5<sup>th</sup> Edition, Newnes, 2003.</li> </ol>		

4. William D. Stanley, “Operational Amplifiers with Linear Integrated Circuits”, 4<sup>th</sup> Edition, Pearson Education, 2004.
5. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, 4<sup>th</sup> Edition, Pearson Education, 2015.
6. Robert F. Coughlin, Fredrick F. Driscoll, “Op-amp and Linear ICs”, 6<sup>th</sup> Edition, Pearson education, 2015.

CS25C13	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	2	4
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To learn algorithm and data structures for efficient data handling.</li> <li>• To understand the concepts and applications of stack and queue data structures.</li> <li>• To study tree structures for various tree traversal and manipulation techniques.</li> <li>• To introduce disjoint set operations and graph algorithms for real-world problems.</li> <li>• To gain knowledge on hashing concepts and apply different sorting algorithms for data organization and retrieval.</li> </ul>					
<b>UNIT I</b>	<b>ALGORITHM ANALYSIS AND LIST DATA STRUCTURE</b>				<b>9</b>
Definition of an Algorithm - Running Time Calculations - Algorithm Complexity: Time and Space – Asymptotic notation, List ADT: array based & linked list based implementation - singly linked lists - circularly linked lists - doubly linked lists - Polynomial Addition using lists					
<b>UNIT II</b>	<b>QUEUE AND STACK DATA STRUCTURES</b>				<b>9</b>
Queue ADT: array-based & linked list based implementation - Types of Queue- Applications Stack ADT: array-based & linked list based implementation - Applications of Stack: Balancing Symbols, Infix to Postfix Conversion, Postfix Expression Evaluation					
<b>UNIT III</b>	<b>TREE DATA STRUCTURES</b>				<b>9</b>
Tree ADT - Representation - Traversals - Binary Tree - Expression trees - Binary Search Tree - AVL Trees					
<b>UNIT IV</b>	<b>DISJOINT SET AND GRAPH</b>				<b>9</b>
Disjoint Set ADT - Dynamic equivalence problem - Smart union algorithms - Path compression – Applications Graph - Traversals - Topological Sort - Prim's and Kruskal's Algorithms - Dijkstra's Algorithm					

<b>UNIT V</b>	<b>HASHING AND SORTING ALGORITHMS</b>	<b>9</b>
Hashing: Hash Table - Hash Function - Load Factor - Collision- Collision Resolution: Separate Chaining, Open Addressing Sorting Algorithms: Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort		
<b>TOTAL: 45 PERIODS</b>		
<b>LIST OF EXPERIMENTS</b>		
<ol style="list-style-type: none"> <li>1. Stack ADT - Array and Linked List implementations</li> <li>2. Queue ADT – Array and linked list implementations</li> <li>3. Implementation of Search Tree ADT - Binary Search Tree</li> <li>4. Implementation of Graphs- Breadth first and Depth first search</li> <li>5. Develop a C++ program for sorting the array elements using Insertion sort</li> <li>6. Develop a C++ program for sorting the array elements using Quick Sort</li> </ol>		
<b>TOTAL: 30 PERIODS</b>		
<b>COURSE OUTCOMES:</b>		
At the end of this course, learners will be able to		
<b>CO1:</b> Apply algorithm analysis techniques and implement list data structures for efficient data management.		
<b>CO2:</b> Interpret stack and queue data structures for computational problems.		
<b>CO3:</b> Establish the tree structures and traversal techniques for hierarchical data processing.		
<b>CO4:</b> Use of disjoint set operations and graph algorithms to solve real-world network problems.		
<b>CO5:</b> Apply hashing and sorting algorithms to manage and retrieve data effectively.		
<b>TEXT BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Mark Allen Weiss, “Data structures and algorithm analysis in C++”, 4<sup>th</sup> edition, Pearson, 2014.</li> <li>2. Richard F. Gilberg, Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, Cengage India Private Limited; 2<sup>nd</sup> edition, 2007.</li> <li>3. Cormen T, Leiserson C., Rivest R., Stein C, “Introduction to Algorithms”, 4<sup>th</sup> Edition, MIT Press, 2022.</li> </ol>		

**REFERENCES:**

1. Tremblay, Jean-Paul, and P. G. Sorenson, "An Introduction to Data Structures with Applications", 2<sup>nd</sup> Edition, Tata McGraw-Hill, 2017.
2. arumanchi, Narasimha, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", 5<sup>th</sup> Edition, Careermonk Publications, 2017.
3. Thareja, Reema. Data Structures Using C, 2<sup>nd</sup> edition, Oxford University Press, 2020.

