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.

Beyond Knowledge

B.E. / B.Tech. Regulations 2023

B.E. – Electronics and Communication Engineering

Curriculum and Syllabi

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

CHAIRPERSON
Board of Studies
Faculty of Electronics & Communication Engg
Knowledge Institute of Technology
KIOT Campus, Kakapalayam,
Salem-637 504

Version: 1.0	**Date:** 06.07.2024

	KNOWLEDGE INSTITUTE OF TECHNOLOGY(AUTONOMOUS), SALEM -637504
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	Website: www.kiot.ac.in

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Salem-637 504

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	Accredited by NAAC and NBA (B.E.:Mech., ECE, EEE & CSE)
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B.E. / B.Tech. REGULATIONS 2023 (R 2023)

CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION

B.E. ELECTRONICS AND COMMUNICATION 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 competent Electronics and Communication Engineers by imparting quality education to meet the industry requirements and for serving the societal needs	
MISSION OF THE DEPARTMENT	
M1	To develop appropriate facilities for promoting research activities
M2	To inculcate leadership qualities among students for self and societal growth
M3	To nurture students on emerging technologies for serving industry needs through industry institute interface
M4	To enrich teaching learning process by transforming young minds to be resourceful engineers

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
PEO 1	To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs
PEO 2	To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity
PEO 3	To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research-oriented methodologies to solve the problems identified

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PROGRAM OUTCOMES (POs)	
Engineering Graduates will be able to:	
PO1	**Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)	
After the successful completion of B.E. Programme in Electronics and Communication Engineering, the graduates will able to	
PSO 1	Use signal processing concepts and tools to provide solutions to real time problems
PSO 2	Use embedded system concepts for developing IoT applications
PSO 3	Use the concepts of analog and digital electronics to design and implement VLSI circuits

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KNOWLEDGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), SALEM - 637504											
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING											Version : 1.1
Courses of Study and Scheme of Assessment (Regulations 2023)											Date : 06.07.24
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**	**12**	**23**	**510**	**490**	**1000**
		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	BE23EC401	Electronic Devices	PC	3	3	0	0	3	40	60	100
5	BE23MC902	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MC	1	1	0	0	1	40	60	100
6	BE23MC903	Universal Human Values and Ethics	MC	3	2	1	0	3	40	60	100
	THEORY CUM PRACTICAL										
7	BE23GE308	Programming in Python	ES	5	3	0	2	4	50	50	100
8	BE23EC402	Circuit Theory and Analysis	PC	5	3	0	2	4	50	50	100
	EMPLOYABILITY ENHANCEMENT										
9	BE23PT802	Human Excellence and Value Education-II	EEC	2	0	0	2	NC	100	-	100
10	BE23PT806	Aptitude Skills-I	EEC	1	0	0	1	0.5	100	-	100
11	BE23PT804	Engineering Clinic-I	EEC	2	0	0	2	1	100	-	100
Total				**32**	**16**	**3**	**13**	**24.5**	**640**	**460**	**1100**

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B.E. ELECTRONICS AND COMMUNICATION ENGINEERING												
Courses of Study and Scheme of Assessment (Regulations 2023)												
Sl. No.	Course Code	Course Title	Periods / Week						Maximum Marks		
			CAT	CP	L	T	P	C	IA	ESE	Total
	SEMESTER III											
	THEORY											
1	BE23MA205	Random Processes and Linear Algebra	BS	3	2	1	0	3	40	60	100
2	BE23EC403	Signals and Systems	PC	5	4	1	0	4	40	60	100
3	BE23EC404	Electromagnetic Fields	PC	3	2	1	0	3	40	60	100
	THEORY CUM PRACTICAL											
4	BE23CS310	Fundamentals of Data Structure and Database	ES	5	2	1	2	4	50	50	100
5	BE23EC405	Analog Electronic Circuits	PC	5	2	1	2	4	50	50	100
6	BE23EC406	Digital Electronics	PC	5	2	1	2	4	50	50	100
	PRACTICAL											
7	BE23EN103	Professional Communication Laboratory – I	HS	2	0	0	2	1	60	40	100
8	BE23PT805	Engineering Clinic – II	EEC	2	0	0	2	1	100	-	100
	EMPLOYABILITY ENHANCEMENT											
9	BE23PT807	Aptitude Skills - II	EEC	1	0	0	1	0.5	100	-	100
Total				**30**	**14**	**6**	**11**	**24.5**	**530**	**370**	**900**

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BE23MA205	RANDOM PROCESSES AND LINEAR ALGEBRA	CP	L	T	P	C
		3	2	1	0	3
Programme & Branch	B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING	Version: 1.0				

Use of Calculator - fx991ms is Permitted

Course Objectives:

1.	To use the concept of random variables in discrete distributions.
2.	To learn the concept of continuous random variables.
3.	To discuss the various random processes models.
4.	To characterize the parameters of linear system of equations in vector space.
5.	To familiarize the concepts of linear transformations between the vector spaces.

