Loyola-ICAM

College of Engineering and Technology (LICET)

(Autonomous)

Loyola Campus, Nungambakkam, Chennai – 600 034

Curriculum and Syllabi (R-2024)

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Loyola-ICAM
College of Engineering and Technology (LICET)
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CURRICULUM AND SYLLABI (R-2024)

CHOICE BASED CREDIT SYSTEM (CBCS)

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Vision of the Institution:

- To form responsible engineers, who would engineer a just society.

Mission of the Institution:

- To provide technical education in a Christian atmosphere to deserving students who are economically poor and socially marginalized.
- To train young men and women of quality to be leaders in all walks of life and serve their fellow men with justice, truth and love.
- To implement teaching learning processes that ensure guidance and mentoring for students throughout their period of study.
- To provide higher education through academic collaboration and pursue research in international perspective of Engineering.

Vision of the Department:

- To transform the students into globally competent electrical engineers, researchers, and entrepreneurs, and thereby contributing value to the technological needs of the society.

Mission of the Department:

M1: To equip the students with advanced knowledge and technological skills to cater to the needs of industries.

M2: To enable students to create and develop innovative engineering applications for the benefit of Marginalized communities.

M3: To enable students to become responsible citizens with a willingness to make a Positive difference to society through their education.

Programme Educational Objectives:

PEO1: Graduates are prepared to have successful career in industry, research areas and motivation for higher Education and to provide an opportunity to work in inter-disciplinary groups and to become future Entrepreneurs.
PEO2: Graduates will possess necessary foundation on computational platforms and software applications in electrical engineering that will continue to develop their knowledge and skills throughout their career.
PEO3: Graduates will inculcate professional ethics and instil social responsibility to work in teams for the Welfare of the society and fellow countrymen.

Programme Outcomes:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes:

PSO1: Use technical and logical skills to model, simulate and analyse the working principle, control, reliability of electric components, circuits, and systems that are forming part of power generation, transmission, and distribution.

PSO2: Ability to apply the fundamental engineering concepts to solve real-time problems using engineering software tools such as Electrical modelling software, Open-source alternatives, Virtual labs, RT Lab, and suitable algorithms.

PSO3: Adapt to emerging technologies like sustainable energy, electric mobility, and industrial automation to stay current with emerging trends in the industry.

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CHOICE BASED CREDIT SYSTEM (CBCS)
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER – I

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	MA24101	Calculus for Engineers	BSC	3	1	0	4	4
2	BE24102	Basic Civil and Mechanical Engineering	ESC	3	0	0	3	3
3	HS24101	English for Professional Communication	HSMC	3	0	0	3	3
4	PH24101	Physics for Electrical Engineers	BSC	3	0	0	3	3
5	GE24101	Heritage of Tamils	HSMC	1	0	0	1	1
LABORATORY INTEGRATED THEORY COURSES								
6	GE24111	Engineering Graphics	ESC	2	0	4	6	4
LABORATORY COURSES								
7	GE24122	Engineering Practices Laboratory – Electrical and Electronics	ESC	0	0	2	2	1
8	PH24121	Physics Laboratory	BSC	0	0	2	2	1
FORMATION COURSES								
9	GE24123	Design Thinking[$]	HSMC	0	0	2	2	1
10	FC24102	Cultural Identities and Globalization	HSMC	2	0	0	2	0
			TOTAL	18	0	10	28	21

[$]Skill based courses

SEMESTER – II

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	EE24201	Circuit Theory	PCC	3	1	0	4	4
2	MA24202	Laplace Transforms and Complex Variables	BSC	3	1	0	4	4
3	CS24201	Programming in C	ESC	3	0	0	3	3
4	CY24201	Chemistry for Electronic Engineering	BSC	3	0	0	3	3
5	GE24201	Tamils and Technology	HSMC	1	0	0	1	1
LABORATORY COURSES								
6	CS24221	C Programming Laboratory	ESC	0	0	4	4	2
7	EE24221	Circuit Theory Laboratory	PCC	0	0	4	4	2
8	CY24121	Engineering Chemistry Laboratory	BSC	0	0	2	2	1
9	GE24121	Engineering Practices Laboratory – Civil and Mechanical	ESC	0	0	2	2	1
FORMATION COURSES								
9	FC24101	Life Skills[$]	HSMC	2	0	0	2	1
TOTAL				15	2	12	29	22

[$]Skill based courses

SEMESTER – III

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	MA24302	Statistics And Numerical Methods	BSC	3	1	0	4	4
2	EE24301	Analog Electronics	PCC	3	0	0	3	3
3	EE24302	DC Machines and Transformers	PCC	3	0	0	3	3
4	EE24303	Electromagnetic Theory	PCC	3	0	0	3	3
LABORATORY INTEGRATED THEORY COURSES								
5	EE24311	Digital Logic Circuits (Theory with lab component)	PCC	3	0	2	5	4
6	EE24312	OOP using C++	PCC	2	0	2	4	3
LABORATORY COURSES								
7	EE24321	Analog Electronics Laboratory	PCC	0	0	3	3	1.5
8	EE24322	DC Machines and Transformers Laboratory	PCC	0	0	3	3	1.5
FORMATION COURSES								
9	HS24321	Communication Skills Building Laboratory[$]	HSMC	0	0	2	2	1
10	FC24301	Soft Skills[$]	HSMC	2	0	0	2	1
TOTAL				19	1	12	32	25

[$]Skill based courses

SEMESTER – IV

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	BS24301	Environmental Science and Sustainability	BSC	3	0	0	3	3
2	EE24401	Measurements and Instrumentation	PCC	3	0	0	3	3
3	EE24402	Synchronous and Induction Machines	PCC	3	0	0	3	3
LABORATORY INTEGRATED THEORY COURSES								
4	EE24411	Control Systems Design	PCC	3	0	2	5	4
5	EE24412	Transmission and Distribution	PCC	3	0	2	5	4
6	EE24413	Python Programming and Data Structures	PCC	2	0	2	4	3
LABORATORY COURSES								
7	EE24421	Synchronous and Induction Machines Laboratory	PCC	0	0	3	3	1.5
8	EE24422	Measurement and Instrumentation Laboratory	PCC	0	0	3	3	1.5
FORMATION COURSES								
9	EE24423	Project Driven Learning[$]	EEC	0	0	2	2	1
10	BS24321	System Discovery and Analysis	BSC	0	0	2	2	0
TOTAL				17	0	16	33	24

[$]Skill based courses

Foreign Language should be completed by the end of IV semester.

SEMESTER – V

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	EE24501	Power Electronics	PCC	3	0	0	3	3
2	EE24502	Microprocessor and Microcontroller	PCC	3	0	0	3	3
3	GE24502	Entrepreneurship and International Business Market	HSMC	2	0	0	2	2
LABORATORY INTEGRATED THEORY COURSES								
4	EE24511	Power System Analysis	PCC	3	0	2	5	4
5		Professional Elective – 1	PEC				4	3
6		Professional Elective – 2	PEC				4	3
LABORATORY COURSES								
7	EE24521	Microprocessor and Microcontroller Laboratory	PCC	0	0	3	3	1.5
8	EE24522	Power Electronics Laboratory	PCC	0	0	3	3	1.5
FORMATION COURSES								
9	FC24501	Universal Human Values and Service Learning[$]	HSMC	1	0	1[*]	1	1
10	BS24502	Logical Reasoning and Aptitude Training	BSC	2	0	0	2	1[#]
TOTAL							30	22

[$]Skill based courses

*Activities on non-working days/ hours

[#] Not included for GPA calculation

SEMESTER – VI

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	GE24501	Project Management and Operation Management	HSMC	2	0	0	2	2
2		Open elective – I	OEC	3	0	0	3	3
3		Professional Elective – 3	PEC				3	3
4		Professional Elective – 4	PEC				3	3
LABORATORY INTEGRATED THEORY COURSES								
5	EE24612	Power System Operation and Control	PCC	3	0	2	5	4
6	EE24613	Protection and Switchgear	PCC	3	0	2	5	4
7	EE24614	Energy Systems	PCC	2	0	2	4	3
FORMATION COURSES								
8	GE24503	Financial Literacy	HSMC	2	0	0	2	0
9	GE24621	Interdisciplinary Project[$]	EEC	0	0	2	2	1
10	GE24622	Problem Solving Techniques	EEC	0	0	2	2	1[#]
TOTAL							31	23

[$]Skill based courses

[#] Not included for GPA Calculation

SEMESTER – VII

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1		Open Elective – II	OEC	3	0	0	3	3
2		Open Elective – III	OEC	3	0	0	3	3
3	GE24701	Working to Engineer a Better World	ESC	2	0	0	2	2
4		Audit Course	HSMC	2	0	0	2	0
LABORATORY INTEGRATED THEORY COURSES								
5		Professional Elective – 5	PEC				4	3
6		Professional Elective – 6	PEC				4	3
7		Professional Elective – 7	PEC				4	3
LABORATORY COURSES								
8	EE24722	Professional Project – I	EEC	1	0	2	3	2
FORMATION COURSES								
9	EE24723	Internship[$]	EEC				-	2
			TOTAL				25	21

[$]Skill based courses

SEMESTER – VIII

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
LABORATORY COURSES								
1	EE24722	Professional Project – II	EEC	0	0	20	20	10
TOTAL							20	10

MA24101	Calculus for Engineers	BSC	L	T	P	C
			3	1	0	4

Course Objectives:

- To develop the usage of matrix algebra techniques and its applications, which are essential for engineers.
- To provide the students with the rules of differentiation.
- To impart the students with the concepts of functions of several variables.
- To make the students understand various techniques of integration.
- To acquaint the students with mathematical knowledge in evaluating multiple integrals and their applications.

UNIT I TRANSFORMATIONS 12

Stretching of an elastic membrane - eigenvalues and eigenvectors of a real matrix – properties – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms - Cayley Hamilton Theorem

UNIT II DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Parametric differentiation- Maxima and Minima of functions of single variable

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Total derivative – Partial differentiation of implicit functions – Jacobians – Taylor's series – Maxima and Minima of a function of two variables - Method of Lagrangian Multipliers - Evaluating extremum of single and two variable functions.

UNIT IV INTEGRAL CALCULUS 12

Techniques of Integration: Substitution rule, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Moments and centre of mass.

UNIT V MULTIPLE INTEGRALS 12

Double integrals in Cartesian and Polar coordinates – Area enclosed by plane curves - Change of order of integration – Change of variables in double integrals - Triple integrals in Cartesian coordinates – Volume of solids - Change of variables from Cartesian to Spherical polar coordinates and Cylindrical polar coordinates.

Total Periods: 60

Course Outcomes:

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

CO1: To identify the eigenvalues and eigenvectors of a matrix and to execute diagonalization.
CO2: Identify the limit of functions and apply the rules of differentiation to differentiate functions.
CO3: Apply differentiation to functions of several variables
CO4: Evaluate extreme values of functions
CO5: Evaluate integrals using various techniques of integration
CO6: Evaluate multiple integrals in various coordinate systems and applications of multiple integrals

Suggested Activities:

- Evaluation of eigenvalues and eigenvectors using scientific tool
- Plotting and visualizing curves, and extreme values using a scientific tool
- Plotting and visualizing surfaces, and extreme values using a scientific tool
- Evaluation of line integrals using scientific tool
- Evaluation of multiple integrals using a scientific tool
- Visualizing 2D and 3D functions using GeoGebra and Desmos

Text Books:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, " Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.

References:

1. Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016.
2. Bali.N., Goyal.M. and Watkins. C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Jain.R.K. and Iyengar. S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5th Edition, 2016.
4. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
5. Kuldeep Singh, “Engineering Mathematics Through Applications”, 2nd Edition, Bloomsbury Academic.
6. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.
7. Amos Gilat, “MATLAB: An Introduction with Applications”, 4th Edition, John Wiley.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	-	-	-	-	-	2	-	-	-
CO2	3	2	1	1	2	-	-	-	-	-	-	2	-	-	-
CO3	3	2	1	1	2	-	-	-	-	-	-	2	-	-	-
CO4	3	2	1	1	2	-	-	-	-	-	-	2	-	-	-
CO5	3	2	1	1	2	-	-	-	-	-	-	2	-	-	-
CO6	3	2	1	1	2	-	-	-	-	-	-	2	-	-	-
Avg.	3	2	1	1	2	-	-	-	-	-	-	2	-	-	-

BE24102	Basic Civil and Mechanical Engineering	ESC	L	T	P	C
			3	0	0	3

Course Objectives:

- To provide the students an illustration of the significance of the concept of Thermodynamics and IC Engines To provide the students with the rules of differentiation.
- To explain the component of Boilers, Power Plants, Turbines and Pumps
- To explain the Refrigeration & Air-conditioning system.
- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To provide an insight to the essentials of components of a building and the infrastructure facilities.

UNIT I INTRODUCTION TO THERMODYNAMICS AND IC ENGINES 9

Role of thermodynamics in engineering and science, types of systems, thermodynamic equilibrium, properties, state, process and cycle, introduction to zeroth, first law of thermodynamics – concept of temperature - Steady flow energy equations-Applications - Internal combustion engines - construction – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles-Comparison.

UNIT II BOILERS, POWER PLANTS, TURBINES AND PUMPS 9

Working principle of Boilers- Fire tube boiler, water tube boilers -accessories and mounting. Classification of Power Plants- Working principle of Steam (Thermal), Hydro -electric and Nuclear Power plants- Reciprocating Pumps and Centrifugal Pumps, Turbines-Types-Applications.

UNIT III REFRIGERATION AND AIR CONDITIONING SYSTEM 9

Properties of air – water mixture, concepts of psychometric and its process - Terminology of Refrigeration and Air Conditioning. Principle of vapor compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

UNIT IV SURVEYING AND CIVIL ENGINEERING MATERIALS 9

Surveying Objects – Classification – Principles – Measurements of Distances and angles – Leveling – Determination of areas– Contours. Civil Engineering - Materials: Bricks – Stones – Sand – Cement – Concrete – Steel – Timber – Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, WaterProofing Materials.

UNIT V BUILDING COMPONENTS AND INFRASTRUCTURE 9

Building plans – Foundations: Types of foundations – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering. Types of Bridges and Dams – Water Supply Network – Rain Water Harvesting – Solid Waste Management – Introduction to Green Buildings.

Total Periods: 45

Course Outcomes:

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

CO1: Understanding the concept of Thermodynamics and IC Engines
CO2: Summaries the knowledge in the basics of Boilers, Power Plants, Turbines and Pumps
CO3: Apply the knowledge gained in Refrigeration & Air-conditioning systems.
CO4: Appraise the material, Structures, machines and energy.
CO5: Illustrate the essentials of components of a building and the infrastructure facilities.

Text Books:

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018

References:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd, 2013.
3. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, 2005.
4. Shantha Kumar SRJ., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, 2000.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	1	2	1	2	-	1	-	-	-
CO2	2	-	-	-	-	-	1	2	1	2	-	2	-	1	-
CO3	2	-	-	-	-	-	1	2	2	2	-	2	-	-	-
CO4	2	-	-	-	-	-	1	2	1	2	-	2	-	-	-
CO5	2	-	-	-	-	-	1	2	1	2	-	2	-	-	-
CO6	2	-	-	-	-	-	1	2	1.2	2	-	1.8	-	1	-
Avg.	2	-	-	-	-	-	1	2	1	2	-	1	-	-	-

HS24101 English for Professional Communication HSMC L T P C

3 0 0 3

Course Objectives:

- To develop effective listening, speaking, reading, and writing skills for professional contexts.
- To cultivate formal correspondence skills for workplace communication.
- To analyze and apply rhetorical techniques in writing and speaking.
- To encourage self-expression through storytelling and reflective writing.
- To strengthen grammar and vocabulary for improved language proficiency.