<b>EE25405</b>	<b>AC MACHINES LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>COURSE OBJECTIVES:</b>					
<ul style="list-style-type: none"> <li>• To experiment with 3 phase alternators to find voltage regulation by EMF, MMF, ZPF and ASA method.</li> <li>• To solve for direct axis reactance of salient pole alternator using slip test.</li> <li>• To develop the characteristics of V and Inverted V curves in synchronous motors.</li> <li>• To explore the performance characteristics of single phase and three phase induction motor.</li> <li>• To examine the characteristics of single phase and three phase induction motor.</li> </ul>					
<b>LIST OF EXPERIMENTS</b>					
<ol style="list-style-type: none"> <li>1. Regulation of three phase alternator by EMF and MMF methods</li> <li>2. Regulation of three phase alternator by ZPF method</li> <li>3. Regulation of three phase salient pole alternator by slip test</li> <li>4. Measurements of negative sequence and zero sequence impedance of alternators</li> <li>5. V and Inverted V curves of Three Phase Synchronous Motor</li> <li>6. Load test on three-phase induction motor</li> <li>7. No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).</li> <li>8. Separation of No-load losses of three-phase induction motor</li> <li>9. Load test on single-phase induction motor</li> <li>10. No load and blocked rotor test on single-phase induction motor</li> <li>11. Harmonic Analysis of Three Phase Induction Motor</li> <li>12. Digital Simulation of three-phase Induction Motor</li> <li>13. Study of Induction motor Starters</li> </ol>					
					<b>TOTAL: 45 PERIODS</b>

**COURSE OUTCOMES:** At the end of the course, learners will be able to

CO1: Calculate the voltage regulation by EMF, MMF, and ZPF methods in 3 phase alternators

CO2: Compute direct axis reactance of salient pole alternator using slip test.

CO3: Explore the characteristics of V and Inverted V curves in synchronous motors

CO4: Develop the performance characteristics of single phase and three phase induction motor

CO5: Construct the characteristics of single phase and three phase induction motor

<b>EE25406</b>	<b>INTEGRATED CIRCUITS AND CONTROL SYSTEMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**COURSE OBJECTIVES:**

- To examine the characteristics of inverting and non-inverting operational amplifiers.
- To explore the function of wave generating circuit using IC 555 timer.
- To investigate the characteristics of P, PI and PID controllers.
- To develop Lag, Lead and Lag-Lead Compensators, stability analysis of linear system and first and second order system.
- To construct the transfer function of DC Motor and armature controlled servo motor.

**LIST OF EXPERIMENTS**

1. Examine the operation of inverting and non-inverting amplifier
2. Investigate the operation of adder and comparator using IC741
3. Implementation of integrator and differentiator using IC741
4. Develop the astable and monostable multivibrator using NE/SE 555 timer
5. Experiment the P, PI and PID Controllers in physical systems
6. Design of Lag, Lead and Lag-Lead Compensator
7. Perform the Stability analysis of Linear System
8. Determination of Transfer function model of DC Motor
9. Derive the Transfer Function Parameters of an Armature Controlled Servo Motor
10. Interpret the digital simulation of first order and Second order system

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:** At the end of the course, learners will be able to

CO1: Interpret the function of adder, comparator, differentiator and integrator using IC 741.

CO2: Investigate the linear ICs for verifying the function of voltage regulator, astable and mono- stable multivibrators.

CO3: Construct the P, PI and PID controller in control system.

CO4: Classify the compensators and also stability analysis in control system.

CO5: Determine the transfer function of DC Motor and armature controlled servo motor.