KNOWLEDGE INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, Affiliated to Anna University, Chennai.
Accredited by NBA (CSE, ECE, EEE & MECH), Accredited by NAAC with 'A' Grade
KIOT Campus, Kakapalayam (PO), Salem – 637 504, Tamil Nadu, India.

B.E. / B.Tech. Regulations 2023

B.E. – Electrical and Electronics Engineering

Curriculum and Syllabi

(For the Students Admitted from the Academic Year 2023-24 Onwards)

Version: 1.0	Date: 06.07.2024

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	KNOWLEDGE INSTITUTE OF TECHNOLOGY(AUTONOMOUS), SALEM -637504
	Approved by AICTE, Affiliated to Anna University, Accredited by NAAC and NBA (B.E.:Mech., ECE, EEE & CSE)
	Website: www.kiot.ac.in

B.E. / B.Tech. REGULATIONS 2023 (R 2023)

CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

VISION OF THE INSTITUTE
• To be a world class institution to impart value and need based professional education to the aspiring youth and carving them into disciplined world class professional who have the quest for excellence, achievement orientation and social responsibilities.

MISSION OF THE INSTITUTE	
A	To promote academic growth by offering state-of-art undergraduate, postgraduate and doctoral programs and to generate new knowledge by engaging in cutting – edge research
B	To nurture talent, innovation, entrepreneurship, all-round personality and value system among the students and to foster competitiveness among students
C	To undertake collaborative projects which offer opportunities for long-term interaction with academia and industry
D	To pursue global standards of excellence in all our endeavors namely teaching, research, consultancy, continuing education and support functions

VISION OF THE DEPARTMENT
To produce technically competent Electrical and Electronics Engineers having exemplary skills with ethical and social values.

MISSION OF THE DEPARTMENT	
M1	To provide state-of-the art facilities in Electrical and Electronics Engineering for improving the learning environment and research activities
M2	To continuously enrich the knowledge and skill of students towards the employment and creation of innovative products for society
M3	To develop ethical, social-valued and entrepreneurship skilled Electrical and Electronics Engineers

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
PEO 1	Succeed in the areas of Electrical and Electronics Engineering and other diverse fields by utilizing the fundamental knowledge of engineering, analytical and creative skills
PEO 2	Design, simulate and develop new innovative product and system in multi-disciplinary fields through life-long learning skill and modern tools handling ability
PEO 3	Demonstrate communication skill, leadership qualities, ethics, team work and social responsibilities

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PROGRAM OUTCOMES (POs)	
Engineering Graduates will be able to:	
PO 1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess Societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)	
After the successful completion of B.E. Programme in Electrical and Electronics Engineering, the graduates will able to	
PSO 1	Apply current technologies in Embedded System Design for providing solution to real world problems through smart product development
PSO 2	Design, develop and implement software based automated system in the field of Electrical Power and Energy to meet out the demands of society and industry
PSO 3	Analyse and diagnose the faults and defects in electrical devices and systems for Energy Management

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KNOWLEDGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), SALEM - 637504												
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING											Version: 1.1	
Courses of Study and Scheme of Assessment (Regulations 2023)											Date: 6.7.24	
Sl. No.	Course Code	Course Title	Periods / Week						Maximum Marks			
			CAT	CP	L	T	P	C	IA	ESE	Total	
SEMESTER I												
-	-	Induction Programme	-	-	-	-	-	-	-	-	-	
	THEORY											
1	BE23EN101	Communicative English-I	HS	2	1	1	0	2	40	60	100	
2	BE23MA201	Calculus for Engineers	BS	3	2	1	0	3	40	60	100	
3	BE23PH204	Engineering Physics	BS	3	3	0	0	3	40	60	100	
4	BE23CY201	Engineering Chemistry	BS	3	3	0	0	3	40	60	100	
5	BE23GE301	Overview of Engineering and Technology	ES	3	3	0	0	3	40	60	100	
6	BE23MC901	தமிழர் மரபு / Heritage of Tamils	MC	1	1	0	0	1	40	60	100	
	THEORY CUM PRACTICAL											
7	BE23GE306	Problem Solving and C Programming	ES	5	3	0	2	4	50	50	100	
	PRACTICAL											
8	BE23BS201	Physics and Chemistry Laboratory	BS	4	0	0	4	2	60	40	100	
9	BE23GE305	Engineering Practices Laboratory	ES	4	0	0	4	2	60	40	100	
	EMPLOYABILITY ENHANCEMENT											
10	BE23PT801	Human Excellence and Value Education - I	EEC	2	1	0	1	NC	100	-	100	
Total				30	17	2	11	23	510	490	1000	

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B.E. ELECTRICAL AND ELECTRONICS ENGINEERING											Version: 1.1	
Courses of Study and Scheme of Assessment (Regulations 2023)											Date: 6.7.24	
Sl. No.	Course Code	Course Title	Periods / Week						Maximum Marks			
			CAT	CP	L	T	P	C	IA	ESE	Total	
SEMESTER II												
	THEORY											
1	BE23EN102	Communicative English-II	HS	2	1	1	0	2	40	60	100	
2	BE23MA208	Vector Calculus and Partial Differential Equations	BS	3	2	1	0	3	40	60	100	
3	BE23GE303	Engineering Graphics and Circuit Drawings	ES	5	1	0	4	3	40	60	100	
4	BE23MC902	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MC	1	1	0	0	1	40	60	100	
5	BE23MC903	Universal Human Values and Ethics	MC	3	2	1	0	3	40	60	100	
	THEORY CUM PRACTICAL											
6	BE23GE308	Programming in Python	ES	5	3	0	2	4	50	50	100	
7	BE23EE401	Circuit Theory	PC	5	2	1	2	4	50	50	100	
	EMPLOYABILITY ENHANCEMENT											
8	BE23PT802	Human Excellence and Value Education-II	EEC	2	1	0	1	NC	100	-	100	
9	BE23PT804	Engineering Clinic-I	EEC	2	0	0	2	1	100	-	100	
10	BE23PT806	Aptitude Skills-I	EEC	1	0	0	1	0.5	100	-	100	
Total				29	13	4	12	21.5	600	400	1000	

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Courses of Study and Scheme of Assessment (Regulations 2023)											Date: 6.7.24	
Sl. No.	Course Code	Course Title		Periods / Week						Maximum Marks		
				CAT	CP	L	T	P	C	IA	ESE	Total
SEMESTER III												
	THEORY											
1	BE23MA209	Transform Methods	BS	3	2	1	0	3		40	60	100
2	BE23EE402	Analog Electronics	PC	3	2	1	0	3		40	60	100
3	BE23EE403	Digital Electronics	PC	3	2	1	0	3		40	60	100
4	BE23EE404	Electromagnetic Theory	PC	3	2	1	0	3		40	60	100
5	BE23EE405	Electrical Machines - I	PC	3	2	1	0	3		40	60	100
	THEORY CUM PRACTICAL											
6	BE23CS310	Fundamentals of Data Structures and Database	ES	5	2	1	2	4		50	50	100
	PRACTICAL											
7	BE23EE406	Electrical Machines - I Laboratory	PC	4	0	0	4	2		60	40	100
8	BE23EE407	Analog and Digital Electronics Laboratory	PC	4	0	0	4	2		60	40	100
9	BE23EN103	Professional Communication Laboratory-I	HS	2	0	0	2	1		60	40	100
	EMPLOYABILITY ENHANCEMENT											
10	BE23PT805	Engineering Clinic-II	EEC	2	0	0	2	1		100	-	100
11	BE23PT807	Aptitude Skills-II	EEC	1	0	0	1	0.5		100	-	100
		Total		**33**	**12**	**6**	**15**	**25.5**		**630**	**470**	**1100**

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BE23MA209	TRANSFORM METHODS	CP	L	T	P	C
		3	2	1	0	3
Programme & Branch	B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING	Version: 1.0				

Use of Calculator - fx991ms is Permitted

Course Objectives

1. To study the concepts of Fourier series.
2. To understand the concepts of Fourier Transforms.
3. To infer the methodologies involved Discrete Fourier transform and Fast Fourier Transform.
4. To learn the concepts of Z Transform and inverse Z transform.
5. To familiarize the concepts of Transform methods and apply them in Engineering Problems.