UNIT I COMMUNICATION BASICS 9

Listening - Link verbal and nonverbal cues and listen to podcasts and news stories.
Reading - Read brochures and running headlines. Social media messages and electronic correspondence relevant to professional advancement
Writing - Formal letters

Speaking - Self-introduction - Dialogues and role plays, discussing news stories, asking doubts (clarification, direction, inquiring details…)
Grammar - Noun, Pronoun, Articles
Vocabulary - one-word substitution, phrasal verbs

UNIT II PROFESSIONAL CORRESPONDENCE 9

Listening - Listen to voicemails, presentations, and panel discussions
Reading - MoM - minutes of the meeting, memos, business and economic articles
Writing - Respond to Business Emails
Speaking - Inaugural speech, Vote of thanks, and mini-presentation
Grammar - Verb, concord, wh questions, and Yes/no, question tag
Vocabulary - Word forms (Prefix & suffix)

UNIT III RHETORIC COMMUNICATION 9

Listening - Monologue from plays and movies, and sale pitches (marketing and promotions)
Reading - Looking for ambiguity - Ethos, pathos, and logos (poem or play)
Writing - Essays - problem solution, cause and effect essay
Speaking - Deliver a monologue - situational scenarios
Grammar - Conjunctions, prepositions, interjections
Vocabulary - Discourse markers for contextual essays, idioms, and phrases

UNIT IV EXTENDED NARRATION 9

Listening - Listen to documentaries, debates, discussions, and Toastmasters speech
Reading - Read professional resumes, LinkedIn profiles, newsletter
Writing - Blog writing, writing reviews
Speaking - Debate, group discussion
Grammar - Mixed tenses, Adverb
Vocabulary - Compound words, Collocation

UNIT V LANGUAGE AND SELF 9

Listening - Listen to tone, mood, and attitude. Find meanings based on the context, and listen to different accents.
Reading - An excerpt from an autobiography
Writing - Reflective journal and diary entries
Speaking - Narrate stories from personal experience
Grammar - Adjective, direct, and indirect speech
Vocabulary - Contextual meaning of words, Abbreviations, and acronyms

Total Periods: 45

Course Outcomes:

CO1: Demonstrate enhanced listening, speaking, reading, and writing skills tailored for professional environments.
CO2: Compose clear formal emails and letters for workplace communication.
CO3: Analyze and use rhetorical techniques to engage and persuade audiences.
CO4: Develop storytelling and reflective writing skills to share personal experiences.
CO5: Improve grammar and vocabulary for effective communication.
CO6: Foster teamwork and discussion abilities through debates and group presentations.

Suggested Activities:

- Take a set of 15 messages and classify them into spam, alerts, scams, discount texts, news, cautionary, personnel, and informative.

- Reflective journal - write your own personal and learning experience so far at LICET. Page limit: 3 pages.
- Rhetoric Writing - Find a product or create a product and employ ethos, pathos, and logos to persuade the customers to buy your product. Write in 250 words.
- Creative writing - Create your account on Blogger and write reviews, articles, and stories.

Text Books:

1. English for Engineers and Technologists. Volume I by Orient Blackswan, 2022
2. English for Science & Technology - I by Cambridge University Press, 2023

References:

1. Interchange. Cambridge University Press. USA, 2022.
2. Embark. Cambridge University Press. USA, 2016.
3. A course in Technical English. Cambridge University Press. USA, 2023.
4. High School English Grammar & Composition. Wren & Martin's Regular & Multicolour Edition. S.Chand Publishing, 2016.
5. Interchange by Jack C. Richards, Fifth Edition, Cambridge University Press, 2017.
6. English for Academic Correspondence and Socializing. Adrian Wallwork, Springer, 2011.
7. The Study Skills Handbook. Stella Cortrell, Red Globe Press, 2019
8. www.uefap.com

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO4	-	-	-	-	-	-	1	-	1	1	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO6	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
Avg.	-	-	-	-	-	-	1	-	2	3	-	3	-	-	-

PH24101 Physics for Electrical Engineers BSC L T P C

3 0 0 3

Course Objectives:

- To instil knowledge of oscillations and waves and make them able to apply this knowledge in engineering situations.
- To establish a sound grasp of foundational principles of quantum mechanics and enable them to perform basic quantum mechanical calculations.
- To introduce the basics principles of photonics and fibre optic communication to students
- To make students understand the applications of quantum mechanics in solid state physics to decipher the electrical properties of materials.
- To make students understand the quantum mechanical basis of magnetic properties of materials

UNIT I OSCILLATIONS AND WAVES 9

Simple harmonic motion - Torsional pendulum – Damped oscillations –Shock Absorber -Forced oscillations and Resonance (qualitative)–Applications of resonance - Electrical analogy of mechanical oscillators - waves on a string - progressive waves - stationary waves- Energy transfer of a wave.

UNIT II QUANTUM MECHANICS 9

Black body radiation – Planck's hypothesis and black body radiation formula (qualitative)- Wave particle duality–de Broglie hypothesis– Uncertainty Principle – The Schrodinger Wave equation (time-dependent and time-independent) – Physical interpretation of wave function - Normalization - Particle in an infinite potential well - Energy values and wavefunctions-Quantum mechanical tunneling. Scanning tunneling microscope.

UNIT III QUANTUM THEORY OF SOLIDS 9

Particle in a three-dimensional box - Degenerate energy states. Electrons in metals -Classical free electron theory- quantum free electron theory Fermi- Dirac statistics – Density of energy states. Fermi energy and free electron density. Drawbacks of quantum free electron theory- Electrons in a periodic potential- Kronig-Penney Model (qualitative) -Band theory. Classification of solids based on energy band structure.

UNIT IV SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode

UNIT V MAGNETIC PROPERTIES OF MATERIALS 9

Magnetization of matter - Magnetic dipole moment- Atomic magnetic moments - Magnetization vector and Magnetizing field - Magnetic permeability and susceptibility- Dia, para, and ferromagnetic materials – paramagnetism in the conduction electrons in metals – exchange interaction and origin of ferromagnetism – Soft and hard magnetic materials - Examples and Uses - Giant magnetoresistance-GMR devices.

Total Periods:45

Course Outcomes:

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

CO1: Express the knowledge of oscillation and wave phenomena.
CO2: Understand basic applications of quantum mechanics and be able to calculate the wave functions and energy values of particles confined to microscopic dimensions by infinite potential wells.
CO3: Describe electrical properties of solids on the basis of quantum mechanical principles
CO4: Describe properties of semiconductors on the basis of quantum mechanical principles
CO5: Describe the transport mechanisms in semiconductors and their applications
CO6: Describe the quantum mechanical origin of magnetic properties of materials and applications of magnetic materials.

Text Books:

1. Avadhanulu M N, Kshirsagar P G, "A Textbook of Engineering Physics", S Chand & Co Ltd, Ninth Revised Edition, 2012.
2. Hitendra K Malik, A K Singh " Engineering Physics McGraw Hill Education; Second edition (3 August 2017)
3. Gaur R K, Gupta S L, "Engineering Physics", Dhanpat Rai Publishers, 2012.

References:

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. Serway R A, Jewett J W, "Physics for Scientists and Engineers", Cengage Learning, 2010.
3. Halliday D, Resnick R, Walker J, "Principles of Physics", Wiley, 2015.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
Avg.	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-

GE24101 Heritage of Tamils

HSMC **L T P C**

1 0 0 1

Course Objectives:

This course enables the students to

- provide an insight to the students into the rich culture and heritage of the state
- provide the students with detailed information on the engineering techniques to construct architectural marvels practiced in Tamil Nadu
- make the students connect with their roots, appreciate, and preserve it.

UNIT I LANGUAGE AND LITERATURE 3

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

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

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

UNIT III HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

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

UNIT IV THINAI CONCEPT OF TAMILS 3

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

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

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

Total Periods:15

Course Outcomes:

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

CO1: Understand the human values and rights in Tamil literature
CO2: Learn the art and culture being practiced by the people of Tamil Nadu
CO3: Understand various games and dance practices by the people of Tamil Nadu
CO4: Understand the Tamil Culture and Customs through Folklore
CO5: Learn the concepts of Sangam Literature and the bravery of Kings
CO6: Learn the life history of freedom fighters Vedic herbs and developments in lifestyle

TEXT-CUM-REFERENCE BOOKS

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

GE24101	தமிழர் மரபு	HSMC	L	T	P	C
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அலகு I மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண

பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தொல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள் **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குக் தமிழர்களின் பங்களிப்பு **3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

Total Periods:15

TEXT-CUM-REFERENCE BOOKS:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.

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

GE24111	Engineering Graphics	ESC	L	T	P	C
			2	0	4	4

Course Objectives:

- To draw engineering curves and freehand sketch of simple objects.
- To draw orthographic projection of solids and sections of solids.
- To draw development of solids
- To draw isometric and perspective projections of simple solids.

CONVENTIONS AND GEOMETRIC CONSTRUCTION (Not for examinations) 1

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+11

Basic curves used in engineering practices: Construction of conic sections by eccentricity method - Construction of cycloidal curves - Construction of involutes of square and circle - Drawing of tangents and normal to the above curves.
Visualization concepts and Free Hand sketching: Visualization principles - Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+11

Projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 6+11

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV SECTION AND DEVELOPMENT OF SOLIDS 6+12

Sectioning of simple solids like prisms, pyramids, cylinders, and cone in a simple vertical position

when the cutting plane is inclined to one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection - isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method.

COMPUTER AIDED DRAFTING (Demonstration Only, Not for Exam) 3

The Concepts of Computer Aided Drafting for Engineering drawing, Computer graphics & Geometrical modelling (2D Orthographic Views) and 3D drafting (Isometric Views) using design software.

Total Periods: 90

Course Outcomes:

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

CO1: Construct the conic curves, involutes and cycloids.
CO2: Visualize and construct multiple views of solid.
CO3: Solve practical problems involving projection of lines and planes.
CO4: Draw the projection of simple solids.
CO5: Draw the sectional views of simple solids, obtain true shape and develop sectioned solids.
CO6: Draw the isometric and perspective projections of simple solids.

Text Books:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Jayapoovan T, "Engineering Graphics using AUTOCAD", Vikas Publishing ,7 th Edition.
3. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

References:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation —Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
4. 5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

Special points applicable to Semester End Examinations on Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.

2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	-	-	-	-	3	-	2	2	-	-
CO2	3	1	2	-	2	-	-	-	-	3	-	2	2	-	-
CO3	3	1	2	-	2	-	-	-	-	3	-	2	2	-	-
CO4	3	1	2	-	2	-	-	-	-	3	-	2	2	-	-
CO5	3	1	2	-	2	-	-	-	-	3	-	2	2	-	-
CO6	3	1	2	-	2	-	-	-	-	3	-	2	2	-	-
Avg.	3	1	2	-	2	-	-	-	-	3	-	2	2	-	-

GE24122 Engineering Practices Laboratory – Electrical and Electronics

ESC | L | T | P | C
0 | 0 | 2 | 1

Course Objectives:

- To learn the basics of electronic components.
- To understand the internal structure and working of the measuring instruments.
- To construct a prototype circuit on a breadboard and verify.
- To understand the process behind the PCB fabrication.
- To introduce the functionality of various electrical components namely switches, fuse, and meters to perform wiring various electrical joints in common household electrical wire work.
- To introduce the methods for measuring electrical quantities

LIST OF EXPERIMENTS:

Electrical

1. Introduction to Electrical Components switches, fuses, indicators, and lamps
2. Basic switchboard wiring with lamp, fan, three-pin socket, and energy meter
3. Staircase wiring
4. Fluorescent Lamp wiring with introduction to CFL and LED types
5. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit

Electronics

1. Study of electronic components resistor, capacitor, inductor, transistor and diode.
2. Introduction to CRO, DSO, MSO, FG and their working principles.
3. Circuit prototyping and verification.
4. Build a printed circuit board and verify the desired output.

Total Periods:30

Course Outcomes:

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

CO1: Identify and describe the function of various electronic components, leading to successful application in circuit design.
CO2: Accurately interpret and apply measurement data in practical scenarios.
CO3: Build a prototype of a circuit and validate its output.

CO4: Gain knowledge of PCB fabrication processes, including design, etching, and assembly.
CO5: Understand the working of electrical switches, measuring instruments, and wiring layouts used in domestic applications and carry out basic electrical wiring work.
CO6: Comprehend the concepts of current, voltage, power, and power factor using various measuring instruments

Laboratory Requirements:

S. No.	Description of equipment	Required numbers (for a batch of 30 students)
1.	Resistors, Capacitors, Inductors – sufficient quantities. Bread Boards	15 nos.
2.	CRO, MSO, DSO, FG, Power Supply	5 Nos.
3.	PCB etching kit (Ferric Chloride, Drilling machine, Layout design)	15 kits
4.	Soldering iron, paste, lead, desoldering pump	15 nos. each
5.	Single way switch, Two way switch, fuses, indicators, 230 V -60W incandescent lamp	5 nos each
6.	Basic switchboard wiring kit and ,Energy meter	5 nos each
7.	Staircase wiring kit	5 nos each
8.	Fluorescent Lamp wiring kit, CFL and LED lamps	5 nos each
9	1φ Auto Transformer, Voltmeter, Ammeter, Rheostat, Capacitor, Choke	5 nos each
10.	Multimeters	6 nos

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	2	-	1	2	1	-	-	-	-	-
CO2	2	1	1	2	1	-	-	-	2	1	-	-	-	-	-
CO3	2	1	1	1	1	-	-	-	2	1	-	-	-	-	-
CO4	2	1	1	1	1	-	-	-	2	1	-	-	-	-	-
CO5	2	1	1	1	1	-	-	1	2	1	-	-	-	-	-
CO6	2	1	1	2	1	2	-	-	2	1	-	-	-	-	-
Avg.	2	1	1	1	1	1	-	1	2	1	-	-	-	-	-

PH24121	Physics Laboratory	BSC	L	T	P	C
			0	0	2	1

Course Objectives:

- To learn the measurements of various elastic moduli of materials
- To learn determination of thermal properties of materials.
- To study different optical phenomena involving ordinary light.
- To measure the characteristic properties of lasers.
- To understand the characteristics of oscillatory motion.
- To learn measurement of rigid body moment of inertia.

LIST OF EXPERIMENTS (any six experiments):

1	Non-uniform bending - Determination of Young's modulus
2	Uniform bending – Determination of Young's modulus
3	Lee's Disc Experiment - Determination of thermal conductivity of bad conductors.
4	Torsional pendulum - Determination moment of inertia of regular and irregular objects.
5	Simple harmonic oscillations of cantilever
6	Ultrasonic interferometer – determination of sound velocity and liquids compressibility
7	Viscosity of Liquids
8	Air wedge - Determination of thickness of a thin sheet/wire
9	Optical fibre -Determination of Numerical Aperture and acceptance angle
10	Spectrometer-Determination of the wavelength of light using grating
11	(a) Laser- Determination of the wavelength of the laser using grating (b) Compact disc- Determination of width of the groove using laser.

Total Periods: 30

Course Outcomes:

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

CO1: Determine various moduli of elasticity of materials
CO2: Determine thermal properties of solids
CO3: Analyze various optical phenomena involving ordinary light.
CO4: Determine the characteristic properties of lasers.
CO5: Measure characteristic properties of systems executing oscillatory motion.
CO6: Determine the moment of inertia of rigid bodies

Text Books:

1. Engineering Physics Practicals by Dr. P. Mani, Dhanam Publications, 2023
2. Practical Physics by Gordon L Squires, Cambridge University Press; 4th edition, 2001

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	-	-	-	-	2	-	-	-	-	-	-
CO2	2	2	-	3	-	-	-	-	2	-	-	-	-	-	-
CO3	2	2	-	3	-	-	-	-	2	-	-	-	-	-	-
CO4	2	2	-	3	-	-	-	-	2	-	-	-	-	-	-
CO5	2	2	-	3	-	-	-	-	2	-	-	-	-	-	-
CO6	2	2	-	3	-	-	-	-	2	-	-	-	-	-	-
CO7	2	2	-	3	-	-	-	-	2	-	-	-	-	-	-
Avg.	2	2	-	3	-	-	-	-	2	-	-	-	-	-	-

GE24123 Design Thinking HSMC L T P C

0 0 2 1

Course Objectives:

- Students will understand the different learning methodologies
- Students will learn the art of observation and visualization
- Students will understand the need for empathy in problem-solving
- Students will learn how to work in a team
- Students will learn to use different design thinking tools to solve problems

Module 1	An Insight to Learning: Understanding the Learning Process and Kolb's Learning Styles	2
Module 2	Journey of my life: Visualization and Wheel of Life. *Introduction to project*	4
Module 3	Observation: Listening vs hearing, Beyond observations and Mind maps	2
Module 4	Teamwork: Divergent thinking and Brainstorming	2
Module 5	Customer Journey: Journey mapping	2
Module 6	Conflict management: Balancing priorities, Reacting and Responding, Constraints to opportunities	2
Module 7	Empathy: Persona and Empathy map	2
Module 8	Design Thinking Model: 5-step process: Empathize, define, ideate, prototype, and scale	2
Module 9	Appreciation: The wonder of recognition, Articulation and Influence	2
Module 10	Project presentation	10

Total Periods: 30

Course Outcomes:

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

CO1: To understand various learning processes and stages

CO2: To observe and visualize different scenarios

CO3: To empathize with a customer

CO4:To develop a journey map based on experiences

CO5: To understand the art of conflict management

CO6: To use design thinking as a tool to solve problems

Suggested Activities:

- Solve real-life problems using Design Thinking

Text Books:

1. Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-solving, Pavan Soni, Penguin Random House India, Pvt. Ltd. 2020
2. Developing Thinking Skills (The Way to Success), E. Balagurusamy, 2024, Khanna Publishing House
3. The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods, Michael Lewrick, Patrick Link, Larry Leifer, Wiley, March 2020.