INTRODUCTION: (Not for Examination)	**2**
Importance: Random processes and linear algebra are foundational pillars in the field of Electronics and Communication Engineering, providing essential tools for analysing and designing systems in diverse applications such as wireless communications, signal processing, and information theory. **Real Life Examples:** Digital Communication-Mobile Communications-FM Radio-3G,4G,5G Technology. **Linkages:** Pre-Requisite: Basic Probability concepts.	

UNIT–I	**DISCRETE RANDOM VARIABLES**	**6+3**
Discrete Probability distribution: Binomial and Poisson (L3)- Joint distributions for Discrete Random Variables (L3) – Marginal and conditional distributions for Discrete Random Variables (L3)		
UNIT–II	**CONTINUOUS RANDOM VARIABLES**	**6+3**
Joint distributions for Continuous Random Variables (L2) – Marginal and conditional distributions for continuous Random Variables(L3) – Transformation of random variables(L3)– Central limit theorem (for independent and identically distributed random variables) (L3).		
UNIT– III	**RANDOM PROCESSES**	**6+3**
Classification(L1) – Stationary process (L3)– Markov process(L3) - Poisson process(L3)- Binomial process(L2)- Gaussian process(L2) - Power Spectral density(L3). ***Application – Mobile phone traffic – Signal strength.**		
UNIT – IV	**VECTOR SPACES**	**6+3**
Vector spaces (L2) – Subspaces (L2)– Linear combinations and linear system of equations(L3) – Linear independence and linear dependence(L3) – Bases and dimensions(L3).		
UNIT–V	**LINEAR TRANSFORMATION AND DIAGONALIZATION**	**6+3**
Linear transformation (L2) - Null spaces and ranges (L3) - Dimension theorem (L2) - Matrix representation of a linear transformations (L3) - Eigenvalues and eigenvectors(L3) - Diagonalizability (L3).		
***Application part is not considered for Internal assessment test and End Semester Examinations**		**TOTAL: 62 PERIODS**

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(IATs & ESE).		
	OPEN ENDED PROBLEMS / QUESTIONS	
Course specific Open-Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments (NTA) and evaluated as Internal Assessment (IA) 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	Apply binomial and Poisson distribution to solve Discrete Random Variables.	**L3 - Apply**
CO2	Apply the concept of Two-Dimensional Random Variable to solve problems in Continuous Random Variables.	**L3 - Apply**
CO3	Apply statistical problems to determine appropriate models for Random Processes.	**L3 - Apply**
CO4	Apply the concepts of Vector Space to solve linear system of equations.	**L3 - Apply**
CO5	Solve and relate Eigen value and Eigen vectors using Linear Transformation and Diagonalization.	**L3 - Apply**

TEXTBOOKS:

1.	Oliver C Ibe., "Fundamentals of Applied Probability and Random Processes", Elsevier,1st Indian Reprint, 2007.
2.	Friedberg. A.H., Insel. A.J. and Spence. L., "Linear Algebra", Prentice Hall of India, New Delhi,4 th Edition, 2004.

REFERENCE BOOKS:

1.	Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
2.	Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
3.	Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

WEB REFERENCES:

	Publisher	**Website link**	**Type of Content**
1.	International Linear Algebra Society	https://journals.uwyo.edu/index.php/ela/article/view/7783/6463	Journal
2.	Springer	https://shorturl.at/8uaJo	Journal

VIDEO REFERENCES:

	Video Details	**Name of the Expert**	**Type of Content**	**Video link**
1.	**NPTEL**	Dilip P.Patil	Lecture	https://youtu.be/Hds3M4dAoCg
2.	**NPTEL**	S.Dharmaraja	Lecture	https://youtu.be/j2CVQ6wfWz4

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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	3	2			1	1									
CO2	3	2			1	1									
CO3	3	2			1	1	1								
CO4	3	2			1										
CO5	3	2			1										
AVG	**3**	**2**			**1**	**1**	**1**								
1–Low, 2 –Medium, 3–High.															

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BE23EC403	SIGNALS AND SYSTEMS	CP	L	T	P	C
		5	4	1	0	4
Programme & Branch	B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING	Version: 1.0				

Course Objectives:

6.	To understand the basic concepts and properties of signals and systems.
7.	To apply Fourier and Laplace transform in continuous time signal analysis.
8.	To learn the properties of linear time-invariant systems using Fourier and Laplace transforms.
9.	To apply Z transform and discrete time Fourier transform in Discrete time signal analysis.
10.	To learn the properties and discrete time Fourier transform in Discrete time system analysis.