INTRODUCTION (Not for Examination)	2

Importance:

Transform methods are mathematical operations that convert data from one domain to another. Solving electrical engineering problems in control systems, power electronics, and digital communications often involves transforming data from the time domain to the frequency domain.

Real-Life Examples:

Digital Filters - Digital Communication -3G,4G,5G Technology - Mobile Communication - Medical Diagnosis (ECG Analysis) - FM-Radio

Linkages:

Pre-Requisite : Calculus for Engineers, Vector Calculus and Partial Differential Equations.
Future courses : Digital Signal Processing and Power Electronics.

UNIT–I	FOURIER SERIES	6+3

Introduction to Fourier Series - Dirichlet's Conditions(L1) – General Fourier series(L3) – Odd and Even Functions(L3)-Root mean square value(L3) – Parseval's Identity(L3) – Harmonic Analysis(L3).

UNIT–II	FOURIER TRANSFORMS	6+3

Introduction to Fourier Transform(L2) - Statement of Fourier Integral Theorem(L2) – Fourier Transform Pair(L3) – Fourier Sine and Cosine Transforms(L3) - Convolution Theorem(L2) – Parseval's Identity(L3).
(**Experiential Learning:** Use MATLAB Fourier transforms function to solve simple problem)

UNIT– III	DISCRETE AND FAST FOURIER TRANSFORMS	6+3

Introduction to DFT and FFT(L2) - General properties of DFT(L2) - Symmetry Properties of DFT of a Real and Complex Sequence(L3)-Decimation in Time FFT(L2) - Decimation in Frequency FFT(L3).
(**Experiential Learning:** Use MATLAB function to solve simple problem)

UNIT – IV	Z – TRANSFORMS	6+3

Introduction to Z-Transforms(L2) - Elementary properties(L2) – Initial and Final Value Theorems(L3)-Inverse Z-transform Using Partial Fraction and Convolution Theorem(L3) - Formation of Difference Equations(L2).

UNIT–V	APPLICATIONS OF TRANSFORMS	6+3

Application of Fourier Series to Electric Circuits(L3) - Application of Fourier Transform to ODE(L3)-Solution of Difference Equations using Z-Transforms(L3) - Application of DFT in Discrete Signal Analysis(L3).

Total: 47 Periods

* Experiential Learning part is not considered for Internal Assessment Tests (IATs) and End Semester Examinations (ESEs).

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	OPEN-ENDED PROBLEMS / QUESTIONS	
Course specific Open-Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments and evaluated as Internal Assessment only and not for the End semester Examinations.		
Course Outcomes **Upon completion of this course the students will be able to**		**Bloom's Taxonomy**
CO1	Compute Fourier series for periodic functions and calculate total energy, RMS values of signals	L3 – Apply
CO2	Apply the principles and applications of Fourier transforms in analyzing signals.	L3 – Apply
CO3	Apply the concepts of Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) in Engineering problems.	L3 – Apply
CO4	Formulate and solve difference equations using Z-transforms and apply the convolution theorem to compute inverse Z-transforms.	L3 – Apply
CO5	Apply Fourier series to solve problems in electric circuits and Utilize the Discrete Fourier Transform (DFT) for analyzing discrete signals	L3 – Apply

TEXTBOOKS

1.	Kreyzig E, "Advanced Engineering Mathematics", Tenth Edition, John Wiley and Sons, 2017.
2.	Glyn James "Advanced Modern Engineering Mathematics", Third Edition, Pearson Education, 2008.

REFERENCE BOOKS

1.	Grewal B.S., "Higher Engineering Mathematics", 44st Edition, Khanna Publishers, New Delhi,2020.
2.	T Veerarajan, "Fourier Series and Integral Transforms", First Edition, Yes Dee Publishing Pvt. Ltd, 2022.
3.	S.Sreenadh,"Fourier Series and Integral Transforms", First Edition, Yes Dee Publishing Pvt. Ltd,2014.

WEB REFERENCES

	Publisher	Website link	Type of Content
1	MathWorks	https://in.mathworks.com/help/matlab/ref/fft.html	Program
2	NICE CXone	https://math.libretexts.org/Bookshelves/Differential_Equations/Introduction_to_Partial_Differential_Equations_(Herman)/09%3A_Transform_Techniques_in_Physics	Problems

VIDEO REFERENCES

	Video Details	Name of the Expert	Type of Content	Video link
1	NPTEL	Prof.S. C Dutta Roy, IIT Delhi	Lecture	https://www.youtube.com/watch?v=gkC7cXa8ewk
2	NPTEL	Prof. V. Balakrishnan, IIT Madras	Lecture	https://youtu.be/lkAvgVUvYvY?si=pG9psRgAt6Y1vqWE

Mapping of COs with POs and PSOs

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

1–Low, 2 –Medium, 3–High.

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BE23EE402	ANALOG ELECTRONICS	CP	L	T	P	C
		3	2	1	0	3
Programme & Branch	B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING	Version: 1.0				

Course Objectives:

1. To understand the operations and characteristics of semiconductor diode and its applications
2. To learn the structure, operations, characteristics and applications of transistors.
3. To study the operations of feedback amplifiers and oscillator circuits.
4. To learn the operations and characteristics of the Op-amp and its applications circuits
5. To Impart knowledge about analog ICs and their application.

INTRODUCTION (Not for Examination) — **2**

Importance:

Signal for information communications - Analog Signal - Signal conditioning - amplifications (increasing the power level) - filtering (removing the noise) – conversion (one level to another level) - discrete active and passive components- integrated circuit (IC) - vacuum tubes - bipolar transistors- CMOS technology.

Signal conditioning and processing circuits are one of the internal components of electrical and electronic systems that are designed using discrete components. Hence, electrical and electronic engineers should acquire the competency of designing signal conditioning and processing circuits and systems using integrated circuits.

Real-Life Examples:

Stereos, Headphones, Speakers, Televisions and Electrocardiograms (Amplify the electrical signals generated by the heart to produce clear readings for diagnosis)

Linkage:

Pre-requisite : Electrical Circuit Theory and Calculus for Engineers.
Future courses : Power Electronics, Microcontroller and Interfacing, Measurement and Instrumentations and Project Work.

UNIT–I	SEMICONDUCTOR DIODES	6+3

Introduction of Basic Semiconductor and PN Junction Theory: Semiconductor Conductivity (L1), PN Junction(L1)- Semiconductor Diode: PN Junction Diode(L2), Characteristics and Parameters(L2), Ideal and Practical Diode(L2), DC Equivalent Circuit(L2), DC load line analysis(L2), Temperature Effects(L2), Diode AC Model(L2), Diode Specifications (Datasheet) (L3), Diode Testing(L3) - Zener Diode: Junction Breakdown(L1), Circuit Symbol and Package(L2), Characteristics and Parameters(L2), Datasheet based device selection(L3).
Diode Applications: Half wave and Full wave rectifier power supply (L3) (Operation, Transformer selection, Diode Specification, Filter capacitor selection) -Clippers, Clampers, Voltage Doubler and Voltage Regulators(L3).

UNIT–II	TRANSISTORS	6+3

Transistors: Introduction to Transistor(L2) - BJT(L2) - Structure(L2), Operation(L2), Characteristics(L2) - CB, CE, CC Configurations.
Application: BJT as an Amplifier and as a Switch (L3) – Introduction to Power Amplifiers(L2), Operation of Class A, B, AB and C Amplifiers (L2)- Heat Sink Calculation (L3).

