



Gyanmanjari
Innovative University

Syllabus
Gyanmanjari Institute of Technology
Semester-1

Subject: Basics of Electronics Engineering: Concepts and Applications - BET1EE11301

Type of course: Major (Core)

Prerequisite: Basic knowledge of Physics and Mathematics.

Rationale: The course is designed to provide Elementary concepts of Electronics Engineering to engineering students. Electronics is the cornerstone of modern technology, playing a vital role in nearly every aspect of contemporary life—from communication systems, healthcare, and transportation to entertainment, industry, and automation. A deep understanding of electronics is essential for students, engineers, and professionals who aspire to innovate and contribute effectively in the 21st-century technological landscape. Without it, modern civilization as we know it would be impossible.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P	C	SEE	CCE	
2	0	4	4	100	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	Semiconductor Diodes and Rectifiers Topics: - Semiconductor basics (P-type, N-type) - PN Junction diode and its characteristics. - Diode Equivalent Circuit - Zener diode - Light Emitting Diode - Sinusoidal Inputs: Half-Wave Rectification	T:08 P:12	25%



- Full-wave Rectification
- Clipper
- Clamper

Practical

Sr. No.	Practical Task	Tools Used	Outcome
1	Plot the V-I characteristics of a PN junction diode	kit +Multimeter	Understand the diode's behavior in forward and reverse bias by plotting its V-I characteristics.
2	Verify characteristics of a Zener diode for Forward and Reverse Bias condition	kit +Multimeter Multisim Software / LT spice	Analyze the reverse breakdown region of a Zener diode through its V-I characteristics.
3	Zener diode as a voltage regulator	kit +Multimeter Multisim Software / LT spice	Demonstrate the use of a Zener diode to maintain a constant output voltage despite load or input changes.
4	To demonstrate how LED works in a simple circuit.	Kit +Multimeter Multisim Software / LT spice	Apply knowledge of circuit fundamentals to build and test an LED circuit using resistors and a power supply.
5	Half-wave rectifier using a diode	kit +Multimeter Multisim Software / LT spice	Observe the conversion of an AC input into a pulsating DC output using a single diode.



6	Full-wave rectifier	kit +Multimeter Multisim Software / LT spice	Verify the full-wave rectification of an AC signal to improve efficiency.		
Evaluation Method					
Sr. No.	Evaluation Component	SEE (Marks)	CCE (Marks)	Description	
1	Circuit Assembly and connection on Software	10	–	Students will design and simulate a given circuit and verify output.	
2	Problem-solving on zener diode.	05		Students will solve problem based on Zener as Regulator depending on a given condition	
2	Active Learning Activity (Component Identification)	-	05	Identify the given component and read its values.	
3	Performance comparison of Rectifiers.	–	05	Students will compare different type of Rectifier and upload Report on GMIU web Portal.	
	Total	15	10		
2	Bipolar junction transistors Topics: • Transistor Construction(NPN and PNP) • Transistor Operation • Operating modes: Active, Saturation, and Cut-off				T:07 P:12 15%



• Common-Base Configuration • Common-Collector Configuration • Common-Emitter Configuration • BJT as an amplifier and switch					
Practical					
Sr. No.	Practical Task	Tools Used	Outcome		
1	Identify the terminals of the BJT using the datasheet and a multimeter	Multimeter + Datasheets	Learn BJT pin configuration and types		
2	Plot the input/output characteristics of the BJT in the CB configuration	Virtual Lab	Analyze the input-output relationship of BJT		
3	Plot the input/output characteristics of the BJT in the CE configuration	Virtual Lab	Analyze the input-output relationship of BJT		
4	Verify the transistor as a switch	Multisim Software & LT spice	Observe transistors as a Switch.		
5	Set up the transistor amplifier circuit	Virtual Lab	Observe signal amplification		
Evaluation Method					
Sr. No.	Evaluation Component	SEE (Marks)	CCE (Marks)	Description	
1	Problem - solving	10	–	Numerical, based on BJT operation, modes, and amplifier design	
2	Active Learning Activities (Judge and Draw)		10	The clue will be given to the students, the Judge, and the circuit will be drawn in a group	