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

Importance:
Fundamental for understanding how to analyze, process, and manipulate signals in both time and frequency domains. These concepts are crucial in various fields like telecommunications, control systems, and signal processing, forming the foundation for designing and optimizing modern engineering systems.

Real Life Example(s): Audio system.

- **Microphone (Continuous-Time Signal):** Captures the speaker's voice as a smooth, continuous signal. Fourier Transform used to find frequencies are present in the speaker's voice.
- **Amplifier (Continuous-Time System):** Takes the continuous sound signal from the microphone and makes it louder
- **Digital Playback (Discrete-Time Signal):** Plays pre-recorded audio from a digital source, like a laptop. The audio is converted into discrete samples (digital format). Discrete Time Fourier Transform used to analyse the digital audio by showing the different frequencies in the sampled data.
- **Audio Processor (Discrete-Time System):** Processes the digital audio to improve sound quality, like adjusting volume or removing noise. Z-Transform is used to understand how the digital signal processor works on the sampled audio to enhance it.
- **Speakers (System Output):** Converts the processed audio signal back into sound waves that everyone in the hall can hear.

Linkages:
Previous Courses: Basic Physics, Calculus for Engineers, Advanced Calculus and Numerical Methods.
Future courses: Digital Signal Processing

UNIT–I	CLASSIFICATION OF SIGNALS AND SYSTEMS	9+3

signals: Introduction, Classification of signals - Continuous time (CT) and Discrete Time (DT) signals (L2), Representation of signals - Step, Ramp, Pulse, Impulse, Signum, Sinc, Complex exponentials and Sinusoids (L2), Periodic and aperiodic signals (L2), Deterministic and Random signals (L2), Energy and Power signals, Operations on Signals (L2).

Systems: Introduction, Classification of systems - CT systems and DT systems (L2), Properties – Linear and Nonlinear (L3), Time-variant and Time-invariant (L3), Causal and Non-causal (L3), Stable and Unstable (L3).

(Experiential Learning: Use MATLAB function to visualize various signals)

UNIT–II	CONTINUOUS TIME SIGNALS ANALYSIS	9+3
Fourier Series representation of Periodic Signals (L3)- Fourier transform- properties and applications in analysis of CT signals (L3), Laplace transform – Region of Convergence (RoC) (L3), properties and applications in analyzing CT signals (L3). **(Experiential Learning: Use MATLAB function to illustrate Fourier transform in signals)***		
UNIT– III	**CONTINUOUS TIME SYSTEM ANALYSIS**	**9+3**
Differential Equation(L3)-Block diagram representation-impulse response(L3), convolution Integrals(L3)-Fourier and Laplace transforms in Analysis(L3).		
UNIT – IV	**DISCRETE TIME SIGNAL ANALYSIS**	**9+3**
Sampling and Reconstruction of Signals, Aliasing (L2), Discrete-Time Fourier transform (DTFT) - properties and applications in DT signals (L3), Z-transform- Region of Convergence (RoC) (L3), properties and applications in DT signals (L3). **(Experiential Learning: Use MATLAB function to solve simple problem)***		
UNIT–V	**DISCRETE TIME SYSTEM ANALYSIS**	**9+3**
Convolution sum - properties and applications (L3), Impulse response – Difference equations, Convolution sum (L3) - Discrete-Time Fourier Transform (DTFT) and Z -Transform Analysis of Recursive & Non-Recursive systems (L4) -DT systems connected in series and parallel (L3).		
PERIODS *** Experiential Learning part is not considered for Internal Assessment Test (IATs) and End Semester Examinations (ESEs).**		**TOTAL: 62**

	OPEN ENDED PROBLEMS / QUESTIONS	
Course specific Open-Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments (NTA) and evaluated as Internal Assessment (IA) 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	Classify the signals and examine the properties of systems.	**L3 - Apply**
CO2	Apply Fourier Series and Fourier transform in Continuous time signal analysis.	**L3 - Apply**
CO3	Apply Fourier and Laplace Transforms for Continuous time LTI systems.	**L3 - Apply**
CO4	Apply DTFT and Z-Transform in discrete time signal analysis.	**L3 - Apply**
CO5	Examine discrete time LTI systems using Z transform and DTFT.	**L3 - Apply**
TEXTBOOKS:		
3.	Alan V. Oppenheim, Alan S. Willsky, S.Hamid Nawab, "Signals and Systems", Pearson Education, 2nd Edition,2024.	
4.	Simon Haykin, Barry Van Veen, "Signals and Systems", John Wiley & Sons, 3rd Edition, 2012.	
REFERENCE BOOKS:		
1.	H. P. Hsu, "Signals and Systems" Schaum's Outline Series, McGraw Hill Professional, 3rd Edition, 2013.	
2.	M. J. Roberts, "Signals and Systems Analysis using Transform methods and MATLAB", 3rd Edition, McGraw- Hill Education, 2018.	

