DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING
(AUTONOMOUS)
COIMBATORE - 641 105 | www.dsce.ac.in

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

REGULATIONS-2024

B.E-ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

NH -47, Palakkad Main Road, Post, Navakkarai,
Coimbatore-641 105
Tamil Nadu, India

REGULATIONS – 2024
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER I

S. No.	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1	HS24001	Communicative English – I	HSM	3	0	0	3	3
2	MA24001	Engineering Mathematics – I	BS	3	1	0	4	4
3	PH24001	Engineering Physics	BS	3	0	0	3	3
4	CY24001	Engineering Chemistry	BS	3	0	0	3	3
5	ES24001	Engineering Graphics	ES	2	0	4	6	4
6	TA24001	Heritage of Tamils	HSM	1	0	0	1	1
7	MN24001	Overview of Engineering and Technology	MN	3	0	0	3	0
PRACTICALS								
8	BS24001	Engineering Physics & Chemistry Laboratory	BS	0	0	4	4	2
9	ES24002	Engineering Practices Laboratory	ES	0	0	4	4	2
10	HS24002	Communicative Laboratory	HSM	0	0	2	2	1
TOTAL				**18**	**1**	**14**	**33**	**23**

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	HS24003	Communicative English II	HSM	3	0	0	3	3
2.	MA24002	Statistics and Numerical Methods	BS	3	1	0	4	4
3.	PH24002	Physics for Electronics Engineering	BS	3	0	0	3	3
4.	EE24001	Circuit Theory	ES	3	1	0	4	4
5.	CS24001	Problem Solving and Python Programming	ES	3	1	0	4	4
6.	TA24002	Tamils and Technology	HSM	1	0	0	1	1
7.	MN24002	Environmental Science and Sustainability	MN	3	0	0	3	0
PRACTICALS								
8.	EE24002	Circuit Theory Laboratory	ES	0	0	4	4	2
9.	CS24002	Problem Solving and Python Programming Laboratory	ES	0	0	4	4	2
TOTAL				**19**	**3**	**8**	**30**	**23**

SEMESTER– III

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	MA24305	Transforms and its Applications	BS	3	1	0	4	4
2.	EE24301	Electromagnetic Theory	PC	3	1	0	4	4
3.	EE24302	Electrical Machines – I	PC	3	0	0	3	3
4.	EE24303	Electronic Devices and Circuits	PC	3	0	0	3	3
5.	EE24304	Network Analysis and Synthesis	PC	3	0	0	3	3
6.	EE24305	Measurement and Instrumentation	PC	3	0	0	3	3
PRACTICALS								
7.	EE24311	Electronic Devices and Circuits Laboratory	PC	0	0	3	3	1.5
8.	EE24312	Electrical Machines Laboratory - I	PC	0	0	3	3	1.5
9.	EE24313	Measurement and Instrumentation	PC	0	0	3	3	1.5
TOTAL				**18**	**2**	**9**	**29**	**24.5**

SEMESTER – IV

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	EE24401	Energy Storage Techniques	PC	2	0	2	4	4
2.	EE24402	Electrical Machines - II	PC	3	0	0	3	3
3.	EE24403	Transmission and Distribution	PC	3	0	0	3	3
4.	EE24404	Power Electronics	PC	3	0	0	3	3
5.	EE24405	Linear and Digital Integrated Circuits	PC	3	0	0	3	3
6.	EE24406	Control Systems	PC	3	0	0	3	3
PRACTICALS								
7.	EE24411	Electrical Machines Laboratory - II	PC	0	0	3	3	1.5
8.	EE24412	Linear and Digital Integrated Circuits Laboratory	PC	0	0	3	3	1.5
9.	EE24413	Control Systems Laboratory	PC	0	0	3	3	1.5
TOTAL				**17**	**0**	**11**	**28**	**23.5**

HS24001-COMMUNICATIVE ENGLISH-I								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- To enable learners to understand the basics of communication.
- To empower learners to use narrative techniques to convey ideas and experiences in academic and work environment.
- To support learners in enhancing their linguistic competence and engaging in effortless dialogue.
- To assist learners in mastering language for the successful academic and professional communication.
- To strengthen language proficiency for effective comprehension of core curricula.

UNIT I - Basics of Communication **Listening -** Telephone conversation, Listening to Podcast, NEWS, Interviews **Speaking -** Verbal and Non-Verbal Conversation, Role play **Reading** - Types of Reading- Skimming, Scanning, Intensive and Extensive finding key information in a given text **Writing -** Passage Comprehension, Formal Letter Writing Professional Email Writing **Grammar -** Parts of Speech - Noun, Verb, Pronoun & Adverb, Tense -Present Tense, Types of Sentences **Vocabulary -** Prefix & Suffix	**9**
UNIT II - Narrative Skill Development **Listening -** Watching travel documentary **Speaking -** Narrating a story , Narrating a personal incident **Reading -** Reading Travelogues, Blogs **Writing** Paragraph Writing, Rearrangement of jumbled sentences **Grammar -** Tense Past Tense, Subject Verb Agreement, Auxiliary and Modal Verbs **Vocabulary -** Synonyms and Antonyms	**9**
UNIT III Enriching Speaking Skills **Listening -** Dialogues & conversations **Speaking -** Group Conversation, Speaking on given topics and context **Reading -** Reading Newspaper Articles, Reading user manuals **Writing -** Instructions, Writing definitions **Grammar -** Adjective, Tense Future Tense, Types of Questions WH Questions **Vocabulary -** Abbreviations & Acronyms	**9**
UNIT IV - Language Enhancement **Listening -** Listening to TED Talks **Speaking -** Speaking about friends/places/hobbies, Delivering Welcome Address **Reading -** Reading Biography, Reading Editorial **Writing -** Short Report writing **Grammar** Preposition, Question Tags, Yes or No questions, Articles **Vocabulary** One word Substitution	**9**
UNIT V - Technical Usage of Language **Listening -** Listening to native dialects & live commentaries **Speaking -** Group Discussion, Debates, Proposing Vote of Thanks **Reading -** Opinion articles, Journal Reports **Writing -** Essay Writing	**9**

Grammar - Cause and Effect expressions**,** Negations **Vocabulary -** Gerund & infinitives, Compound Noun	
Total Hours	**45**
Textbook(s)	
1	English for Engineers & Technologists Orient Blackswan Private Ltd., Anna University, 2020.
2	Veena Selvam, Sujatha Priyadarshini, Deepa Mary Francis, K. N. Shoba, Lourdes Joevani, English for Science & Technology, Cambridge University Press, 2021.
Reference(s)	
1	English for Academic Correspondence and Socializing by Adrian Wall work, Springer, 2011.
2	Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.
3	Meenakshi Raman, Technical Communication, Oxford University Press, New Delhi, 2017
4	Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.

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

Course Outcomes		Level
CO1	Communicate effectively using grammatical words according to the context.	K1
CO2	Analyze the given context and frame content accordingly using narrative skills.	K2
CO3	Effectively use language techniques in extended discussions.	K2
CO4	Frame short and long sentences using grammatical techniques according to given context.	K1
CO5	Respond with clarity and accuracy in a range of professional situations, using appropriate linguistic accuracy.	K3

Mapping with Program Outcomes

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

3 – Strong, 2 – Medium, 1 – Low

MA24001 – ENGINEERING MATHEMATICS – I								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	1	0	60	4	40	60	100

Course Objectives

- Understand the concept of matrices and reduction quadratic form to canonical form.
- Solve the problems using fundamentals principles of calculus.
- Apply the concept of calculus in several variables.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals.

UNIT I - MATRICES Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.	**12**
UNIT II – DIFFERENTIAL CALCULUS Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications: Maxima and Minima of functions of one variable	**12**
UNIT III - FUNCTIONS OF SEVERAL VARIABLES Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.	**12**
UNIT IV – INTEGRAL CALCULUS Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts(reduction),Trigonometric substitutions, Integration of rational functions by partial fraction,improper intergrals.	**12**
UNIT V - MULTIPLE INTEGRALS Double integrals – Change of order of integration – Double integrals in polar coordinates – Area as a double integral - Triple integrals.	**12**
Total Hours	**60**

Textbook(s)

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.

Reference(s)

1	Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016.
2	Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd), New Delhi, 7th Edition, 2009.
3	Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.

4	Narayanan. S. and Manicavachagom Pillai. T. K., “Calculus” Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6	Srimantha Pal and Bhunia. S.C, "Engineering Mathematics" Oxford University Press, 2015.
7	Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

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

Course Outcomes		Level
CO1	Understand the matrix algebra methods for solving practical problems.	K2
CO2	Apply differential calculus tools in solving various application problems.	K4
CO3	Use differential calculus ideas on several variable functions.	K3
CO4	Apply different methods of integration in solving problems.	K4
CO5	Apply multiple integral ideas to find the area.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO2	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO3	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO4	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO5	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

PH24001 – ENGINEERING PHYSICS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- To introduce the concepts of Laser and its applications.
- To achieve an understanding of mechanics.
- To introduce the concepts of thermal physics.
- To gain knowledge about the basics of quantum mechanics.
- To understand the applications of quantum mechanics.

UNIT I – LASER Theory of laser - characteristics - spontaneous and stimulated emission - Laser action- Einstein's A and B coefficients derivation - pumping methods - resonant cavity, optical amplification (qualitative) - population inversion - Types of laser – Nd -YAG laser, CO_2 laser - Basic applications of lasers in industries – laser heat treatment in annealing, welding, drilling, cutting and soldering – Application of laser in fibre optic communication system.	**9**
UNIT II - MECHANICS Linear motion and rotational motion – Multi particle dynamics – Center of mass (CM) – kinetic energy of system of particles– Physical significance of moment of inertia – M.I of a diatomic molecule – Torsional pendulum.	**9**
UNIT III - THERMAL PHYSICS Modes of heat transfer - thermal conduction, convection and radiation - heat conduction in solids - thermal conductivity - Lee's disc method: theory and experiment - conduction through compound media (series and parallel) - Application: Solar water heater.	**9**
UNIT IV - BASIC QUANTUM MECHANICS Photons and light waves - wave particle duality - De Broglie's wavelength - Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - particle in an infinite potential well - particle in a 3D box - correspondence principle (qualitative).	**9**
UNIT V - APPLIED QUANTUM MECHANICS Barrier penetration and quantum tunneling (qualitative)- Scanning Tunneling microscope – Resonant diode – Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model.	**9**
Total Hours	**45**

Textbook(s)

1	M. N. Avadhanulu, P. G. Kshirsagar, T. V. S. Arun Murthy, "A Textbook of Engineering Physics", 11th Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2019.
2	D. K. Bhattacharya, T. Poonam, "Engineering Physics". Oxford University Press, 2015.
3	R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 2013.
4	D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017

Reference(s)

1	R. Wolfson, "Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2009.

2	D. Halliday, R. Resnick, J. Walker, "Principles of Physics", Wiley Publishers (Indian Edition), 2015.
3	Dattu R Joshi, "Engineering Physics", 1st Edition, Tata McGraw Hill Publications, New Delhi, 2010.
4	B. K. Pandey, S. Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
5	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw Hill (Indian Edition), 2017.

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

Course Outcomes		Level
CO1	Gain knowledge about lasers and its applications.	K2
CO2	Understand the importance of mechanics.	K1
CO3	Acquire knowledge on the concepts of thermal physics.	K2
CO4	Understand the concepts of quantum mechanics.	K1
CO5	Comprehend and express their knowledge about applications of quantum mechanics.	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	2	1	-	-	-	-	-	-	-	-	-
CO3	3	3	2	2	2	1	-	-	-	-	-	1	-	-	-
CO4	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
CO5	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

CY24001 – ENGINEERING CHEMISTRY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- The objective of this course is to better understanding of basic concepts of chemistry and its applications on engineering domine.
- It imparts knowledge on properties of water and its treatment methods, different types of fuels and its applications.
- It also imparts knowledge about different storage devices.
- This course also highlights the preparation, properties and applications of nanomaterials.
- It also gives basic idea about different types of engineering materials.