References:

1. Internet Reference: https://www.interaction-design.org/
2. Internet Reference: https://online.hbs.edu/
3. Internet Reference: https://dschool.stanford.edu/

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	1	1	-	-	3	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-	3	-	-	-
CO3	-	-	-	-	-	2	-	2	2	2	-	3	-	-	-
CO4	-	-	-	-	-	2	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	-	2	-	2	2	2	-	3	-	-	-
CO6	-	-	-	-	-	3	-	2	3	2	2	3	-	-	-
Avg.	-	-	-	-	-	2.1	-	1.7	2	2	2	3	-	-	-

FC24102 Cultural Identities and Globalisation HSMC L T P C

2 0 0 0

Course Objectives:

- To enable students to reflect on their own cultural identity in relation to their socialisation.
- To encourage cultural diversity that underpins the formation of identity and social behaviours.
- To give exposure to the varied cultural influences on the parent culture.
- To prepare to address the challenges and tensions in the globalised society.

UNIT I EXPLORING SOCIAL AND CULTURAL IDENTITY 5

Identity formation & environmental interaction

- Race/ethnicity
- Gender
- Language
- Religion
- Socialisation (contact with different cultures)

UNIT II REGIONAL AND CULTURAL INFLUENCE ON SOCIAL BEHAVIOUR AND IDENTITY 6

- Assimilation, Amalgamation and Hybridisation
- Cultural Behaviour - dialect, traditions, social behaviour (customs), etiquette (work culture), habits, cuisine and regional variation

UNIT III DISSEMINATION OF MASS CULTURE PRACTICES 6

- Cultural Imperialism
- Colonisation and Globalization - Cultural turn
- Manufacturing pop culture - Language, food, movies, music, fashion, cosmetics.

UNIT IV SOCIO-CULTURAL CHANGES VIA GLOBALISATION 6

- Indian globalisation through trade liberalisation
- Increased migration flow with economic opportunities
- Cultural exchange, global networks
- Urbanisation - impact on family ideology and social structure

UNIT V EMBRACING GLOBAL IDENTITIES 7

- Challenges and tension
- Adaptable to changing society - etiquettes (in cross-cultural workspace) and social behaviours
- Building understanding and tolerance

Total Periods: 30

Course Outcomes:

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

CO1: Engage in conversations with themselves in relation to their local culture and society.
CO2: Realise the nuances of identity formation through various means of socialisation.
CO3: Critically assess the countless social and cultural behaviours that influence their identity and behaviour.
CO4: Examine the role of globalisation and liberalisation in urbanisation and cultural imperialism.
CO5: Adapt to the cross-cultural changes and engage in global networking.
CO6: Respond appropriately in a multicultural space by building tolerance and understanding.

Suggested Activities:

- Exercise on identity formation - creation of mind maps / storyboards
- A mini presentation on “Identifying one's own culture amidst the influence of the diverse cultural environment” - expressing only one cultural aspect (language, attire, habits, food, …)
- Opinion piece speech - Deliver a short speech expressing personal opinions
- Survey report - Comparison chart (5 exchanges) by engaging conversations with a elderly stranger or grandparents
- Produce a 30-second reel showcasing their understanding of the social etiquette of a specific country.

Text Books:

1. Worksheets and activity sheets.

References:

1. Brooks, Ann. Popular Culture: Global Intercultural Perspectives. United Kingdom, Bloomsbury Publishing, 2014.
2. Verkuyten, Maykel. Identity and Cultural Diversity: What Social Psychology Can Teach Us. United Kingdom, Taylor & Francis, 2013, pp. 1-27.
3. Savage, Michael, et al. Globalization and Belonging. United Kingdom, SAGE Publications, 2004, pp. 29-77.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	2	1	-	2	-	-	-
CO2	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	1	-	2	-	-	-
CO4	-	-	-	-	-	2	1	-	2	1	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	2	-	-	2	1	-	2	-	-	-
Avg.	-	-	-	-	-	2	1	-	2	1	-	2	-	-	-

EE24201	Circuit Theory	PCC	L	T	P	C
			3	1	0	4

Course Objectives:

- To introduce electric circuits and their analysis
- To provide key concepts to analyze and understand electrical circuits
- To impart knowledge on solving circuit equations using network theorems
- To introduce Phasor diagrams and analysis of single & three phase circuits
- To educate on obtaining the transient response of circuits.
- To introduce the phenomenon of resonance in coupled circuits.

UNIT I DC CIRCUIT ANALYSIS 9+3

Fundamentals concepts of R, L, and C elements - Basic concepts - Charge, current, voltage, and Power - Energy Sources- Nodes, Branches, Loops - Ohm's law, Kirchoff's Law- Series resistor and voltage division- Parallel resistor and current division- source transformation - wye-delta transformation - Mesh current and node voltage methods of analysis for D.C circuits – Applications

UNIT II AC CIRCUIT ANALYSIS 9+3

A.C Circuits – Average and RMS Value – Complex Impedance – Phasor diagram - Real and Reactive Power, Power Factor, Energy- Phasor relationship for circuit elements- impedance, admittance-impedance combinations - Mesh current and node voltage methods of analysis for A.C circuits - Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced and unbalanced

UNIT III NETWORK THEOREMS FOR DC AND AC CIRCUITS 9+3

Theorems – Superposition, Thevenin's and Norton's Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem- Tellegen's Theorem-Statement, application to DC and AC Circuits

UNIT IV TRANSIENT RESPONSE ANALYSIS 9+3

Introduction – Laplace transforms and inverse Laplace transforms- standard test signals -Transient response of RL, RC, and RLC circuits using Laplace transform for source-free, Step input, and Sinusoidal input

UNIT V RESONANCE AND COUPLED CIRCUITS 9+3

Series and parallel resonance –frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Dot analysis of coupled circuits– Single Tuned circuits.

Total Periods:60

Course Outcomes:

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

CO1: Explain circuit's behaviour using circuit laws.

CO2: Apply mesh analysis/ nodal analysis / network theorems to determine behaviour of the given DC and AC circuit

CO3: Compute the transient response of first order and second order systems to step and sinusoidal input

CO4: Compute power, line/ phase voltage and currents of the given three phase circuit

CO5: Explain the frequency response of series and parallel RLC circuits

CO6: Explain the behaviour of magnetically coupled circuits.

Text Books:

1. William H. HaytJr, Jack E. Kemmerly, and Steven M. Durbin, "Engineering Circuits Analysis",
2. McGraw Hill Publishers, 9th edition, New Delhi, 2020.
3. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2019.
4. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

References:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai& Sons, New Delhi, 2020.
2. Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019.
3. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
4. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley Sons, Inc. 2018.
5. Sudhakar A and Shyam Mohan SP, "Circuits and Networks Analysis and Synthesis", McGraw-Hill, 2015

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	1	-	-	-	-	1	2	1	-
CO2	3	2	2	-	1	-	1	-	-	-	-	1	2	1	-
CO3	3	2	2	-	1	-	1	-	-	-	-	1	2	1	-
CO4	3	2	2	-	1	-	1	-	-	-	-	1	2	1	-
CO5	3	2	2	-	1	-	1	-	-	-	-	1	2	1	-
CO6	3	2	2	-	1	-	1	-	-	-	-	1	2	1	-
Avg.	3	2	2	-	1	-	1	-	-	-	-	1	2	1	-

MA24202 Laplace Transforms and Complex Variables BSC L T P C

3 1 0 4

Course Objectives:

The objective of this course is to enable the student to

- Find the Laplace transforms of standard functions
- Find the inverse Laplace transform of a function and use it in solving differential equations
- To introduce vector differential operator and evaluation of sine, surface and volume integrals

- To introduce the basic understanding and application of the concepts of divergence and curl
- Enhance the understanding of Cauchy-Reimann equations and it's usage in the construction of analytic functions
- Familiarise the methods of complex integration, series expansion of functions

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

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

UNIT II LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Transform of periodic functions - Initial and final value theorems – Inverse Laplace transforms – Convolution theorem – Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT III VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems (without proof).

UNIT IV ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping: $w=z+c$, cz, $1/z$, z^2, Bilinear transformation.

UNIT V COMPLEX INTEGRATION 12

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals

Total Periods: 60

Course Outcomes:

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

CO1: Use Laplace transforms to compute transformations of functions
CO2: Solve higher-order linear differential equations with constant coefficients
CO3: Solve higher-order linear equations with variable coefficients
CO4: Compute vector differential quantities and vector integrals
CO5: To understand the standard techniques of complex variable theory in particular analytic function
CO6: To familiarise with complex integration techniques

Suggested Activities:

- Evaluation of Laplace transforms using scientific tool
- Evaluation of Inverse Laplace transforms using scientific tool
- Evaluation of higher order ODE using scientific tool
- Visualizing complex analytic function using scientific tool
- Visualizing complex line integrals using scientific tool

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Publishers, 10th Edition, 2014.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
3. S. Arumugam., A. Thangapandian Issac and A. Somasundaram, Complex Analysis, SCITECH Publications Private Limited, 2004.

References:

1. Churchill, R.V. and Brown, J.W, Complex Variables and Applications, Tata Mc Graw-Hill, 8th Edition, 2012.
2. Murray Spiegel, John Schiller, Probability and Statistics, Schaum's Outline Series, 3rd Edition, 2010.
3. Conway J.B., "Functions of one Complex variables", Springer International Student Edition, Second Edition, New York, 2000.
4. Lars V. Ahlfors, "Complex Analysis", McGraw Hill International, Indian Edition, 2017.
5. Kumaresan, S. A Pathway to Complex Analysis, Techno Wold Publication, Kolkata, 2022
6. Ponnusamy S., Foundations of Complex Analysis, Narosa Publishing House, Second Edition, New Delhi, 2018.
7. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-
CO2	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-
CO3	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-
CO4	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-
CO5	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-
CO6	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-
Avg.	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-

CS24201 Programming in C

ESC	L	T	P	C
	3	0	0	3

Course Objectives:

- To understand the constructs of C Language.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures
- To do input/output and file handling in C

UNIT I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process

UNIT II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III FUNCTIONS AND POINTERS 9

Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions –Pointers – Pointer operators – Pointer arithmetic -Function pointers– Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT IV STRUCTURES AND UNION 9

Structure - Nested structures – Pointer and Structures – Array of structures – Self-referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.

UNIT V FILE PROCESSING 9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to
CO1: Demonstrate knowledge on C Programming constructs
CO2: Develop simple applications in C using basic constructs
CO3: Design and implement applications using arrays and strings
CO4: Develop and implement modular applications in C using functions
CO5: Develop applications in C using structures and pointers
CO6: Design applications using sequential and random-access file processing

Suggested Activities:

- Create exercises where students write their own macros and use preprocessor directives like #define, #include, etc., in various scenarios.
- Quizzes on Code Snippets
- Assignment on numerical problems
- Present real-world problem scenarios that can be solved using C. For example, writing a simple command-line calculator, implementing sorting algorithms, or creating a small text-based game.
- External Learning – Graphics in C

Text Books:

1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.

References:

1. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, “Schaum’s Outline of Theory and Problems of Programming with C”, McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2013.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	1	1	2	-	3	2	-	2	-
CO2	2	2	2	1	2	1	1	1	2	-	3	3	-	2	-
CO3	2	3	2	1	2	1	1	1	2	-	3	2	-	2	-
CO4	3	2	2	1	3	1	1	1	2	-	3	3	-	2	-
CO5	2	3	3	1	2	1	2	1	2	-	3	2	-	2	-
CO6	2	2	3	2	1	2	-	-	2	-	2	2	-	2	-
Avg.	2	2.3	2.3	1.2	2	1.2	1.2	1	2	-	2.8	2.3	-	2	-

CY24201	Chemistry for Electronic Engineering	BSC	L	T	P	C
			3	0	0	3

Course Objectives:

- To understand the fundamental concepts of electrochemical cells, redox reactions, and their applications in various chemical processes.
- To introduce the principles of corrosion, including the types, factors influencing corrosion, and methods for corrosion control.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.
- To impart knowledge on the basic principles and preparatory methods of nano-materials.
- To learn the techniques of instrumental analysis for the characterization of materials.
- To explore the properties and applications of smart materials in engineering.

UNIT I ELECTROCHEMISTRY AND CORROSION 9

Electrochemical Cell, Redox Reaction, Electrode Potential - Oxidation and Reduction Potential. Nernst Equation and Applications. Emf series.
Introduction to Corrosion - Chemical and Electrochemical Corrosion (Galvanic Corrosion, Concentration Cell Corrosion), Galvanic series - Factors Influencing Corrosion. Corrosion Control - Material Selection and Design - Electrochemical Protection - Sacrificial Anodic Protection and Impressed Current Cathodic Protection. Protective Coatings - Metallic Coatings (Galvanizing, Tinning), Organic Coatings (Paints). Paints: Constituents and Functions.

UNIT II STORAGE DEVICES AND ENERGY SOURCES 9

Batteries - Characteristics - Types of Batteries – Primary Battery (Alkaline Battery), Secondary Battery (Lead Acid, Lithium - Ion - Battery) - Emerging Batteries – Nickel - Metal Hydride Battery, Aluminium Air Battery, Batteries for Automobiles and Satellites - Fuel Cells (Types) – H2-O2 Fuel Cell – Super capacitors - Types and Applications,
Nuclear Energy – Nuclear Fission, Fusion, Differences, Characteristics – Nuclear Chain Reactions – Light Water Nuclear Reactor – Breeder Reactor.
Renewable Energy: Solar energy - Solar Cells, DSSC

UNIT III NANO CHEMISTRY 9

Basics: Distinction Between Molecules, Nanomaterials and Bulk materials; Size - Dependent Properties (Optical, Electrical, Mechanical, Magnetic and Catalytic). Types of Nanomaterials: Definition, Properties and Uses of - Nanoparticle, Nanocluster, Nanorod, Nanowire and Nanotube. Preparation of Nanomaterials: Sol-Gel, Solvothermal, Laser Ablation, Chemical Vapour Deposition, Electrochemical Deposition and Electro Spinning. Applications of Nanomaterials in Medicine, Agriculture, Energy, Electronics and Catalysis.

UNIT IV INSTRUMENTAL METHODS AND ANALYSIS 9

Introduction, Absorption of Radiation, Types of Spectra, UV-Visible and IR Spectrophotometer: Instrumentation and Applications, Cyclic Voltammetry for Redox System. Thermal Methods of Analysis TGA, DTA, DSC. Sensors: Oxygen, Pulse Oximeter, Biometrics, and Glucose Sensor.

UNIT V SMART MATERIALS FOR ENGINEERING APPLICATIONS 9

Polymers – Definition – Classification – Smart Polymeric Materials - Preparation, Properties and Applications of Piezoelectric Polymer - Polyvinylidene Fluoride (PVDF), Electroactive Polymer - Polyaniline (PANI) and Biodegradable Polymer - Polylactic acid (PLA). Polymer Composites: Definition, Classification – FRP's – Kevlar.
Shape Memory Alloys: Introduction, Shape Memory Effect – Functional Properties of SMAs – Types of SMA - Nitinol (Ni-Ti) Alloys - Applications.
Chromogenic Materials: Introduction – Types - Applications.

Total Periods: 45

Course Outcomes:

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

CO1: Explain the electrochemical cells, electrode potential and its applications.
CO2: Analyze the factors leading to corrosion for corrosion prevention and control in engineering materials.
CO3: Explain the operating principles, working processes and applications of energy conversion and storage devices.
CO4: Apply the basic concepts of Nano chemistry in designing the synthesis of nanomaterials for engineering applications.
CO5: Analyze materials using various instrumental techniques and sensors.
CO6: Understand the characteristics of smart materials for advanced engineering applications.

Suggested Activities:

- Quiz
- Mind Mapping on Types of Nanomaterials
- Seminar
- Animated videos on Nuclear Power Plant
- Electroplating process by group of students
- Demonstration of sensors

Text Books:

1. Jain P. C. & Monica Jain., "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi,2012.
3. Dara S.S., "A Textbook of Engineering Chemistry", Chand Publications, 2004.
4. B.K.Sharma, "Instrumental Methods of Chemical Analysis" , 28th Edition, Goel Publishing House. 2012.

References:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text Book of Nanoscience and Nanotechnology", Universities Press - IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd

Edition, 2017.
3. Friedrich Emich, “Engineering Chemistry”, Scientific International PVT, LTD, New Delhi, 2014.
4. ShikhaAgarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry - A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.
6. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, “Polymer Science”, New AGE International Publishers, 2009.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	2	2	-	-	-	-	2	1	-	-
CO2	3	2	2	1	-	2	2	-	-	-	-	2	1	-	-
CO3	3	1	2	1	-	2	2	-	-	-	-	2	1	-	-
CO4	2	1	-	-	-	-	2	-	-	-	-	1	1	-	-
CO5	2	1	1	-	-	1	1	-	-	-	-	1	1	-	-
CO6	3	1	2	-	-	2	1	-	-	-	-	1	1	-	-
Avg.	2.7	1.3	1.5	1	-	1.5	1.7	-	-	-	-	1.5	1	-	-

GE24201 Tamils and Technology HSMC L T P C

1 0 0 1

Course Objectives:

This course enables the students to
- Understand the art of making things and developments in the lifestyle of people
- Understand the various methods of constructing buildings
- Understand the techniques being used in Architecture by Tamils
- Understand and apply the concepts of Tamils with modern technology

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

Total Periods:15

Course Outcomes:

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

CO1: Know the gradual improvement in the life history of Tamils
CO2: Construct buildings with the impact of the past with the present
CO3: Learn to manufacture remarkable things with the help of technology
CO4: Apply new Concepts in agriculture to the upliftment of the future society
CO5: Apply the ancient skills to find out the measurements of oceans
CO6: Apply the concepts of Tamil with modern technology

Text-cum-Reference Books:

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

GE24201	தமிழரும் தொழில்நுட்பமும்	HSMC	L	T	P	C
			1	0	0	1

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவு தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தொ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III உற்பத்தித் தொழில் நுட்பம் 3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

Total Periods:15

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
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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.

CS24221	C Programming Laboratory	ESC	L	T	P	C
			0	0	4	2

Course Objectives:

- To familiarise with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:

Note: The lab instructor is expected to design problems based on the topics listed.

1. I/O statements, operators, expressions
2. Decision-making constructs: if-else, goto, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.

10. Files: reading and writing, File pointers, file operations, random access, processor directives.

Total Periods: 60

Course Outcomes:

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

CO1: Develop simple applications in C using basic constructs
CO2: Develop simple applications in C using control flow constructs
CO3: Design and implement applications using arrays and strings
CO4: Develop and implement modular applications in C using functions
CO5: Develop applications in C using structures and pointers
CO6: Design applications using sequential and random access file processing

References:

1. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.
2. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2013.
3. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.
4. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
6. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.

Laboratory Requirements:

Sl. No	Description of Equipment	Required numbers (for batch of 30 Students)
1	INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17” or higher TFT Monitor, Keyboard and mouse	30
2	Windows 10 or higher operating system / Linux Ubuntu 20 or higher	30
3	Dev C++ / Linux Operating System with GNU compiler / equivalent open-source IDE	30

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	1	1	1	-	-	2	-	2	2	-	2	-
CO2	2	3	3	2	1	1	-	-	2	-	2	2	-	2	-
CO3	2	2	2	1	1	2	-	-	2	-	2	2	-	2	-
CO4	2	2	2	2	1	2	-	-	3	-	3	3	-	2	-
CO5	2	2	3	2	3	2	-	-	3	-	3	3	-	2	-
CO6	2	2	3	2	1	2	-	-	2	-	2	2	-	2	-
Avg.	1.8	2.3	2.7	1.7	1.3	1.7	-	-	2.3	-	2.3	2.3	-	2	-

EE24221	Circuit Theory Laboratory	PCC	L	T	P	C
			0	0	4	2

Course Objectives:

- To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- To gain practical experience in electric circuits and verification of theorems

LIST OF EXPERIMENTS:

Familiarization with various electrical components, sources, and measuring instruments

1. Simulation and experimental verification of series and parallel electrical circuits using fundamental laws.
2. Simulation of three-phase balanced and unbalanced star, delta networks circuit (Power and Power factor calculations).
3. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
4. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
5. Simulation and experimental verification of electrical circuit problems using the Superposition theorem.
6. Simulation and experimental verification of Maximum Power transfer theorem.
7. Simulation and Experimental validation of R-C, R-L and RLC electric circuit transients
8. Simulation and Experimental validation of frequency response of series RLC electric circuit.
9. Simulation and Experimental validation of frequency response of parallel RLC electric circuit.

Total Periods: 60

Course Outcomes:

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

CO1: Demonstrate knowledge on realising circuits on breadboard and select appropriate electrical components, sources, and measuring instruments for the given circuit

CO2: Use simulation and experimental methods to verify the fundamental electrical laws for the given circuit

CO3: Use simulation and experimental methods to verify the various electrical theorems (Superposition, Thevenin, Norton, and Maximum power transfer theorems) for the given circuit.

CO4: Analyse the transient behaviour of the given RL/RC/RLC circuit using simulation and experimental methods

CO5: Analyse the frequency response of the given series and parallel RLC circuit using simulation and experimentation methods

CO6: Analyse the performance of the given three-phase circuit using simulation and experimental methods

Laboratory Requirements:

S. No.	Description of equipment	Required numbers (for a batch of 30 students)
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)	15 Nos
4.	Function Generators (MHz Range)	5 Nos
5	Oscilloscope (20MHz)	10 Nos
6	Digital Storage Oscilloscope (20MHz)	2 Nos
7	AC/DC - Voltmeter 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	Necessary quantities of resistors, Inductors, and Capacitors of various capacitance (Quarter Watt to 10 Watt)	

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	1	-	2	1	-	2	3	2	3
CO2	3	3	3	3	3	-	1	-	2	1	-	2	3	2	3
CO3	3	3	3	3	3	-	1	-	2	1	-	2	3	2	3
CO4	3	3	3	3	3	-	1	-	2	1	-	2	3	2	3
CO5	3	3	3	3	3	-	1	-	2	1	-	2	3	2	3
CO6	3	3	3	3	3	-	1	-	2	1	-	2	3	2	3
Avg.	3	3	3	3	3	-	1	-	2	1	-	2	3	2	3

CY24121	Engineering Chemistry Laboratory	BSC	L	T	P	C
			0	0	2	1

Course Objectives:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, TDS, and Chloride.
- To demonstrate the synthesis of nanoparticles.
- To familiarize the students with the determination of the molecular weight of a polymer by a viscometer.
- To familiarize the students with electroanalytical techniques such as pH metry, Potentiometry, and Conductometry to determine impurities in aqueous solutions.
- To understand the factors influencing corrosion.

LIST OF EXPERIMENTS:(Minimum of 7 experiments to be conducted)

1. Estimation of HCl using Na2CO3 as primary standard
2. Determination of alkalinity in water sample.
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Determination of strength of given hydrochloric acid using pH meter.
8. Conductometric titration of strong acid vs strong base.
9. Estimation of iron content of the given solution using potentiometer.
10. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
11. Estimation of sodium and potassium present in water using a flame photometer.
12. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
13. Determination of Glass transition temperature of a polymer.
14. Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol-Gel method.
15. Corrosion experiment-weight loss method.
16. Conductometric titration of barium chloride Vs Sodium Sulphate - Precipitation method.

Total Periods: 30

Course Outcomes:

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

- Analyse the quality of water samples with respect to their acidity, alkalinity, hardness and chloride.
- Comprehend the factors influencing corrosion in domestic and industrial applications.
- Demonstrate precipitation method for synthesis of nanoparticles
- Determine the molecular weight of the polymer.
- Estimate the amount of analyte by conductometry.
- Quantitatively analyse the impurities in solution by electroanalytical techniques.

References:

1. Engineering Chemistry Laboratory Manual – Department of SH-CHEMISTRY, LICET,2024.
2. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

Laboratory Requirements:

1.Conductivity meter – 15 Nos.
2. pH meter - 15 Nos.

3. Potentiometer - 15 Nos.
4.Viscometer - 35 Nos.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	2	2	-	-	-	-	2	-	-	-
CO2	3	2	1	-	-	2	2	-	-	-	-	2	-	-	-
CO3	2	1	2	-	-	2	2	-	-	-	-	-	-	-	-
CO4	2	1	2	-	-	1	1	-	-	-	-	1	-	-	-
CO5	3	1	2	-	1	2	2	-	-	-	-	2	-	-	-
CO6	3	1	2	-	1	2	2	-	-	-	-	2	-	-	-
Avg.	2.7	1.3	1.7	-	1	1.8	1.8	-	-	-	-	1.5	-	-	-

GE24121	Engineering Practices Laboratory - Civil and Mechanical	ESC	L	T	P	C
			0	0	2	1

Course Objectives:

- Familiarize students with basic tools and equipment used in engineering.
- Develop practical skills in Mechanical, Civil and 3D Printing practices.
- Encourage teamwork and collaboration in a lab environment.
- Foster an understanding of safety protocols and procedures.

INTRODUCTION AND SAFETY PRACTICES

Overview of lab rules, expectations, and safety protocols**,** Personal Protective Equipment (PPE), handling tools and equipment safely, emergency procedures.

MECHANICAL PRACTICES

Workshop Tools: Identification and usage of basic mechanical tools (hammers, wrenches, screwdrivers, etc.). **Basic Machining:** Introduction to lathe and drilling machines. Practicing Facing, Turning, and Drilling. **Sheet Metal Works:** Making a dustpan and funnel.

CIVIL PRACTICES

Plumbing: Exposure to different plumbing components. Exposure to plumbing repair methods and troubleshooting of existing connections. Practicing pipe connection to the wash basin from the water tank. **Carpentry:** A study on carpentry procedure. Making joints like the Tee joint and the Dovetail joint. Exposure and usage of power tools.

ADDITIVE MANUFACTURING PRACTICES

Welding: Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding, CO2, gas, and MIG welding techniques. **Foundry:** Introduction to the foundry process and tools. Mold preparation for solid and split patterns. **3D Printing:** Basics of 3D printing and simple projects.

ASSEMBLING AND FITTING

Introduction to Systems - Dismantling and Assembling of Mixer/IC Engines/Refrigerator and Air Conditioner

Total Periods: 30

Course Outcomes:

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

CO1: To perform basic machining operations
CO2: To perform operations on the given sheet metal
CO3: To understand the concepts of additive manufacturing methods like Welding, Moulding and 3D Printing
CO4: To understand the rudimentary concepts of refrigeration and air conditioning systems
CO5: To do basic household works like Plumbing, Carpentry Joints
CO6: To identify the components of Mixer/IC Engines/Refrigerator/AC.

Text Books:

1.Workshop Technology by W.A.J. Chapman
2.Electrical Engineering Fundamentals by Vincent Del Toro
3.Basic Civil Engineering by M.S. Palanichamy

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	2	-	-	-	2	-	-	-	2	-	-	-	-	-	-
CO4	2	-	-	-	1	-	-	-	2	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO6	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Avg.	1.6	-	-	-	1.5	-	-	-	2	-	-	-	-	-	-

FC24101 Life Skills HSMC L T P C

2 0 0 1

Course Objectives:

- To enhance self-awareness and understanding of personal strengths, weaknesses, and potential.
- To develop mechanisms to navigate through emotions and stress.
- To build effective interpersonal skills and maintain healthy social relationships.
- To foster and develop strategies for holistic well-being.
- To reflect on personal growth.

UNIT I KNOWING THYSELF 6

- Knowing Thyself
  - Strengths, Limitations, Characteristics, Habits and Experiences
- Sense of SELF
  - Self Awareness, Self Image, Self Esteem, Self Love, Self Respect
- Three Dimensions of SELF
  - 1) Ideal Self, 2) Social Self, and 3) Real Self
- Personality Types
  - 1) Introvert, 2) Extrovert, and 3) Ambivert

UNIT II EMOTIONAL COMPETENCE 6

- Understanding emotions
- Understanding the patterns of thoughts, feelings, and behaviors (Cognitive Behavior Theory)

- Handling stress, anxiety, and fear (flight mode) / anger (fright mode)
- Happy chemicals (4 chemicals - Dopamine, Oxytocin, etc)
- Positive Thinking

UNIT III **INTERPERSONAL SKILLS** **6**

- Interpersonal relationships
- Communicating Positive Expressions
  (Empathy, Trust, Forgiveness, Gratitude, Compassion)
- Personal and Social Associations - Family systems, Relationship management
- Building personal, social, and digital intelligence
- Sense of OTHERS
- Gender Equity

UNIT IV **DIMENSIONS OF WELL-BEING** **6**

- Intellectual Well-being
- Emotional Well-being
- Spiritual Well-being
- Physical Well-being
- Social Well-being

UNIT V **LIFE TO THE FULLEST** **6**

- Happiness v/s Having fun
- Self Retrospection and Positive Transformation
- Synthesis, Personal Reflection, and Way Forward

Total Periods: 30

Course Outcomes:

CO1: Identify their strengths and weaknesses and demonstrate self-awareness through reflective practices.
CO2: Demonstrate the ability to recognize emotions and handle stress.
CO3: Enhance interpersonal skills to build strong and positive relationships.
CO4: Adapt to a comprehensive understanding of well-being, and be able to implement strategies for maintaining mental health.
CO5: Develop a deeper understanding of personal and social relationships, and identify areas for growth.
CO6: Synthesize learning into a cohesive life plan for future growth.

Suggested Activities:

- Cognitive behaviour therapy
- PLOT
- SLOT
- SWOT
- Johari Window

References:

1. Bradberry, Travis, and Jean Greaves. Emotional Intelligence 2.0. TalentSmart,2009.
2. Republic of Philippines, Department of Education. K to 12 Senior High School Core Curriculum. - Personal Development , May 2016.
3. US Department of Education, Career Guidance and Counselling Programs. Rich South High School Horizon Program: (Rich Town Park Illinois: Rich South High School, 1998)

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	3	3	3	3	-	-	-	-	-
CO4	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	-	-	3	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
Avg.	-	-	-	-	-	-	2.2	3	0.6	1.2	-	1.2	-	-	-

MA24302	Statistics and Numerical Methods	BSC	L	T	P	C
			3	1	0	4

Course Objectives:

- To acquaint the students with the knowledge of testing hypotheses for small and large samples in real life problems
- To provide a foundation in the design and analysis of experiments using various statistical techniques
- To introduce the basic concepts of solving algebraic and transcendental equations, simultaneous equations and determine eigenvalues of a matrix using numerical techniques
- To introduce the numerical techniques of interpolation, differentiation and integration which plays an important role in engineering and technology disciplines
- To familiarise various numerical techniques of solving ordinary differential equations

UNIT I TESTING OF HYPOTHESIS 9+3

Introduction to relevant basics of probability - Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9+3

One way and two-way classifications - Completely randomized design – Randomized block design – Latin square design - factorial design (introduction only).

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

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

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

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

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

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

Total Periods: 60

Course Outcomes:

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

CO1: Apply the concept of testing of hypotheses for large and small samples in real life problems
CO2: Analyse the design of experiments using ANOVA techniques
CO3: Utilise numerical techniques in solving algebraic and transcendental equations, simultaneous equations and determine eigenvalues
CO4: Interpolate values and approximate derivatives for equal and unequal intervals of discrete data using numerical techniques
CO5: Evaluate single and double integrals using numerical techniques
CO6: Compute solutions to initial value problems for ordinary differential equations

Text Books:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., “Miller and Freund’s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

References:

1. Burden, R.L and Faires, J.D, "Numerical Analysis”, 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences”, Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis” Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., “Fundamentals of Mathematical Statistics”, Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum’s Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., “Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.
7. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
CO4	3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
CO6	3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
Avg.	3	3	-	2	-	-	-	-	-	-	-	-	-	2	-

EE24301	Analog Electronics	PCC	L	T	P	C
			3	0	0	3

Course Objectives:

- To be familiar with the structure of basic semiconductor devices.
- To be exposed to the operation of electronic devices and their circuits.
- To impart knowledge on the IC fabrication process.
- To analyze circuit characteristics with signal analysis using Op-amp IC's.
- To design and construct application circuits with IC's as Op-amp, 555, 566 etc.
- To study internal functional blocks and the applications of special IC's like Timers, PLL circuits, regulator circuits and DAC/ADCs.

UNIT I ELECTRONIC DEVICES WITH CHARACTERISTICS 9

PN junction diodes: structure, operation and VI characteristics, drift and diffusion current, transient capacitance - BJT: structure, operation and characteristics, biasing - Introduction to: JFET, MOSFET and UJT - Applications.

UNIT II AMPLIFIER CIRCUITS 9

BJT small signal model: Analysis of CE amplifier, Gain and Frequency response - Differential Amplifier - Two-stage amplifier: Common mode and Differential mode analysis - Introduction to: Feedback amplifiers, Power amplifiers - Types (Qualitative analysis). Operation and analysis of RC phase shift, Hartley and Crystal oscillators.