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3.	Rodger E Ziemer, William H Tranter, D Ronald Fannin "Signals & Systems: Continuous and Discrete", 4th Edition, Pearson Education Limited, 2015.
4.	B. P. Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford, 2009.

WEB REFERENCES:

	Publisher	Website link	Type of Content
1.	Springer	https://link.springer.com/journal/498	Articles
	Libretext.org	https://eng.libretexts.org/Bookshelves/ Electrical_Engineering/ Signal_ Processing_ and_Modeling	Signals and system – Lecture Notes
2.	Research Gate	https://www.researchgate.net/	Articles on Signal Processing

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video link
1.	MIT Open Courseware	Prof. Alan V. Oppenheim	Lecture notes /Assignment	https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/pages/lecture-notes/
2.	NPTEL course on Signals and Systems	Prof. S.C. Dutta Roy	Lecture Video	https://www.youtube.com/watch?v=h-CdTxDShho&list=PLC6210462711083C4&index=1

Mapping of COs with POs and PSOs

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

1–Low, 2 –Medium, 3–High.

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BE23EC404	ELECTROMAGNETIC FIELDS	CP	L	T	P	C
		3	2	1	0	3
Programme & Branch	B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING	Version: 1.0				

Course Objectives:

1.	To relate the coordinate systems and theorem in static electric field.
2.	To interpret the effect of static magnetic field on a current conducting material.
3.	To relate the effect of electric field in lossless and lossy media.
4.	To understand the effect of magnetic field in lossless and lossy media.
5.	To apply Maxwell's equations in Electromagnetic wave propagation in lossless and lossy media.

INTRODUCTION: (Not for examination) — **2**

Importance:
Electromagnetic Fields courses are crucial for understanding how electric and magnetic forces interact in various applications, from communication systems to power distribution. This course provides foundational knowledge for designing advanced technologies like antennas, sensors, and wireless networks.

Real Life Example: Microwave Oven

- **Static Electric Field**: Electric field concepts, such as Coulomb's law and Gauss's law, are essential for understanding how electric charges are distributed in the system's components like capacitors in resonant circuits.
- **Static Magnetic Field**: The magnetic field generated by a coil (using Biot-Savart's Law) is key in wireless power transfer. Magnetic flux and field intensity help induce a current in the receiving coil, enabling power transfer.
- **Electric Fields in Materials**: The dielectric properties of materials in the coils and surrounding environment affect the efficiency of energy transfer by influencing the capacitance and electromagnetic interference (EMI).
- **Magnetic Fields in Materials**: The inductance and magnetic boundary conditions of the transmitting and receiving coils are critical in ensuring that the magnetic field couples efficiently between the coils for effective energy transfer.
- **Time-Varying Fields and Maxwell's Equations**: Maxwell's equations describe the propagation of electromagnetic waves, essential for understanding the oscillating fields used in Wireless charges. The Poynting vector explains the flow of power from the transmitting coil to the receiving coil.

Linkages:
Previous Courses: Engineering Physics
Future courses: Communication Systems, Transmission Lines and Antennas, Optical and Microwave Engineering

UNIT–I	STATIC ELECTRIC FIELD	6+3

Co-ordinate Systems – Gradient, Divergence, Curl, Divergence theorem (L2), Stokes theorem (L2), Coulomb's law and applications (L2), Electric field intensity in line, surface, and volume (L3), Gauss's law and applications (L3), Electric potential (L2), **Application - Transcutaneous electrical nerve stimulation (TENS) (L2).**
(Experiential Learning: Use MATLAB function to visualize coordinate systems)*

UNIT–II	STATIC MAGNETIC FIELD	6+3

Biot-Savart's Law (L2) – Magnetic Field intensity due to infinite and finite wire carrying current (L3), Ampere's circuital law and applications (L3), Magnetic flux density (L2), Lorentz force equation (L2), Force on a wire carrying a current placed in a magnetic field (L3), Torque on a loop carrying a current (L3), Magnetic moment (L2), Magnetic Vector Potential (L2), **Application – Magnetic bearings (L2).**