UNIT I - WATER TECHNOLOGY **Water Technology:** Introduction – Sources − Impurities − Hardness of water −Estimation of harness of water − Boiler feed water − Boiler troubles (Scale and Sludge, Boiler corrosion, Caustic embrittlement, Priming and Foaming)− Treatment of boiler feed water − Internal treatment (Phosphate, Sodium aluminate, Colloidal, Calgon conditioning) − External treatment (Demineralisation process, Zeolite process) − Desalination process − Reverse Osmosis − Municipal water treatment– Case study.	**9**
UNIT II - FUELS **Fuels:** Introduction − Classification of fuels − Solid fuels − Coal and Coke − Metallurgical coke − Manufacture of metallurgical coke (Otto Hoffmann's by-product oven) − Liquid fuels − Petroleum and Diesel − Synthetic petrol (Bergius process) − Knocking in petrol − Octane number − Knocking in diesel − Cetane number − Power alcohol – Gaseous fuels – Natural gaseous fuel – Synthetic gaseous fuel (CNG, LPG) – Flue gas analysis – ORSAT method.	**9**
UNIT III - ELECTROCHEMICAL STORAGE DEVICES **Batteries:** Introduction – Types of batteries – Primary battery (Dry cell) – Secondary battery (Lead acid battery) – Modern battery (Lithium ion battery) – Fuel cells – H_2-O_2 fuel cell– Solar Cells –Electric vehicles: Working principles –Super capacitors: Types and examples.	**9**
UNIT IV - NANO CHEMISTRY **Nano Materials:**Introduction – Types of nano materials – Nanoparticle, Nanocluster, Nanorod, Nanowire and Nanotube – Preparation of nanomaterials (Sol-gel, Solvothermal, Chemical vapour deposition (CVD), Electro chemical deposition (ECD), Laser ablation and Electro spinning methods) – Applications of nanomaterials.	**9**
UNIT V - ENGINEERING MATERIALS **Engineering Polymers:** Introduction – Types of polymers (Natural and Synthetic polymers) – Polymerization – Types of polymerization (Addition polymerization and Condensation polymerization) –Degree of polymerization – Thermosetting and Thermoplastic polymers– Application of polymers.	**9**
Total Hours	**45**

Textbook(s)

1.	P. C. Jain and Monica Jain, "A Text Book of Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company Pvt Ltd, New Delhi, 2020.

2.	Shashi Chawla "A Text Book of Engineering Chemistry" 3rd Edition, Dhanpat Rai Publishing Company Pvt Ltd, New Delhi, 2011.
3.	S. S. Dara and S. S. Umare "A Text Book of Engineering Chemistry", 12th Edition, S. Chand & Company Publishing, 2018.
4.	B. Sivasankar, "Engineering Chemistry", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008.
Reference(s)	
1.	Shikha Agarwal, "Engineering Chemistry - Fundamentals and Applications", 2nd Edition, Cambridge University Press, New Delhi, 2019.
2.	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath, James Murday, "Text Book of Nanoscience and Nanotechnology", Universities Press – IIM Series in Metallurgy and Materials Science, 2018.
3.	V. R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, "Polymer Science" New Age International Publishers, 2009.

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

Course Outcomes		Level
CO1	Knowledge about different types of water and propose suitable methods for treatment of water.	K1
CO2	Customize various types of fuels for engineering processes and applications.	K3
CO3	Dramatize different storage devices and apply the concepts in engineering energy sectors.	K3
CO4	Identify and apply the basic concepts of nanotechnology and design the synthesis of nano materials for the applications of engineering and technology.	K1
CO5	Summarize the types of engineering materials and their suitable applications in recent technologies.	K2

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
CO2	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-
CO5	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

ES24001 – ENGINEERING GRAPHICS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	2	0	4	60	4	40	60	100

Course Objectives

- Drawing engineering curves and free hand sketch of simple objects.
- Drawing orthographic projection of points, lines and plane surface.
- Drawing orthographic projection of solids.
- Drawing development of solids and section of solids.
- Drawing isometric and perspective projections of simple solids.

CONCETPS AND CONVENTIONS (Not for Examination) 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 FREE HAND SKETCHING** Basic Geometrical constructions, Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves.	**12**
UNIT II - PROJECTION OF POINTS, LINES AND PLANE SURFACE Orthographic projection – principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only first angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of Planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.	**12**
UNIT III - PROJECTION OF SOLIDS Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method and auxiliary plane method.	**12**
UNIT IV - PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other-obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids-Prisms, Pyramids cylinders and cones.	**12**
UNIT V - ISOMETRIC AND PERSPECTIVE PROJECTIONS Principles of isometric projection - isometric scale - Isometric projections of simple solids and truncated solids- Prisms, Pyramids cylinders and cones. Combination of two solid objects vertical positions. Perspective projection of simple solids- Prisms, Pyramids and cylinders by visual ray method. Computer assisted isometric and perspective projections.	**12**
Total Hours	**60**

Textbook(s)

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

Reference(s)

1	Basant Agarwal,C. M. Agarwal, "Engineering Drawing", McGraw Hill, 2ndEdition, 2019.
2	K. R. Gopalakrishna, "Engineering Drawing" (Vol.I & II combined), 27th Edition, Subhas Publications, Bangalore, 2017.
3	J. Luzzader, Warren,M. Duff, John, "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	N. S. Parthasarathy, Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5	M. B. Shah, B. C. Rana, "Engineering Drawing", 2ndEdition, Pearson Education India, 2009.
6	K. Venugopal,V. Prabhu Raja, "Engineering Graphics", New Age International (P) Ltd, 2008.

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

Course Outcomes		Level
CO1	Familiarize with the fundamentals and standards of engineering drawing. Construct the conic curves, in volutes and cycloid, and perform free hand sketching of basic geometrical constructions and multiple views of objects.	K3
CO2	Draw the orthographic projections of points, lines and plane surfaces.	K4
CO3	Draw the projection of simple solids.	K3
CO4	Draw the projection of sectioned solids and draw the development of surfaces of simple solids.	K3
CO5	Visualize and projections of Isometric and perspective projections of simple solids.	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO2	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO3	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO4	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO5	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
3 – Strong, 2 – Medium, 1 – Low															

TA24001 – HERITAGE OF TAMILS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	1	0	0	15	1	40	60	100

Course Objectives

- To learn the extensive literature of classical tamil.
- To review the fine arts heritage of tamil culture.
- To realize the contribution in Indian freedom struggle.
- To understand the role of Temple in Sangam cities/ports, Chola conquest.
- To examine Tamil cultural influence in India.

UNIT I - LANGUAGE AND LITERATURE 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.	**3**
UNIT II - HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 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.	**3**
UNIT III - FOLK AND MARTIAL ARTS Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	**3**
UNIT IV - THINAI CONCEPT OF TAMILS 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.	**3**
UNIT V - CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement Inscriptions & Manuscripts.	**3**
Total Hours	**15**

Textbook(s)

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).

Reference(s)

1	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL (in print).
2	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies
3	Historical Heritage of the Tamils (Dr. S. V. Subramanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

4	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
5	Keeladi - 'Sangam City Civilization on the banks of River Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author).
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
8	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL).

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

Course Outcomes		Level
CO1	Remember the extensive literature of tamil and its classical nature, musical instruments, Folk, Thinai concept, Indian Freedom Struggle & Aham, Puram and Aram Concept.	K1
CO2	Remember the principles in Thirukural, Bakthi Literature Azhwars and Nayanmars, heritage of sculpture, painting ancient people.	K1
CO3	Understand on folk and martial arts of tamil people, Justice in Sangam Literature, Development of Modern literature in Tamil, Making of musical instruments.	K2
CO4	Understand the Ancient Cities and Ports of Sangam Age of Tamils	K2
CO5	Understand the Cultural Influence of Tamils over the other parts of India, contribution of Tamils self-esteem movement.	K1

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO2	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

TA24001 – தமிழர் மரபு								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ES	Total
I	1	0	0	15	1	40	60	100

Course Objectives

- விரிவான இலக்கியம் மற்றும் செம்மொழி தமிழ் கற்க.
- தமிழ் கலாச்சாரத்தின் நுண்கலை பாரம்பரியத்தை மதிப்பாய்வு செய்ய.
- இந்திய சுதந்திரப் போராட்டத்தில் பங்களிப்பை உணர வேண்டும்.
- சங்க நகரங்கள்/துறைமுகங்களில் கோயிலின் பங்கைப் புரிந்து கொள்ள, சோழர்களின் வெற்றி.
- இந்தியாவில் தமிழ் கலாச்சார தாக்கத்தை ஆய்வு செய்ய.

அலகு I - மொழி மற்றும் இலக்கியம் இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை திருக்குறளில் மேலாண்மைக் கருத்துக்கள் தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் -பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் சிற்றிலக்கியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி.	**3**
அலகு II - மரபு பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - நாட்டுப்புறத் தெய்வங்கள் குமரிமுனையில் திருவள்ளுவர் சிலை .	**3**
அலகு III - நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் தெருக்கூத்து கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து. ஒயிலாட்டம் தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	**3**
அலகு IV - தமிழர்களின் திணைக் கோட்பாடுகள் தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும்.	**3**
அலகு V - இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம், கையெழுத்துப்படிகள்.	**3**
Total Hours	**15**

Textbook(s)

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

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

Course Outcomes		Level
CO1	Remember the extensive literature of tamil and its classical nature, musical instruments, Folk, Thinai concept, Indian Freedom Struggle & Aham, Puram and Aram Concept.	K1
CO2	Remember the principles in Thirukural, Bakthi Literature Azhwars and Nayanmars, heritage of sculpture, painting of ancient people.	K1
CO3	Understand on folk and martial arts of tamil people, Justice in Sangam Literature, Development of Modern literature in Tamil, Making of musical instruments.	K2
CO4	Understand the Ancient Cities and Ports of Sangam Age of Tamils	K2
CO5	Understand the Cultural Influence of Tamils over the other parts of India, contribution of Tamils self-esteem movement.	K1

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO2	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

MN24001 – OVERVIEW OF ENGINEERING AND TECHNOLOGY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	0	100	0	100

Course Objectives

- To outline the basics of the Civil Engineering.
- To learn the fundamentals of Mechanical Engineering.
- To impart knowledge on fundamental concepts and recent trends in the field of Electrical and Control Systems.
- To provide the overview of the Computer Science and Engineering and AI&DS.
- To provide the overview of Food Technology and Bio Medical Engineering.

UNIT I – INTRODUCTION TO ENGINEERING & TECHNOLOGY Science, Engineering and Technology(E&T), Approaches for a Scientific process vs an Engineering process; Engineering Product Life Cycle, processes in Engineering Design Methodology with few examples; various branches in Engineering and Technology (Traditional and Recent), Impact of E&T on human life, (pros & cons); Activities performed by an Engineer, Interdisciplinary nature of real world problems; Revised Bloom's Taxonomy Levels (BTL)	**9**
UNIT II – OVERVIEW OF CIVIL, MECHANICAL AND AGRICULTURAL ENGINEERING Introduction - Who is a civil Engineer? -Roles and Responsibilities- Scope and Opportunities- Structures -Geo Technical Engineering - Estimation and Costing- Construction - Project Management - Structural Engineering - Irrigation and Water Supply. Introduction - Who is a Mechanical Engineer? - Roles and Responsibilities - Scope and Opportunities – Manufacturing- Design - Automobile-Power Generation - Industrial Engineering- computer aided design and manufacturing - computer integrated manufacturing. Introduction - Who is an Agricultural Engineer? - Difference between Agricultural & Horticultural Engineering - Types of Agricultural Engineering - Processing or Post Harvest Engineering - Farm Power and Machinery Engineering - Soil and Water Conservation Engineering - Environmental Control Engineering - Forestry - Wood Product Engineering - Food Engineering - Scope and Opportunities.	**9**
UNIT III – OVERVIEW OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERING Introduction- Different between Electrical Engineer and Electronics Engineer - Roles and Responsibilities - Scope and Opportunities - Power Generation and Consumption - Reason development - Current area of research - Energy audit - Energy utilization -PLC- Embedded control systems and computer based control system- wired and wireless communication- satellite communication- IoT communication network.	**9**
UNIT IV - OVERVIEWOF COMPUTER SCIENCE AND ENGINEERING, CYBER SECURITY & AI &DS Introduction- Different between Computer Science and Engineering and AI&DS - Job Description-Roles and Responsibilities - Scope and Opportunities.Computer hardware and software - programming languages, operating system - application of software-database management system (DBMS) - Computer networks - Internet and computer security- Web	**9**

technology - Mobile application - Artificial intelligent (AI) - Machine learning(ML) - Internet of things(IoT) - Black chain - Cyber security -Cloud computing.	
UNIT V –OVERVIEW OF FOOD TECHNOLOGY AND BIO MEDICAL ENGINEERING Introduction - Scope and Importance of Food Technology - Historical development and trends in the field - Sources of food - Chemical composition of food - Microorganisms in food - Food borne illness and safety measures - Unit operations in food Processing - Principles and methods of Food Processing - Case studies on successful food products or processes. Introduction-Role of Biomedical Engineer - Scope of Biomedical Engineer- Key Areas: Bio materials, Biomechanics, Biomedical Instrumentation, Medical Devices, Clinical Engineering, Cell and Tissue Engineering-Career Opportunities:Research and Development- Applications and Future Directions.	**9**
Total Hours	**45**

Textbook(s)	
1	"Overview of Engineering and Technology", Lecture Notes from DSCE, 2024.
2	"Introduction to Engineering Technology and Engineering" by Val D Hawks, A Brent Strong, 1st Edition, Pearson Publisher, 2000.
Reference(s)	
1	N. R. Banapurmath,V. S. Yalliwal, "Basics of Mechanical Engineering",Vikas Publishing House, 2021.
2	G. Shanmugam, M. S. Palanichamy, "Basic Civil and Mechanical Engineering", McGraw Hill Education; 1st Edition, 2018.
3	D. P. Kothari, I.J. Nagrath, "Basic Electrical Engineering", 4th Edition, McGraw Hill Education, 2019.
4	Albert Malvino, David J. Bates," Electronic Principles (SIE)", 7th Education, McGraw Hill 2017.
5	Reema Thareja, "Fundamentals of Computer", Oxford University Press, 2016.