UNIT III IC FABRICATION AND CHARACTERISTICS OF OP AMP 9

Fundamental of Monolithic IC technology - Ideal OP AMP characteristics - DC characteristics - AC characteristics - Basic applications: Inverting - Non- inverting - Adder - Subtractor.

UNIT IV APPLICATION OF OP AMPS 9

Differentiator - Integrator - Instrumentation amplifiers - Comparators - Schmitt Trigger - D/A converters - Weighted resistance type and R-2R ladder type - A/D converters - Flash type - Dual slope type - Successive Approximation type.

UNIT V SPECIAL IC'S 9

555 Timer circuit: Functional block diagram - Characteristics & applications – Astable and Monostable multivibrator - 566 Voltage Controlled Oscillator circuits - PLL Phase Locked Loop applications - IC Voltage regulators –LM78XX, LM79XX.

Total Periods: 45

Course Outcomes:

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

CO1 Develop a thorough understanding of semiconductor structure and underlying physics.
CO2 Develop and implement circuits using electronic devices.
CO3 Understand Monolithic IC fabrication process and the characteristics of OP AMP.
CO4 Analyze, comprehend and design of analog electronic circuits involving OP-AMP.
CO5 Explain functional blocks, characteristics and applications of 555 Timer and Multivibrators.
CO6 Analyze, comprehend and design of analog electronic circuits involving PLL, voltage regulator & other special ICs.

Text Books:

1. David A bell, " Electronic circuits" , Oxford University Press, 2011.
2. Donald A Neamen, “Electronic Circuits”, McGraw Hill, edition,2007.
3. Roy Choudhary, Sheil B. Jani, ‘Linear Integrated Circuits’, , New Age, Fourth Edition, 2018.
4. Ramakant A.Gayakward, ‘Op-amps and Linear Integrated Circuits’, IV edition, Pearson Education, PHI 2021

References:

1. Millman and Halkias, " Integrated Electronics", McGraw Hill Publications, 2010.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Muhammad H. Rashid, " Linear Integrated Circuits", Cengage Learning, 2014.
4. David A. Bell, ‘Op-amp & Linear ICs’, Oxford, Third Edition, 2011.
5. Jacob Millman, Christos C.Halkias, ‘Integrated Electronics - Analog and Digital circuits system’, McGraw Hill, 2nd Edition, 2017.
6. Sergio Franco, ‘Design with Operational Amplifiers and Analog Integrated Circuits’, McGraw Hill, 2016 – Fourth Edition.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2
CO2	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2
CO3	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2
CO4	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2
CO5	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2
CO6	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2
Avg.	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2

EE24302 DC Machines and Transformers PCC L T P C

3 0 0 3

Course Objectives:

- To understand the concept of an electromechanical energy conversion system.
- To identify the appropriate machine for a given application based on its characteristics.
- To identify the appropriate test to determine the performance parameters of a given machine.
- To familiarize with the procedure for parallel operation of generators and transformers.
- To deliberate the working of autotransformers and three-phase transformers.

UNIT I ELECTROMECHANICAL ENERGY CONVERSION 9

Fundamentals of Magnetic circuits- Statically and dynamically induced EMF - Principle of electromechanical energy conversion forces and torque in magnetic field systems- energy balance in magnetic circuits- magnetic force- co-energy in singly excited and multi-excited magnetic field system

UNIT II TRANSFORMERS 9

Types of transformers and constructional details - EMF equation - Phasor representation on no load and on load - Equivalent circuit - losses, and efficiency – regulation - All day efficiency - OC and SC tests - Sumpner's test - separation of losses test-parallel operation with equal and unequal voltage ratios

UNIT III AUTO TRANSFORMERS AND THREE-PHASE TRANSFORMERS 9

Construction and working of the autotransformer, comparison with two winding transformers, applications of the autotransformer.- Three-Phase Transformer- Construction, types of connections and their comparative features.

UNIT IV DC GENERATORS 9

Principle of operation, constructional details, armature windings and their types, EMF equation, armature reaction, demagnetizing, and cross magnetizing Ampere turns, commutation, OCC and load characteristics of different types of DC Generators - applications of DC Generators.

UNIT V DC MOTORS 9

Principle of operation, the significance of back emf, torque equations, and power developed by the armature, speed control of DC motors, starting methods of DC motors, load characteristics of DC motors, losses and efficiency in DC machines, conditions for maximum efficiency. Testing of DC Machines: Brake test, Swinburne's test, Hopkinson's test- applications of DC motors.

Total Periods: 45

Course Outcomes:

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

CO1: Apply the laws governing the electromechanical energy conversion for singly and multiple excited systems.
CO2: Explain the construction and working principle of DC machines.
CO3: Interpret various characteristics of DC machines.
CO4: Compute various performance parameters of the machine by conducting suitable tests.
CO5: Draw the equivalent circuit of the transformer and predetermine the efficiency and regulation.
CO6: Describe the working principle of transformers, autotransformers, three phase transformers with different types of connections

Text Books:

1. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017.
2. P. S. Bimbhra, "Electric Machinery", Khanna Publishers, 2nd Edition, 2021.
3. J B Gupta, "Theory & Performance of Electrical Machines",S.K. Kataria &Sons,2013.

References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 6th Edition 2017.
2. A Textbook of Electrical Technology by B.L.Theraja & A.L.Theraja, Volume-2, Schand Publishing.
3. Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.
4. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
5.M. G. Say, "Performance and Design of AC Machines", CBS Publishers, 3rd Edition, 2002

Web References:

1. Lecture Series on Electrical Machines - I by Prof. Tapas Kumar Bhattacharya , Department of Electrical Engineering, Indian Institute of Technology, Kharagpur NPTEL: Electrical Engineering - NOC: Electrical Machines - I
2. Lecture Series on Electrical Machines by Professor G. Bhuvaneswari , Department of Electrical Engineering, Indian Institute of Technology, Delhi. NPTEL :: Electrical Engineering - NOC: Electrical Machines
3. Lecture Series on Electrical Machines-1 by Prof. Suman Maiti, Indian Institute of Technology, Kharagpur NPTEL: Electrical Engineering - Electrical Machines -I

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2
CO2	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2
CO3	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2
CO4	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2
CO5	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2
CO6	3	2	1	1	1	-	-	-	-	-	-	1	3	1	1
Avg.	3	2	1	1	1	-	-	-	-	-	-	1	3	1.8	1.8

EE24303	Electromagnetic Theory	PCC	L	T	P	C
			3	0	0	3

Course Objectives:

- Fundamental mathematical principles related to electromagnetic vector fields.
- Understanding electrostatics, including electrical potential, energy density, and their computations.
- Key concepts of magnetostatics, covering magnetic flux density, and their calculations.
- Application of Faraday's laws induced electromotive force (emf), Maxwell's equations, wave equations and their significance.

UNIT I VECTOR ANALYSIS 9

Vector fields – Various coordinate systems: Cartesian, Cylindrical, and Spherical – Gradient, Divergence, and Curl operations – Gauss's Divergence Theorem – Stokes' Theorem.

UNIT II ELECTROSTATICS – I 9

Sources and effects of electromagnetic fields – Coulomb's Law – Electric field intensity – Field generated by point and continuous charge distributions – Gauss's Law and its applications – Electric potential – Energy density.

UNIT III ELECTROSTATICS – II 9

Electric field behaviour in free space, conductors, and dielectrics – Dielectric polarization and strength – Electric field distribution in multiple dielectrics – Boundary conditions – Capacitance – Coaxial cable, Two parallel wires.

UNIT IV MAGNETOSTATICS 9

Magnetic field intensity – Biot-Savart Law – Ampere's Law and applications – Magnetic field due to straight conductors, circular loop, infinite sheet of current – Magnetic flux density (B) – Magnetization – Boundary conditions – Inductance – Solenoid, Coaxial cable, Two wire Transmission line – Energy density.

UNIT V ELECTRODYNAMIC FIELDS 9

Magnetic force – Lorentz Law of force – Torque – Faraday's laws, induced emf – Transformer and motional EMF – Maxwell's equations (differential and integral forms) – Displacement current – Derivation of generalized Wave Equations from Maxwell's equations.

Total Periods: 45

Course Outcomes:

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

- Utilize fundamental mathematical principles of electromagnetic vector fields for field calculations.
- Implement electrostatic concepts to determine electric field intensity, electrical potential, and energy density.
- Analyse electric fields in free space, conductors, and dielectrics, including multiple dielectrics, and apply fundamental capacitance principles.
- Apply magnetostatic concepts to compute magnetic flux density, and energy density.
- Explain various methods of electromagnetic force (emf) generation and the fundamentals of Maxwell's equations.
- Interpret and apply Maxwell's equations in differential and integral forms, wave equations to analyse electromagnetic fields.

Text Books:

1. Mathew N. O. Sadiku, "Elements of Electromagnetics", Oxford University Press Inc., Seventh Edition, 2018.
2. William H. Hayt, "Engineering Electromagnetics", McGraw Hill, Indian Edition, 2014.
3. Y. Mallikarjuna Reddy , " Electromagnetic Fields" ,Universities Press Private Limited, 2013.

References:

1. Joseph A. Edminister, "Theory and Problems of Electromagnetics", Second Edition, Schaum Series, McGraw Hill, 1993.
2. Kraus and Fleish, "Electromagnetics with Applications", McGraw Hill International Editions, Fifth Edition, 2010.
3. Ashutosh Pramanik, "Electromagnetism – Theory and Applications", Prentice-Hall of India Private Limited.,2008.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	2	3	2	2
CO2	3	3	2	2	-	-	2	-	-	-	-	2	3	2	2
CO3	3	3	2	2	-	-	2	-	-	-	-	2	3	2	2
CO4	3	3	2	2	-	-	2	-	-	-	-	2	3	2	2
CO5	3	3	2	2	-	-	2	-	-	-	-	2	3	2	2
CO6	3	3	2	2	-	-	2	-	-	-	-	2	3	2	2
Avg.	3	3	2	2	-	-	2	-	-	-	-	2	3	2	2

EE24311	Digital Logic Circuits	PCC	L	T	P	C
			3	0	2	4

Course Objectives:

- To study various number systems and to simplify the mathematical expressions using Boolean functions word problems.
- To introduce the fundamentals, design, and implementation of combinational logic circuits.
- To introduce the fundamentals, design, and implementation of synchronous sequential digital circuits.
- To introduce the fundamentals, design, and implementation of asynchronous sequential digital circuits.
- To introduce digital simulation techniques for the development of application-oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 9

Number system, error detection, corrections & code conversions, Boolean algebra: De-Morgan's theorem, representation of logic functions - SOP and POS form, switching functions. Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families - operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 9

Combinational logic - K-map representations - Minimization using K maps - implementation of combinational logic - code converters (gray to binary, Excess-3 to BCD and vice-versa), adders, subtractors, Encoders, Decoders, Multiplexers and Demultiplexers.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - Shift registers - counters - asynchronous and synchronous type - Modulo counters - design of synchronous sequential circuits – Moore and Mealy models- state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES 9

Asynchronous sequential logic Circuits- race conditions, hazards &errors in digital circuits; analysis of asynchronous sequential logic circuits- introduction to Programmability Logic Devices: PROM – PLA –PAL - CPLD - FPGA.

UNIT V VHDL 9

Introduction to VHDL - Structure of a VHDL program – Operators – Introduction to Packages – Subprograms – Test bench – combinational logic – Sequential circuit (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

Periods: 45

Lab Components:

1. Implementation of Boolean Functions, Full Adder and Full Subtractor circuits.
2. Implementation of multiplexers and demultiplexers.
3. Code converters: Binary to Gray code and vice versa
4. Counters: Design and implementation of mod10 counters as synchronous types using FF IC's.
5. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO

modes using suitability IC's.

6. Implementation of Combinational logic (Adders/subtractors) and sequential logic circuits (Registers/Counters) using VHDL Program/Matlab.

Periods: 30

Total Periods:75

Course Outcomes:

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

CO1: Explain various number systems, code conversions and characteristics of digital logic families
CO2: Apply K-maps to simplify Boolean expressions and implement combinational circuits.
CO3: Design various synchronous circuits using Flip Flops.
CO4: Design of asynchronous sequential circuits and programmable logic devices.
CO5: Explain VHDL for simulating and testing combinational and sequential circuits.
CO6**:** Simulation and testing of Combinational logic using Matlab/VHDL.

Text Books:

1. Morris Mano.M, 'Digital Logic and Computer Design', Prentice Hall of India, 3rdEdition, 2005.
2. Donald D.Givone, 'Digital Principles and Design', Tata McGraw Hill,1st Edition, 2003
3. Thomas L Floyd, 'Digital fundamentals', Pearson Education Limited, 11th Edition, 2018

References:

1. Tocci R.J., Neal S. Widmer, 'Digital Systems: Principles and Applications', Pearson Education Asia, 12th Edition, 2017.
2. Donald P Leach, Albert Paul Malvino, Goutam Sha, 'Digital Principles and Applications', Tata McGraw Hill, 7th Edition, 2010.

Laboratory Requirements:

S. No.	**Description of Equipment**	**Required numbers (for batch of 30 students)**
1	Digital IC Trainer Kit	10 Nos
2	Digital Multimeter	5 nos.
3	Matlab User License	30 Nos
4	Analog and Digital IC Tester	2 nos. each
5	Bread Board	Sufficient number
6	IC 7408 (AND gate)	Sufficient number
7	IC 7432 (OR gate)	Sufficient number
8	IC 7404 (NOT gate)	Sufficient number
9	IC 7400 (NAND gate)	Sufficient number
10	IC 7402 (NOR gate)	Sufficient number
11	IC 7486 (EX-OR gate)	Sufficient number
12	IC 74266 (EX-NOR gate)	Sufficient number
13	IC 7411 (AND gate - three input)	Sufficient number
14	IC7474 (D FF)	Sufficient number
15	IC 7476 (JK FF)	Sufficient number
16	IC7490 (Counter IC)	Sufficient number
17	Single strand wire	Sufficient number

MAPPING OF COs WITH POs AND PSOs

CO	POs												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	3	-	-	1	3	1	-	2	3	3	1
CO2	3	3	2	1	3	-	-	1	3	1	-	2	3	3	1
CO3	3	3	2	1	3	-	-	1	3	1	-	2	3	3	1
CO4	3	3	2	1	3	-	-	1	3	1	-	2	3	3	1
CO5	3	3	2	1	3	-	-	1	3	1	-	2	3	3	1
CO6	3	3	2	1	3	-	-	1	3	1	-	2	3	3	1
Avg	3	3	2	1	3	-	-	1	3	1	-	2	3	3	1

EE24312 Object Oriented Programming Using C++ PCC L T P C

2 0 2 3

Course Objectives:

- To use C++ programming elements like data types, loops, and functions in simple programs.
- To work with classes and objects to create programs that solve basic problems.
- To create programs that use inheritance between classes.
- To use virtual functions and abstract classes in programs.
- To handle file input/output operations and use Standard Template Library components in programs.
- To understand exception handling

UNIT I INTRODUCTION TO C++ 7

OOPS concepts - Procedural Vs Object oriented programming – objects - classes – methods and messages - abstraction and encapsulation – Inheritance - Polymorphism.
Introduction to C++: Data types - Declaration of variables – Expressions – Operators - Type conversions – Control flow – Conditional and looping statements

UNIT II CLASSES AND DATA ABSTRACTION 6

Functions: Declaration, Definition, Parameter Passing, Default Arguments, Inline Functions, Recursion – Function Overloading - Pointers and Arrays - Classes – Members and Member Functions - Access Specifiers - Objects - Constructors and Destructors - this pointer - Static Members, Constant Members

UNIT III INHERITANCE AND POLYMORPHISM 6

Class hierarchy – Inheritance - Types of Inheritance - Access to the base class members, Base and Derived class construction, Destructors, Polymorphism - Static binding: Operator overloading - Dynamic binding: Virtual base class - Virtual functions, Overriding – Pure virtual functions, Abstract classes – Interfaces

UNIT IV FILE HANDLING AND GENERIC PROGRAMMING 6

File handling – Sequential and Random access – Generic Programming - Function Templates and Class Templates

UNIT V EXCEPTIONS 5

Benefits of exception handling, Throwing an exception, Try and catch - Exception objects - Exception specifications - Rethrowing an exception – user defined exceptions

Periods:30

LIST OF EXPERIMENTS

1) Write basic C++ programs
2) Write programs for linear search and binary search
3) Write a program to demonstrate functions: call by value and reference
4) Write a program to demonstrate recursion
5) Write a program to demonstrate class encapsulation using a Student class with private data (name, rollNo).
6) Write a program to demonstrate constructors and destructors by simulating a Bank Account.
7) Write a program to demonstrate static members by tracking object count in a Counter class.
8) Write a program to demonstrate single inheritance using a Vehicle → Car hierarchy.
9) Write a program to demonstrate virtual base class to resolve the diamond problem (Person → Student/Employee → TeachingAssistant).
10) Write a program to demonstrate runtime polymorphism using Shape → Circle/Rectangle with virtual area().
11) Write a program to demonstrate abstract classes using Shape with pure virtual printArea() and derived Rectangle/Circle.
12) Write a program to demonstrate interfaces.
13) Write a program to demonstrate file handing by reading/writing student records to a text file.
14) Write a program to demonstrate templates.
15) Write a program to demonstrate exception handling for division-by-zero and file-not-found errors.

