Course Title	BASIC ELECTRONICS		
Course Code	23BEE13/23	(L-T-P)C	(3-0-0)3
SEE duration	3hours	Hours/Week	03
CIE(Theory)marks	30	Activity marks	20
SEE marks	50	Total contact hours	40

Course Objective:
The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.

Course Outcomes(COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	Mapping To POs
1.	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2
2.	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9
3.	Developcompetenceknowledgetoconstructbasicdigitalcircuitbymakingus eofbasic gate and its function.	1, 5, 9
4.	Apply the knowledge of various transducers for basic communication system.	1,2

Course Contents:

MODULE –1 — **10 Hrs.**

Semiconductor Diodes : Introduction, PN Junction diode, Characteristics, Diode Approximations, (Text1:2.1,2.2,2.3,2.4)

Diode Applications: Introduction, Half Wave Rectification, Full Wave Center tapped and bridge Rectifier, Full wave Capacitor Filter Circuit,
(Text1:3.1,3.2,3.4,3.5)

Zener Diodes: Junction Breakdown, Characteristics, Zener Diode as Voltage Regulator (Numerical). (Text1:2.9, 3.7)

MODULE–2 — **10 Hrs.**

Bipolar Junction Transistors: Introduction, PNP and NPN Transistor, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, DC Loadline and Biaspoint: Self bias, fixed bias and voltage divider bias (Text1:4.2, 4.3, 4.5,4.6,4.7, 5.1, 5.2, 5.3, 5.4)

Field Effect Transistor: Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs(Text1: 9.1,9.2,9.5)

MODULE –3 — **10 Hrs.**

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting &Non-Inverting Amplifier.

Op-AmpApplications: InvertingConfiguration,Non-InvertingConfiguration,DifferentialConfiguration, Voltage Follower, Integrator, Differentiator, Summer and subtractor (Text 2: 1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,6.5.1,6.5.2,6.5.3, 6.12, 6.13).

MODULE– 4	10hrs.
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions. **Digital Logic Gates** (Text3: 1.2,1.3,1.4,1.5,2.1,2.2,2.3,2.4, 2.5,2.6, 2.7) **Combinational logic**: Introduction, Design procedure, Adders-Half adder, Full adder (Text3:4.1,4.2,4.3) **Communications:** Introduction to Communication System, Modulation- AM and FM(Derivation and numerical)(Textbook5:1.1,1.2, 1.3, 3.1, 5.1)	

List of Activities

Activity Number	Activity Name	Description	Marks
1	**Analog Circuit design and implementation using open Source Simulator**	• Use Multisim Live Circuit Simulator (Online Simulation) • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	**10**
2	**Digital Circuit design and implementation using open-source Simulator**	• Use Multisim Live Circuit Simulator (Online Simulation) • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	**10**

Activity1Details:

Following are the experiments list of analog circuit design and implementation using open-source simulator.

1. For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
2. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
3. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audio signal frequency of 2kHz.
4. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be2.5 V.
5. A direct-coupled non inverting amplifier with a ± 25 mV input is to produce a ± 5 V output. Design the circuit with suitable resistance values.
6. Design a bridge full wave rectifier circuit to produce 12 Vun regulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
7. The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values.
8. Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.

Activity2 Details:

Following are the experiments list of circuit design and implementation using open source simulator.

1. Realization of Boolean expressions using basic gates.
2. Realization of half adder circuit.
3. Realization of full adder circuit.
4. Realization of 4-bit parallel adder.
5. Realization of SR and D flip flops.
6. Realization of JK and T flip flop.
7. Conversion of JK flip flop into D flips flop.
8. Realization of 4x 2 encoder and 2 x4 decoder.

Suggested Learning Resources:
Books (Title of the Book / Name of the author/ Name of the publisher/Edition and Year)

1. Electronic Devices and Circuits, David A Bell, 5th Edition,Oxford,2016
2. Op-amp s and Linear Integrated Circuits, Ramakanth A Gayakwad, PearsonEducation,4th Edition
3. Digital Logic and ComputerDesign,M.MorrisMano,PHILearning,2008ISBN-978-81-203-0417-8
4. Electronic Instrumentation and Measurements (3rd Edition) – David A. Bell, OxfordUniversity Press,2013 ElectronicCommunicationSystems,GeorgeKennedy,4thEdition,TMH

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

Course Title	INTRODUCTIONTOELECTRONICSENGINEERING		
Course Code	22ESC143/243	**(L-T-P)C**	(3-0-0)3
SEE duration	3hours	**Hours/Week**	03
CIE(Theory)marks	30	**Activity marks**	20
SEE marks	50	**Total contact hours**	40

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Course Outcomes (COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	Mapping To POs
3.	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2
4.	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9
5.	Develop competence knowledge to construct basic digital circuit by make	1, 5, 9
6.	Use of basic gate and its function.	1,2

Course Contents:

MODULE –1	10 Hrs.
Power Supplies–Block diagram, Half-wave rectifier, Full- wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers. **Amplifiers**–CE amplifier with and without feedback, multi-stage amplifier; BJT as a switch: Cut-off and saturation modes, BJT Biasing: Introduction, DC Load line and Bias point-Self bias, fixed bias. (Text 1)	
MODULE –2	**10 Hrs.**
Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Colpitt's and Hartley oscillator, Multi vibrators, Single-stage a stable oscillator, Crystal controlled oscillators (Only Concepts, working, and wave forms. No mathematical derivations) **Operational amplifiers** - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator.(Text 1)	
MODULE –3	**10 Hrs.**
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms,OtherLogicOperations,DigitalLogicGates(Text2:1.2,1.3,1.4,1.5,2.1,2.2,2.3,2.4, 2.5,2.6, 2.7)**.** **Combinational logic:** Introduction, Designprocedure,Adders/subtractors-	

Halfadder/Subtractor,Fulladder/subtractor. (Text 2:4.1,4.2, 4.3).	
MODULE –4	**10 Hrs.**
Embedded Systems–Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC**.** (Text1). **Analog Communication Schemes**–Modern communication system scheme, Information source, and input transducer, Transmitter, Channel – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts)–AM, FM,	

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2	**Digital Circuit design and implementation using open-source Simulator**	• Use Multisim Live Circuit Simulator (Online Simulation) • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	**10**

Activity1Details:

Following are the experiments list of analog circuit design and implementation using open-source simulator.

9. For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
10. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
11. Construct as inusoidal wave generator circuit using crystal oscillator to generate an audio
    Signal frequency of 2kHz.
12. Design an inverting amplifier to have a voltage gain of 50and the output voltage amplitude is to be2.5 V.
13. A direct-coupled non inverting amplifier with a ± 25 mV input is to produce a ± 5 V

output. Design the circuit with suitable resistance values.

14. Design a bridge full wave rectifier circuit to produce12 Vunregulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
15. The difference of two input signals is to be amplified by a factor of 20.Design the circuit with suitable resistance values.
16. Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.

Activity2Details:

Following are the experiments list of circuit design and implementation using open source simulator.

9. Realization of Boolean expressions using basic gates.
10. Realization of half adder circuit.
11. Realization of full adder circuit.
12. Realization of 4-bit parallel adder.
13. Realization of half subtractor circuit.
14. Realization of full subtractor circuit.
15. Realization of Integrator.
16. Realization of Differentiator.

Suggested Learning Resources:
Books(TitleoftheBook/Nameoftheauthor/Nameofthepublisher/EditionandYear)

1.Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4th Edition, Elsevier,2015.DOIhttps://doi.org/10.4324/9781315737980. eBook ISBN9781315737980.

2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-84.

3.D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),PrivateLimited, 2018.