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

Course Outcomes		**Level**
CO1	Identify the major areas and relate their current trends in Civil Engineering.	K1
CO2	Explain the principles behind various mechanical systems and components.	K2
CO3	Identify different Electricals and Control Systems applied in the Engineering field.	K3
CO4	Relate the various Electronics and Communication Systems involved in real life.	K4
CO5	Understand the components of computer hardware, software, and operating systems and their applications in real life.	K2

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	-	1	1	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	1	1	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	1	1	-	-	-	-	-	-	-	-	-
CO4	3	-	2	2	2	1	-	-	-	-	-	-	-	-	-
CO5	3	1	-	-	1	3	-	-	-	-	-	-	-	-	-
3 – Strong, 2 – Medium, 1 - Low															

BS24001 – ENGINEERING PHYSICS AND CHEMISTRY LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	4	60	2	60	40	100

ENGINEERING PHYSICS LABORATORY

Course Objectives

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics and properties of matter for developing basic experimental skills.
- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To determine error in experimental measurements and techniques used to minimize such errors.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS (Any 7 Experiments)	
1. Determination of rigidity modulus of a metallic wire using torsional pendulum.	
2. Determination of Young's modulus – Non-uniform bending method.	
3. Determination of Young's modulus – Uniform bending method.	
4. Determination of Young's modulus – Cantilever method.	
5. Determination of wavelength of the laser using grating.	
6. a) Determination of Acceptance angle and Numerical aperture of an optical fiber. b) Determination of width of the groove using laser.	
7. Determination of thickness of a thin film by air-wedge arrangement.	
8. Determination of velocity of sound and compressibility of liquid using Ultrasonic Interferometer.	
9. Determination of velocity of ultrasonic waves using acoustic grating.	
10. Determination of the band gap of a given semiconducting material.	
11. Determination of Planck's constant and work function using Photoelectric effect.	
12. Determination of frequency of the vibrator using Melde's string arrangement.	
Total Hours	**30**

Reference(s)

1	M. N. Srinivasan, S. Balasubramanian, R. Ranganathan, "Practical Physics", S. Chand & Sons Educational Publications, New Delhi, 2011.
2	P. R Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

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

Course Outcomes		Level
CO1	Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications.	K1
CO2	Use graphical models to analyze laboratory data.	K2
CO3	Use mathematical models as a medium for quantitative reasoning and describing physical reality.	K2
CO4	Access, process and analyze scientific information.	K3
CO5	Solve problems individually and collaboratively	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

ENGINEERING CHEMISTRY LABORATORY	
Course Objectives • To make the students to acquire practical skills in basic understanding of water quality parameters such as, hardness, alkalinity, acidity, DO, chloride and copper content. • To induce the students to familiarize with electro analytical techniques such as, conductometry, potentiometry and pH metry. • To demonstrate the synthesis of nano particles. • To develop skills on analysis of coal.	
LIST OF EXPERIMENTS: (Any 7 Experiments)	
1. Estimation of acidity of a water sample using the primary standard.	
2. Determination of types and amount 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. Estimation of TDS of a water sample by gravimetry.	
8. Determination of strength of strong acid using conductivity meter.	
9. Determination of strength of acids in a mixture of acids using conductivity meter.	
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)	
11. Determination of strength of given hydrochloric acid using pH meter.	
12. Estimation of iron content of the given solution using potentiometer.	
13. Estimation of sodium/potassium present in water using flame photometer.	
14. Preparation of nano particles (TiO_2/ZnO/CuO) by Sol-Gel method.	
15. Proximate analysis of Coal	
Total Hours	**30**

Reference(s)	
1	J. Mendham, R. C. Denney, J. D. Barnes, M. Thomas, B. Sivasankar, "Vogel's Text Book of Quantitative Chemical Analysis", (2009).
2	G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney, "Vogel's Text Book of Quantitative Chemical Analysis, 5th Edition, 2009.

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

Course Outcomes		Level
CO1	Analyze the quality of water samples with respect to their hardness, alkalinity, acidity and DO.	K4
CO2	Determine the amount of metal ions through volumetric and spectroscopic techniques.	K4
CO3	Analyze and determine the composition of coals.	K3
CO4	Learn simple method of synthesis of nano particles.	K1
CO5	Quantitatively analyze the impurities in solution by electro analytical techniques.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
CO2	3	1	2	-	-	1	2	-	-	-	-	1	-	-	-
CO3	3	2	1	1	-	-	1	-	-	-	-	-	-	-	-
CO4	2	1	2	-	-	2	2	-	-	-	-	-	-	-	-
CO5	2	1	2	-	1	2	2	-	-	-	-	1	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

HS24002-COMMUNICATIVE LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	2	30	1	60	40	100

Course Objectives

- To enable learners to understand the basics of communication.
- To empower learners to use narrative techniques to convey ideas and experiences in academic and work environment.
- To support learners in enhancing their linguistic competence and engaging in effortless dialogue.
- To assist learners in mastering language for the successful academic and professional communication.
- To strengthen language proficiency for effective comprehension of core curricula.

Basics of Communication **Listening -** Telephone conversation, Listening to Podcast, NEWS, Interviews **Speaking -** Verbal and Non-Verbal Conversation, Role play **Reading -** Types of Reading- Skimming, Scanning, Intensive and Extensive - finding key information in a given text	**6**
Narrative Skill Development **Listening -** Watching travel documentary **Speaking -** Narrating a story -Narrating a personal incident **Reading -** Reading Travelogues, Blogs	**6**
Enriching Speaking Skills **Listening -**Dialogues & Conversations **Speaking -**Group Conversation, Speaking on given topics and context **Reading -** Reading Newspaper Articles, Reading user manuals	**6**
Language Enhancement **Listening -** Listening to TED Talks, **Speaking -** Speaking about friends/places/hobbies, Delivering Welcome Address **Reading -** Reading Biography, Reading Editorial.	**6**
Technical Usage of Language **Listening -** Listening to native dialects & live commentaries **Speaking -** Group Discussion, Debates, Proposing Vote of Thanks **Reading -** Opinion articles, Journal Reports	**6**
Total Hours	**30**

Reference(s)

1	English for Academic Correspondence and Socializing by Adrian Wall work, Springer, 2011.
2	Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.

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

Course Outcomes		Level
CO1	Communicate effectively using grammatical words according to the context.	K3
CO2	Analyze the given context and frame content accordingly using narrative skills.	K4
CO3	Effectively use language techniques in extended discussions.	K3
CO4	Frame short and long sentences using grammatical techniques according to given context.	K3
CO5	Respond with clarity and accuracy in a range of professional situations, using appropriate linguistic accuracy.	K4

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	1	3	3	3	3	3	3	3	-	-	-
CO2	2	3	3	3	1	3	3	3	3	3	3	3	-	-	-
CO3	2	2	3	3	1	3	3	3	3	3	3	3	-	-	-
CO4	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
CO5	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
3 - Strong, 2 - Medium, 1 – Low															

ES24002 – ENGINEERING PRACTICES LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	4	60	2	60	40	100

Course Objectives

- Prepare pipe line plan; laying and connecting various pipe fittings used in common household plumbing work. Making joints in wood materials used in common household wood work.
- Prepare various welding joints in steel plates using arc welding work
- Wiring various electrical joints in common household electrical wire work.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

CIVIL ENGINEERING PRACTICES:

PLUMBING WORK:

- Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
- Preparing plumbing line sketches.
- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

- Sawing
- Planning
- Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

WOOD WORK STUDY:

- Studying joints indoor panels and wooden furniture.
- Studying common industrial trusses using models.

ELECTRICAL ENGINEERING PRACTICES :

- Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
- Staircase wiring
- Fluorescent Lamp wiring with introduction to CFL and LED types.
- Energy meter wiring and related calculations/ calibration
- Study of Iron Box wiring and assembly
- Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
- Study of emergency lamp wiring/Water heater

MECHANICAL ENGINEERING PRACTICES :	
WELDING WORK: • Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. • Practicing gas welding • Making of models.	
BASIC MACHINING WORK: • (simple) Turning. • (simple) Drilling. • (simple) Tapping.	
SHEET METAL WORK: • Making of as square tray.	
FOUNDRY WORK: • Demonstrating basic foundry operations.	
ELECTRONIC ENGINEERING PRACTICES:	
SOLDERING WORK: • Soldering simple electronic circuits and checking continuity	
ELECTRONIC ASSEMBLY AND TESTING WORK: • Assembling and testing electronic components on a small PCB.	
ELECTRONIC EQUIPMENT STUDY: • Study elements of smart phone. • Study of TV parts and working. • Assembly and dismantle of computer/ laptop	
Total Hours	**60**
Reference(s)	
1.	Shoop, Charles Franklin, "Mechanical Engineering Practice: A Laboratory reference text", McGraw-Hill Publisher, 1956.
2.	S Gowri, T Jayapoovan, "Engineering Practices Lab Manual", Vikas Publishing House, 2011.

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

	Course Outcomes	Level
CO1	Draw pipe line plan; layout and connect various pipe fittings used in common household plumbing work; make joints in wood materials used in common household wood work.	K1
CO2	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assembles simple mechanical common household equipments; Make a tray out of metal sheet using sheet metal work.	K2
CO3	Wire various electrical joints in common household electrical wire work.	K2
CO4	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1

CO2	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO3	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO4	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

SEMESTER -II

HS24003-COMMUNICATIVE ENGLISH II								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	1	0	45	3	40	60	100

Course Objectives

To enable the students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.
- Explore the business communication knowledge and understand the importance of presentation

UNIT I INTRODUCTION TO TECHNICAL ENGLISH **Listening** - Listening to talks mostly of a scientific/technical nature and completing information-gap exercises **Speaking** - Asking for and giving directions **Reading** - reading short technical texts from journals- news papers **Writing** - purpose statements – extended definitions – writing instructions – checklists- recommendations **Language Development** - subject verb agreement - compound words.	**9**
UNIT II READING AND STUDY SKILLS **Listening** - Listening to longer technical talks and completing exercises based on them- **Speaking** – Describing a process **Reading** – Reading longer technical texts- identifying the various transitions in a text- paragraphing **Writing** - Interpreting charts, graphs **Vocabulary Development**-vocabulary used in formal letters/emails and reports **Language Development** - Impersonal passive voice, numerical adjectives.	**9**
UNIT III TECHNICAL WRITING AND GRAMMAR **Listening** - Listening to classroom lectures/ talks on engineering/technology **Speaking** - Introduction to technical presentations **Reading** – longer texts both general and technical, practice in speed reading; **Writing** - Describing a process, use of sequence words **Vocabulary Development** - sequence words- Misspelled words. **Language Development** - embedded sentences.	**9**
UNIT IV PROFESSIONAL WRITING **Listening** - Listening to documentaries and making notes. **Speaking** – mechanics of presentations **Reading** – reading for detailed comprehension **Writing** - email etiquette - job application – cover letter – Resume preparation (digital and paper based) – analytical essays and issue based essays **Vocabulary Development** - finding suitable synonyms-paraphrasing	**9**

Language Development - clauses- if conditionals.	
UNIT V BUSINESS COMMUNICATION **Listening** - TED/Ink talks **Speaking** – participating in a group discussion **Reading** – reading and understanding technical articles **Writing** – Writing reports - accident and survey report – Memos – Notices - Circulars - Minutes of a meeting **Vocabulary Development**- verbal analogies- reported speech.	**9**
Total Hours	**45**

Textbook(s)	
1.	Swan Michael- Practical English Usage-Oxford University Press.
2.	Thomas A.J. and Martinet A.V- A Practical English Language-Oxford
Reference(s)	
1.	Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2.	Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad, 2015.
3.	Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4.	Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.