UNIT– III	FEEDBACK AMPLIFIERS AND OSCILLATORS	6+3

Feedback Amplifiers: Introduction(L2) – Gain with feedback(L2) – Effect of feedback on gain stability(L2), Distortion(L2), Bandwidth(L2), Input and Output Impedances(L2) - Topologies of Feedback Amplifiers(L2), Case-studies(L3)- Application of Negative Feedback Amplifiers(L3).
Oscillators: Introduction(L1), Positive Feedback(L2), Barkhausen Criterion for Oscillation(L2)– Applications: Phase shift, Wien-Bridge and Crystal Oscillators(L3).

UNIT – IV	OPERATIONAL AMPLIFIERS AND APPLICATIONS	6+3

OP-AMP: Introduction(L2) - Ideal OP-AMP Characteristics(L2) - DC Characteristics(L2) - AC characteristics(L2) - Inverting and Non-Inverting Amplifier(L2) - Introduction to Active Filters(L2)
Applications: Differential Amplifier(L3), Summer(L3), Differentiator(L3), Integrator-V/I & I/V Converters(L3). (**Experiential Learning:** Design of OP-AMP based circuits).

UNIT–V	INTEGRATED CIRCUITS AND APPLICATIONS	6+3

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555 Timer: Introduction(L2) - Monostable and Astable Modes of Operation(L2) - Application of 555 Timer(L3). **IC Voltage Regulators**: Introduction(L2) - Fixed Voltage Regulator LM78XX,79XX(L2)- Adjustable Voltage Regulator – LM317, LM340, LM337 (L2). **(Experiential Learning**: Design of Regulated Power Supply)
Total: 47 Periods

* Experiential Learning part is not considered for Internal Assessment Tests (IATs) and End Semester Examinations (ESEs).

	OPEN-ENDED PROBLEMS / QUESTIONS	
Course specific Open-Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments and evaluated as Internal Assessment only and not for the End semester Examinations.		
Course Outcomes: **Upon completion of this course the students will be able to:**		**BLOOM'S Taxonomy**
CO1	Explain the structure and operation of semiconductor diode and construct various types of voltage conversion devices.	L2 – Understand
CO2	Describe the operation and characteristics of BJT and the operation of the amplifier and switching circuit.	L2 – Understand
CO3	Describe the operation of feedback amplifiers and oscillator circuits	L2 – Understand
CO4	Design the arithmetic operator and I-V and V-I converter using Op-Amp IC 741	L3 – Apply
CO5	Design a fixed and adjustable voltage regulator using LM series ICs	L3 – Apply

TEXTBOOKS:

1.	David A. Bell, "Electronic Devices and Circuits", Oxford University Higher Education, 5th Edition 2008.
2.	D. Roy Choudhary, Sheil B. Jani, "Linear Integrated Circuits", New Age, Fourth Edition, 2018.

REFERENCE BOOKS:

1.	Thomas L. Floyd, David M. Buchla, "Electronics Fundamentals", 7th Edition, Pearson Prentice Hall, 2010.
2.	Robert.L.Boylestad, "Electronic Devices and Circuit Theory", Pearson, 10th Edition, 2009.
3.	Sedra Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press, 2010.

WEB REFERENCES:

	Publisher	**Website link**	**Type of Content**
1.	METU Courseware	https://ocw.metu.edu.tr/course/view.php?id=105	Course Material
2.	MIT Courseware	https://ocw.mit.edu/courses/6-101-introductory-analog-electronics-laboratory-spring-2007/pages/study-materials/	Course Material
3.	IIT-Kharagpur	http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpAE	Virtual Labs

VIDEO REFERENCES:

	Video Details	**Name of the Expert**	**Type of Content**	**Video Link**
1.	NPTEL	Prof.Shouribrata Chatterjee/ IIT Delhi	Lecture	https://www.youtube.com/playlist?list=PLp6ek2hDcoNDAw1BehPFazZ5ogPV8UlQa
2.	NPTEL	Prof. A.N. Chandorkar, IIT Bombay.	Lecture	https://www.youtube.com/playlist?list=PLbMVogVj5nJRdd1G38L_8GzxvcW11zMwN

Mapping of COs with POs and PSOs

COs	**POs**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1													
CO2	2	1													
CO3	2	1													
CO4	2	2	2	2	1								2		1
CO5	2	2	2	2	1								2		1
Avg.	**2.2**	**1.4**	**2**	**2**	**1**								**2**		**1**

1–Low, 2 –Medium, 3–High.

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BE23EE403	DIGITAL ELECTRONICS	CP	L	T	P	C
		3	2	1	0	3
Programme & Branch	B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING	Version: 1.0				

Course Objectives:

1. To study various number systems and the working of digital logic gates.
2. To provide an introduction to simplification of mathematical expressions using Boolean functions and fundamentals of combinational circuits.
3. To study and construct synchronous sequential circuits using flip-flops.
4. To study the construct the asynchronous sequential circuits.
5. To introduce Programmable Logic Devices (PLD's) and implement the digital functions.

INTRODUCTION (Not for Examination)	2

Importance:

Signal (analog-Digtial)- analog to digital conversion - Integrated Circuit (IC) - two voltage bands ("ground":0/false), ("supply voltage":1/true)-programming logic devices. This course provides the fundamental knowledge to understand the advancements in interconnected systems and smart devices in smart grid communication, control, power systems, and embedded technologies.

Real-Life Examples:

Smartwatches, Smartphones, Smart TVs, Washing Machines and Computer

Linkage:

Pre-requisites : Engineering Physics & Circuit Theory.
Future courses : Microcontrollers and Interfacing, Embedded Systems, and VLSI design

UNIT I	INTRODUCTION TO NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES	6 + 3

Number System: Introduction(L2) – Number Base Conversions(L2), Complements of Numbers (L2) - Binary Codes(L2) - Error Detecting and Correcting Codes(L2).
Digital Logic Families: Introduction to Logic gates and Digital ICs (L2) - RTL, DTL, TTL & ECL and MOS Families(L2).

UNIT II	BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS	6 + 3

Boolean Algebra: Introduction(L2) - Boolean Postulates and Theorems(L1), Canonical and Standard forms (L2) - SOP and POS forms(L2), Karnaugh Map Representations(L2) - Minimization of K maps (upto 4 variables) (L2).
Minimization of Combinational Circuits: Adder and Subtractor(L2), Multiplexers and Demultipiexers(L3), Encoders and Decoders(L3), Code Converters(L3), Magnitude Comparators(L3).

UNIT III	SYNCHRONOUS SEQUENTIAL CIRCUITS	6 + 3

Sequential Circuits: Introduction to Latches and Flip-Flops(L2) - Level Triggering and Edge Triggering(L2) - SR, D, JK, T and Master JK Flip-Flops(L2).
Design of Synchronous Sequential Circuits: Moore and Mealy Mode(L2), Registers and its types(L2) - Counters and its types(L2) - Designing of Counters(L3).

UNIT IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	6 + 3

Asynchronous Sequential Circuits: Introduction(L2) - Procedures to solve the Fundamental Mode and Pulse Mode Circuits(L2).
Designing of Hazard Free Circuits: Cycles(L3), Races(L3), Hazards - Elimination of Static, Dynamic and Essential Hazards(L3).

UNIT V	PROGRAMMABLE LOGIC DEVICES	6 + 3

Programmable Logic Devices: Introduction(L2), PROM - EEPROM - Flash Memory – PLA – PAL Architecture(L2), Implementation of Digital Function in PLD's, CPLD-FPGA(L2).
VHDL & Verilog: Introduction(L2), VHDL Operators & RTL Design(L2).
(Experiential Learning:
1.Simulation: Circuits in Test Bench-Adder/Subtractors/Flip-Flops.
2.Case study: e-Waste management of Memory Chips.)

Total: 47 Periods

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* **Experiential Learning** part is not considered for Internal Assessment Tests (IATs) and End Semester Examinations (ESEs).

	OPEN-ENDED PROBLEMS / QUESTIONS	
Course specific Open-Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments and evaluated as Internal Assessment only and not for the End semester Examinations.		