Periods:30

Total Periods:60

Course Outcomes:

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

CO1: Implement C++ programs using fundamental concepts
CO2: Apply the concepts of classes and objects to solve simple problems
CO3: Develop applications using concept of inheritance
CO4: Apply polymorphism through virtual functions and abstract classes
CO5: Build applications with I/O and File handling
CO6: Apply STL for data manipulations
CO7: Handle Exceptions in programming

Suggested Activities:

1. Mini Project

Text Books:

1. Ira Pohl, “Object-Oriented Programming Using C++”, Pearson Education Asia, 2003.
2. B. Trivedi, Programming with ANSI C++, Oxford University Press. 2007.

References:

1. Bjarne Stroustrup, “The C++ Programming Language”, Pearson Education, 2004.
2. H.M.Deitel, P.J.Deitel, “Java : how to program”, Fifth edition, Prentice Hall of India private limited, 2003.

Laboratory Requirements:

S. No	Name of the Equipment/Software	Required
1	INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2	Windows 10 or higher operating system / Linux Ubuntu 20 or higher	30
3	Dev C++ / Eclipse CDT / Code Blocks / CodeLite / equivalent open source IDE	30

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	-	2	-	-	-	-	-	-	1	-	2	-
CO2	3	2	3	-	2	-	-	-	-	-	-	1	-	2	-
CO3	3	3	3	-	2	-	-	-	-	-	-	1	-	2	-
CO4	3	3	3	-	2	-	-	-	-	-	-	1	-	2	-
CO5	3	2	3	-	2	-	-	-	-	-	-	1	-	2	-
CO6	2	3	3	-	2	-	-	-	-	-	-	1	-	2	-
CO7	2	2	3	-	2	-	-	-	-	-	-	1	-	2	-
Avg.	3	3	2	2	2	-	-	-	-	-	-	1	-	2	-

EE24321 Analog Electronics Laboratory PCC L T P C

0 0 3 1.5

Course Objectives:

- To be exposed to the operation and application of electronic devices and their circuits.
- To analyze circuit characteristics with signal analysis using Op-amp IC's.
- To learn design, testing and characterizing of circuit behaviour with analog IC's like 555 timer.
- To study internal functional blocks and the applications of special IC's like Timers.

List of Experiments:

I. **Experiments on Basic Electronic Devices**

1. Characteristics of Semiconductor diode and Zener diode.
2. Common Emitter input-output characteristics.
3. Transistor-based RC phase shift oscillator.
4. Transistor-based Hartley oscillator.
5. Differential amplifiers using FET.

II. **Experiments using Linear Integrated Circuits (ICs)**

1. Op-Amp based amplifier circuits Inverting amplifier and Non-Inverting amplifier.
2. Design of Adder-Subtractor circuits using Op-Amp.
3. Application of Op-Amp: Differentiator.
4. Op-Amp-based Analog Integrator.
5. IC 555 – timer based Astable and Monostable Multi-Vibrator.

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to
CO1 Ability to understand the structure and underlying semiconductor physics concepts.
CO2 Ability to design circuits employing electronic devices.
CO3 Ability to acquire knowledge on the IC fabrication process.
CO4 Ability to acquire knowledge on Application of Op-Amp.
CO5 Analyze, comprehend and design of analog electronic circuits involving OP-AMP.
CO6 Analyze, comprehend and design of analog electronic circuits involving timer 555.

Lab Requirements:

S.No	Description of Equipment	Required numbers
1	Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor	10
2	Resistors, Capacitors and inductors	10
3	Necessary digital IC	10
4	Function Generators	10
5	Regulated 3 output Power Supply 5, ± 15V	10
6	CRO	10
7	Storage Oscilloscope	1
8	Bread boards	10
9	Regulated Power supply +12/-12V,5V	15 nos.
10	Cathode Ray Oscilloscope (CRO) 50 Mhz	10 nos.
11	Digital Multimeter	10 nos.
12	Function Generator	5 nos.
13	Analog and Digital IC Tester	2 nos. each
14	Bread Board	Sufficient number
15	IC 741/ICNE555	Sufficient number
16	Digital IC Types	Sufficient number
17	LED	Sufficient number
18	Transistor	Sufficient number
19	Diodes, IN4001	Sufficient number
20	Zener diodes	Sufficient number
21	Potentiometer	Sufficient number
22	Step-down Transformer 230V/12-0-12V	Sufficient number
23	Capacitor	Sufficient number
24	Resistors ¼ Watt Assorted	Sufficient number
25	Single strand wire	Sufficient number

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	-	-	-	-	3	2	2	2	2
CO2	3	3	3	3	3	3	-	-	-	-	3	2	2	2	2
CO3	3	3	3	3	3	3	-	-	-	-	3	2	2	2	2
CO4	3	3	3	3	3	3	-	-	-	-	3	2	2	2	2
CO5	3	3	3	3	3	3	-	-	-	-	3	2	2	2	2
CO6	3	3	3	3	3	3	-	-	-	-	3	2	2	2	2
Avg.	3	3	3	3	3	3	-	-	-	-	3	2	2	2	2

EE24322	DC Machines and Transformers Laboratory	PCC	L	T	P	C
			0	0	3	1.5

Course Objectives:

- To familiarize students with the determination of characteristics of DC machines and transformers through hands-on experimentation.
- To provide practical experience in evaluating the performance parameters of DC machines and transformers by conducting appropriate tests.
- To develop students' proficiency in utilizing simulation tools for analyzing and interpreting the behavior of DC machines and transformers.

List of Experiments:

1. Open circuit and load characteristics of DC shunt generator- calculation of critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt and series motor.
4. Swinburne’s test on DC Shunt motor
5. Speed control of the DC shunt motor.
6. Hopkinson’s test on DC motor–generator set.
7. Load test on single-phase transformer.
8. Open circuit and short circuit tests on the single-phase transformer.
9. Analysis of Load Characteristics and Performance Variations in a DC Machine using MATLAB Simulation
10. Load test of three-phase transformers using MATLAB

Total Periods: 45

Course Outcomes:

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

CO1: Demonstrate the ability to evaluate the characteristics and performance of DC shunt and compound generators under varying conditions.
CO2: Gain hands-on experience in testing and analyzing the performance of DC shunt and series motors.
CO3: Perform and interpret open circuit, short circuit, and load tests on single-phase transformers to assess efficiency and regulation.
CO4: Conduct Swinburne’s and Hopkinson’s tests to evaluate DC machine efficiency and master various speed control techniques.
CO5: Utilize MATLAB simulations for load characteristics of DC machines, analyzing performance deviations under varying operating conditions..
CO6: Interpret machine behavior using both hands-on experiments and simulations.

Laboratory Requirements :

Sl.No.	Description of Equipment	Required numbers (for batch of 30 students)
1	DC Shunt Motor with Loading Arrangement	3
2	DC Shunt Motor Coupled With Three phase Alternator	1
3	Single Phase Transformer	4
4	DC Series Motor with Loading Arrangement	1
5	DC Compound motor with loading arrangement	1
6	DC Shunt Motor Coupled With DC Compound Generator	2
7	DC Shunt Motor Coupled With DC Shunt Generator	1
8	Tachometer -Digital/Analog	8
9	Single Phase Auto Transformer	2
10	Three Phase Auto Transformer	1
11	Single Phase Resistive Loading Bank	2
12	Three Phase Resistive Loading Bank	2
13	Rheostats	As per the requirement for the machines

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
CO2	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
CO3	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
CO4	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
CO5	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
CO6	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
Avg.	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2

HS24321 Communication Skills Building Laboratory HSMC L T P C

0 0 2 1

Course Objectives:

- Develop the ability to construct grammatically correct and contextually appropriate sentences
- Enhance critical thinking skills for analyzing and interpreting texts, media, and experiences
- Strengthen comprehension, summarization, and documentation skills for professional contexts
- Improve verbal and non-verbal communication for effective interaction in diverse professional settings
- Equip learners with teamwork, networking, and interview skills essential for career advancement
- Enable the creation of a professional digital identity through resumes, LinkedIn profiles, and self-presentation techniques

UNIT I THE ART OF DISCOURSE 6

Listening: Listen to stand-up comedy, political commentaries, and campaigns for appreciative listening.
Reading: Read and evaluate business and economic news articles; determine tone (neutral, positive, negative) and fact-check.
Writing: Craft commentary and opinion pieces to persuade or provoke discussion.
Speaking: Explain satire comic strips (e.g., Amul advertisements, political cartoons)

UNIT II PROFESSIONAL COMMUNICATION ESSENTIALS 6

Listening: Listen to voicemail, messages, and fill out forms.
Reading: Compare products & services; analyze advertisements.
Writing: Draft meeting agendas and minutes.
Speaking: Engage in open-field group discussions.

UNIT III DOCUMENTATION AND SUMMATION 6

Listening: Listen to documentaries, book summaries, and movie summaries for comprehensive understanding.
Reading: Read and analyze reports on significant events (e.g., environmental disasters, economic downturns).
Writing: Write survey reports and paraphrase key information.
Speaking: Report news, weather forecasts, and predictions.

UNIT IV REFINING PROFESSIONAL COMPETENCE 6

Listening: Translate informal language into formal business communication (Contextual translation)
Reading: Read and interpret technical texts and industry-specific jargon.
Writing: Write cover letters and statements of purpose.
Speaking: Role-play professional etiquette in workplace scenarios (e.g., expressing empathy, kindness, courtesy).

UNIT V DEVELOPING A PROFESSIONAL PROFILE 6

Listening: Listen to podcasts, Josh Talks, and professional interviews.
Reading: Analyze professional resumes and LinkedIn profiles.
Writing: Set up a LinkedIn profile and write engaging posts.
Speaking: Conduct mock interviews and deliver an effective elevator pitch.

Total Periods: 30

Course Outcomes:

On completion of the course, the students will be able to
C01: Construct coherent and professional sentences tailored to various workplace scenarios
C02: Analyze and critically interpret professional texts and multimedia content
C03: Document, summarize, and report information effectively across multiple formats
C04: Communicate effectively in professional and social interactions
C05: Demonstrate teamwork, networking, and interview skills relevant to career development
C06: Curate a professional online presence through resume development - LinkedIn, Indeed,

Suggested Activities:

1. Documentation and Summation

Assignment: Newsroom Simulation (20 Marks)

- Students record a 2-minute news report on an environmental/economic issue.
- Must include paraphrased content from real news reports (cite sources).

- Submission: Video + written news script.

2. Group Discussion (30 Marks)
3. Refining Professional Competence

Assignment: Corporate Dilemma Roleplay (20 Marks)

- Scenario-based role play on professional etiquette (handling client complaints, rejecting proposals kindly, etc.).
- Each student submits a formal email responding to the scenario professionally.

4. Developing a Professional Profile

Assignment: LinkedIn Challenge (30 Marks)

- Students create or optimize their LinkedIn profile and write a compelling post (e.g., career reflections, lessons from a recent project).
- Submit a screenshot of updated profile + link to post.

Optional: Engage with at least three classmates' posts with meaningful comments.

Text Books:

1. English for Engineers and Technologists. Volume I by Orient Blackswan, 2022
2. English for Science & Technology - I by Cambridge University Press, 2023

References:

1. Seely, John. Oxford Guide to Effective Writing and Speaking: How to Communicate Clearly. Oxford University Press, 2013.
2. Cottrell, Stella. Critical Thinking Skills: Developing Effective Analysis and Argument. Bloomsbury Academic, 2017.
3. Bhatnagar, Nitin. Communicative English for Professional Courses. Pearson, 2010.
4. Guffey, Mary Ellen, and Dana Loewy. Essentials of Business Communication. Cengage Learning, 2021.
5. Collins, Patrick. Speak with Power and Confidence: Tested Ideas for Becoming a More Powerful Communicator. Prentice Hall, 2009.
6. Locker, Kitty O., and Stephen Kyo Kaczmarek. Business Communication: Building Critical Skills. McGraw-Hill, 2020.

MAPPING OF COs WITH POs AND PSOs

Cos	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-		-	1	-	1	1	1	1	-	_	_	_
CO2	-	1	-	1	-	-	-	-	1	1	-	1	_	_	_
CO3	-	-	-		-	-	-	-	-	1	-	1	_	_	_
CO4	-	-	-		-	-	-	1	1	1	-	-	_	_	_
CO5	-	-	-		-	-	-	-	1	1	-	1	_	_	_
CO6	-	-	-		-	-	-	-	-	-	-	1	_	_	_
Avg.	-	1	-	1	-	1	-	1	1	1	1	1	-	-	-

FC24301	Soft Skills	HSMC	L	T	P	C
			2	0	0	1

Course Objectives:

- Understand and apply proper etiquette in social, corporate, and online interactions
- Develop effective verbal and nonverbal communication skills, including body language and posture
- Enhance participation in group discussions and structured professional conversations
- Prepare for job interviews with appropriate etiquette, research, and response techniques
- Communicate professionally in written formats such as emails, inquiries, and job offer letters
- Deliver structured and engaging presentations using storytelling and persuasive techniques

UNIT I ETIQUETTE 6

Definition

- Social
- Corporate/Business - Meeting
- Telephone
- Netiquette

UNIT II BODY LANGUAGE AND NONVERBAL COMMUNICATION 6

- Posture
- Personal grooming
- Facial expression/ gesture/eye contact

UNIT III GROUP DISCUSSION 6

- Etiquette - Rules of conduct
- GD flow
- Pestel - Political, economic, social, tech, legal, environmental
- Handling unpredictable situation

UNIT IV JOB INTERVIEW – ETIQUETTE 6

- Pre-interview prep and research
- Responding to non-technical questions (star model - situation/task/ action plan/ result)
- Speaking your resume
- Writing inquiries and responding to job offer letters

UNIT V PRESENTATION SKILLS 6

- Setting the tone/ storytelling
- JAM/ Turn your Court

Total Periods:30

Course Outcomes:

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

1. Demonstrate professionalism in meetings, telephone calls, and digital communication
2. Use appropriate body language, facial expressions, and gestures to enhance communication
3. Participate effectively in group discussions, debates, and structured dialogues
4. Apply job interview strategies, including answering behavioural questions using the STAR model
5. Write clear and professional business correspondence, including inquiries and job offers
6. Present ideas confidently with a structured approach, engaging tone, and strong delivery

Suggested Activities:

1. **Role-Playing Business Meetings** – Students are assigned different corporate roles (CEO, Manager, Employee) and have them conduct a mock meeting with proper etiquette.
2. Group Discussion
3. **PESTEL Case Study** – Students analyze a real-world company using PESTEL factors and present their findings.
4. **Resume Pitching** – Students present their resumes as a story, explaining their achievements in an engaging way.
5. **Turn the Court Debate Organizer** – Students list arguments for and against a topic to prepare for persuasive speaking.

Work Sheets:

1. Business Meeting Etiquette Checklist – A checklist where students identify correct/incorrect meeting behaviors.
2. PESTEL Case Study Template – A table where students analyze a company using Political, Economic, Social, Technological, Environmental, and Legal factors.
3. STAR Method Interview Worksheet – Students write answers to common behavioral questions using the situation, Task, Action, Result format.

References:

1. Pachter, Barbara. The Essentials of Business Etiquette: How to Greet, Eat, and Tweet Your Way to Success. McGraw-Hill, 2013.
2. Pease, Allan, and Barbara Pease. The Definitive Book of Body Language. Bantam, 2004.
3. Gage, Martha. The Power of STAR Method: How to Succeed at Behavioral Job Interviews. Independently published, 2019.

MAPPING OF COs WITH POs AND PSOs

Cos	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
Avg.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BS24301	Environmental Science and Sustainability	BSC	L	T	P	C
			3	0	0	3

Course Objectives:

- To introduce the basic concepts of environment, ecosystems.
- To emphasize on the biodiversity of India and its conservation.
- To familiarise with the causes and effects of different types of pollution in the environment.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability**.**
- To impart knowledge about waste management and their recovery methods.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles.