				of 3 or 4, and upload it to the GMIU Web Portal																																
	Total	10	10																																	
3	Field Effect Transistor Topics: • Construction and Characteristics of FET • Transfer Characteristics • Depletion-type MOSFET • Enhancement Type MOSFET. Practical <table><tr><th>Sr. No.</th><th>Practical Task</th><th>Tools Used</th><th>Outcome</th></tr><tr><td>1</td><td>Study MOSFET as a switch</td><td>Proteus or Multisim</td><td>Learn the switching behavior; ON/OFF control via gate voltage</td></tr><tr><td>2</td><td>Simulate FET characteristics</td><td>Proteus or Multisim</td><td>Virtual observation of JFET/MOSFET behavior; reinforce theory with simulation</td></tr><tr><td>3</td><td>Design and simulate a JFET amplifier</td><td>Proteus or Multisim</td><td>Observe amplified output.</td></tr><tr><td>4.</td><td>Simulate an application-based circuit</td><td>Proteus / Multisim</td><td>Apply Knowledge in a simple application</td></tr></table> Evaluation Method <table><tr><th>Sr. No.</th><th>Evaluation Component</th><th>SEE (Marks)</th><th>CCE (Marks)</th><th>Description</th></tr><tr><td>1</td><td>Designing of circuit in software tool</td><td>10</td><td>–</td><td>Simulation FET circuit Design in software tool</td></tr></table>				Sr. No.	Practical Task	Tools Used	Outcome	1	Study MOSFET as a switch	Proteus or Multisim	Learn the switching behavior; ON/OFF control via gate voltage	2	Simulate FET characteristics	Proteus or Multisim	Virtual observation of JFET/MOSFET behavior; reinforce theory with simulation	3	Design and simulate a JFET amplifier	Proteus or Multisim	Observe amplified output.	4.	Simulate an application-based circuit	Proteus / Multisim	Apply Knowledge in a simple application	Sr. No.	Evaluation Component	SEE (Marks)	CCE (Marks)	Description	1	Designing of circuit in software tool	10	–	Simulation FET circuit Design in software tool	T:07 P:12	20%
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	2	Active Learning Activities Component Hunt: Identify 5 real-world devices that use diodes, transistors, or MOSFETs (e.g., TV, inverter, charger).)	–	5	Understand the practical use of components and upload findings on the portal.																						
	3	Viva Voce	–	5	Oral questions																						
		Total	10	10																							
4	Operational Amplifier Topics: • op-amp Introduction • Inverting Amplifier • Non Inverting Amplifier • op-amp Application. Practical <table><tr><th>Sr. No.</th><th>Practical Task</th><th>Tools Used</th><th>Outcome</th></tr><tr><td>1</td><td>op-amp in Inverting Mode</td><td>Proteus or Multisim</td><td>Understand phase inversion and gain control.</td></tr><tr><td>2</td><td>op-amp in Non-Inverting Modes</td><td>Proteus or Multisim</td><td>Analyze signal amplification without phase shift.</td></tr><tr><td>3</td><td>Op-amp as Summer Amplifier</td><td>Proteus or Multisim</td><td>Perform multiple input voltage addition.</td></tr><tr><td>4</td><td>Integrator</td><td>Proteus or Multisim</td><td>Understand integration of input waveform over time.</td></tr></table>					Sr. No.	Practical Task	Tools Used	Outcome	1	op-amp in Inverting Mode	Proteus or Multisim	Understand phase inversion and gain control.	2	op-amp in Non-Inverting Modes	Proteus or Multisim	Analyze signal amplification without phase shift.	3	Op-amp as Summer Amplifier	Proteus or Multisim	Perform multiple input voltage addition.	4	Integrator	Proteus or Multisim	Understand integration of input waveform over time.	T:08 P:12	20%
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5	Differentiator	Proteus or Multisim	Analyze rapid signal changes and output response.		
Evaluation Method					
Sr. No.	Evaluation Component	SEE (Marks)	CCE (Marks)	Description	
1	Design a Specific Function using Op-amp	10		Students research, design, simulate and then build and test their circuits and explain their results.	
2	Analyze the given circuit Parameter	05		Students need to find parameters (like gain) of a given circuit	
3	Quiz (MCQ – Conceptual & Circuit-based)	–	05	Questions on Op-Amp basics	
4	Fault-Finder: What's Wrong with The Circuit?		05	Students identify the error, and propose a correct solution.	
	Total	15	10		
5	Feedback and Oscillator Circuit Topics: • Feedback connection Types • Oscillator Operation • RC, LC Oscillator • Wien's Bridge Oscillator • Tuned Oscillator • Crystal oscillator Practical:			T:08 P:12	20%
Sr. No.	Practical Task	Tools Used	Learning Outcome		