Course Outcomes: Upon completion of this course the students will be able to:		**BLOOM'S Taxonomy**
CO1	Understand the number systems and characteristics of digital logic families and simplify the given Boolean expressions.	L2 - Understand
CO2	Apply Karnaugh maps (K-maps) and implement combinational circuits such as multiplexers and demultiplexers, including code converters, adders, subtractors, encoders, and decoders.	L3 - Apply
CO3	Design the various synchronous circuits and counters using Flip Flops.	L3 - Apply
CO4	Design the asynchronous sequential circuits.	L3 - Apply
CO5	Implement the digital function using programmable logic devices.	L3 - Apply

TEXTBOOKS:

1.	Morris Mano.M, "Digital Logic and Computer Design", 6th edition, Prentice Hall of India, 2018.
2.	Ananda Natarajan, "Digital Electronics", PHI Learning, 2015.

REFERENCE BOOKS:

1.	Dhanasekharan Natarajan, "Fundamentals of Digital Electronics" Springer International Publishing, 2021.
2.	A.P.Godse, Dr.D.A.Godse, "Digital Logic Circuits", Technical Publication, 2022.
3.	Soumithra kumar mandal, "Digital Electronics", MC Graw Hill Education, 2017.

WEB REFERENCES:

	Publisher	Website link	Type of Content
1.	Tutorialspoint	https://www.tutorialspoint.com/digital_circuits/digital_circuits_number_systems.htm	Articles with Examples
2.	Allaboutcircuits	https://www.allaboutcircuits.com/textbook/digital/chpt-3/digital-signals-gates/	Articles with Examples
3.	Electronicsforu	https://www.electronicsforu.com/technology-trends/learn-electronics/digital-circuit-design-types-applications-examples	Articles with Examples
4.	IIT, Delhi	https://de-iitr.vlabs.ac.in/exp/truth-table-gates/simulation.html	Virtual Labs
5.	IIT, Delhi	https://www.vlab.co.in/broad-area-electronics-and-communications	Virtual Labs

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video link
1.	Introduction to Digital Circuits	Prof.S.Srinivasan, IIT Madras	NPTEL Video	https://www.youtube.com/watch?v=CeD2L6KbtVM&list=PL803563859BF7ED8C

Mapping of COs with POs and PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1											
CO2	3	2	2												
CO3	3	2	2	2	1								2		
CO4	3	2	2	2	1								2		2
CO5	3	2	2	2	1		1						1	1	1
Avg.	**3**	**2**	**2**	**1**	**1**		**1**						**1.6**	**1**	**1.5**

1–Low, 2 –Medium, 3–High.

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BE23EE404	ELECTROMAGNETIC THEORY	CP	L	T	P	C
		3	2	1	0	3
Programme &Branch	B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING	Version: 1.0				

Course Objectives:

1	To introduce the basic mathematical concepts and theorems related to electromagnetic vector fields
2	To impart knowledge on the concepts of electrostatic fields and their applications.
3	To impart knowledge on the concepts of magneto static fields and its applications.
4	To learn electromagnetic waves and characterizing parameters
5	To learn electromagnetic interference and electromagnetic Compatibility

INTRODUCTION (Not for Examination) — **2**

Importance:

Electric charge - static (produce electric field), moving (produces current-magnetic field), acceleration (produces electromagnetic field)- Electromagnetic Theory is to be learned to understand the behavior of electromagnetic materials for machine design and electromagnetic waves generation, transmission & Interferences.

Real-Life Examples:

Motors, Generators, Transformers, Magnetic Levitation Systems and Pacemaker.

Linkages:

Pre-requisite : Electrical Circuit Theory and Engineering Physics.
Future Courses : Transmission and Distribution, Electrical Machines, Power Quality and Power System Analysis and Stability.

UNIT–I **VECTOR ANALYSIS AND LAWS** — **6+3**

Vector Analysis: Vector Algebra(L2) - Coordinate Systems and Transformation(L3) – Vector Calculus: Gradient, Divergence & Curl (L3)
Theorems & Laws: Divergence Theorem(L3) - Stoke's Theorem(L2) - Coulomb's Law(L3) - Electric Field Intensity(L2) – Field due to Point and Continuous Charges(L2) - Gauss's Law(L2).

UNIT–II **ELECTROSTATICS** — **6+3**

Introduction: Electrical Potential (L2) – Relationship Between E & V (L2) – An Electric Dipole and Flux Lines (L2) – Energy Density (L3).
Electric Field in Material Space: Properties of Materials (L2) – Conductors (L2) - Dielectric Polarization (L2) - Dielectric Strength (L2) - Electric Field in Multiple Dielectrics (L3) – Electric Boundary Conditions (L2) - Poisson's and Laplace's Equations (L2) – Capacitance of Parallel Plate, Co-Axial Cable & Spherical Cables (L3)

UNIT– III **MAGNETOSTATICS** — **6+3**

Introduction: Magnetic Flux Intensity(L2) - Biot Savart's Law(L2) - Ampere's Circuital Law(L2) – Applications of Ampere's Law(L2) – Magnetic Flux Density(L2) – Magnetic Scalar and Vector potentials(L2).
Magnetic Forces and Materials: Forces due to Magnetic Fields (L3) - Magnetic Torque and Moment (L2) – Magnetic Dipole (L2) – Magnetization in Materials (L2) – Classification of Magnetic Materials (L2) – Magnetic Boundary Conditions (L2) – Inductor and Inductance (L3) – Magnetic Energy (L3)

UNIT – IV **TIME VARYING FIELDS AND ELECTROMAGNETIC WAVES** — **6+3**

Maxwell Equations: Faraday's Law (L2) - Transformer and Motional EMF(L2) - Displacement and Conduction Current(L3) - Maxwell Equations in Final Forms (L2)
EM Wave Propagation: Waves in General (L3) – Wave Propagation in Lossy Dielectrics(L2) – Plane Waves in Lossless, Free and Good Dielectrics (L2) – Wave Polarization (L2) – Power and Poynting Vector (L3) – Reflection of waves in Normal Incidence (L3)

UNIT–V **ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY** — **6+3**

Introduction(L2) – Sources and Characteristics of EMI (L2) – EMI (L2): Grounding, Shielding, Filters - Problem of Intentional Electromagnetic Interference, Lightning Protection (L2) – EMI/EMC Measurements and Standards (L2) – Introduction to Finite Element Method (L2)

Total: 47 Periods

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	OPEN-ENDED PROBLEMS / QUESTIONS	
Course specific Open-Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments and evaluated as Internal Assessment only and not for the End semester Examinations.		

Course Outcomes: Upon completion of this course, the students will be able to:		**BLOOM'S Taxonomy**
CO1	Understand various coordinate systems of electric fields with various laws	L2- Understand
CO2	Understand the concepts of Electrostatic fields and its boundary conditions	L2- Understand
CO3	Understand concepts of Magnetostatic fields and its boundary conditions	L2- Understand
CO4	Construct electromagnetic wave generation equations by applying maxwell's equations	L3- Apply
CO5	Understand concepts of electromagnetic interference and electromagnetic Compatibility	L2- Understand
TEXTBOOKS:		
1.	Mathew N. O. Sadiku, "Principles of Electromagnetics", 6th Edition, Oxford University Press Inc. Asian edition, 2015.	
2.	S.Salivahanan and S.Karthie, "Electromagnetic Theory", Vikas Publication House, 2016.	
REFERENCEBOOKS:		
1.	William H. Hayt and John A. Buck, "Engineering Electromagnetics", McGraw Hill Special Indian edition, 2014.	
2.	S.P.Ghosh, LipikaDatta, "Electromagnetic Field Theory", First Edition, McGraw Hill Education(India) Private Limited, 2012.	
3.	K A Gangadhar, "Electromagnetic Field Theory", Khanna Publishers; Eighth Reprint, 2015.	