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

Course Outcomes		**Level**
CO1	Use proper technical vocabulary and grammar in appropriate contexts.	K2
CO2	Enhance speaking skills to participate confidently in formal / informal conversations and to do effective Presentations/Discussions.	K1
CO3	Critically read and analyze technical texts and articles of a general kind.	K1
CO4	Acquire a working knowledge of writing strategies, formats and templates of professional writing.	K3
CO5	Analyze different way of communication and get familiarized with proper presentation.	K2

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
CO2	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
CO3	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
CO4	3	3	3	3	2	3	3	3	2	3	3	3	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	3	3	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

MA24002 – STATISTICS AND NUMERICAL METHODS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	1	0	60	4	40	60	100

Course Objective

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

UNIT I NON- PARAMETRIC TESTS Introduction - The Sign test - The Signed - Rank test - Rank - sum tests - The U test - The H test - Tests based on Runs - Test of randomness - The Kolmogorov Tests.	**12**
UNIT II - DESIGN OF EXPERIMENTS One way and two way classifications - Completely randomized design – Randomized block design – Latin square design**.**	**12**
UNIT III - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.	**12**
UNIT IV - INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single integrations using Trapezoidal and Simpson's 1/3 rules.	**12**
UNIT V - NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 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.	**12**
Total Hours	**60**

Textbook(s)

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.

Reference(s)	
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.

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

Course Outcomes		Level
CO1	Apply the concept of testing of hypothesis for small and large samples in real life problems.	K1
CO2	Apply the basic concepts of classifications of design of experiments in the field of agriculture.	K2
CO3	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	K1
CO4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	K3
CO5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
CO2	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
CO3	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
CO4	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
CO5	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

PH24002 - PHYSICS FOR ELECTRONICS ENGINEERING

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	45	3	40	60	100

Course Objectives

- To make the students effectively understand the nature of conductors.
- To impart knowledge on semiconductor physics and its applications.
- To introduce the concepts of magnetic materials.
- To understand the importance of optical materials.
- To enable the students understand the applications of nano materials.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS Classical free electron theory – Expression for electrical conductivity – Thermal conductivity – Wiedemann-Franz law – Success and failures of CFE– Quantum free electron theory: degenerate states – Fermi- Dirac statistics –Effect of temperature on fermi function – Density of energy states – Energy bands in solids.	**9**
UNIT II SEMI CONDUCTORS AND ITS PROPERTIES Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in an intrinsic semiconductor – extrinsic semiconductors – Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect and devices.	**9**
UNIT III MAGNETIC MATERIALS AND SUPER CONDUCTORS Magnetic dipole moment – magnetic induction - magnetic permeability and susceptibility – Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism– para magnetism in the conduction electrons in metals – hard and soft magnetic materials – GMR devices. Introduction to super conductors – properties – types of superconductos – Application – magnetic levitation and SQUID.	**9**
UNIT IV OPTICAL PROPERTIES OF MATERIALS Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain – Optoelectronic devices: light detectors and solar cells – light emitting diode - optical processes in organic semiconductor devices.	**9**
UNIT V NANODEVICES Density of states for solids – Quantum confinement – Quantum structures – Density of states for quantum wells, wires and dots – Band gap of nano materials –synthesis of nano materials – top down and bottom-up process – pulsed laser method and chemical vapour deposition method – Carbon nanotubes: Properties and applications.	**9**
Total Hours	**45**

Textbook(s)

1	Kasap, S.O., “Principles of Electronic Materials and Devices”, McGraw-Hill Education, 2007.

2	Umesh K Mishra and Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
3	Wahab, M.A., "Solid State Physics: Structure and Properties of Materials", Narosa Publishing House, 2009.
Reference(s)	
1	Halliday, D., Resnick, R. and Walker. J, "Principles of Physics", Wiley, 2015.
2	Avathanulu, M.N. and Kshirsagar, P.G., "Engineering Physics", S. Chand and company, 2014.
3	Arthur Beiser, "Concepts of Modern Physics", Tata McGraw Hill, 2009.
4	Pillai, S.O., "Solid State Physics", New age International Publishers, 7th Edition, 2015

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

Course Outcomes		Level
CO1	Express their knowledge in understanding the electrical properties of materials.	K2
CO2	Able to gain knowledge on semi conducting materials.	K3
CO3	Understand the concepts of magnetic storage devices.	K3
CO4	Gain knowledge about opto electronic devices.	K2
CO5	Demonstrate a strong foundational knowledge in nano devices	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	1	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	1	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	1	-	-	-	-	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

EE24001 – CIRCUIT THEORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	1	0	60	4	40	60	100

Course Objectives

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits
- To educate on obtaining the transient response of circuits
- To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUIT ANALYSIS Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis DC and AC circuits. Simulation of kirchoffs laws by using multisim software.	**9**
UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem. Simulation of theorems by using PSIM software.	**9**
UNIT III TRANSIENT RESPONSE ANALYSIS L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input. Simulation of R, L, RL, RC, RLC circuits using Simscape software.	**9**
UNIT IV RESONANCE AND COUPLED CIRCUITS Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits. Simulation of resonance and coupled circuits using MATLAB software.	**9**
UNIT V THREE PHASE CIRCUITS Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced system– phasor diagram of voltages and currents – power measurement in three phase circuits-power factor calculations. Simulation of three phase circuits using National Instruments software.	**9**
Total Hours	**45**

Textbook(s)

1	William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2	Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", SecondEdition, McGraw Hill, 2013.
3	Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning

	India, 2013.
Reference(s)	
1	Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2	Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3	Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4	M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5	Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd.,New Delhi, 2015.
6	Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
7	Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.

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

Course Outcomes		Level
CO1	Ability to analyse electrical circuits	K1
CO2	Ability to apply circuit theorems	K2
CO3	Ability to analyse transients	K2
CO4	Ability to understand resonance and coupled circuits	K3
CO5	Ability to analyse three phase circuits	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	-	-	1	1	1	-	1	3	3	2
CO2	2	2	3	2	2	-	-	1	1	1	-	1	3	3	2
CO3	2	2	3	2	2	-	-	1	1	1	-	1	3	3	2
CO4	2	2	3	2	2	-	-	1	1	1	-	1	3	3	2
CO5	2	2	3	2	2	-	-	1	1	1	-	1	3	3	2
3 – Strong, 2 – Medium, 1 – Low															

CS24001-PROBLEM SOLVING AND PYTHON PROGRAMMING

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	1	0	60	4	40	60	100

Course Objectives

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

UNIT I INTRODUCTION TO PROBLEM SOLVING Fundamentals of Computing, Identification of computational problems, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).	**12**
UNIT II BASICS OF PYTHON PROGRAMMING Introduction: Features, Installation, Modes of operations (interpreter and interactive mode); variables and data types: int, float, boolean, string, and list; expressions, statements, operators and comments; modules and functions.	**12**
UNIT III CONTROL STATEMENTS & FUNCTIONS Conditionals:Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,parameters, local and global scope, function composition, recursion.	**12**
UNIT IV SEQUENTIAL DATA TYPES Strings: String slices, String functions and methods, immutability; Lists: list operations, list slices, list methods, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.	**12**
UNIT V FILES HANDLING AND EXCEPTIONS Files Handling: File types and operations (open, close, read and write), file positions; command line arguments; Exceptions: Introduction to errors and exceptions, handling exceptions, modules, packages.	**12**
Total Hours	**60**

Textbook(s)

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

Reference(s)

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

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

Course Outcomes		Level
CO1	Develop algorithmic solutions to simple computational problems.	K1
CO2	Develop and execute simple Python programs.	K2
CO3	Write simple Python programs using conditionals and loops for solving problems.	K2
CO4	Represent compound data using Python lists, tuples, dictionaries etc.	K3
CO5	Read and write data from/to files in Python programs.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
CO2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
CO3	3	3	3	2	2	-	-	-	-	-	2	-	3	-	-
CO4	2	2	-	-	2	-	-	-	-	-	1	-	3	-	-
CO5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
3 – Strong, 2 – Medium, 1 – Low															

TA24002 – TAMILS AND TECHNOLOGY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	1	0	0	15	1	40	60	100

Course Objectives

- Explore the historical development of technology in the Tamil region.
- Examine how traditional Tamil practices and knowledge systems have influenced technological advancements
- Promote inclusivity and diversity in the technology sector, encouraging the participation of Tamils in various technological fields.
- Provide a global perspective on Tamil contributions to technology and the role of Tamils in the global technology landscape.
- Explore the role of the Tamil language in technology, including the development of software, language processing, and digital content in Tamil.

UNIT I WEAVING AND CERAMIC TECHNOLOGY Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	**3**
UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 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)- ThirumalaiNayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	**3**
UNIT III - MANUFACTURING TECHNOLOGY 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.	**3**
UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu 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.	**3**
UNIT V - SCIENTIFIC TAMIL & TAMIL COMPUTING 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.	**3**
Total Hours	**15**

Textbook(s)	
1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (inprint).
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
Reference(s)	
1	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.)
2	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)
3	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
4	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

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

Course Outcomes		Level
CO1	Understand the extensive literature of Tamil and its classical nature.	K1
CO2	Understand the heritage of sculpture, painting and musical instruments of ancient people.	K2
CO3	Review on folk and martial arts of Tamil people.	K2
CO4	Realization of Thinai concepts, trade and victory of chozha dynasty.	K2
CO5	Understand the contribution of Tamils in Indian freedom struggle, self-esteem movement and siddha medicine.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
3 – Strong, 2 – Medium, 1 – Low															

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Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	1	0	0	15	1	40	60	100

Course Objective

- தமிழ் பிராந்தியத்தில் தொழில்நுட்பத்தின் வரலாற்று வளர்ச்சியை ஆராய்ச்சி செய்யுங்கள்.
- பாரம்பரிய தமிழ் நடைமுறைகளும் அறிவு அமைப்புகளும் தொழில்நுட்ப முன்னேற்றங்களை எவ்வாறு பாதித்துள்ளன என்பதை ஆராயுங்கள்
- பல்வேறு தொழில்நுட்பத் துறைகளில் தமிழர்களின் பங்கேற்பை ஊக்குவித்தல், தொழில்நுட்பத் துறையில் உள்ளடக்கம் மற்றும் பன்முகத்தன்மையை ஊக்குவித்தல்.
- தொழில்நுட்பத்திற்கான தமிழ் பங்களிப்புகள் மற்றும் உலகளாவிய தொழில்நுட்ப நிலப்பரப்பில் தமிழர்களின் பங்கு பற்றிய உலகளாவிய கண்ணோட்டத்தை வழங்கவும்.
- மென்பொருளின் வளர்ச்சி, மொழி செயலாக்கம், தமிழில் டிஜிட்டல் உள்ளடக்கம் உள்ளிட்ட தொழில்நுட்பத்தில் தமிழ் மொழியின் பங்கை ஆராயுங்கள்.

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் சங்க காலத்தில் நெசவுத் தொழில் பானைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.	**3**
அலகு II - வடிவமைப்பு மற்றும் சுட்டிடத் தொழில்நுட்பம் 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 இந்தோ-சாரோசெனிக் கட்டிடக் கலை.	**3**
அலகு III - உற்பத்தித் தொழில் நுட்பம் 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.	**3**
அலகு IV - வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம் அணை, ஏரி குளங்கள், மதகு சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் கால்நடை பராமரிப்பு கால்நடைகளுக்காக	**3**

வடிவமைக்கப்பட்ட கிணறுகள் வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் கடல்சார் அறிவு - மீன்வளம் முத்து மற்றும் முத்துக்குளித்தல் பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார சமூகம்.	
அலகு V - அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.	**3**
Total Hours	**15**

Textbook(s)	
1	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் - முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
Reference(s)	
1	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
2	Studies in the History of India with special reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
3	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

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

	Course Outcomes	Level
CO1	தமிழின் விரிவான இலக்கியங்களையும் அதன் செம்மொழித் தன்மையையும் புரிந்து கொள்ளுங்கள்.	K1
CO2	பழங்கால மக்களின் சிற்ப ஓவியம் மற்றும் இசைக்கருவிகளின் பாரம்பரியத்தைப் புரிந்து கொள்ளுங்கள்	K2
CO3	தமிழ் மக்களின் நாட்டுப்புற மற்றும் தற்காப்பு கலைகள் பற்றிய ஆய்வு.	K2
CO4	திணை கருத்துக்கள், வர்த்தகம் மற்றும் சோழ வம்சத்தின் வெற்றி.	K2
CO5	இந்திய சுதந்திரப் போராட்டத்திலும், சுயமரியாதை இயக்கத்திலும், சித்த மருத்துவத்திலும் தமிழர்களின் பங்களிப்பைப் புரிந்து கொள்ளுங்கள்	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
3 – Strong, 2 – Medium, 1 – Low															

MN24002 – ENVIRONMENTAL SCIENCE AND SUSTAINABILITY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	30	0	100	0	100

Course Objective

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I ENVIRONMENT AND BIODIVERSITY Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow – ecological succession. Biodiversity - Types of biodiversity: genetic, species and ecosystem biodiversity – Values of biodiversity, India as a megadive/rsity nation – hot-spots of biodiversity – Threats to biodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and Endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation.	**6**
UNIT II - ENVIRONMENTAL POLLUTION Causes, Effects and Preventive measures of Air pollution, Water pollution, Soil pollution and Noise pollution. Solid, Hazardous and E-Waste management. Environmental protection, Environmental protection acts.	**6**
UNIT III - RENEWABLE SOURCES OF ENERGY Energy management and conservation, New Energy Sources: Need of new sources. Different typesnew energy sources. Applications of Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.	**6**
UNIT IV - SUSTAINABILITY AND MANAGEMENT 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 - targets, indicators and intervention areas Climate change - Global, Regional and Local environmental issues and possible solutions - case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry - A case study.	**6**
UNIT V - SUSTAINABILITY PRACTICES Zero waste and R concept, Circular economy, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles -	**6**

carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization - Socio-economical and technological change.	
Total Hours	**30**

Textbook(s)	
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.
Reference(s)	
1	R. K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances andStandards", 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, 3rd Edition, 2015.
5	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" OrientBlackswan Pvt. Ltd. 2013.