(Experiential Learning: Use MATLAB function to illustrate flux density and intensity)*		
UNIT– III	**ELECTRIC FIELDS IN MATERIALS**	**6+3**
Polarization in dielectric materials (L2), Boundary conditions for electric fields (L3), Poisson's and Laplace's equation (L2) – Application of Laplace's equation in calculating the parallel and series capacitance (L3), **Electromagnetic Interference (EMI) (L2), Electromagnetic Interference Compatibility (EMIC) (L2).**		
UNIT– IV	**MAGNETIC FIELDS IN MATERIALS**	**6+3**
Magnetization and Permeability (L2) - Magnetic boundary conditions (L3), Electric current – Current density (L3) – Continuity equation for current (L3), Inductance – Self and Mutual inductance (L3), Energy density in magnetic fields (L2).		
UNIT – V	**TIME-VARYING FIELDS AND MAXWELL's EQUATIONS**	**6+3**
Maxwell's equations - Integral form and differential form (L3), Poynting Vector and the flow of power – Poynting theorem (L3), Wave equations - Conducting and non-conducting media (L3), Uniform plane waves (L3) - perfect dielectrics, conductors, and free space (L3), Total Internal Reflection (L2)- Skin effect (L2), Brewster angle (L2), **Application – Radio waves (L2).**		
TOTAL: 47 PERIODS		
*** Experiential Learning part is not considered for Internal Assessment Test (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 (NTA) and evaluated as Internal Assessment (IA) 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	Apply the Coulomb's and Gauss law to compute electric field intensity and potential for point, line, and surface charge distributions	**L3 - Apply**
CO2	Apply Biot-Savart's Law and Ampere's circuital law to compute Magnetic field Intensity	**L3 - Apply**
CO3	Interpret the behavior of electric fields in materials	**L3 - Apply**
CO4	Interpret the behavior of magnetic fields in materials	**L3 - Apply**
CO5	Apply the Maxwell's equations in wave propagation.	**L3 - Apply**
TEXTBOOKS:		
1.	D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 2014.	
2.	M.N.O. Sadiku and S.V. Kulkarni, Principles of electromagnetics, 6th ed., Oxford (Asian Edition), 2015.	
REFERENCE BOOKS:		
1.	Edward C. Jordan & Keith G. Balmain, Electromagnetic waves and Radiating Systems, 2nd Edition, Prentice-Hall Electrical Engineering Series, 2015.	
2.	W.H. Hayt and J.A. Buck, Engineering Electromagnetics, 8th Edition, McGraw-Hill (India), 2017.	
3.	Branislav Notaros, Electromagnetics, 1st edition, Pearson, 2010.	
4.	KA Gangadhar, "Electromagnetic Field Theory", 2nd Edition, Khanna Publishers, 2018.	
WEB REFERENCES:		

	Publisher	Website link	Type of Content
1.	Massachusetts Institute of Technology	https://ocw.mit.edu/courses/6-641-electromagnetic-fields-forces-and-motion-spring-2009/	Articles and Notes
2.	Libretext.org	https://eng.libretexts.org/Bookshelves/Electrical Engineering/Electro-Optics/Book%3A_Electromagnetics_I_(Ellingson)	Notes and Illustrations

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video link
1.	NPTEL	Dr.K.Pradeep kumar, IIT Kharagpur	Lecture	https://archive.nptel.ac.in/courses/108/106/108106073/
2.	The origin of Electromagnetic waves	Science clinic	Animation	https://www.youtube.com/watch?v=V_jYXQFjCmA

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	1	1	1	1							1		
CO2	3	2	1	1	1	1							1		
CO3	3	2	1	1			1						1		
CO4	3	2	1	1									1		
CO5	3	2	1	1		1							1		
AVG	**3**	**1.8**	**1**	**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

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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 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/EXCERCISES:	
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 discussed during the classroom teaching. Such problems can be given as Assignments (NTA) and evaluated as Internal Assessment (IA) 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://shorturl.at/H25HD	Online Course
2.	Hackerrank	https://shorturl.at/9VNDK	Online Course
3.	Geeksforgeeks	https://shorturl.at/8fEB7	Online Course

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video link
1.	YouTube	K.Ravikumar	Lecture	https://shorturl.at/Jpdxh
2.	YouTube	Jenny's Lectures	Lecture	https://rb.gy/zojtr1
3.	NPTEL	Prof. Partha Pratim Das, Prof. Samiran Chattopadhyay	Lecture	https://rb.gy/i7p3m6

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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BE23EC405	ANALOG ELECTRONIC CIRCUITS	CP	L	T	P	C
		5	2	1	2	4
Programme & Branch	B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING	Version: 1.0				

Course Objectives:

6.	To understand the methods of biasing and analyze the response of small signal BJT amplifiers
7.	To interpret the methods of biasing, analyze the response of small signal FET amplifiers
8.	To relate multistage amplifier circuits and tuned amplifiers.
9.	To employ feedback concepts to build LC and RC oscillators
10.	To outline the different types of power amplifiers and DC convertors.