WEB REFERENCES:

	Publisher	Website link	Type of Content
1.	NPTEL	https://archive.nptel.ac.in/courses/108/106/108106073/	Course Material
2.	NPTEL	https://archive.nptel.ac.in/courses/108/106/108106138/	Course Material

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video link
1.	The origin of Electromagnetic waves	ScienceClic English	Animation Lecture	https://www.youtube.com/watch?v=V_jYXQFjCmA
2.	Understanding Electromagnetic Radiation	Lesics	Animation Lecture	https://www.youtube.com/watch?v=FWCN_uI5ygY

Mapping of COs with POs and PSOs

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

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BE23EE405	ELECTRICAL MACHINES - I	CP	L	T	P	C
		3	2	1	0	3
Programme & Branch	B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING	Version: 1.0				

Course Objectives:

1	To understand the concept of Electromechanical Energy Conversion.
2	To impart knowledge on construction and working principles of DC Generator.
3	To understand the working principle and speed control of DC Motor.
4	To learn the fundamental knowledge of transformer's construction, types, and operation.
5	To impart knowledge of testing methods of transformers and application of transformers.

INTRODUCTION (Not for Examination) — **2**

Importance:
Energy Conversion: Generators (Mechanical to Electrical), Motors (Electrical to Mechanical), and Transformers (voltage level Conversion) these devices are the backbone of power systems and electrical infrastructure. These devices play crucial roles in Generating, Transmitting, and utilizing Electrical Energy.

Real-Life Examples:
Generators: Electric Generators in Power Plant; Motors: Water pump, Washing Machines and Refrigerators; Transformers: Distribution Transformers.

Linkage:
Pre-requisite : Circuit Theory
Future Courses: Electric Drives, Transmission & Distribution, Power System Protection and Special Machines.

UNIT–I | **PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSION** | **6+3**

Magnetic Circuits: Magnetic Circuits(L1) – Magnetization Characteristics(L2) - Magnetic Circuit Calculations(L3) – Magnetic Materials and their Properties(L2)

Principles of Electromechanical Energy Conversion: Laws Governing Magnetic Circuits(L2) - Energy in Magnetic System: Conservative system(L2) – Field Energy and Mechanical Force Flow of Energy in Electromechanical Devices(L2) – Multiple Excited System(L3) –Expressions for Field Energy and Co-Energy(L3).

UNIT–II | **DC GENERATORS** | **6+3**

Construction & Working: Constructional Details(L1) – Working Principle(L2) – Armature Winding and commutator(L2) – EMF Equation(L3) – Armature Reaction and Commutation(L2) - Methods of Excitation(L2).

Characteristics & Applications: Operating Characteristics(L2): No load, Load, External and Armature Characteristics(L2) - Characteristics of Series, Shunt and Compound Generators(L2) – Parallel Operation(L2) - Efficiency(L3) – Applications: Dynamometers, Welding and Tachogenerator(L3).

UNIT–III | **DC MOTORS** | **6+3**

Working & Characteristics: Principle of Operation(L2) – Back EMF and Torque Equations (L3)– Types of DC Motors(L2) – Characteristics of Series, Shunt and Compound Motors(L2) – Applications: Hoist, Cranes, Traction, Conveyors and Centrifugal Pumps(L3).

Starting Methods & Speed Control: Starting of DC motors(L2) – Speed Control Methods(L2) – Testing of DC Machines(L3) – Introduction to Energy Efficient Motors(L2) – (**Experiential Learning**: Design of DC Motor)(L3).

UNIT–IV | **TRANSFORMERS** | **6+3**

Construction & Operation: Constructional Details(L2) – Types(L2) – Principle of Operation(L2) – EMF Equation(L3) – Transformer on No Load (L2) – Ideal Transformer (L2) – Practical Transformer(L2) – Equivalent Circuit(L3) – Voltage Regulation (L3) - Auto Transformers (L2) - Parallel Operation of Single-Phase Transformers(L2).

Three Phase Transformers: Three Phase Transformers (L2) – Parallel Operation of Three-Phase Transformers (L2) – Voltage and Current Transformers (L2). Introduction to Coreless Transformer (L2).

(**Experiential Learning**: 1. Design of stepdown Transformer.
2.Case Study: Impact of Transformer Insulation oil on environment)

UNIT–V | **TESTING OF TRANSFORMER** | **6+3**

Transformer Testing: Testing of Transformers(L2) – OC and SC Test(L3) – Polarity Test, Load Test(L3) – Phasing out Test(L2) – Sumpner's Test(L2) – IEC/IEEE Standard Practices of Testing Transformers(L2).

Efficiency of Transformer: Transformer Losses(L3) - Efficiency and Voltage Regulation(L3) – All Day Efficiency(L3) - Applications: Audio Frequency, Grounding and Welding Transformers(L3).

Total : 47 Periods

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	OPEN-ENDED PROBLEMS / QUESTIONS	
Course specific Open-Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments and evaluated as Internal Assessment only and not for the End semester Examinations.		

	Course Outcomes: **Upon completion of this course, the students will be able to:**	**BLOOM'S Taxonomy**
CO1	Interpret the concepts of magnetic circuits and electromechanical energy conversion	L2- Understand
CO2	Describe the constructional details and working principle of DC generators, including the role of armature winding and excitation methods.	L2- Understand
CO3	Design a DC motor and select suitable speed control method for the motor.	L3- Apply
CO4	Design the transformer and calculate the voltage regulation and efficiency of the transformer.	L3- Apply
CO5	Illustrate various testing methods of transformers and understand the national and international testing standards.	L2- Understand

TEXTBOOKS:

1.	Kothari D.P. and Nagrath I.J., "Electric Machines", 5th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2018.
2.	P. S. Bimbhra, "Electric Machinery", 2nd Edition, Khanna Publishers, 2021.

REFERENCE BOOKS:

1.	Theodore Wildi, "Electrical Machines, Drives and Power Systems", 6th Edition, Pearson Publications, 2014.
2.	Fitzgerald, Kingsley and Umans, "Electric Machinery", 6th Edition, Tata McGraw Hill, New Delhi, 2015.
3.	Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.

WEB REFERENCES:

	Publisher	**Website link**	**Type of Content**
1.	NPTEL	Course "Electrical Machines": https://nptel.ac.in/courses/108102146	Study Materials
2.	NEMA - National Electrical Manufacturers Association	https://www.nema.org/	Electrical Standards, Electrical news and trends
3.	Youtube	https://www.youtube.com/@LearningEngineering	Study materials with Animation videos, etc

VIDEO REFERENCES:

	Video Details	**Name of the Expert**	**Type of Content**	**Video link**
1.	Electrical Machines	Dr.G. Bhuvaneswari, IIT Delhi	YouTube videos	https://www.youtube.com/watch?v=LPcQYXjPdIQ&list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV

Mapping of COs with POs and PSOs

COs	**POs**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3													
CO2	2	2		1											
CO3	3	2	2	1	1										1
CO4	3	2	2	1	1		1								1
CO5	3	2	2	1		1									1
Avg.	**2.8**	**2.2**	**2**	**1**	**1**	**1**	**1**								**1**

1–Low,2–Medium,3–High

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BE23CS310	FUNDAMENTALS OF DATA STRUCTURES AND DATABASE	CP	L	T	P	C
		5	2	1	2	4
Programme & Branch	Common to B.E.(EEE, ECE, MECH and CIVIL)	Version: 1.0				

Course Objectives:

1.	To understand the concepts of ADTs and to learn linear data structure - list ADT.
2.	To learn linear data structures - stacks, and queues.
3.	To understand nonlinear data structures - trees and graphs.
4.	To learn the fundamentals of database system, relational database and ER Model.
5.	To understand the basic concepts of SQL database, SQL comments and normalizations.

INTRODUCTION (Not for Examination) — 2

Importance of Data Structures:

Efficiency in Data Management - Performance Optimization - Real World Applications - Competitive Programming and Contest and Problem-Solving Skills.

Importance of Database:

Databases are the technique of storing, maintaining and accessing any sort of data. They collect information on people, places or things. It provides organizations a complete, clear view into the way data is shared and ensuring there aren't unnecessary copies of data.

