Semester:	I/II	**Course Type:**	IESC		
Course Title: Fundamentals of Electronics & Communication Engineering					
Course Code:	**25ECI14/24**			**Credits:**	4
Teaching Hours/Week (L:T:P:S)			3:0:2:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students:

- To understand the construction, operation and characteristics of Semiconductor Diodes, BJT, JFET and MOSFET.
- To describe the operation and applications of Op-Amp.
- To discuss the basic digital circuits.
- To explain the basics of communication systems, WLAN and Bluetooth.

II. Teaching-Learning Process :

- Chalk and talk method
- Power Point Presentation / keynotes
- Videos
- Demonstration of components /circuits
- Virtual Labs
- Case-based teaching
- Role play

III. COURSE CONTENT

Module-1 : Semiconductor Diodes and its Applications	8 Hours

Semiconductor diode, Ideal Versus Practical, Resistance Level, Diode Equivalent Circuits, Zener diodes, Zener diode as Voltage Regulator, Load Line Analysis.
Half Wave Rectification, Full Wave Rectification, Capacitor filter.

Textbook-1 : Chapter - 1, 2, 15 : Sections: 1.6, 1.7, 1.8, 1.9, 1.15, 2.2, 2.6, 2.7, 2.10, 15.3

RBT Levels: L1, L2, L3

Module-2 : BJT & Field Effect Transistor	8 Hours

Introduction, Transistor construction, Transistor Operation, Common Base, Transistor Amplifying Action, Common Emitter, Common Collector Configuration

Introduction, Construction and Characteristics of JFET, Transfer Characteristics, Depletion Type MOSFET and Enhancement Type MOSFET.
Textbook 1: Chapter - 3, 6 Sections 3.1, 3.2, 3.3, 3.4 ,3.5, 3.6, 3.7, 6.1, 6.2, 6.3, 6.7, 6.8

RBT Levels: L1, L2, L3

Module-3 : Operational Amplifiers and its Applications	8 Hours

Operational Amplifier, Block diagram of typical Op-Amp, Pin diagram of Op-Amp, Ideal Op-Amp, Equivalent circuit of an Op-Amp , Open loop Op-Amp configurations

Op-Amp Applications: Summing, scaling, Averaging Amplifiers, Subtractor, Voltage Follower, Integrator and Differentiator

Text 2 : Chapter – 1, 2, 6 Sections: 1.1, 1.2, 1.3, 2.3, 2.4, 2.6, 6.5.1, 6.12, 6.13

RBT Levels: L1, L2, L3

Module-4 : Digital Electronics Fundamentals	8 Hours

Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal numbers, 1's and 2's Complement

Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates.

Combinational Logic : Introduction, design procedure, NAND & NOR as Universal Gates, adders.

Text 3 : Chapter 1 , 2 , 4 Sections: 1.1, 1.2, 1.3, 1.4, 1.5 2.1,2.2, 2.3, 2.4, 2.5, 2.7 4.1, 4.2, 4.3,4.7

RBT Levels: L1, L2, L3

Module-5 : Communication Systems	8 Hours

Introduction, Modern Communication System Scheme, Transmitter, Channel, Noise, Receiver, Modulation, Types of Communication System.

Cellular Telephone System, Cellular Concept and Frequency Reuse, GSM Communication, Wireless LAN, Bluetooth.

Text 4: Chapter 1, 8 Sections: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.9, 1.15, 8.1, 8.2, 8.3, 8.7, 8.16, 8.17

RBT Levels: L1, L2, L3

III(b). PRACTICAL PART

Sl. No.	**Experiments / Programs (Use MATLAB/Simulink/Modelsim/SCILAB/Multisim/Trainer kit)**
1.	Determine the Ripple Factor and Efficiency of Half-Wave Rectifier with and Without Filter.
2.	Determine the Ripple Factor and Efficiency of centre tap Full-Wave Rectifier with and Without Filter.
3.	Test a Bridge Rectifier with and Without Filter for determining Ripple Factor and Efficiency
4.	Conduct an experiment to plot Input and Output Characteristics of a Bipolar Junction Transistor in Common Emitter Configuration
5.	Study of Transfer and Drain Characteristics of a MOSFET in Common Source Configuration
6.	Investigation of Op-Amp in Inverting and Non-Inverting Modes with Gain Measurement
7.	Testing of Op-Amp as voltage follower and a weighted summer
8.	Verify the Truth Tables of all Basic and Universal Gates
9.	Realization of Half Adder using Logic Gates
10.	Realization of Full Adder using Logic Gates

IV. COURSE OUTCOMES

At the end of the course students will be able to

CO1	Apply the working principles, fundamental characteristics of various semiconductor devices including diodes, transistors and operational amplifiers in basic electronic circuits.

CO2	Analyze basic rectifier and amplifier circuits using the principles of diodes, BJTs, and operational amplifiers.
CO3	Design basic combinational circuits using the fundamental principles of digital systems.
CO4	Illustrate the fundamental concepts of communication systems and their applications.
CO5	Apply the operating principles of semiconductor devices, opamp and logic gates to construct and test basic analog and digital circuits.

V. CO-PO-PSO MAPPING (H=3; M=2; L=1)

PO/ PSO	1	2	3	4	5	6	7	8	9	10	11	S1	S2	S3
CO1	3											2		
CO2		3						2	2			2		
CO3			3									2		
CO4	2											2		
CO5	3			2	3			3	3			2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer to Academic Regulations

Continuous Internal Evaluation (CIE): Refer to Annexure SL #2

Semester End Examination (SEE): Refer to Annexure SL #2

VII. Learning Resources

VII(a): Textbooks:

Sl. No	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Electronic Devices and Circuits Theory	Robert L Boylestad & Louis Nashelsky	10th edition	Pearson
2	Op-Amps and Linear Integrated Circuits	Ramakanth A Gayakwad	4th edition	PHI Learning
3	Digital Logic and Computer Design	M. Morris Mano	ISBN-978-81-203-0417-8,2008	PHI Learning
4	Communication Systems	S L Kakani , Priyanka Punglia	1st edition, 2017	New Age International Pvt Ltd

VII(b): Reference Books:

1	Electronic Devices and Circuit Theory	David A Bell	5th Edition	Oxford University Press
2	Electronic Communication Systems	George Kennedy	4th edition	TMH

VII(c): Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132
- https://nptel.ac.in/courses/117104072
- https://youtu.be/C0s7TS6HK0I
- https://youtu.be/j8V8nDCIHXY

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Welcome to Virtual Labs - A MHRD Govt of India Initiative (vlabs.ac.in)