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

Course Outcomes		Level
CO1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.	K1
CO2	To identify the causes, effects of environmental pollution and natural disasters and contributeto the preventive measures in the society.	K1
CO3	To identify and apply the understanding of renewable and non-renewable resources andcontribute to the sustainable measures to preserve them for future generations.	K3
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K2
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energycycles and the role of sustainable urbanization	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	3	3	-	-	-	-	2	-	-	-
CO3	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
CO4	3	2	1	1	-	2	2	-	-	-	-	2	-	-	-
CO5	3	2	1	-	-	2	2	-	-	-	-	1	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

EE24002 –CIRCUIT THEORY LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	0	0	4	60	2	60	40	100

Course Objective

The goal of this course is for students to,

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

List of Experiments

1. Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of Maximum Power transfer Theorem.
5. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
6. Simulation and Experimental validation of R-C and RLC electric circuit transients.
7. Simulation of three phase balanced and unbalanced star, delta networks circuits.

Reference(s)

1	Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill, 2022.
2	Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, 2017.

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

Course Outcomes		Level
CO1	Understand and apply circuit theorems and concepts in engineering applications.	K1
CO2	Simulate electric circuits.	K3

Mapping with Program Outcomes

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

3 – Strong, 2 – Medium, 1 – Low

CS24002 – PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	0	0	4	60	2	60	40	100

Course Objective

The goal of this course is for students to,

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

List of Experiments

1. a. Write a program for checking the given number is even or odd.
   b. Write a program for displaying reversal of a number.
2. a. Write a program for finding biggest number among 3 numbers.
   b. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
3. a. Implement python script to check the given year is leap year or not.
   b. Implement Python Script to generate first N natural numbers.
4. a. Implement Python Script to generate first N natural numbers.
   b. Implement Python Script to check given number is palindrome or not.
5. a. Implement Python script to print factorial of a number.
   b. Implement Python Script to print sum of N natural numbers.
6. a. Implement Python Script to check given number is Armstrong or not.
   b. Implement Python Script to generate prime numbers series up to n
7. Finding the minimum and maximum elements in the lists
8. Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.
9. Implement a python script for factorial of number by using recursion
10. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
11. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
12. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)

Reference(s)

1	Paul Deitel, Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2	John V Guttag, “Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, 3rd Edition, MIT Press, 2021.

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

Course Outcomes		Level
CO1	Develop algorithmic solutions to simple computational problems.	K2
CO2	Develop and execute simple Python programs.	K2
CO3	Write simple Python programs using conditionals and loops for solving problems.	K3
CO4	Decompose a Python program into functions.	K3
CO5	Represent compound data using Python lists, tuples, dictionaries etc.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
CO2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
CO3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
CO4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
CO5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
3 – Strong, 2 – Medium, 1 – Low															

SEMESTER - III

MA24305 – TRANSFORMS AND ITS APPLICATIONS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	1	0	60	4	40	60	100

Course Objectives

- To provide the idea of calculating area and volume involving ordinary and vector functions using integrals.
- To cater the needs of techniques to solve the problems occurring in fluid dynamics, electro-magnetic field theory
- To Analyze the Fourier series techniques in solving heat flow problems.
- To Apply Fourier series analysis for solving boundary value problems.
- To perform Fourier transform techniques in signal estimation Develop skills in complex integration and contour integration techniques, particularly their applications in evaluating real integrals.

UNIT I - VECTOR CALCULUS Gradient and directional derivative – Divergence and curl, irrotational and solenoidal vector fields – line, surface and volume integral - Green's theorem in a plane, Gauss's divergence theorem and Stoke's theorem (excluding proofs) verification and applications in evaluating line, surface and volume integrals.	**12**
UNIT II - FOURIER SERIES Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis	**12**
UNIT- III FOURIER TRANSFORMS Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity	**12**
UNIT IV – LAPLACE TRANSFORM Laplace transform-Sufficient conditions for existence-Transform of elementary functions-Basic Properties-Transform of derivatives and integral functions-Derivatives and integrals of transforms-Transforms of unit step function and impulse functions-Transform of periodic functions	**12**
UNIT V- INVERSE LAPLACE TRANSFORM Inverse Laplace Transform-Statement of convolution theorem-Initial and final value theorems-Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.	**12**

Total Hours	60
Textbook(s)	
1	Grewal B.S., “Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Delhi, 2022.
2	Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2021.
Reference(s)	
1	Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 2021.
2	Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2021.
3	James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi, 2022.
4	Narayanan. S., ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 2022..

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

Course Outcomes		Level
CO1	Solve engineering problems using the concepts of vector calculus.	K2
CO2	Construct an analytic function, when its real or imaginary part is known.	K3
CO3	Evaluating integrals using cauchy’s integral formula and residue theorem.	K3
CO4	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.	K2
CO5	Solve differential equations using Fourier transformation analysis which plays a vital role in engineering applications.	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	-	-	-	1	3	3	1	3	3	2
CO2	3	2	1	2	1	-	-	-	1	3	3	1	3	3	2
CO3	3	3	2	3	2	-	-	-	1	3	3	2	3	3	3
CO4	3	2	1	2	1	-	-	-	1	3	3	1	3	3	2
CO5	3	2	1	2	1	-	-	-	1	3	3	1	3	3	2
3 – Strong, 2 – Medium, 1 – Low															

EE24301 – ELECTROMAGNETIC THEORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	1	0	60	4	40	60	100

Course Objective

The goal of this course is for students to,

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of Electrostatic fields, electric potential, energy density and their applications.
- To impart knowledge on the concepts of Magnetostatic fields, magnetic flux density, vector potential and its applications.
- To impart knowledge on the concepts of Electromagnetic waves and characterizing parameters
- To impart knowledge on the concepts of Different methods of emf generation and Maxwell's equations

UNIT I BASICS OF ELECTROSTATICS Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications, simulation using Max FEM.	**12**
UNIT II ELECTROSTATICS Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization –Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density, Applications.	**12**
UNIT III MAGNETOSTATICS Lorentz force, magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop- Magnetic flux density (B) –, magnetic materials – Magnetization, Magnetic field in multiple media –Boundary conditions, Inductance, Energy density, Applications.	**12**
UNIT IV ELECTROMAGNETIC WAVES Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction.	**12**
UNIT V ELECTRODYNAMIC FIELDS Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory – Applications.	**12**
Total Hours	**60**

Textbook(s)

1.	S. Salivahanan and S. Karthie, " Electromagnetic Fields and Waves", Pearson Education, 3rd edition, 2024.
2.	Ahmad Shahid Khan and Saurabh Kumar Mukerji, "Electromagnetic Fields", CRC Press, 2023.
3.	Christos Christopoulos, "Principles and Techniques of Electromagnetic Compatibility" CRC Press 3rd edition, 2022.

Reference(s)

1.	James Clerk Maxwell, " A dynamic theory of the Electromagnetic field", Find Yo Genius Edition, 2024.
2.	Sedki M. Raid and Iman M. Salama, "Electromagnetic Fields and Waves", McGraw Hill Education (India), 2020.
3.	W H HaytJr, J A Buck, "Engineering Electromagnetics", McGraw Hill, 9th edition, 2020.

4.	V.V.Sarwate, "Electromagnetic fields and waves", Second Edition, Newage Publishers, 2018.
5.	Joseph. A.Edminister, "Schaum's Outline of Electromagnetics", Fifth Edition (Schaum's Outline Series), McGraw Hill, 2018.

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

Course Outcomes		Level
CO1	Illustrate Vector Calculus and Coordinate Systems	K2
CO2	Analyze electrostatic fields, electric potential and energy density along with their applications.	K4
CO3	Analyze Magnetostatic Fields	K4
CO4	Explain the concept of Electromagnetic Wave Propagation	K5
CO5	Compare Maxwell's Equations	K2

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	1	-	2	-	-	3	2	3	-	2	2
CO2	3	3	1	3	1	3	-	-	3	3	3	1	3	3
CO3	3	3	1	3	1	3	-	-	3	3	3	1	3	3
CO4	3	3	2	3	2	3	-	-	3	3	3	2	3	3
CO5	2	1	-	1	-	2	-	-	3	2	3	-	2	2
3 – Strong, 2 – Medium, 1 – Low														

EE24302 – ELECTRICAL MACHINES – I								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	40	60	100

Course Objective

The goal of this course is for students to,

- To understand the concept of 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 auto transformer and three phase transformers.

UNIT I MAGNETIC CIRCUITS AND ELECTROMECHANICAL ENERGY CONVERSION 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 mmf of distributed winding, magnetic fields in rotating machines.	**9**
UNIT II DC GENERATORS Principle of operation, constructional details, armature windings and its types, EMF equation, armature reaction, demagnetizing and cross magnetizing Ampere turns, compensating winding, commutation, methods of improving commutation, OCC and load characteristics of different types of DC Generators. Parallel operation of DC Generators, applications of DC Generators.	**9**
UNIT III DC MOTORS Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors, load characteristics of DC motors, losses and efficiency, condition for maximum efficiency. Testing of DC Machines: Brake test, Swinburne's test, Hopkinson's test, Separation of core losses-applications of DC motors, Fault diagnosis in DC machines, Simulation of rotating DC machines.	**9**
UNIT IV SINGLE PHASE TRANSFORMER Construction and principle of operation, equivalent circuit, phasor diagrams, testing - polarity test, open circuit and short circuit tests, voltage regulation, losses and efficiency, all day efficiency, back-to-back test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer.	**9**
UNIT V AUTOTRANSFORMER AND THREE PHASE TRANSFORMER Construction and working of auto transformer, comparison with two winding transformers, applications of autotransformer. Three Phase Transformer- Construction, types of connections and their comparative features, Scott connection, applications of Scott connection,Simulation of transformers.	**9**
Total Hours	**45**

Textbook(s)

1	Dr.S.KSen, "Electrical Machinery" ,Khanna Publishers, Latest Print 2025
2	TuranGonen& Ali Mehrizi-Sani"Electrical Machines and Their Applications", CRC Press, 2024.
3	P. S. Bimbhra, "Electric Machinery", Khanna Publishers, 2nd Edition, 2021.
4	I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017.

Reference(s)

1	Theraja B.L, Theraja A.K "Electrical Technology Volume II" S.Chand publications, Edition-2025.

2	A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBSPublishers, 2018.
3	A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 6th Edition 2017.

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

Course Outcomes		Level
CO1	Apply the laws governing the electromechanical energy conversion for singly and multiple excited systems.	K3
CO2	Explain the construction and working principle of DC Generators.	K5
CO3	Interpret the operation, starting, speed control methods and characteristics of DC motors.	K2
CO4	Construct the equivalent circuit of transformer and predetermine the efficiency and regulation.	K6
CO5	Elaborate the working principle of auto transformer, three phase transformer with different types of connections.	K6

Mapping with Program Outcomes

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

EE24303 – ELECTRONIC DEVICES AND CIRCUITS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	40	60	100

Course Objectives

The goal of this course is for students to,

- To understand the structure of basic electronic devices.
- To be exposed to active and passive circuit elements.
- To familiarize the operation and applications of transistor like BJT and FET.
- To explore the characteristics of amplifier gain and frequency response.
- To learn the required functionality of positive and negative feedback systems.

UNIT I PN JUNCTION DEVICES PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers — Half Wave and Full Wave Rectifier– Display devices- LED, Laser diodes, Zener diode characteristics - Zener Reverse characteristics–Zener as regulator	**9**
UNIT II TRANSISTORS AND THYRISTORS Biasing-need and types, DC and AC load line, Q point, BJT, JFET, MOSFET- structure, operation, characteristics, UJT, Thyristors and IGBT -Structure and characteristics.	**9**
UNIT III AMPLIFIERS BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.	**9**
UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers–Types (Qualitative analysis) PSpice simulator for circuit design.	**9**
UNIT V FEED BACK AMPLIFIERS AND OSCILLATORS Advantages of negative feedback – voltage / current, series, Shunt feedback –positive feedback – Condition for oscillations, phase shift– Wien bridge, Hartley, Colpitts and Crystal oscillators.	**9**
Total Hours	**45**

Textbook(s)

1.	K.Lal Kishore, “Electronic Devices and Circuits” , B S Publications, 4th Edition, 2025.
2.	Dale Patrick, Stephen Fardo, Ray Richardson and Vigyan Chandra “Electronic Devices and Circuit Fundamentals”, River Publishers, 2023.