Real-life Examples:

Arrays: Online Shopping Carts - Linked Lists: Music Playlists - Stacks: Web Browser History - Queues: Customer Service Systems - Trees: File Systems - Graphs: Social Networks and Google Map - Mark sheet generation – EB bill - Library Management System – Banking System.

Linkages:

Pre-requisite: Problem Solving using C Programming.

Future courses: Coding Skills – I, Coding Skills – II.

UNIT–I	DATA STRUCTURES TYPES AND LIST ADT	6+3

Data Structure – Types(L1), Abstract Data Types (ADTs)(L1) - **List ADT:** Array implementation of List ADT and Linked List implementation of List ADT(L3) - Singly linked lists(L3) - Circularly Singly linked lists(L3) - Doubly linked lists(L3).

UNIT–II	LINEAR DATA STRUCTURES (STACK AND QUEUE)	6+3

Stack ADT: Operations - Array and Linked List implementation(L2) - **Applications:** Expression Evaluation - Infix to Postfix conversion(L3) - Evaluation of Postfix Expression(L3) - **Queue ADT:** Operations - Array and Linked List implementation(L3) - Circular Queue(L2).

UNIT– III	NON LINEAR DATA STRUCTURES (TREES AND GRAPHS)	6+3

Tree ADT: Tree Definition(L1) - Tree terminologies(L2), General tree and Binary Tree(L2) - Tree traversal(L3) - Expression tree(L3) - Binary Search Tree(L3) - **Graph ADT**: Graph Definition(L1) - Graph terminologies(L2), Representation of Graphs(L2) - Graph traversal(L3) - **Shortest Path algorithms:** Dijkstra's algorithms(L3) - **Minimum Spanning Tree:** Prim's and Kruskal's algorithms(L3).

UNIT – IV	INTRODUCTION TO DATABASE SYSTEM	4+3

Database System: Definition and Purpose of Database System(L2) - Views of data(L2) - Data Models(L2) - Database System Architecture(L2) - **Introduction to relational databases:** Relational Model(L2) - Relational Algebra(L3) - **Entity Relationship model:** ER Diagrams(L3).

UNIT–V	FUNDAMENTALS OF MySQL and SQL	8+3

MySQL: Introduction to MySQL(L2) - Environmental Setup(L2) **SQL:** Introduction to SQL(L2) - Process of SQL(L2) - Advantages and Disadvantages of SQL(L2) - SQL Syntax(L2) - SQL Data

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Types(L2) - SQL Operators(L2) – Keys(L2) **SQL Commands:** DDL(L3), DML(L3), DCL(L3), TCL(L3), DQL(L3) - Normalizations(L3) - Joins(L3) - Sub queries(L3) - Aggregate Functions(L3).	
	Total (LT) : 47 Periods
LIST OF EXPERIMENTS/EXERCISES:	
1.	Implement array and pointer based list.
2.	Implement array and pointer based stack.
3.	Implement array and pointer based queue.
4.	Implement binary tree traversals.
5.	Implement Shortest path and Minimum Spanning Tree algorithm.
6.	Implementation of DDL commands of SQL for the following operations. • Create table • Alter table • Drop Table
7.	Implementation of DML commands of SQL for the following operations. • Insert • Update • Delete
8.	Implementation of different types of operators in SQL. • Arithmetic Operators • Logical Operators • Comparison Operator • Special Operator • Set Operation
	Total (P) : 30 Periods
	Total (LT+P) : 77 Periods

	OPEN-ENDED PROBLEMS / QUESTIONS	
Course specific Open Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments and evaluated as Internal Assessment only and not for the End semester Examinations.		
Course Outcomes: **Upon completion of this course, the students will be able to:**		**BLOOM'S Taxonomy**
CO1	Implement linear data structure operations using List.	**L3 - Apply**
CO2	Use stack and queue data structure operations for solving a given problem.	**L3 - Apply**
CO3	Use appropriate non-linear data structure operations for solving a given problem.	**L3 - Apply**
CO4	Construct queries using relational algebra.	**L3 - Apply**
CO5	Apply SQL queries to handle SQL database.	**L3 - Apply**

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TEXTBOOKS:	
1.	Reema Thareja, "Data Structures Using C", Third Edition, Oxford University Press, 2023.
2.	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 9th Edition, McGraw Hill, 2022.
REFERENCE BOOKS:	
1.	Ritika Mehra, "Data Structures using C", 1st Edition, Pearson Education, 2021.
2.	Langsam, Augenstein and Tanenbaum, "Data Structures Using C and C++", 4th Edition, Pearson Education, 2022.
3.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Fourth Edition, Mcgraw Hill/ MIT Press, 2022.
4.	Alfred V. Aho, Jeffrey D. Ullman,John E. Hopcroft, "Data Structures and Algorithms", 4th edition, Pearson, 2020.
5.	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 8th Edition, Pearson Education, 2020.

WEB REFERENCES:

	Publisher	Website link	Type of Content
1.	Tutorialspoint	https://www.tutorialspoint.com/dsa_using_c/dsa_using_c_useful_resources.htm	Online Course
2.	Hackerrank	https://www.hackerrank.com/domains/datastructures	Online Course
3.	Geeksforgeeks	https://www.geeksforgeeks.org/introductionofdbmsdatabasemanagementsystemset1/	Online Course

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video Link
1.	YouTube	K.Ravikumar	Lecture	https://www.youtube.com/@reachtutorravi3115
2.	YouTube	Jenny's Lectures	Lecture	https://www.mygreatlearning.com/academy/learnforfree/courses/datastructures inc
3.	NPTEL	Prof. Partha Pratim Das, Prof. Samiran Chattopadhyay	Lecture	https://onlinecourses.nptel.ac.in/noc22_cs91/preview

Mapping of COs with POs and PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1				1			2	3	1	1
CO2	3	2	2	1	1				1			2	3	1	1
CO3	3	2	2	1	1	1			1			2	3	1	1
CO4	2	2	2	1	2	1						1	1		
CO5	2	2	2	1	2	1						1			
Avg.	**2.6**	**2.0**	**2.0**	**1.0**	**1.4**	**1.0**			**1.0**			**1.6**	**2.5**	**1.0**	**1.0**

1–Low, 2 –Medium, 3–High.

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BE23EE406	ELECTRICAL MACHINES - I LABORATORY	CP	L	T	P	C
		4	0	0	4	2
Programme & Branch	B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING	Version: 1.0				

Course Objectives:

1.	To expose the students to determine the characteristics of DC Motor by performing suitable experiments.
2.	To provide hands on experience to evaluate the performance parameters of DC Generator and by conducting suitable tests.
3.	To Perform suitable test to determine the efficiency and to draw equivalent circuit of an Transformer.

List of Experiments / Exercises

1.	Study of DC motor and Starters.
2.	Study of 3 phase transformer.
3.	Load characteristics of DC series motor.
4.	Load characteristics of DC compound motor.
5.	Speed control of DC shunt motor.
6.	Predetermine the efficiency of DC machine using Swinburne's test.
7.	Open circuit and load characteristics of DC shunt generator.
8.	Load characteristics of DC compound generator with differential and cumulative connections.
9.	Hopkinson's test on DC motor generator set to determine the Efficiency.
10.	Load test on single phase and three phase transformers to determine efficiency and voltage regulation.
11.	Open Circuit and Short Circuit test of transformer to determine the parameters of equivalent circuit.
12.	Back-to-Back test on transformer to determine its efficiency.
13.	**Experiential Learning:** Vibration measurement on DC motor.
14.	**Experiential Learning:** Design of DC Motors and Transformer using FEMM software tools.

Total: 60 Periods

*** Experiential Learning** part is not considered for Internal Assessment Tests (IATs) and End Semester Examinations (ESEs).