UNIT I ENVIRONMENT AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness. Ecosystem and Energy flow – food chain, food web, ecological pyramids-ecological succession. Types of biodiversity: genetic, species and ecosystem diversity – values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION 9

Causes, Effects and Preventive measures of Air, Water, Soil, Thermal and Noise Pollutions. Nuclear hazards and human health risks-case study. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection-Air act, Water act, Environmental protection act. Role of an individual in prevention of pollution.

UNIT III SUSTAINABILITY AND MANAGEMENT 9

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals - intervention areas- Climate change-global warming, acid rain, Ozone layer depletion- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT IV WASTE MANAGEMENT AND RESOURCE RECOVERY 9

Biodegradable, non-biodegradable wastes, Solid, Hazardous and E-Waste management.
Bio-medical waste management, Concept of waste to energy processes (WTE) - Combustion, Pyrolysis, Landfill gas (LFG) recovery. Recycling of spent batteries, end-of- life vehicle (ELV) recycling-Waste engine oil recycling-Solvent recovery, Barriers for material recycling-social, legal and economic factors-Environment impact of waste recycling.

UNIT V SUSTAINABILITY PRACTICES 9

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources-Ocean energy sources, Geothermal energy, Energy Cycles- carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio- economical and technological change.

Total Periods:45

Course Outcomes:

On completion of the course, the students will be able to
CO1 To understand the functions of the environment, ecosystems.
CO2 To analyse the threats of biodiversity and their conservation.
CO3 To explain the types of environmental pollution and environment protection acts.
CO4 To recognize the different goals of sustainable development and environmental standards.
CO5 To correlate the different types of waste management and possible resource recovery methods.
CO6 To explain the sustainability practices pertaining to sustainable energy, sustainable habitat and sustainable urbanization.

Suggested Activities:
- Quiz
- Mind Mapping
- Group discussion
- Seminar
- Animated videos

Text Books:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998

References:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice Hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha "Text book of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	1
CO2	2	1	-	-	-	2	3	-	-	-	-	2	-	-	1
CO3	3	2	-	-	-	3	3	-	1	-	-	2	-	-	1
CO4	3	2	1	-	-	2	2	-	1	-	-	2	-	-	1
CO5	3	2	1	-	-	2	2	-	-	-	-	2	-	-	1
CO6	3	2	1	-	-	2	2	-	1	-	-	2	-	-	1
Avg.	2.7	1.6	1	-	-	2.2	2.5	-	1	-	-	2	-	-	1

EE24401 Measurements and Instrumentation

PCC	L	T	P	C
	3	0	0	3

Course Objectives:

- To educate the fundamental concepts and characteristics of measurement and errors
- To impart the knowledge on the functional aspects of measuring instruments
- To infer the importance of various bridge circuits used with measuring instruments.
- To educate the fundamental working of sensors and transducers and their applications
- To summarize the overall measurement and instrumentation with the knowledge on digital instrumentation principles.

UNIT I CONCEPTS OF MEASUREMENTS 9

Instruments: classification, applications – Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement -Statistical evaluation of measurement data.

UNIT II MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS 9

Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type watt meters – Energy meter – Megger – Instrument transformers (CT & PT).

UNIT III AC/DC BRIDGES AND INSTRUMENTATION AMPLIFIERS 9

Wheatstone bridge, Kelvin double bridge - Maxwell, Hay, Wien and Schering bridges – Errors and compensation in A.C. bridges - Instrumentation Amplifiers

UNIT IV TRANSDUCERS FOR MEASUREMENT OF NON- ELECTRICAL PARAMETERS 9

Classification of transducers – Measurement of pressure, temperature, displacement, flow, angular velocity – Digital transducers – Characteristics of Sensors - Infrared and ultrasonic sensors.

UNIT V DIGITAL INSTRUMENTATION 9

A/D converters: types and characteristics – Sampling, Errors- Measurement of voltage, Current, frequency and phase - D/A converters: types and characteristics- DSO- Data Loggers – Basics of PLC programming and Introduction to Virtual Instrumentation - Instrument standards.

Total Periods:45

Course Outcomes:

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

CO1: Ability to understand the structural elements of various measuring instruments
CO2: Ability to understand the measurement of parameters in Electrical System
CO3: Ability to understand the importance of bridge circuits.
CO4: Ability to understand various transducers and their characteristics by experiments.
CO5: Ability to understand the concept of digital instrumentation and virtual instrumentation by experiments.
CO6: Ability to understand the basics of PLC programming.

Text Books:

1. A.K. Sawhney, Puneet Sawhney ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, New Delhi, Edition 2011.
2. H.S. Kalsi, ‘Electronic Instrumentation’, Tata McGraw-Hill, New Delhi, 2010

References:

1. M.M.S. Anand, ‘Electronics Instruments and Instrumentation Technology’, Prentice Hall India, New Delhi, 2009
2. J.J. Carr, ‘Elements of Electronic Instrumentation and Measurement’, Pearson Education India, New Delhi, 2011
3. W.Bolton, Programmable Logic Controllers, 6th Edition, Elseiver, 2015.
4. R.B. Northrop, ‘Introduction to Instrumentation and Measurements’, Taylor & Francis, New Delhi, 3 rd Edition 2014.
5. E. O. Doebelin and D. N. Manik, “Measurement Systems – Application and Design”, Tata McGraw-Hill, New Delhi, 6th Edition 2017.

6. R. K. Rajput, “Electrical and Electronics Measurements and Instrumentation”, Chand Pub, 2016.
7. G.N. Srinivas and S. Narasimha "Electrical and Electronic Measurements and Instrumentation" by G.N. Srinivas and S. Narasimha, B.S Publication, Hyderabad, 2018

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	-	-	-	-	-	-	3	2	2	1
CO2	3	3	1	1	1	-	-	-	-	-	-	3	2	2	1
CO3	3	2	3	-	3	2	-	-	-	-	-	3	2	2	1
CO4	3	2	3	-	-	-	-	2	-	-	-	-	2	2	1
CO5	3	2	3	2	3	-	-	-	-	3	-	3	2	2	1
CO6	3	3	1	2	3	-	-	-	-	-	-	3	2	2	1
Avg.	3	3	1	1.5	2	-	-	-	-	-	-	3	2	2	1

EE24402 Synchronous and Induction Machines PCC L T P C

3 0 0 3

Course Objectives:

- To provide a comprehensive understanding of the construction, operation, performance, and control of synchronous machines, three-phase and single-phase induction motors, and special electrical machines.
- To analyze their characteristics, conduct tests to determine parameters, explore starting and speed control techniques, and understand the operation of special machines.

UNIT I SYNCHRONOUS GENERATOR 9

Constructional details – Types of rotors –winding factors- EMF equation – Synchronous reactance – Armature reaction – Phasor diagrams of synchronous generator - Synchronizing and parallel operation – Voltage regulation – EMF, MMF, ZPF method – steady state power- angle characteristics– Two reaction theory –slip test - Capability Curves.

UNIT II SYNCHRONOUS MOTOR 9

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods –Effect of change in excitation and load on motor --Hunting – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 9

Constructional details – Types of rotors –- Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors – Induction generators.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star delta starters – 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.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL ELECTRIC MOTORS **9**

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor – Construction and Working Principle of PMSM, BLDC and Stepper motors– Introduction to magnetic levitation systems-Linear induction motor.

Total Periods:45

Course Outcomes:

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

CO1: Analyze the construction, performance, and voltage regulation of synchronous generators through tests and theoretical methods like EMF, MMF, and ZPF.
CO2: Examine the operation and characteristics of synchronous motors, including V and inverted V curves, torque equations, and starting methods.
CO3: Understand the working principles, torque-slip characteristics, and efficiency of three-phase induction motors through practical tests and loss analysis.
CO4: Demonstrate the ability to start and control the speed of three-phase induction motors using various methods, including V/f control and slip power recovery schemes.
CO5: Conduct tests on single-phase induction motors to analyze their starting methods, performance characteristics, and equivalent circuits.
CO6: Explore the construction, operation, and applications of special machines.

Text Books:

1. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers,3rd Edition, Reprint 2015.
2. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 6th Education 2017.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th edition, McGraw Hill Education Pvt. Ltd, 4th Edition 2017.
4. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 5th Edition 2017
5. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, edition 2, 2021.

References:

1. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
2. M.N. Bandyo padhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2011.
3. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, First edition 2010.
4. Alexander S. Langsdorf, 'Theory of Alternating-Current Machinery', McGraw Hill Publications, 2001.
5. https://archive.nptel.ac.in/courses/108/105/108105131/

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	1	2	-	-	2	3	1	1
CO2	3	3	2	2	-	-	-	1	2	-	-	2	3	1	1
CO3	3	3	2	2	-	-	-	1	2	-	-	2	3	1	1
CO4	3	3	2	2	-	-	-	1	2	-	-	2	3	1	1
CO5	3	3	2	2	-	-	-	1	2	-	-	2	3	1	1
CO6	3	3	2	2	-	-	-	1	2	-	-	2	3	1	1
Avg.	3	3	2	2	-	-	-	1	2	-	-	2	3	1	1

EE24411	CONTROL SYSTEMS DESIGN	PCC	L	T	P	C
			3	0	2	4

Course Objectives:

- To understand the fundamentals of Control Systems.
- To develop Mathematical Models of Dynamic Systems.
- To analyze System performance in the Time Domain.
- To analyze System behavior in the Frequency Domain.
- To explore State-Space Analysis Techniques.
- Design and implement feedback Control Systems.

UNIT I MODELING OF LINEAR TIME INVARIANT (LTIV) SYSTEMS 9

Open loop and Closed loop systems – Feedback control system characteristics – First principle modeling: Mechanical, Electrical and Electromechanical systems – Transfer function representations: Block diagram and Signal flow graph.

UNIT II TIME DOMAIN ANALYSIS 9

Standard test inputs – Time responses for First order and Second order systems – Time domain specifications –Time domain parameters for second order systems - Stability analysis: Concept of stability – Routh Hurwitz stability criterion – Root locus: Construction and Interpretation.

UNIT III FREQUENCY DOMAIN ANALYSIS 9

Frequency domain specifications - Bode plot and Polar plot - Introduction to closed loop Frequency Response.

UNIT IV DESIGN OF FEEDBACK CONTROL SYSTEM 9

Design specifications - Lead, Lag and Lag-lead compensators using Bode plot – Design of P, PI, PD and PID controllers.

UNIT V STATE VARIABLE ANALYSIS 9

State variable formulation – State transition matrix – Eigen values – Eigen vectors – Controllability – Observability.

Periods:45

LIST OF EXPERIMENTS

1. Mathematical modelling and analysis of Mechanical and Electrical systems using transfer function approach.
2. Time domain analysis of second order system.
3. Study of stability using Routh Hurwitz criterion.
4. Root locus technique-based stability analysis.
5. Frequency response and stability analysis using Bode plot.
6. Frequency response and stability analysis using Polar plot.
7. Mathematical modelling and analysis of Mechanical and Electrical systems using state space approach.
8. Test of controllability and observability of a state space model.

9. Digital Simulation of First and Second Order Systems.
10. Design of PID controllers and evaluation of closed loop performance.

Periods:30

Total Periods:75

Course Outcomes:

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

CO1: Represent simple systems in transfer function and state variable forms.
CO2: Analyze and evaluate the performance of systems in time domain
CO3: Infer the stability of systems in time and frequency domain.
CO4: Analyze and evaluate the performance of systems in frequency domain.
CO5: Analyze the simple systems using state space approach
CO6: Design and evaluate the performance of closed loop systems with compensators

Text Books:

1. Nagrath.I.J & Gopal.M, "Control Systems Engineering", New Age International Pvt. Ltd., 7th Edition, 2021.
2. Katsuhiko Ogata, "Modern Control Engineering", Pearson, 5th Edition, 2015.

References:

1. Benjamin C. Kuo and Farid Golnaraghi, "Automatic Control Systems", McGraw Hill, 10th Edition, 2017.
2. Richard C.Dorf and Bishop, R.H., "Modern Control Systems", Education Pearson, 13th Edition, 2017.
3. S.K.Bhattacharya, "Control System Engineering", Pearson, 3rd Edition, 2013.
4. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor & Francis, 6th, 2013.
5. NPTEL Video Lecture Notes on "Control Engineering" by Prof.S.D.Agashe, IIT Bombay

Laboratory Requirements:

Sl. No.	Description of Equipment	Required numbers
1	Desktop (Intel i5 or equivalent, 8GB RAM, 256GB SSD)	30 Nos.
2	MatLab Latest Version with Control System Tool Box	30 User

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	-	2	3	-	-	2	2	2	3
CO2	3	3	2	2	3	-	-	2	3	-	-	2	2	2	3
CO3	3	3	2	2	3	-	-	2	3	-	-	2	2	2	3
CO4	3	3	2	2	3	-	-	2	3	-	-	2	2	2	3
CO5	3	3	2	2	3	-	-	2	3	-	-	2	2	2	3
CO6	3	3	2	2	3	-	-	2	3	-	-	2	2	2	3
Avg.	3	3	2	2	3	-	-	2	3	-	-	2	2	2	3

EE24412	Transmission and Distribution	PCC	L	T	P	C
			3	0	2	4

Course Objectives:

- To impart the knowledge about the configuration of electric power systems and transmission line parameters
- To study the modelling and performance of transmission lines
- To learn about the different insulators and underground cables
- To understand the substations and mechanical design of transmission lines.
- To analyse the different distribution systems.

UNIT I TRANSMISSION LINE PARAMETERS 9

Structure of electric power system: generation, transmission and distribution - Parameters of single and three phase transmission lines with single and double circuits - Resistance, inductance and capacitance of solid, stranded and bundled conductors, conductor types - symmetrical and unsymmetrical spacing and transposition-application of self and mutual GMD; skin and proximity effects - Effects of earth on capacitance of transmission line - corona discharge, factors affecting corona-advantages and disadvantages.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Classification of lines–short line, medium line and long line-Evaluation of A, B, C, D constants-equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance and surge impedance loading; transmission efficiency and voltage regulation, real and reactive power flow in lines, Power-circle diagrams (with receiving end voltage as reference), methods of voltage control; Ferranti effect, Charging current and losses in an open circuited line.

UNIT III INSULATORS AND CABLES 9

Main components of overhead lines-Insulators-Types, voltage distribution in insulator string, improvement of string efficiency, Underground cables - Types of cables, insulation materials, Parameters of cable, Grading of cables, Capacitance of 3-core cable, heating, thermal resistance of cables.

UNIT IV SUBSTATIONS AND MECHANICAL DESIGN OF LINES 9

Mechanical design of transmission line, sag and tension calculations for different weather conditions, Tower spotting, Types of towers, Sub-station Layout (AIS, GIS). Trends in Transmission and Distribution: EHVAC and HVDC transmission - Introduction to FACTS devices.

UNIT V DISTRIBUTION SYSTEMS 9

Choice of transmission voltage, overhead and underground systems, Types of AC and DC distributors–distributed and concentrated loads–voltage tolerances, interconnection - advantages and limitations.

Periods:45

List of Experiments:

1. Computation of Transmission Line Parameter of three phase lines with single circuit
2. Computation of Transmission Line Parameter Calculation of three phase lines with double circuit
3. Modelling of Transmission Lines, Calculation of transmission efficiency and voltage

regulation

4. Calculation of String efficiency of insulator string with and without guard ring
5. Calculation of Voltage drop in DC distribution system fed at one end and both ends
6. Calculation of Voltage drop in DC ring main distribution system with and without interconnector

Periods:30

Total Periods:75

Course Outcomes:

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

CO1 : Understand the structure of the electric power system and to compute the transmission line parameters.

CO2 : Obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.

CO3 : Study the types of insulators, construction of cables and analyse voltage distribution in insulator strings to improve the efficiency.

CO4 : Analyse the mechanical design of transmission lines and understand the types of substations, EHVAC, HVDC and FACTS.

CO5 : Analyse the different DC and AC distribution systems.

CO6: Application of all parameters in the configuration of electric power systems

Text Books:

1. S.N.Singh, 'Electric Power Generation ,Transmission and Distribution', Prentice Hall of India Pvt.Ltd, New Delhi, 2008.
2. B.R.Gupta,' Power System Analysis and Design', S.Chand, New Delhi, Fifth Edition 2005-08.