Reference(s)

1.	J.B Gupta, “Electronic Devices and Circuits”, S.K.Kataria&Sons, 2022.
2.	S.Salivahanan, N.Suresh Kumar, “Electronic Devices and Circuits”, McGraw Hill, 5th edition 2022.
3.	R.Rajaragavi, N. Jayanthi, “Electronic Devices and Circuits”, Lakshmi Publications, Chennai, 2022.
4.	DhananjeyanRajendran, “Electronic Devices and Circuits”, Charulatha Publications, 2022.
5.	Dr.T.Tirupal, Dr.B..Chandra Mohan, Dr.S. Srinivas Kumar and Ms.P.BinduSwetha, “Electronic Devices and Circuits”,Mantech Publication, 2020.

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

Course Outcomes		Level
CO1	Explain the Physics of Semiconductor Devices	K2
CO2	Analyze BJT and FET Operation	K4
CO3	Analyze the structure and characteristics BJT, FET, MOSFET, UJT, Thyristor and IGBT	K4
CO4	Examine the performance of various configurations of BJT and MOSFET based amplifier	K4
CO5	Design Feedback Amplifier Circuits and Oscillators	K6

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	2	-	-	1	-	-	-	3	-	2	2
CO2	3	3	1	3	1	-	1	-	-	-	3	1	3	3
CO3	3	3	1	3	1	-	1	-	-	-	3	1	3	3
CO4	3	3	1	3	1	-	1	-	-	-	3	1	3	3
CO5	3	3	3	3	3	-	1	-	-	-	3	3	3	3
3 – Strong, 2 – Medium, 1 – Low														

EE24304- NETWORK ANALYSIS AND SYNTHESIS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	40	60	100

Course Objective

The goal of this course is for students to,

- To impart knowledge in design of two port network.
- Ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.
- To have knowledge in synthesis of any network knowing the stability of the system.
- To understand the various topologies of the network.

UNIT I -NETWORK THEOREMS (BOTH DC AND AC) Superposition Theorem - Reciprocity Theorem - Thevenin's Theorem - Norton's Theorem - Maximum Power Transfer Theorem, Millman's theorem, and Tellegen's theorem.	**9**
UNIT II - NETWORK FUNCTIONS AND ITS PARAMETERS Network Functions - Driving Point Impedance - Transfer Functions - Poles and Zeros, Significance of Poles and Zeros - Determination of Network Function of One Port and Two Port Network - Network Parameters - Z,Y, h and ABCD- Conditions for Reciprocity - Parameter Conversion.	**9**
UNIT III -TWO PORT NETWORKS Image Parameters - Iterative Parameter - Image and Iterative Parameters in terms of Open Circuit and Short Circuit Network - Parameters of Important Networks - Lattice Network - T Network , p Network - Twin Network - Network Conversions.	**9**
UNIT IV -SYNTHESIS OF LC, RL AND RC NETWORK Hurwitz polynomial - Positive Real function - Elementary Synthesis Procedure - Properties of LC, RC, and RL Driving Point Functions - Synthesis of LC, RC, RL and RLC Network using Foster and Cauer Forms.	**9**
UNIT V- NETWORK TOPOLOGY Network Topology - Basic concepts of Graph Theory, Network Graph, Tree, Incidence & Reduced Incidence Matrices, Cut sets, Tie sets, Cut Set Schedule, Tie set Schedule - Duality and Dual Networks.	**9**
Total Hours	**45**

Textbook(s)

1.	"Network Analysis", Valkenburg, 3rd Edition , Pearson Education.2024
2.	Circuit theory, Kurikose-PHI Publications. 2024

Reference(s)

1.	"Introduction to Network Synthesis", Valkenburg, PHI Publications.2023
2.	Sudhakar, A. Shyammohan, "Circuits and Network", Third Edition, 2020,Tata McGraw Hill.
3.	Kelkar, Pandit, "Linear Network Theory", Pratibha Publication,2021
4.	"Network Analysis And Synthesis", Wadhwa, New Age Publications.2022

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

Course Outcomes		Level
CO1	Explain the theorem statements and basics of solving a circuit Design.	K2
CO2	Relate pole and zero locations to characteristics of time-domain functions and frequency domain functions.	K1
CO3	Analyze the given network using different two port network parameters during the study of transmission and distribution.	K4
CO4	Interpret the basics of network synthesis.	K2
CO5	Illustrate various topologies of the network.	K2

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	1	-	-	1	-	-	-	3	-	2	2
CO2	1	-	-	-	-	-	1	-	-	-	2	-	1	2
CO3	3	3	1	3	1	-	1	-	-	-	3	1	3	2
CO4	2	1	-	1	-	-	1	-	-	-	3	-	2	2
CO5	2	1	-	1	-	-	1	-	-	-	3	-	2	2
3 – Strong, 2 – Medium, 1 – Low														

EE24305 –MEASUREMENT AND INSTRUMENTATION								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	40	60	100

Course Objectivess

The goal of this course is for students to,

- 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 Instruments: classification, applications – Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement -Statistical evaluation of measurement data.	**9**
UNIT II MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type watt meters – Energy meter – Megger – Instrument transformers (CT & PT).	**9**
UNIT III AC/DC BRIDGES AND INSTRUMENTATION AMPLIFIERS Wheatstone bridge, Kelvin double bridge - Maxwell, Hay, Wien and Schering bridges – Errors and compensation in A.C. bridges - Instrumentation Amplifiers.	**9**
UNIT IV TRANSDUCERS Classification of transducers – Measurement of pressure, temperature, displacement, flow, angular velocity – Digital transducers – Smart Sensors.	**9**
UNIT V DIGITAL INSTRUMENTATION 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.	**9**
Total Hours	**45**

Textbook(s)

1.	A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', DhanpatRai and Co, New Delhi, Edition 2024.
2.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2023

Reference(s)

1.	M.M.S. Anand, 'Electronics Instruments and Instrumentation Technology', Prentice Hall India, New Delhi, 2020
2.	J.J. Carr, 'Elements of Electronic Instrumentation and Measurement', Pearson Education India, New Delhi, 2023
3.	W.Bolton, Programmable Logic Controllers, 6th Edition, Elseiver, 2020.
4.	E. O. Doebelin and D. N. Manik, "Measurement Systems – Application and Design", Tata McGraw-Hill, New Delhi, 6th Edition 2020.

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

Course Outcomes		Level
CO1	Explain the fundamentals of measurement systems and the characteristics of instruments.	K2

CO2	Examine basic Electrical parameters	K4
CO3	Analyze bridge circuits	K4
CO4	Evaluate suitable transducers for measuring mechanical, thermal, optical, and electrical quantities such as displacement, temperature, pressure, and light.	K5
CO5	Apply digital techniques in measurement systems, including digital encoding, data logging, and storage	K3

Mapping with Program Outcomes

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

EE24311 – ELECTRONIC DEVICES AND CIRCUITS LABORATORY							
Hours/Week			Total Hours	Credit	Maximum Marks		
L	T	P		C	CIAT	ESE	Total
0	0	3	45	1.5	60	40	100

Course Objectives

The goal of this course is for students to,

- To expose the students to determine the characteristics of DC machines and transformers by performing experiments on these machines.
- To provide hands on experience to evaluate the performance parameters of DC machines and transformer by conducting suitable tests.

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 motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne's test and speed control of DC shunt motor.
7. Hopkinson's test on DC motor–generator set.
8. Load test on single-phase transformer.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner's test on single phase transformers.
11. Study of starters and 3-phase transformers connections.

References

1	Theraja B.L, Theraja A.K "Electrical Technology Volume II" S.Chand publications, Edition-2025.
2	J.B. Gupta, "Electrical Machines (AC, DC Machine)", S.K. Kataria& Sons, 4th edition, 2020.
3	A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBSPublishers, 2018.
4	Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.

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

Course Outcomes		Level
CO1	Analyze the performance of DC motors and DC generators by performing load test.	K4
CO2	Determine the Open and load Characteristics of a DC shunt/compound generators by performing suitable experiment.	K5
CO3	Inspect the direct and indirect testing methods of DC machine for obtaining the various performance characteristics.	K4
CO4	Examine the efficiency and regulation of the transformer by performing load test.	K4
CO5	Evaluate the performance of transformer under short circuit test, open circuit test and Sumpner's Test.	K5

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	3	1	3	-	1	-	-	3	1	3	-
CO2	3	3	2	3	2	3	-	1	-	-	3	2	3	-
CO3	3	3	1	3	1	3	-	1	-	-	3	1	3	-
CO4	3	3	1	3	1	3	-	1	-	-	3	1	3	-
CO5	3	3	2	3	2	3	-	1	-	-	3	2	3	-
3 – Strong, 2 – Medium, 1 – Low														

EE24313 – MEASUREMENT AND INSTRUMENTATION LABORATORY							
Hours/Week			Total Hours	Credit	Maximum Marks		
L	T	P		C	CIAT	ESE	Total
3	0	0	60	1.5	60	40	100

Course Objective

The goal of this course is for students to,

- To familiarize with the fundamental principles of measurement systems and instrumentation.
- To develop hands-on skills in handling various measurement instruments and transducers.
- To analyze and interpret experimental data systematically.
- To study the characteristics and behaviour of sensors and transducers.
- To gain experience in designing and setting up measurement systems.

List of Experiments

1. Calibration and Testing of Single Phase Energy Meter
2. Calibration of Dynamometer Type Power Factor Meter
3. Measurement of inductance using Maxwell's Bridge.
4. Measurement of capacitance using Schering Bridge.
5. Measurement of low resistance using Kelvin's Double Bridge.
6. Measurement of Power using CT and PT.
7. Measuring displacement using LVDT.
8. Measuring temperature using thermocouple.
9. Speed measurement using Hall Effect sensor.
10. PC based data logging of temperature sensor using LabVIEW/MATLAB
11. Signal conditioning of analog signal using LabVIEW /MATLAB

Textbooks

1	A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', DhanpatRai and Co, New Delhi, Edition 2024.
2	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2023

References

1	M.M.S. Anand, 'Electronics Instruments and Instrumentation Technology', Prentice Hall India, New Delhi, 2020
2	J.J. Carr, 'Elements of Electronic Instrumentation and Measurement', Pearson Education India, New Delhi, 2023
3	W.Bolton, Programmable Logic Controllers, 6th Edition, Elseiver, 2020.
4	E. O. Doebelin and D. N. Manik, "Measurement Systems – Application and Design", Tata McGraw-Hill, New Delhi, 6th Edition 2020.

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

Course Outcomes		Level
CO1	Explain the importance of calibration of measuring instruments	K4
CO2	Demonstrate the construction and working of different measuring instruments.	K5
CO3	Analyze Dc bridges for accurate resistance measurement	K4
CO4	Measure the electrical engineering parameters like voltage, current, power & phase difference in industry as well as in power generation, transmission and distribution sectors.	K4
CO5	Analyze the problems in the field of electrical measurements.	K5

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	-	1	-	3	1	1	2	2	3	-	3	-
CO2	3	1	-	1	-	3	1	1	2	2	3	-	3	-
CO3	3	3	1	3	1	3	1	1	2	2	3	1	3	-
CO4	3	3	2	3	2	3	1	1	2	2	3	2	3	-
CO5	3	3	1	3	1	3	1	1	2	2	3	1	3	-
3 – Strong, 2 – Medium, 1 – Low														

SEMESTER-IV

EE24401 – ENERGY STORAGE TECHNIQUES								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	60	4	50	50	100

Course Objectives

The goal of this course is for students to,

- To classify storage technologies by energy.
- To understand the Energy storage systems in modern electrical systems.
- To design the batteries in both software and hardware development
- To understand the Current and future trends in energy storage systems.