	INTRODUCTION: (Not for examination)	2

Importance:
Analog electronic circuits play a crucial role in interfacing the real world with digital systems by processing continuous signals for accurate measurements and control. Their importance extends across diverse applications, from audio amplification to sensor signal conditioning.

Real Life Example: Home Audio system

BJT and FET amplifiers: BJTs or MOSFETs to build the initial amplification stages.

Multistage amplifiers: Incorporate multiple stages if higher amplification is needed.

Feedback amplifiers: Implement negative feedback to improve sound clarity and reduce distortion.

Power amplifiers: Choose an appropriate power amplifier class and use a basic linear power supply to ensure reliable operation.

Linkages:

Previous courses: Electronic Devices, Circuit Theory and Analysis

Future courses: Linear Integrated Circuits, Embedded System, VLSI Design.

UNIT–I	BJT AMPLIFIERS	6+3

Introduction to BJT, Biasing methods of BJT - Need for biasing (L2), DC & AC Load Line (L2), Bias Point, Comparison of biasing methods (L2), Small Signal analysis - Analysis of CE, CB and CC amplifiers using Hybrid π equivalent circuits (L3), Gain and frequency response (L3)– Calculation of gain and frequency response of amplifiers (L3), High frequency analysis of CE amplifier (L2), Effect of parasitic capacitances on high-frequency response (L3).

UNIT–II	FET AMPLIFIERS	6+3

Introduction to MOSFET, MOSFET Biasing (L2), Analysis of CS, CG and CD amplifiers using Hybrid π equivalent circuits (L3), Short circuit current gain (L2), Frequency response of MOSFET (L3)- Effect of coupling capacitors on frequency response (L2)- Calculation of bandwidth and cutoff frequencies (L3), High frequency analysis of CS amplifier (L2)- Transistor Switching Times(L2).

UNIT– III	MULTISTAGE AMPLIFIERS AND TUNED AMPLIFIERS	6+3

Multistage Amplifiers (L2) – Single Stage versus Multistage Amplifiers (L2), Analysis of cascade configurations (L3), Differential Amplifiers - Basic BJT and FET differential pair (L2), Small signal analysis (L3), Common-mode rejection ratio (CMRR) (L2), Tuned Amplifiers - Introduction, Analysis of capacitor-coupled single-tuned amplifier (L3), Bandwidth effects of cascading tuned amplifiers (L2), Stagger-tuned amplifiers (L3) and Hazeltine neutralization (L2).

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UNIT – IV	FEEDBACK AMPLIFIERS AND OSCILLATORS	6+3
Feedback –positive and negative (L2), Negative feedback - Effect of negative feedback (L3), Design of Feedback amplifiers (L3), Positive feedback – Characteristics (L2), Barkhausen Criterion (L2), Oscillators - RC Phase shift, Hartley, Colpitts and Crystal oscillator (L3).		
UNIT–V	**POWER AMPLIFIERS**	**6+3**
Power amplifiers (L2)- Class A -Class B - Class AB -Class C - Class D - Class S (L2) - Power MOSFET amplifiers (L2), Power Supply - Linear Mode Power Supply (LMPS) and Switched Mode Power Supply (SMPS) (L2).		
		TOTAL: 47 PERIODS

LIST OF EXPERIMENTS/EXCERCISES:	
9.	Analysis of BJT with Fixed bias and Collector to Base bias using SPICE.
10.	Analysis of BJT with Voltage divider bias using SPICE.
11.	Frequency Response of CE and CC amplifiers.
12.	Frequency Response of CS and CG amplifiers.
13.	Differential Amplifiers - Transfer characteristics, CMRR Measurement using SPICE.
14.	Design of Common Emitter cascade amplifier.
15.	Design a low frequency oscillator using SPICE.
16.	Design a high frequency oscillator.
17.	Analysis of power amplifier using SPICE.
	Total: 30 PERIODS
	Total 47+30: 77 PERIODS

	OPEN ENDED PROBLEMS / QUESTIONS	
Course specific Open-Ended Problems will be discussed during the classroom teaching. Such problems can be given as Assignments (NTA) and evaluated as Internal Assessment (IA) 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	Design and analysis of BJT amplifiers	**L3 – Apply**
CO2	Design and analysis of MOSFET amplifiers	**L3 – Apply**
CO3	Design and analysis of differential amplifiers and tuned amplifiers	**L3 – Apply**
CO4	Design feedback amplifiers using negative feedback and design oscillators using positive feedback	**L3 – Apply**
CO5	Explain the operation of power amplifiers, temperature effects on performance and management techniques	**L2 - Understand**