	Course Outcomes: Upon completion of this course the students will be able to:	**BLOOM'S Taxonomy**
1.	Draw the performance characteristics of DC machines.	L3 – Apply
2.	Compute the efficiency of DC machines by conducting various tests.	L3 – Apply
3.	Execute the armature and filed control methods of speed control in DC motor	L3 – Apply
4.	Determine the voltage regulation, efficiency, and equivalent circuit parameters of a transformer using experimental testing methods	L3 – Apply
5.	Analyze the DC motor condition using vibration signals	L4 – Analyze

TEXTBOOKS:

1.	D.P.Kothari, B.S.Umre, "Laboratory Manual for Electrical Machines", 2nd edition, Dreamtech Press.

Mapping of COs with POs and PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2								1						
CO2	2								1						
CO3	2	2	1	2					1						
CO4	2	3	2	2					1						
CO5	2	3	3	3	2				3						3
Avg.	**2**	**3**	**2**	**2.5**	**2**				**1.4**						**3**

1–Low, 2 –Medium, 3–High.

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BE23EE407	ANALOG AND DIGITAL ELECTRONICS LABORATORY	CP	L	T	P	C
		4	0	0	4	2
Programme & Branch	B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING	Version: 1.0				

Course Objectives:

1	To conduct the experiment to determine the characteristics of electronic components (Diodes and Transistors)
2	To design the Integrator, Differentiator, amplifiers, ADC & DAC for various applications.
3	To construct the code converters, Adder & Subtractors, MUX – DeMUX, Encoders & Decoders using suitable IC's.

List of Experiments / Exercise

	ANALOG ELECTRONICS
1.	Characteristics of PN junction diode and Zener diode.
2.	Characteristics of NPN Transistor Configurations(any one).
3.	Design of DC Power supply using voltage-regulated ICs
4.	Design of an Integrator and Differentiator circuit using Op-amp.
5.	Design of Differential Amplifier & RC Oscillators
6.	Design of ADCs and DACs
	DIGITAL ELECTRONICS
7.	Study and Verification of Basic Digital IC's & Universal Gates.
8.	Design of Adder and Subrtactors using Logic Gates.
9.	Design of Code Converters – BCD To GRAY / BCD to Excess – 3
10.	Design of Counters & Flip-Flops(any two).
11.	Design of Mux & Demux, Encoder and Decoder.
12.	**Experiential Learning:** Design and Implementation of Combinational Circuits in FPGA using VHDL / Verilog.
13.	**Experiential Learning:** Design and Implementation of Sequential Circuits in FPGA using VHDL / Verilog.
	Total: 60 Periods

*** Experiential Learning** part is not considered for Internal Assessment Tests (IATs) and End Semester Examinations (ESEs).

Course Outcomes: Upon completion of this course the students will be able to:		**BLOOM'S Taxonomy**
1.	conduct the experiment and draw the characteristics of the diode and BJT	L3 – Apply
2.	Design the Integrator, Differentiator and amplifiers circuit using Opam IC	L3 – Apply
3.	Design ADC & DAC for given specifications of signals	L3 – Apply
4.	Verify the code converters for given digital logic functions.	L3 – Apply
5.	Design and implement of combinational circuits using VHDL	L4- Analyze

Virtual Labs:

1.	https://de-iitr.vlabs.ac.in/exp/truth-table-gates/simulation.html
2.	http://vlabs.iitkgp.ac.in/dec/#
3.	https://www.vlab.co.in/broad-area-electronics-and-communications

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Mapping of COs with POs and PSOs															
COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2								1						
CO2	2	2	2	2					1						
CO3	2	2	2	2	2				1						
CO4	2	2	2	2	2				1						
CO5	2	3	3	2	3				3				3	2	3
Avg.	**2**	**2.2**	**2.2**	**2**	**2.3**				**1.4**				**3**	**2**	**3**
1-Low,2-Medium,3-High															

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BE23EN103	PROFESSIONAL COMMUNICATION LABORATORY - I	CP	L	T	P	C
		2	0	0	2	1
Programme & Branch	(COMMON TO ALL BRANCHES EXCEPT B.Tech CSBS)	Version : 1.0				

Course Objectives:

1.	To use language for employment and social interaction.
2.	To help learners frame sentences in the correct context.
3.	To develop learners' confidence for presentation.
4.	To strengthen learners' communication in formal contexts.
5.	To participate confidently and appropriately in team conversations.

INTRODUCTION (Not for Examination)

Importance:

- The course provides a platform for students to enhance their language competence.
- It helps learners acquire career skills sought by industries for campus recruitment.
- It improves communication skills in formal and informal situations.

Real-life Example(s):

Writing letters - drafting e-mails - blog writing - writing abstracts - public speaking- presentation

Linkages:

Pre-requisite: Communicative English - I, Communicative English - II.

LIST OF EXPERIMENTS

1.	Listening & Reading Comprehension (L2)
2.	Root words & Sentence formation (L3)
3.	Expressing oneself in an everyday situation (L3)
4.	Conversation and Just a minute talk (L3)
5.	Oral presentation – Long turn (L3)
6.	Group Discussion (L3)
7.	Creative writing (L3)
8.	Business Letter writing (L3)
9.	Giving constructive feedback and offering suggestions (L3)
10.	E-mail writing (L3)

Total: 30 Periods

Course Outcomes: Upon completion of this course, the students will be able to:		BLOOM'S Taxonomy
CO1	Use language effectively for employment.	L3 - Apply
CO2	Enhance writing skills for better communication.	L3 - Apply
CO3	Present ideas in public forum.	L3 - Apply
CO4	Write business letters in a comprehensive manner.	L3 - Apply
CO5	Express opinions assertively in group discussions.	L3 - Apply

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TEXTBOOKS:	
1.	Richardson, Mathew. Advanced Communication Skills. Charlie Creative Lab, 2020.
2.	Rizvi, Ashrif. Effective Technical Communication, Tata Mc Grahill, 2011.

REFERENCE BOOKS:	
1.	Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English.Cambridge University Press, Cambridge: Reprint 2011
2.	Terk, Natasha. Reports, Proposals and Procedures: A write it well guide. Gildan Media, 2015.
3.	Carnegie, Dale. The Art of Public Speaking. Prabhat Prakashan Pvt. Ltd. 1st Edition: New Delhi, 2016

WEB REFERENCES:

	Publisher	Website link	Type of Content
1.	Leverageedu	https://leverageedu.com/blog/group-discussion-topics/	others
2.	Forbes	https://www.forbes.com/advisor/in/business/business-letter-format/	others

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video Link
1.	NPTEL	Dr.T.Ravichandran IIT, Kanpur	Lecture	https://nptel.ac.in/courses/109104031
2.	NPTEL	Dr.Binod Mishra IIT, Roorkee	Lecture	https://onlinecourses.nptel.ac.in/noc21_hs76/preview

Mapping of COs with POs and PSOs

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

1-Low, 2 -Medium, 3-High.

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BE23PT805	ENGINEERING CLINIC - II	CP	L	T	P	C
		2	0	0	2	1
(COMMON TO ALL BRANCHES)						
Programme & Branch	B.E.- MECHANICAL ENGINEERING	Version: 1.0				

Course Objectives:

1	To provide a platform for hands-on learning experiences in order to build relevant engineering skills.
2	To enable students to learn and develop skills on designing of new product for real world application using 3D Printer and IoT.
3	To take entrepreneurship, product development, startup-related activities and problem-solving skills in higher semesters and final semester project work.

A. CONCEPT

Engineering Clinic laboratory provides hands-on training for students to develop certain simple real-world products or applications with the help of faculty. It is a team activity consisting of maximum 3 students per team. A list of products or applications will be given. Engineering Clinic - II focus on product development involving interdisciplinary Engineering courses. Each team can choose one or more products for a given application. The students have to design, fabricate and demonstrate the working of the product.