UNIT I ENERGY STORAGE TECHNOLOGIES Classification of Storage Technologies by Energy type- Thermal Energy: Heat Storage; Chemical Energy: Organic and Non- Organic; Mechanical Energy: Kinetic and Potential Energy; Electrical Energy: Electrical Potential.	**9**
UNIT II ENERGY STORAGE SYSTEMS IN MODERN ELECTRICAL SYSTEMS Lead-acid battery, Nickel-cadmium battery, Lithium-ion battery, Sodium-sulfur battery, Nickel metal hydride battery, Fuel cells, Capacitors and Super capacitors. Solid state Batteries. Differences amongst different ESS.	**9**
UNIT III BATTERIES FOR THE EV APPLICATION Batteries for the EV application: Performance criterion for EV batteries- Energy density, Amp hour density, Energy efficiency, Cost, Operating temperature, number of life cycles, recharge and self-discharge rates and commercial availability, some reference batteries and extension to non- automotive sectors	**9**
UNIT IV BATTERY MANAGEMENT SYSTEMS Introduction to BMS, Objectives of the BMS: Discharging control, Charging control, State-of-Charge Determination, State-of-Health Determination, Cell Balancing; BMS topologies: Distributed Topology, Modular Topology and Centralized Topology, Firmware development, Certification, Aging.	**9**
UNIT V DEVELOPMENT CYCLE OF BATTERIES ESS sizing, Electrical, Mechanical and Thermal Design, BMS Software and Hardware development, Prototype development, System Validation, Lab Testing, Safety test and Certification.	**9**
LAB COMPONENTS : **1.** Identify the Components in Electric Vehicle **2.** Testing the Components of Battery , Key Switch , Controller, Headlight in Electric Vehicle **3.** Design a BLDC Circuit in Electric Vehicle **4.** Identify the Weight of each Cell in Different Battery **5.** Using A 4-Pin Relay and Simulate the Working of the Motor and Charger	**15**
Total Hours	**60**

Textbook(s)

1.	Towards Next Generation Energy Storage Technologies" by Yu Li, Minghua Chen, SaisaiQiu, and Minghua Chen (2024):
2.	Tom Denton, "Automotive Electrical and Electronic Systems", 5thEdition, Routledge ,2018
3.	MehardEhsani, YimingGao, Stefano longo and KambizEbrahimi, "Modern Electric, Hybrid Electric, and

	Fuel Cell Vehicles", CRC Press, 3rd Edition. 2019
Reference(s)	
1.	Energy Storage Systems: A Comprehensive Guide" by Abdellatif M. Sadeq (2023):
2.	K. T. Chau, "Energy Systems for Electric and Hybrid Vehicles," IET Transportation Series 2 ,2016
3.	Jiuchun Jiang and Caiping Zhang, "Fundamentals and Applications of Lithium–Ion Batteries in Electric Drive Vehicles," John Wiley & Sons ,2015
4.	E. Karden, S. Ploumen, B. Fricke, T. Miller and K. Snyder, "Energy storage devices for future hybrid electric vehicles," J. Power Sources, vol. 168, no. 1, pp. 2–11, 2007

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

Course Outcomes		Level
CO1	Distinguish various Energy Storage Technologies	K4
CO2	Identify Energy Storage Systems in Modern Electrical Systems	K3
CO3	Analyze the characteristics and development cycle of Batteries	K4
CO4	Explain the different topologies in Energy Management Systems	K5
CO5	Analyze the performance of EV batteries	K4

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	3	1	3	-	-	1	-	3	1	3	-
CO2	3	2	-	2	-	3	-	-	1	-	3	-	3	-
CO3	3	3	1	3	1	3	-	-	1	-	3	1	3	-
CO4	3	3	2	3	2	3	-	-	1	-	3	2	3	-
CO5	3	3	1	3	1	3	-	-	1	-	3	1	3	-
3 – Strong, 2 – Medium, 1 – Low														

EE24402- ELECTRICAL MACHINES - II								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

The goal of this course is for students to,

- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor
- Construction, principle of operation and performance of induction machines
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I - SYNCHRONOUS GENERATOR Constructional details – Types of rotors - EMF equation – Synchronous reactance – Armature reaction – Phasor diagrams of non-salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A method.	**9**
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 – Current loci for constant power input, constant excitation and constant power Developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.	
UNIT III THREE PHASE INDUCTION MOTOR 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 – Synchronous induction motor- Induction generators.	**9**
UNIT IV STARTING, SPEED CONTROL AND BRAKING OF THREE PHASE INDUCTION MOTOR 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.	**9**
UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 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 - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems, Simulation of special machines.	**9**
Total Hours	**45**

Textbook(s)

1.	Theraja B.L, Theraja A.K "Electrical Technology Volume II" S.Chand publications, Edition-2025.
2.	DionysiosAliprantis, Oleg Wasynczuk, "Electric Machines", Cambridge University Press Published 2022.
3.	A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 7th Education 2020.
4.	D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 5th Edition 2017.

Reference(s)

1.	Satish Kumar Peddapelli& Sridhar Gaddam, "Electrical Machines: A Practical Approach", De Gruyter publisher, 2020.
2.	V.K Mehta, Rohit Mehta, "Principles of Electrical Machines"S Chand publications, 2nd Edition 2019.

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

Course Outcomes		Level
CO1	Infer the principle of operation and constructional details of Synchronous generators.	K3
CO2	Elaborate the principle of operation and starting methods of Synchronous Motor.	K5
CO3	Demonstrate the working operation and conducting load tests of Three Phase Induction Motor.	K4
CO4	Build the knowledge on various starting and speed control methods of induction motors	K5
CO5	Interpret the working operation of Single-phase induction motors and Special Electrical Machines.	K5

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	1	-	2	-	-	1	-	2	-	2	-
CO2	3	3	3	3	3	3	-	-	1	-	3	3	3	-
CO3	2	1	-	1	-	2	-	-	1	-	2	-	2	-
CO4	3	2	-	2	-	3	-	-	1	-	3	-	3	-
CO5	3	3	2	3	2	3	-	-	1	-	3	2	3	-
3 – Strong, 2 – Medium, 1 – Low														

EE24403 -TRANSMISSION AND DISTRIBUTION								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

The goal of this course is for students to,

- Understand the configuration of electrical power systems.
- Explain the line parameters and their interference with neighbouring circuits.
- Analyze the mechanical design and performance of transmission lines.
- Compare and contrast the different types of insulators and underground cables.
- Assess the distribution system and its components.

UNIT I - TRANSMISSION LINE PARAMETERS Structure of electric power system - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance, and capacitance of solid, stranded, and bundled conductors - Typical configuration, conductor types - Symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD; skin and proximity effects.	**9**
UNIT II - MODELLING AND PERFORMANCE OF TRANSMISSION LINES Performance of Transmission lines – short line, medium line and long line – equivalent circuits, phasor diagram, surge impedance – transmission efficiency and voltage regulation, real and reactive power flow in lines – Power Circle diagrams – Ferranti effect – Formation of Corona – Critical Voltages – Effect on line Performance.	**9**
UNIT III DESIGN OF OVERHEAD LINES Mechanical design of overhead lines – Line Supports –Types of towers – Tension and Sag Calculation for different weather conditions – Methods of grounding - Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators**.**	**9**
UNIT IV UNDERGROUND CABLES Underground cables – Types of cables – Construction of single-core and 3-core belted cables– Insulation Resistance – Potential Gradient – Capacitance of single-core and 3-core belted cables – Grading of cables – Power factor and heating of cables– DC cables.	**9**
UNIT V AC AND DC DISTRIBUTION SYSTEMS Distribution Systems – General Aspects – Kelvin's Law – AC and DC distributions–Concentrated and Distributed loading- Techniques of Voltage Control and Power factor improvement – Distribution Loss – Types of Substations – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).	**9**
Total Hours	**45**

Textbook(s)	
1.	C.L.Wadhwa, 'Electrical Power Systems', New Age International Ltd, seventh edition 2022.
2.	D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Mc Graw-Hill Publishing Company limited, New Delhi, Third Edition, 2019.
Reference(s)	
1.	B.R.Gupta, 'Power System Analysis and Design' S. Chand, New Delhi, Sixth Edition, 2011.
2.	R.K.Rajput, 'A Text Book of Power System Engineering' 2nd edition, Laxmi Publications (P) Ltd, New Delhi, 2016.
3.	HadiSaadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 23rd reprint, 2015.
4.	V.K.Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi,
5.	G.Ramamurthy, "Handbook of Electrical power Distribution," Universities Press, 2013

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

Course Outcomes		Level
CO1	Explain the structure of electric power systems, including generation, transmission, and distribution networks.	K3
CO2	Analyze the performance of transmission lines in terms of voltage regulation, efficiency, and power losses.	K4
CO3	Estimate the sag and tension in transmission lines under various loading conditions using appropriate methods	K6
CO4	Design cable systems considering insulation levels, voltage ratings, and laying methods in accordance with standards.	K5
CO5	Illustrate the structure and components of AC and DC distribution systems, including feeders, distributors, and service mains.	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	1	-	2	-	-	1	-	3	-	2	-
CO2	3	3	1	3	1	3	-	-	1	-	3	1	3	-
CO3	3	3	2	3	2	3	-	-	1	-	3	2	3	-
CO4	3	3	3	3	3	3	-	-	1	-	3	3	3	-
CO5	2	1	-	1	-	2	-	-	1	-	3	-	2	-
3 – Strong, 2 – Medium, 1 – Low														

EE24404- POWER ELECTRONICS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

The goal of this course is for students to,

- To understand the various applications of power electronic devices for conversion, control and conditioning of the electrical power.
- To understand the operation, characteristics and perform of controlled rectifiers.
- To understand the operation, switching techniques and basic topologies of DC-DC switching regulators.
- To understand the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To understand the operation of AC voltage controller and various configurations of AC voltage controller.

UNIT I INTRODUCTION TO POWER ELECTRONICS Overview of Power Electronics and Applications-Power Semiconductor Devices: Diodes, Thyristors, MOSFETs, IGBTs-Characteristics and Switching Behavior of Power Devices-Drive Circuits for Power Semiconductor Devices-Thermal Management and Heat Sinks	**9**
UNIT II AC-DC CONVERTERS (RECTIFIERS) Principles of AC-DC Conversion-Single-Phase and Three-Phase Rectifiers-Controlled Rectifiers and Phase-Control Techniques-Power Factor Correction and Harmonics-Design and Analysis of Rectifier Circuits	**9**
UNIT III DC-DC CONVERTERS Basic Concepts of DC-DC Conversion-Buck, Boost, Buck-Boost, and Cuk Converters-Continuous and Discontinuous Conduction Modes-Design and Analysis of DC-DC Converters-Applications of DC-DC Converters in Power Supplies and Renewable Energy Systems	**9**
UNIT IV DC-AC CONVERTERS (INVERTERS) Principles of DC-AC Conversion-Single-Phase and Three-Phase Inverters-Pulse Width Modulation (PWM) Techniques-Design and Analysis of Inverter Circuits-Applications of Inverters in Motor Drives and Renewable Energy Systems	**9**
UNIT V AC-AC CONVERTERS AC Voltage Controllers and Cycloconverters-Matrix Converters and Their Applications-Resonant Converters and Soft-Switching Techniques-Power Electronics in Renewable Energy Systems: Solar, Wind, and Energy Storage-Future Trends and Innovations in Power Electronics	**9**
Total Hours	**45**

Textbook(s)

1.	Ned Mohan, T.M.Undeland, W.P.Robbins, ”Power Electronics: Converters, applications and design”, John Wiley and Sons, 2020
2.	Rashid M.H., Power Electronics Circuits, Devices and Applications, Prentice Hall India, New Delhi, 2024.

Reference(s)

1.	Cyril. W.Lander, Power Electronics, McGraw Hill International,2019.
2.	P.S.Bimbhra, Power Electronics, Khanna Publishers, Third Edition 2003
3.	Philip T.Krein, Elements of Power Electronics, Oxford University Press, 2013

4.	P.C.Sen, Power Electronics, Tata McGraw-Hill, 30th reprint, 2008.

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

Course Outcomes		Level
CO1	Illustrate the operation of semiconductor devices	K2
CO2	Analyze AC-DC Converters (Rectifiers)	K4
CO3	Examine DC-DC Converters (Choppers)	K3
CO4	Explain the working of single-phase and three- phase inverters, and understand pulse – width modulation(PWM) techniques.	K5
CO5	Examine AC-AC Converter	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	2	-	2	1	-	1	-	3	-	2	-
CO2	3	3	1	3	1	3	1	-	1	-	3	1	3	-
CO3	3	3	1	3	1	3	1	-	1	-	3	1	3	-
CO4	3	3	2	3	2	3	1	-	1	-	3	2	3	-
CO5	3	3	1	3	1	3	1	-	1	-	3	1	3	-
3 – Strong, 2 – Medium, 1 – Low														

EE24405 – LINEAR AND DIGITAL INTEGRATED CIRCUITS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

The goal of this course is for students to,

- IC fabrication procedure and Signal analysis using Op-amp based circuits.
- Characteristics of Op-amp.
- Applications of Op-amp.
- Various number systems and simplify mathematical expressions using Boolean functions
- Analyze combinational and sequential circuit