References:

1. R. K. Rajput, 'Power System Engineering' Laxmi Publications (P) Ltd, New Delhi, 2006
2. C. L. Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009
3. Hadi Saadat, 'Power System Analysis', PSA Publishing; Third Edition, 2010.
4. S. L. Uppal - Electrical power, Khanna Publishers, 1996.
5. Soni ML and Gupta PV - A Textbook on Power Systems Engineering – Dhanpat Rai 1st Edition-1998.
6. https://nptel.ac.in/courses/108/108/108108099/

Standards:

1. IS 5613-1-1 (1985): Code of Practice for Design, Installation and Maintenance of Overhead Power Lines, Part 1: Lines Up to and Including 11 kV, Section 1: Design [ETD 37: Conductors and Accessories for Overhead Lines]
2. IS 12360:1988 - Voltage Bands For Electrical Installations Including Preferred Voltages And Frequency
3. 141-1993 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants.
4. IS 1885-71 (1993): Electrotechnical Vocabulary, Part 71: Generation, transmission and distribution of electricity Substations [ETD 1: Basic Electrotechnical Standards]
5. Draft Indian Standard Voltage Bands for Electrical Installations including preferred Voltage and Frequency (First Revision)

Laboratory Requirements:

Sl.No.	Description of Equipment	Required numbers (for batch of 30 students)
1.	Personal Computers (Intel Core i5 or i7, 500 GB, 8 GB RAM)	30
2.	Laser Printer	1
3.	Software: MATLAB/ EMTP / ETAP / CYME / MIPOWER / any Power system simulation software	8
4.	Testing of String insulator – Simulator Model	1
5.	DC Distribution System – Test setup	1

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	2	-	3	2	-	2	3	3	2
CO2	3	3	3	2	2	-	2	-	3	2	-	2	3	3	2
CO3	3	3	3	2	2	-	2	-	3	2	-	2	3	3	2
CO4	3	3	3	2	2	-	2	-	3	2	-	2	3	3	2
CO5	3	3	3	2	2	-	2	-	3	2	-	2	3	3	2
CO6	3	3	3	2	2	-	2	-	3	2	-	2	3	3	2
Avg.	3	3	3	2	2	-	2	-	3	2	-	2	3	3	2

EE24413 Python Programming and Data Structures PCC L T P C

2 0 2 3

Course Objectives:

- To introduce the fundamental concepts of Python programming
- To enable students to use Python's built-in data structures
- To provide an understanding of Abstract Data Types (ADTs)
- To develop problem-solving skills using stack and queue data structures
- To familiarize students with fundamental searching, sorting, and hashing techniques

UNIT I INTRODUCTION TO PYTHON PROGRAMMING 6

Introduction to Python – Literals – Variables and Identifiers -Comments- Reserved words – Data Types - Operators and Expressions - Input and Output: Working with user input, displaying output, and formatting - Conditional if - alternative if - chained conditional - Iteration: state, while, for, break, continue, pass

UNIT II DATA STRUCTURES, FUNCTIONS AND FILES IN PYTHON 6

Lists – Operations, Tuples – Assignment, return values. Dictionaries – Operations and methods. Sets – Creation, operations. Function: Definition, usage and types. Strings , Text file handling – Read/write, command-line arguments. Errors and exception handling

UNIT III ABSTRACT DATA TYPES AND LIST 6

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists

UNIT IV STACKS AND QUEUES 6

Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions – Infix to Postfix conversion – Queue ADT – Operations – Circular Queue – Applications of Queues.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 6

Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Quick Sort – Insertion sort – Merge Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Periods:30

LIST OF EXPERIMENTS:

1. Solving problems using iterative loops (Palindrome, Factorial, Prime Numbers).
2. Implementing real-time/technical applications using List, Tuples, Dictionary, Set.
3. Implementing programs using functions.
4. Implementing programs using strings.
5. Implementation of Singly and doubly linked list.
6. Array/linked list implementation of Stack and Queue ADTs.
7. Implementation of Linear and Binary Search.
8. Implementation of any one Sorting technique.

Periods:30

Total Periods:60

Course Outcomes:

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

CO1: Apply Python syntax and semantics to write and debug basic programs.

CO2: Use Python data structures and functions to build modular programs.

CO3: Implement lists using array and linked list representations.

CO4: Apply stacks and queues to solve computational problems.

CO5: Analyze and implement basic searching and sorting algorithms.

CO6: Apply hashing techniques for efficient data access.

Suggested Activities:

1. Assign a project to create a small application that uses various Python data structures (lists, tuples, dictionaries, and sets) to manage and process a dataset.
2. Create exercises where students write their own macros and use preprocessor directives like #define, #include, etc., in various scenarios.
3. Quizzes on Code Snippets
4. Assignment on numerical problems
5. Present real-world problem scenarios that can be solved using C.
6. Flipped Learning
7. Mini Project

Text Books:

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

Programming", 1st Edition, BCS Learning & Development Limited, 2017.
3. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2005.
4. Kamthane, Introduction to Data Structures in C, 1st Edition, Pearson Education, 2007.

References:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021.
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.
7. Langsam, Augenstein and Tanenbaum, "Data Structures Using C and C++", 2nd Edition, Pearson Education, 2015.
8. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Fourth Edition, Mcgraw Hill/ MIT Press, 2022.
9. Alfred V. Aho, Jeffrey D. Ullman,John E. Hopcroft ,"Data Structures and Algorithms", 1st edition, Pearson, 2002.
10. Kruse, "Data Structures and Program Design in C", 2nd Edition, Pearson Education, 2006.

Laboratory Requirements:

S. No	**Name of the Equipment/Software**	**Required**
1	INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2	Windows 10 or higher operating system / Linux Ubuntu 20 or higher	30
3	Dev C++ / Eclipse CDT / Code Blocks / CodeLite / equivalent open source IDE	30
4	Python 3 installed on standalone desktops (Windows/Linux)	30

MAPPING OF COs WITH POs AND PSOs

COs	**POs**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO2	3	2	2	-	2	-	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-	-	2	-
CO4	3	3	2	-	2	-	-	-	-	-	-	-	-	2	-
CO5	3	3	2	2	2	-	-	-	-	-	-	-	-	2	-
CO6	3	2	2	-	3	-	-	-	-	-	-	-	-	2	-
Avg.	3	2.33	2	2	2.16	-	-	-	-	-	-	-	-	2	-

EE24421	Synchronous and Induction Machines Laboratory	PCC	L	T	P	C
			0	0	3	1.5

Course Objectives:

- To provide students with hands-on experience in analyzing the performance of electrical machines such as alternators, synchronous motors, and induction motors.
- To conduct various tests, study motor characteristics, and explore techniques for induction motor control.

LIST OF EXPERIMENTS

1. Regulation of three-phase alternator by EMF and MMF methods.
2. Regulation of three-phase alternator by ZPF methods.
3. Regulation of three-phase salient pole alternator by slip test.
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
8. Separation of No-load losses of three-phase induction motor.
9. Load test on single-phase induction motor.
10. No load and blocked rotor test on single-phase induction motor.
11. Speed control of Slip Ring Induction Motor.
12. Study of Induction Motor Starters

Total Periods:45

Course Outcomes:

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

CO1: Demonstrate proficiency in determining the voltage regulation of three-phase alternators using EMF, MMF, and ZPF methods and conduct slip tests on salient pole alternators.

CO2: Evaluate negative sequence and zero sequence impedances of alternators to understand their behavior under unbalanced load conditions.

CO3: Plot and interpret V and inverted V curves of three-phase synchronous motors to understand their performance under varying excitation and load conditions.

CO4: Perform load tests, no-load tests, and blocked rotor tests on single-phase and three-phase induction motors to determine equivalent circuit parameters and evaluate motor efficiency and performance.

CO5: Separate and analyze the no-load losses of three-phase induction motors to assess their efficiency and power loss distribution.

CO6: Apply speed control techniques for slip-ring induction motors and study various starter mechanisms to understand their role in ensuring safe and efficient motor operation.

Laboratory Requirements:

Sl. No.	Description of Equipment	Required numbers (for batch of 30 students)
1	DC Shunt Motor Coupled With Three phase Salient Pole Alternator	1
2	DC Shunt Motor Coupled With Three phase non-salient pole Alternator	3
3	DC Shunt Motor Coupled With Three phase Slip ring Induction motor	1
4	Three Phase Induction Motor with Loading Arrangement	2
5	Single Phase Induction Motor with Loading Arrangement	2
6	Tachometer -Digital/Analog	8
7	Single Phase Auto Transformer	2
8	Three Phase Auto Transformer	3
9	Single Phase Resistive Loading Bank	2
10	Three Phase Resistive Loading Bank	2
11	Capacitor Bank	1
12	Three phase inductive load	1
13	Rheostats	As per the requirement for the machines

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	3	3	-	3	3	3	3
CO2	3	3	3	3	-	-	-	-	3	3	-	3	3	3	3
CO3	3	3	3	3	-	-	-	-	3	3	-	3	3	3	3
CO4	3	3	3	3	-	-	-	-	3	3	-	3	3	3	3
CO5	3	3	3	3	-	-	-	-	3	3	-	3	3	3	3
CO6	3	3	3	3	-	-	-	-	3	3	-	3	3	3	3
Avg.	3	3	3	3	-	-	-	-	3	3	-	3	3	3	3

EE24422	Measurements and Instrumentation Laboratory	PCC	L	T	P	C
			0	0	3	1.5

Course Objectives:

- To analyse AC and DC bridges and determining the unknown values of resistance , inductance and capacitance
- To understand and evaluate the bridge balancing conditions
- To understand how physical quantities are measured and how they are converted to electrical forms.
- To infer and measure the physical quantities such as pressure, temperature, flow, displacement.
- To measure the power and energy using wattmeter and energy meter.
- To implement a simple logic for industrial applications using PLC programming language.

List of Experiments:

Bridge Networks –AC and DC Bridges

1. Measurement of medium resistance using Wheatstone bridge
2. Measurement of low resistance using Kelvin's Bridge
3. Measurement of unknown inductance using Maxwell's Inductance Bridge
4. Measurement of unknown capacitance using Schering Bridge

Dynamics of Sensors/Transducers

5. Measurement of Temperature
   a) RTD b) Thermistor c)Thermocouple
6. Measurement of pressure using Bourdon Gauge
7. Measurement of Displacement using LVDT
8. Measurement of speed using Optical sensor
9. Measurement of weight using Strain gauge
10. Measurement of Flow using orifice meter
11. Measurement of Power and Energy using Energy meter by Two Wattmeter method.
12. Implementation of a simple ladder logic program using PLC.

Total Periods:45

Course Outcomes:

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

CO1: Analyze the bridges for the measurement of low, medium resistance
CO2: Analyze the bridges for the measurement of inductance and capacitance measurement
CO3: Gain knowledge about the principle of operation and characteristics of different types of temperature and pressure transducers.
CO4: Gain knowledge about the principle of operation and characteristics of different types of Optical, Flow and Displacement transducers.
CO5: Measurement of power and energy using wattmeter and energy meter.
CO6: Implement a simple logic for industrial applications using PLC programming language

Laboratory Requirements:

Sl. No.	Description of Equipment	Required numbers (for batch of 30 students)
1	Position Control Systems Kit	1
2	R, L, C Bridge kit	1
3	Electric heater	1
4	Thermometer	1
5	Thermistor (silicon type) RTD nickel type	1
6	30 psi Pressure chamber (complete set)	1
7	Air foot pump (with necessary connecting tubes)	1
8	LVDT20mm core length movable type	1
9	Flow measurement Trainer kit (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)	1
10	IC trainer kit	1
11	Strain Gauge Kit with Handy lever beam	1
12	100gm weights	10

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	3	-	-	-	1.5	-	-	-	3	3	1	3
CO2	2	1	2	3	-	-	-	1.5	-	-	-	3	3	1	3
CO3	2	1	2	3	-	-	-	1.5	-	-	-	3	3	1	3
CO4	2	1	2	3	-	-	-	1.5	-	-	-	3	3	1	3
CO5	2	1	2	3	-	-	-	1.5	-	-	-	3	3	1	3
CO6	2	1	2	3	-	-	-	1.5	-	-	-	3	3	1	3
Avg.	2	1	2	3	-	-	-	1.5	-	-	-	3	3	1	3

EE24423 Project Driven Learning EEC L T P C

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Course Objectives:

- Apply Design Thinking & Problem-Solving Techniques
- Develop and Implement a Structured Project Plan
- Build Functional Prototypes & Minimum Viable Products (MVPs)
- Evaluate Performance & Optimize Solutions
- Present and Deploy Innovative Solutions

UNIT I IDEATION & PROBLEM IDENTIFICATION 6

- Icebreaker & Team Formation
- Brainstorming Sessions (Design Thinking, Mind Mapping)
- Understanding User Needs & Problem Validation
- Conducting Market Research & Competitor Analysis

UNIT II SOLUTION CONCEPTUALIZATION & PLANNING 6

- Exploring Feasible Solutions (Convergent Thinking)
- Selecting the Tech Stack & Tools
- Creating a Project Timeline (Agile/Scrum Basics)
- Sketching Wireframes, Flowcharts, or System Diagrams
- Risk Analysis & Contingency Planning

UNIT III PROTOTYPING & IMPLEMENTATION 6

- . Creating a Low-Fidelity Prototype (Paper/Digital Mockups)
- Building a Minimum Viable Product (MVP)
- Testing & Refining the Prototype Based on Feedback
- Implementing Core Functionalities of the Solution
- Code/Design Review & Iteration

UNIT IV PERFORMANCE METRICS, BENCHMARKING & OPTIMIZATION **6**

- Defining Key Performance Metrics (KPIs) for the Project
- Setting Industry Benchmarks & Performance Goals
- Conducting Functional & Usability Testing
- Analyzing System Performance & Bottleneck Detection
- Optimizing Code, UI/UX, and Resource Utilization

UNIT V PRESENTATION & DEPLOYMENT **6**

- Crafting a Compelling Pitch (Storytelling, Business Model)
    - Tools: Business Model Canvas, Pitch Deck Templates (Canva, Google Slides)
- Creating a Demo
- Pitching & Receiving Feedback from Mentors/Peers
- Deploying/Publishing the Project
    - Tools: GitHub Pages
- Showcasing the Final Product & Reflection

Total Periods:30

Course Outcomes:

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

- Finalize a well-defined problem statement and identify key stakeholders
- Develop a structured project plan, defining goals, tech stack, and execution roadmap
- Build a functional prototype with key features working
- Establish clear performance benchmarks, conduct thorough testing, and optimize their project for efficiency, usability, and scalability.
- Successfully present and deploy their projects
- Demonstrate end-to-end project development skills, integrating problem-solving, technical implementation, optimization, and presentation to create impactful solutions

Learning Links:

1. Miro Basics
2. Lucidchart Tutorials
3. Figma Wireframing Guide
4. Trello Agile Basics
5. GitHub Basics
6. GitHub Pages Deployment

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	1	2	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	1	2	-
CO4	3	3	3	3	3	2	2	-	-	-	-	-	1	2	-
CO5	-	-	-	-	3	-	-	-	3	-	-	-	-	2	2
CO6	-	-	-	3	-	-	-	3	3	3	3	3	1	-	2
Avg.	3	2.7	3	3	3	2	2	3	3	3	3	3	1	2	2

BS24321	System Discovery and Analysis	BSC	L	T	P	C
			0	0	2	0

Course Objectives:

- To identify key components of any hardware.
- To analyse individual components and its working.
- To understand how data and control flows within a system
- To identify the need, the user, and functional specifications of the system
- To understand the evolution of an electronic system through study and presentation

List of Components:
Any two components can be selected per semester

1) Miniature Circuit Breaker
2) Wiper motor
3) Centrifugal pump
4) Electric Fan
5) Starter Motor
6) Inverter
7) Mosquito bat
8) Raspberry Pi/ Arduino Board

System Discovery (6 periods)
System Analysis (18 periods)
Presentation + Documentation (6 periods)

Total Periods:30

Course Outcomes:

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

1. Identify and describe the essential components and architecture of commonly used hardware systems.
2. Evaluate and document system design requirements, including end-user needs, functional goals, constraints, and standards.
3. Use project management tools, bull and octopus diagrams to understand the existing system.
4. Disassemble and analyze systems to distinguish between hardware, software, and network components
5. Understand and articulate how information is processed, transmitted, and stored.
6. Propose an improvisation of any existing system by adopting a new design and technology.

Text Books:

Laboratory Manual

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	1	-	-	-	-	3	1	-	1	1	-	-
CO2	2	2	-	1	-	-	-	-	3	1	1	1	1	-	-
CO3	2	2	-	1	-	-	-	-	3	1	1	1	1	-	-
CO4	2	2	-	2	-	-	-	-	3	1	-	1	1	-	-
CO5	2	2	-	2	-	-	-	-	3	1	-	1	1	-	-
CO6	2	2	-	1	-	-	-	-	3	1	-	1	1	-	-
Avg.	2	2	-	1	-	-	-	-	3	1	1	1	1	-	-