TEXTBOOKS:	
3.	Donald A. Neamen, "Microelectronics: Circuit Analysis and Design", 4th Ed, McGraw Hill, 2021.
4.	Adel S. Sedra, Kenneth C. Smith, "Microelectronic Circuits", 7th Edition, Oxford University Press, 2017.
REFERENCE BOOKS:	
1.	Robert L Boylestad, "Electronic Devices and Circuit Theory", 11th Edition, Pearson, 2021.
2.	Paul Horowit, "The Art of Electronics", 3rd Edition, Cambridge University Press, 2015.

3.	Jacob millman and Christos C Halkias, "Integrated Electronics", 2nd Edition, Tata McGraw Hill, 2017.
4.	David A. Bell, Electronic Devices & Circuits, 5th Edition, Oxford University Press, 2008.

WEB REFERENCES:

	Publisher	Website link	Type of Content
1.	Electronics For You	www.electronicsforu.com	Articles on recent advancements
2.	Silicon chip – Online Magazine	https://www.siliconchip.com.au/	Articles, Projects

VIDEO REFERENCES:

	Video Details	Name of the Expert	Type of Content	Video link
1.	NPTEL	Dr.Pradeep Mandal, IIT Kharagpur	Lecture	https://archive.nptel.ac.in/courses/108/105/108105158/

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	3				2						2
CO2	3	2	1	1	3				2						2
CO3	3	2	1	1	3				2						2
CO4	3	2	1		3				2						2
CO5	3	2	1		3				2						2
AVG	**3**	**2**	**1**	**1**	**3**				**2**						**2**

1–Low, 2 –Medium, 3–High.

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BE23EC406	DIGITAL ELECTRONICS	CP	L	T	P	C
		5	2	1	2	4
Programme & Branch	B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING	Version: 1.0				

Course Objectives:

1.	To acquire the basic knowledge of digital fundamentals, Boolean Algebra and simplification methods.
2.	To design various combinational digital logic circuits using basic gates.
3.	To differentiate sequential logic components like flip flop, latches and relate their applications.
4.	To design and analyse clocked and asynchronous sequential circuits.
5.	To apply the fundamental Verilog constructs to create simple designs.

INTRODUCTION (Not for Examination)	**2**

Importance:

Foundation of modern computing systems, including computers, smartphones, and digital appliances. Digital circuits generally consume less power compared to analog circuits, making them more energy-efficient.

Real Life Example: Digital Alarm System

Boolean Functions: Simplify Boolean functions to design the basic logic for alarm triggers.

Combinational Logic Circuits: Use combinational circuits to create an alarm system with code converters and multiplexers for user input processing.

Sequential Logic Circuits: Implement sequential logic for timers and counters that manage the alarm's timing functions.

Design and Analysis of Sequential Circuits: Design state machines for different alarm states (e.g., armed, disarmed, triggered) and ensure they function correctly.

Verilog HDL: Use Verilog HDL to model and simulate the entire alarm system before hardware implementation, and choose the appropriate logic family (e.g., CMOS) for the circuit.

Linkages:

Previous courses: Electronic Devices

Future courses: Microcontrollers and Embedded Systems, VLSI Design

UNIT–I	**Introduction and Simplification of Boolean Functions**	**6+3**

Introduction – Overview of Number Systems and Binary Codes (L2), Boolean Algebra – Postulates and Theorems (L2)– Canonical and Standard forms – SOP and POS (L2), Minterms, Maxterms, Logic gates, Universal Logic gates (L2), Simplification of Boolean Functions (L3)– Karnaugh Map (upto 5 Variables) (L3), Tabulation Method (upto 6 Variables) – Prime Implicants and Essential Prime Implicants (L3).

UNIT–II	**Combinational Logic Circuits**	**6+3**

Arithmetic Circuits: Adders – Half adder, Full Adder, Parallel Binary adder, Carry Look Ahead adder (CLA), BCD adder (L3), Subtractors (L3), Code Converter Circuits - Encoder, Priority Encoder (L3), Decoder, Multiplexer, De-Multiplexer (L3), Realization of SOP using MUX (L3), Realization of Programmable Logic Devices – Programmable Array Logic (PAL), Programmable Logic Arrays (PLA) (L3) – Applications in automation.