1	To design, simulate, and analyze RC oscillators	Proteus or Multisim	Design, simulate, and analyze RC oscillators in Multisim.
2	To simulate simple LC oscillators,	Proteus or Multisim	Design, simulate, and analyze LC oscillators in Multisim
3	To simulate a crystal oscillator	Proteus or Multisim	Perform crystal oscillator Analysis

Evaluation Method				
Sr. No.	Evaluation Component	SEE (Marks)	CCE (Marks)	Description
1	Computational Analysis of Oscillator Circuits	10	-	Compute Parameters of given Oscillator and verify them Through Simulation
2	Performance Prediction		5	Simulation of any Oscillator predicting how an oscillator will perform under various operating conditions (temperature, voltage, load).
3	Comparison between different Types of Feedback.		5	Preparation of Poster
	Total	10	10	



Project Objective To enhance practical understanding and design thinking by allowing students to apply fundamental electronics concepts in a real-world mini project. Students will build simple functional circuits, simulate operations, and present their ideas—developing teamwork, documentation, and problem-solving skills.				
Evaluation Method				
Sr. No.	Evaluation Component	SEE (Marks)	CCE (Marks)	Description
1	Report	5	—	Submit a concise report covering circuit design, components used, working principle, and observations.
2	Presentation	10	—	Present the project idea, working logic, and relevance through slides or a live demo.
3	Model Working	15	—	Evaluate based on correct implementation, functionality, and simulation (if applicable).
4	Viva Voce	10	—	Oral questions on circuit behavior, design logic, and individual contribution.



Suggested Specification Table with Marks:

Distribution of Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	10%	15%	20%	10%	15%	30%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the evaluation may vary slightly from the above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Analyze PN junction, Zener, and LEDs, their characteristics, equivalent circuits, and apply them in half-wave and full-wave rectification
CO2	Familiarize with NPN and PNP transistors, and analyze their behavior in common-base, common-emitter, and common-collector configurations for use as Switches and amplifiers
CO3	Illustrate the construction and characteristics of FETs, interpret their transfer characteristics, and differentiate between depletion and enhancement type MOSFETs for various electronic applications
CO4	Explore and evaluate the operation and applications of operational amplifiers.
CO5	Understand the concept of Feedback and oscillator circuitry.

Instructional Method:

The course delivery method will depend on the requirements of the content and the needs of students. The teacher, in addition to the conventional teaching method by the blackboard, may also use any of the tools such as demonstration, role play, quizzes, brainstorming, MOOCs, etc.

From the content, 10% of topics are suggested for flipped mode instruction.

Students will utilize supplementary resources, including online videos, NPTEL/SWAYAM videos, e-courses, and Virtual Laboratories.

The internal evaluation will be done on the basis of the CCE-Continuous and Comprehensive Evaluation.



SEE: Semester End Evaluation will be conducted at the end of the semester for evaluation of the performance of students in the laboratory.

Reference Books

- [1] R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th ed. Boston, MA, USA: Pearson Education, 2013.
- [2] A. P. Malvino and D. J. Bates, Electronic Principles, 7th ed. New York, NY, USA: McGraw-Hill, 2007.
- [3] R. A. Gaikwad, Op-Amps and Linear Integrated Circuits, 4th ed. New Delhi, India: PHI Learning Pvt. Ltd., 2013.
- [4] R. S. Sedha, A Textbook of Applied Electronics, 3rd ed. New Delhi, India: S. Chand & Co., 2014.
- [5] H. S. Kalsi, Electronic Instrumentation, 3rd ed. New Delhi, India: Tata McGraw-Hill, 2010.