B. EXECUTION

Day	Session	Course content / Activity	No. of Periods
1	S 1	Introduction to Embedded Systems and IoT.	2
	S 2	Hands-on Training to write a code for IoT Circuit design using open-source software.	4
	S 3	Demonstration and explanation of real-time IoT application circuits in various sectors.	6
2	S 4	Introduction to 3D Printing Technology.	2
	S 5	Hands-on Training to design 3D Printing model using open-source software.	4
	S 6	Fabrication of 3D Printing Models.	6
3	S 7	Demonstration of Sublimation and Vinyl cutter Machine.	3
	S 8	Demonstration of Wood router Machine.	3
		Total	**30 Periods**

A list of sample applications/products is attached.

C. ASSESSMENT

i. Assessment is done by internal mode only and there is no End Semester Examination.
ii. Sessions (S7 & S8) are intended for demonstration purposes only, not for assessment.
iii. Marks distribution for Infernal Assessment is,

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Method	Review I	Review II	Review III	Review IV
Details	System description and Circuit design.	Testing, Validation and Demonstration.	Design and Fabrication of 3D Printing Models.	Final Product Demonstration / Presentation.
Marks	25	25	25	25

For Product/Application the student team can choose themselves.

Total: 30 PERIODS

Course Outcomes: Upon completion of this course the students will be able to:		BLOOM'S Taxonomy
CO1	Understand the Basics of IoT components.	L2- Understand
CO2	Design and Demonstrate the prototype of expedient product using 3D Printer.	L4 -Analyze
CO3	Practice the culture of Innovation and Product Development towards Start-ups in an Institution.	L4 - Analyze

Mapping of COs with POs and PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	1	2	2	2	2	2	2	3
CO2	3	3	3	2	2	2	2	1	2	2	3	2	2	2	3
CO3	3	3	3	2	2	2	2	1	2	3	3	2	2	2	3
Average	3	3	3	2	2	2	2	1	2	2.3	2.6	2	2	2	3

1–Low, 2 –Medium, 3–High.

List of sample Applications / Products for Engineering Clinic II

1. Automated Irrigation System
2. Smart Home Automation
3. AI based Image Capturing Robot
4. Vehicle Tracking System
5. IoT based Smart Traffic Management
6. IoT based Smart Hybrid Energy Management System
7. IoT based Garbage Monitoring System
8. Miniature of Home / Buildings / Bridges
9. Miniature of Robot /Quad copter/Motor and Drives
10. Development of Wood Wall Art/logo pendant /Door design.

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BE23PT807	APTITUDE SKILLS - II	CP	L	T	P	C
		1	0	0	1	0.5
Programme & Branch	Common to all B.E. / B.Tech. Courses	Version: 1.0				

Course Objectives:

1.	To develop foundational knowledge and skills in averages, percentages, problems on ages, ratios and proportions
2.	To enhance logical reasoning skills from Venn diagrams, cubes and cuboids charts, tables and graphs

INTRODUCTION (Not for Examination)	**01**

Importance:

Problem-solving skills, analytical skills and logical reasoning are crucial in various aspects of an engineering education, career, and professional development. Hence, aptitude skills are needed for engineers in the following areas:

1. Engineering Design and Analysis
2. Innovation and Research
3. Project Management
4. Competitive Exams and Career Advancement

Real-Life Example(s):

a. **Budgeting and Financial Planning**: Managing personal or business finances involves calculating expenses, savings, investments, and returns. For instance, creating a monthly budget requires understanding percentages and basic arithmetic to allocate funds appropriately.

b. **Productivity:** A manager in a factory calculates the average number of units produced by employees to gauge overall productivity.

c. **Data Analysis:** In various professions, analyzing data to make informed decisions is crucial. For example, a marketing analyst uses quantitative skills to interpret sales data and forecast future trends.

d. **Shopping and Discounts**: While doing shopping, calculating discounts and comparing prices involves quantitative skills.

Linkages:

Previous Courses: Aptitude Skills I
Future Courses: Aptitude Skills III and Aptitude Skills IV

UNIT–I	**Quantitative Aptitude**	**08**

Number system(L3): Remainder Theorem - Unit digits - Factor and Factorial Theorem - Divisibility Rule

Averages(L3): Basic Concepts of Averages - Properties of Averages- Weighted Averages - Problems on Averages - Averages of Averages

Percentage(L3): Basic Concepts of Percentages - Percentage Increase and Decrease - Finding Percentages - Percentage Change - Successive Percentage Changes - Percentage Comparisons

Profit and Loss(L3): Basic Concepts of Profit and Loss - Profit and Loss Percentages - Selling Price and Cost Price Calculations - Mark Price and Discount - Successive Selling and Buying - Overheads and Additional Costs - Markup and Margin - Cost Variations and Impact on Profit/Loss - Application of Profit and Loss in Business Scenarios

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Problems on Ages(L3): Basic Concepts of Age Problems - Formulating Equations Based on Age Statements - Solving Single-variable Age Problems - Solving Multi-variable Age Problems - Age Differences - Sum of Ages - Average Age - Age Ratios - Age Problems Involving Future and Past Scenarios - Age Problems in Competitive Exams - Age Puzzles and Riddles

Ratios & Proportions(L3): Basic Concepts of Ratios - Comparing Ratios - Proportions - Direct Proportion - Inverse Proportion - Compound Ratios - Ratio and Proportion in Real-life Applications - Ratio of Increase and Decrease - Advanced Problems on Ratios and Proportions

UNIT–II	Logical Reasoning	06

Venn Diagrams(L3): Basic Concepts of Venn Diagrams - Types of Venn Diagrams - Union and Intersection of Sets - Difference of Sets - Complement of a Set - Cardinality of Sets - Subset and Superset Relationships - Using Venn Diagrams for Logical Reasoning - Diagrammatic Representation of Data - Real-life Applications

Cubes & Cuboids(L3) : Basic Concepts and Definitions - Surface Area of Cubes and Cuboids - Volume of Cubes and Cuboids - Diagonal of Cubes and Cuboids - Face Diagonal of Cubes and Cuboids - Relationship Between Edge Lengths and Dimensions - Construction of Cubes and Cuboids - Applications in Real-life Scenarios

Data-Interpretation and Data-Sufficiency(L3): Introduction to Data Interpretation - Types of Charts and Graphs - Calculations and Approximations - Percentage Calculations - Comparison and Analysis – Problem Solving Techniques

TOTAL: 15 PERIODS

Course Outcomes: Upon completion of this course the students will be able to:		Bloom's Taxonomy
CO1	solve quantitative problems, including averages, percentages, problems on ages, ratios and proportions	L3 – Apply
CO2	apply logical reasoning and draw conclusions from Venn diagrams, cubes and cuboids, charts, tables and graphs	L3 – Apply

TEXTBOOKS:

1.	Dr. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand and Company Ltd., 2022
2.	Dr. R.S. Aggarwal, "A Modern Approach to Logical Reasoning", S.Chand and Company Ltd., 2022
3.	FACE, "Aptipedia: Aptitude Encyclopedia", 2nd edition, Wiley India Pvt. Ltd., 2017

REFERENCE BOOKS:

1.	Arun Sharma, "Quantitative Aptitude for the CAT" 10th edition, McGraw-Hill Publishing, 2022
2.	Praveen R. V., "Quantitative Aptitude and Reasoning", 3rd edition, PHI Learning Pvt. Ltd., 2016

WEB REFERENCES:

	Publisher	Website link	Type of Content
1.	Indiabix	https://www.indiabix.com/online-test/aptitude-test/	Tests for Practice

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2.	Placement preparation	https://www.placementpreparation.io/quantitative-aptitude/	Tests for Practice
3.	Geeks for geeks	https://www.geeksforgeeks.org/aptitude-for-placements/	Learning Resources and Tests for Practice

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video link
1.	YouTube	CareerRide	Video Lectures	https://www.youtube.com/playlist?list=PLpyc33gOcbVA4qXMoQ5vmhefTruk5t9lt
2.	YouTube	Freshersworld.com	Video Lectures	https://www.youtube.com/playlist?list=PLjLhUHPsqNYkcq6YOfiywbTfnvf_TN7i9

Mapping of COs with POs and PSOs

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

1–Low, 2 –Medium, 3–High.

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