UNIT– III	**Sequential Logic Circuits**	**6+3**

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Introduction – Flipflops, Latches, Triggering, SR, JK, T, D, Master/Slave FF – Operation and Excitation Tables (L3), Characteristic table and Equation, State Diagram (L3), Design of synchronous counters - up counter, down counter, up-down counter, Ripple counters (L3) – Registers: Shift registers, Universal shift register (L3).		
UNIT – IV	**Design and Analysis of Sequential Circuits**	**6+3**
Design and analysis of clocked sequential circuits (L3)- State Reduction techniques (L3), Sequence Detector (L3), Introduction to asynchronous sequential circuits – Analysis of Fundamental and Pulse mode Circuits (L3) – Cycles, Races, Hazards, Hazards Elimination (L2).		
UNIT–V	**Logic families and Verilog HDL**	**6+3**
Logic Families: RTL, TTL, ECL, IIL, CMOS (L2)– Fan in and Fan out (L2)- Overview of Verilog HDL – Data Types(L2), Modules(L2), Operators(L2), Operands, fan in, fan out, propagation delay, Modelling – Behavioral, Structural and Dataflow(L3), Implementation of Combinational Circuits using Verilog HDL(L3).		
		TOTAL: 47 PERIODS
LIST OF EXPERIMENTS/EXCERCISES:		
1.	Study of Logic gates	
2.	Design an Adder and Subtractor Circuit.	
3.	Design an Multiplexer and De-Multiplexer Circuit	
4.	Design an Binary to Gray and Gray to Binary Code Converter.	
5.	Design an up counter and down counter using Flip Flop	
6.	Construct the logic circuit of a washing machine using AND & NOT Gates.	
7.	Design a combinational electronic lock using basic logic gates.	
8.	Design and Simulate a Seven Segment Display using Verilog HDL	
9.	Design and Simulate an ALU using Verilog HDL	
10.	Design an Simulate MUX and DEMUX using Verilog HDL	
		Total: 30 PERIODS
		Total 47+30: 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 (NTA) and evaluated as Internal Assessment (IA) 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 Boolean Postulates and theorems used for Boolean function simplification with a specified number of variables.	L2 - Understand
CO2	Design Combinational circuits using logic gates to perform specific logical functions.	L3 - Apply
CO3	Design sequential logic circuits with a understanding of clocking, setup time, and hold time.	L3 - Apply

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CO4	Analyze and predict the behavior of sequential circuits using state diagrams and state tables.	L3 - Apply
CO5	Apply appropriate modeling in Verilog to describe the functionality of combinational circuits.	L3 - Apply

TEXTBOOKS:

1.	M. Morris Mano and Michael D. Ciletti, "Digital Design", Pearson, 6th Edition, 2018.
2.	Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson, 2017.

REFERENCE BOOKS:

1.	Charles Roth, "Fundamental of Logic Design", 5th Edition, Wadsworth Publishing, 2005.
2.	John Yarbrough, "Digital Logic Applications and Principles", 1st Edition, Pearson Education, 2006.
3.	Stephan Brown and Zvonk Vranesic, "Fundamentals of Digital Logic with Verilog Design", 2nd Edition, 2008, McGraw-Hill.

WEB REFERENCES:

S.No	Publisher	Website link	Type of Content
1.	The Regents of the University of California.	https://www.falstad.com/circuit/	Online Simulation Tool
2.	NPTEL	https://archive.nptel.ac.in/courses/108/105/108105132/	NPTEL Material
3.	Geeks for Geeks	https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/?ref=lbp	Blog

VIDEO REFERENCES:

S.No	Video Details	Name of the Expert	Type of Content	Video link
1.	NPTEL	Prof. S. Srinivasan Department of Electrical Engineering, IIT Madras	Lecture	https://youtube.com/playlist?list=PL803563859BF7ED8C&si=z_XeS8KVdj3aSoHw
2.	Youtube	Mr. Sujeet Singh, Neso Academy	Lecture / Real Time Applications	https://youtube.com/playlist?list=PLBlnK6fEyqRjMH3mWf6kwqiTbT798eAOm&si=yQ2a9nQjPTh_PL_PQ

Mapping of COs with POs and PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1			1				2						2
CO2	3	2	1	1	3	1			2						2
CO3	3	2	1	1	3	1			2						2
CO4	3	2	1	1	3				2						2
CO5	3	2	1	1	3				2						2
AVG	2.8	1.8	1	1	2.6	1			2						2

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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) — **2**

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

OPEN ENDED PROBLEMS / QUESTIONS

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Course specific Open-Ended Problems will be solved during the classroom teaching. Such problems can be given as Assignments (NTA) and evaluated as Internal Assessment (IA) 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	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**

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:

S.No	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:

S.No	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

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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									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

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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

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

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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
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													
Average	**3**	**2**													

1–Low, 2 –Medium, 3–High.

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