UNIT I IC FABRICATION IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Fabrication of diodes, capacitance, resistance, FETs and PV Cell	**9**
UNIT II CHARACTERISTICS OF OPAMP Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier, frequency response of OP-AMP, Basic applications of op-amp – Inverting and Non-inverting Amplifiers, summer, differentiator and integrator-V/I & I/V converters.	**9**
UNIT III APPLICATIONS OF OPAMP Instrumentation amplifier and its applications for transducer Bridge, Log and Antilog Amplifiers- first and second order active filters, comparators, multivibrators, waveform generators, clippers, clampers.	**9**
UNIT IV FUNDAMENTALS OF DIGITAL LOGIC Introduction to Digital Systems-Binary Numbers and Arithmetic-Boolean Algebra and Boolean Functions-Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR-Simplification of Boolean Functions using Karnaugh Maps, simulation using Verilog.	**9**
UNIT V COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS Design and Analysis of Combinational Circuits-Adders, Subtractors, and Comparators-Multiplexers and Demultiplexers-Encoders and Decoders Introduction to Sequential Circuits-Flip-Flops: SR, D, JK, and T Flip-Flops-Design and Analysis of Synchronous Sequential Circuits-Counters: Asynchronous and Synchronous-Shift Registers and Applications	**9**
Total Hours	**45**

Textbook(s)

1.	D. Roy Choudhary, Shalil B. Jain, "Linear Integrated Circuits", New Age, 6th Edition, 2023.
2.	Morris Mano.M, Michael D Ciletti,"Digital Design -With an Introduction to the Verilog HDL, VHDL and system Verilog", Prentice Hall of India, 6thEdition, 2022.
3.	A. Anand Kumar, "Fundamentals of Digital Circuits", PHI, 4th edition, 2022.
4.	RamakantA.Gayakward, "Op-amps and Linear Integrated Circuits", IV edition, Pearson Education, PHI 2021.
5	Thomas L Floyd, "Digital fundamentals", Pearson Education Limited, 11th Edition, 2018
6	Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4th Edition, Tata Mc Graw-Hill, 2016

Reference(s)

1.	Widmer and Moss Tocci, "Digital Systems", Pearson Education, 12th edition, 2022.

2.	Thomas Floyd, “Digital Fundamentals”, Pearson Education, 11th edition, 2021.
3.	Donald P Leach, Albert Paul Malvino, GoutamSaha, “Digital Principles and Applications”, Tata McGraw Hill, 8th Edition, 2020.
4.	Jacob Millman, Christos C.Halkias, “Integrated Electronics - Analog and Digital circuits system”, McGraw Hill, 2nd Edition, 2017.
5.	Tocci R.J., Neal S. Widmer, “Digital Systems: Principles and Applications", Pearson Education Asia, 12th Edition, 2017

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

Course Outcomes		Level
CO1	Explain fabrication of monolithic ICs, fabrication of diodes, capacitance, resistance, FETs and PV Cell.	K2
CO2	Analyze the characteristics and basic applications (inverting/non-inverting amplifier, summer, differentiator, integrator, V/I and I/V converter) of Op-Amp	K4
CO3	Evaluate op-amp based instrumentation amplifier, log/antilog amplifier, analog multiplier /divider, active filters, comparators, waveform generators	K5
CO4	Explain the fundamentals of logic circuits	K2
CO5	Analyze various Combinational and Sequential circuit	K4

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	1	-	2	-	-	1	-	3	-	2	-
CO2	3	3	1	3	1	3	-	-	1	-	3	1	3	-
CO3	3	3	2	3	2	3	-	-	1	-	3	2	3	-
CO4	2	1	-	1	-	2	-	-	1	-	3	-	2	-
CO5	3	3	2	3	2	3	-	-	1	-	3	2	3	-
3 – Strong, 2 – Medium, 1 – Low														

EE24406-CONTROL SYSTEMS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

The goal of this course is for students to,

- To make the students to familiarize with various representations of systems.
- To make the students to analyze the stability of linear systems in the time domain and frequency domain.
- To make the students to analyze the stability of linear systems in the frequency domain.
- To make the students to design compensator based on the time and frequency domain specifications.
- To develop linear models: mainly state variable model and Transfer function model.

UNIT I -MODELING OF LINEAR TIME INVARIANT SYSTEM (LTIV) Control system: Open loop and Closed loop–Feedback control system characteristics–First principle modeling: Mechanical, Electrical and Electromechanical systems–Transfer function representations: Block diagram and Signal flow graph.	**9**
UNIT II -TIME DOMAIN ANALYSIS Standard test inputs – Time response – Time domain specifications – Stability analysis: Concept of stability– Routh Hurwitz stability criterion–Root locus: Construction and Interpretation. Effect of adding poles and zeros.	**9**
UNIT III -FREQUENCY DOMAIN ANALYSIS Bode plot, Polar plot and Nyquist plot: –Frequency domain specifications Introduction to closed loop Frequency Response	**9**
UNIT IV -STATE VARIABLE ANALYSIS State variable formulation – Non uniqueness of state space model – State transition matrix –Eigen values – Eigen vectors - Free and forced responses for Time Invariant and Time Varying Systems – Controllability – Observability	**9**
UNIT V -DESIGN OF FEED BACK CONTROL SYSTEM Design specifications –Lead, Lag and Lag-lead compensators using Root locus and Bode plot techniques–PID controller –PID control in State Feedback form.	**9**
Total Hours	**45**

Textbook(s)

1.	J.Nagrath , M Gopal,"Control Systems Engineering", New Age International Private Limited,8th Edition 2025
2.	Dr. S. Panda, S.Padhy, S.R. Das , "Control Systems Engineering", S.k. Kataria& Sons, Reprint 2024
3.	Arthur G.O. Mutambara , "Design and Analysis of Control Systems" ,Second Edition 2024, CRC Press

Reference(s)

1.	Dr.FaridGolnaraghi, Dr.BenjaminC.Kuo , "Automatic Control Systems", 10th Edition , McGraw Hill Education.2024
2.	Adrian Olaru, GabrialFrumusanu, CatalinAlexandru , "Dynamic Modelling and Simulation for Control Systems", 2nd Edition, ,2024 , MDPI Books.
3.	AdrainMedioli, Graham Goodwin, "Practical Control System Design", Wiley publications, 2024.
4.	Mohammad H Rashid , "Control System Analysis and Design", Cengage publications, 2022.

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

Course Outcomes		Level
CO1	Analyze the modelling of linear invariant system.	K4
CO2	Examine time domain analysis	K3
CO3	Analyze frequency domain in closed loop system	K4
CO4	Infer state variable forms in systems.	K3
CO5	Design feedback control systems using PID controller.	K6

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	3	1	3	-	-	2	-	3	1	3	-
CO2	3	3	1	3	1	3	-	-	2	-	3	1	3	-
CO3	3	3	1	3	1	3	-	-	2	-	3	1	3	-
CO4	2	1	-	1	-	2	-	-	2	-	3	-	2	-
CO5	3	3	3	3	3	3	-	-	2	-	3	3	3	-
3 – Strong, 2 – Medium, 1 – Low														

EE24411 - ELECTRICAL MACHINES LABORATORY – II							
Hours/Week			Total Hours	Credit	Maximum Marks		
L	T	P		C	CIAT	ESE	Total
0	0	4	60	1.5	60	40	100

Course Objective

The goal of this course is for students to,

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

List of Experiments

1. Regulation of three phase alternator by EMF and MMF methods
2. Regulation of three phase alternator by ZPF and ASA methods
3. Regulation of three phase salient pole alternator by slip test
4. V and Inverted V curves of Three Phase Synchronous Motor
5. Load test on three-phase induction motor
6. No load and blocked rotor tests on three-phase induction motor.
7. Separation of No-load losses of three-phase induction motor
8. Load test on single-phase induction motor
9. No load and blocked rotor test on single-phase induction motor
10. Study of Induction Motor Starters

Reference(s)

1	Leonard Oulton, "Practical Testing Of Electrical Machines"Legare Street Press Edition 2023.
2	A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 7th Education 2020.
3	B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers,3rd Edition, Reprint 2020.

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

Course Outcomes		Level
CO1	Analyze the voltage regulation by using EMF and MMF methods.	K4
CO2	Examine the characteristics of V and Inverted V curves.	K4
CO3	Evaluate the performance of alternators by conducting various tests.	K5
CO4	Determine the performance of induction motors using standard, analytical as well as graphical methods.	K5
CO5	Inspect the separation of losses in a three phase induction motor with an experiment.	K4

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	3	1	-	1	1	-	1	3	1	3	-
CO2	3	3	1	3	1	-	1	1	-	1	3	1	3	-
CO3	3	3	2	3	2	-	1	1	-	1	3	2	3	-
CO4	3	3	2	3	2	-	1	1	-	1	3	2	3	-
CO5	3	3	1	3	1	-	1	1	-	1	3	1	3	-
3 – Strong, 2 – Medium, 1 – Low														

EE24412 – LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY							
Hours/Week			Total Hours	Credit	Maximum Marks		
L	T	P		C	CIAT	ESE	Total
0	0	3	60	1.5	60	40	100

Course Objective

The goal of this course is for students to,

- To learn design, testing and simulation of circuit behaviour with combinational logic gate ICs.
- To learn design, testing and characterizing of circuit behaviour with register/ counter and sequential logic ICs.
- To learn design, testing and characterizing of circuit behaviour with digital ICs like decoders, multiplexers.
- To learn design, testing and characterizing of circuit behavior with OPAMP ICs.

List of Experiments

1. Implementation of Boolean Functions, Adder and Subtractor circuits and also simulate it using Verilog software.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa.
3. Parity generator and parity checking
4. Encoders and Decoders.
5. Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter ICs
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC's.
7. Study of multiplexer and de multiplexer
8. Timer IC application: Study of NE/SE 555 timer in Astability, Mono stability operation.
9. Applications of Op-Amp: inverting and non-inverting amplifier, Adder, comparator.
10. Applications of Op-Amp: Integrator and Differentiator

Reference(s)

1	D. Roy Choudhary, Shalil B. Jain, "Linear Integrated Circuits", New Age, 6th Edition, 2023.
2	Morris Mano.M, Michael D Ciletti,"Digital Design -With an Introduction to the Verilog HDL, VHDL and system Verilog", Prentice Hall of India, 6thEdition, 2022.
3	Thomas Floyd, "Digital Fundamentals", Pearson Education, 11th edition, 2021.

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

Course Outcomes		Level
CO1	Examine Boolean Functions, Adders and subtractors using verilog	K4
CO2	Analyze the importance of code conversion and parity generators	K4
CO3	Design decoders, multiplexers, registers and counters.	K6
CO4	Analyze inverting and non-inverting amplifier, Adder and Comparator.	K4
CO5	Construct Integrator and Differentiator.	K6

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	3	1	1	1	3	1	1	3	1	3	-
CO2	3	3	1	3	1	1	1	3	1	1	3	1	3	-
CO3	3	3	3	3	3	1	1	3	1	1	3	3	3	-
CO4	3	3	1	3	1	1	1	3	1	1	3	1	3	-
CO5	3	3	3	3	3	1	1	3	1	1	3	3	3	-

3 – Strong, 2 – Medium, 1 – Low

EE24413- CONTROL SYSTEMS LABORATORY							
Hours/Week			Total Hours	Credit	Maximum Marks		
L	T	P		C	CIAT	ESE	Total
0	0	3	60	1.5	60	40	100

Course Objective

The goal of this course is for students to,

- To make the students familiarize with various representations of systems.
- To make the students analyze the stability of linear systems in the time domain and frequency domain.
- To make the students design compensator based on the time and frequency domain Specifications.
- To develop linear models mainly state variable model and transfer function model
- To make the students to design a complete closed loop control system for the physical systems.

List of Experiments

1. Analog (op amp based) simulation of linear differential equations.
2. Numerical Simulation of given nonlinear differential equations.
3. Real time simulation of differential equations
4. Root Locus based analysis in simulation platform.
5. Mathematical modeling and simulation of physical systems in at least two fields.
   1. Mechanical
   2. Electrical
   3. Chemical process
6. Stability Analysis by Frequency Response Methods
7. Design of compensator in frequency domain and time domain
8. State Space Model analysis and design
9. PID Controller Design
10. Performance of a typical process control system

Reference(s)

1	Benjamin C. Kuo, "Automatic Control Systems", 7th edition PHI Learning Private Ltd, 2022
2	Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers 2020.

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

Course Outcomes		Level
CO1	Develop mathematical models (transfer functions/state-space) of mechanical , electrical, and electromechanical systems.	K6
CO2	Analyze the time response and frequency response of control systems using experimental and simulation methods.	K4
CO3	Design PID Controllers	K6
CO4	Contrast Theoretical Concepts with Hardware and Simulation	K4
CO5	Inspect System Analysis and Design using simulation tools.	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	1	1	1	3	3	3	-
CO2	3	3	1	3	1	3	1	1	1	1	3	1	3	-
CO3	3	3	3	3	3	3	1	1	1	1	3	3	3	-
CO4	3	3	1	3	1	3	1	1	1	1	3	1	3	-
CO5	3	3	1	3	1	3	1	1	1	1	3	1	3	-
3 – Strong, 2 – Medium, 1 – Low														