# **Course Handout (2021-22 EVEN SEMESTER)**

Subject Name/Code : BASIC ELECTRONICS ENGINEERING(BTEC-T- ES-001) Branch/Sem/Batch :

Name of Faculty : Aradhana Raju , SANGHAMITRA DAS , Debangana Das

Scope & Objective -:

Know broadly the concepts and functionalities of the electronic devices, toolsand instruments. Understand general specifications and deployability of theelectronic devices, and assemblies. Develop confidence in handling and usage of electronic devices, tools and instruments in engineering applications.

Pre-Requisite -:

<u>Detailed Syllabus:</u>

Module#	CO	Topics	Hours
1	CO-1	Introduction to Electronics: Signals, Frequency spectrum of signals, Analogand digital signals; Diodes and Applications: Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as aSwitch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers, BreakdownMechanisms, Zener Diode - Operation and Applications; Clipper and Clamper Circuits, Diode applications	7
2	CO-2	Bipolar Junction Transistor (BJT): Construction, Operation, AmplifyingAction, Common Base, Common Emitter and Common CollectorConfigurations, Operating Point, Fixed and Voltage divider BiasingConfigurations.	6
3	CO-3	Field Effect Transistor (FET): Construction, Characteristics of Junction FET(JFET), Depletion and Enhancement type Metal Oxide Semiconductor FETs(MOSFET), Introduction to Complementary MOS (CMOS) circuits.	5
4	CO-4	Operational Amplifiers and Applications: Introduction to Op- Amp, Differential Amplifier Configurations, Basics of Op-Amp, Characteristicsof Ideal Op-Amp, CMRR, PSRR, Slew Rate; Block Diagram and PinConfiguration of IC 741 Op-Amp, Applications of Op-Amp as: SummingAmplifier, Difference Amplifier, Differentiator, Integrator.	5
5	CO-5	Feedback Amplifiers:Principle, Advantages of Negative Feedback,Different Feedback Topologies.Oscillators: Classification, RC Phase ShiftOscillator.	5
		Total	28 Hours

#	Topic	Module	Chapter	Course Coverage	No of Classes
1	Introduction to Electronics: Signals, Analog and Digital Signals	1		TRUE	1
2	Frequency spectrum of signals	1		TRUE	1
3	Diodes and Applications: Semiconductor Diode - Ideal versus Practical, Resistance Levels.	1 TRUE		1	
4	Diode Equivalent Circuits, Load Line Analysis			TRUE	1
5	problem solving			TRUE	1
6	6 Diode as a Switch			TRUE	1
7	Diode as a Rectifier, Half Wave Rectifier.	1		TRUE	1
8	8 Full Wave Rectifiers.			TRUE	1
9	9 Problem solving			TRUE	1

10	Breakdown Mechanisms, Zener Diode- Operation and Applications	1	TRUE		1
11	Clipper and Clamper circuits	1		TRUE	1
12	12 Problem Solving		TRUE		1
13	Diode Applications: Opto-Electronic Devices - LEDs, Photo diode.	1		TRUE	1
14	Construction, Operation of BJT	2		TRUE	1
15	Amplifying Action of BJT	2		TRUE	1
16	Common Base Configuration of BJT	2	TRUE		1
17	Common Emitter configuration of BJT	2		TRUE	1
18	Common Collector Configurations, Operating Point of BJT	2		TRUE	1
19	Fixed Biasing Configuration and problems	2		TRUE	1
20	Voltage divider Biasing Configuration and problems	2		TRUE	1
21	problem solving 2			TRUE	1
22	Construction of Junction FET	3		TRUE	1
23	Characteristics of Junction FET	3		TRUE	1
24	problem solving	3		TRUE	1
25	Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs	3		TRUE	1
26	Introduction to CMOS circuits	3		TRUE	1
27	Introduction to Op-Amp, Differential Amplifier Configurations	4		TRUE	1
28	Basics of Op-Amp, Characteristics of Ideal Op-Amp, CMRR, PSRR, Slew Rate.	4		TRUE	1
29	Block Diagram and Pin Configuration of IC 741 Op-Amp	4		TRUE	1
30	Applications of OpAmp as: Summing Amplifier, Difference Amplifier,	4		TRUE	1
31	problem solving	4		TRUE	1
32	Differentiator, Integrator	4		TRUE	1
33	problem solving	4		TRUE	1
34	Feedback Amplifiers: Principle, Advantages of Negative Feedback	5	5 TRUE		1
35	Different Feedback Topologies	5		TRUE	1
36	Continuation of previous class	5		TRUE	1
37	Oscillators: Classification, RC Phase Shift Oscillator	5		TRUE	1
38	problem solving	5		TRUE	1

Total no. of classes : 38

### Text Book

R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11thEdition, PearsonEducation, 2015, ., .

A. S. Sedra and K. C. Smith, Microelectronic Circuits, 7th Edition, Oxford University Press, 2009., . .

## Reference Book

A. Agarwal and J. Lang, Foundations of Analog and Digital Electronic Circuits, 1stEdition, MorganKaufmann, 2005., ., . V. K. Mehta and Rohit Mehta, Principles of Electronics, 10thRev. Edition, S. Chand Publishing, 2006., ., .

#### Online Reference Material(s):

https://nptel.ac.in/courses/117/103/117103063/: by Prof. G. Barua, IIT Guwahati https://nptel.ac.in/courses/108/101/108101091/: By Prof. M. B. Patil, IIT Bombay https://nptel.ac.in/courses/122/106/122106025/: By Prof. T. S. Natarajan, IIT Madras https://nptel.ac.in/courses/117/107/117107095/: Web Content by IIT Roorkee https://nptel.ac.in/courses/122/104/122104013/: Web Content by IIT Kanpu

### Course Outcome:

**CO-1** Become familiar with basic signals, diodes and their applications

<b>CO-2</b>	Investigate on the operation of different configurations of bipolar junction transistor. Analyzeand design different biasing configurations with their applications.
CO-3	Understand the construction, operation and characteristics of JFET and MOSFET. Analyzeand design different biasing configurations with their applications
<b>CO-4</b>	Learn the construction and characteristics of Op-Amp and design circuits for variousapplications using Op-Amp
CO-5	Understand different types of feedback topologies and design various kinds of oscillators.

## Program Outcomes Relevent to the Course:

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PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
	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.
1	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.
	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.
PUX	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.
	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.

# Mapping of CO's to PO's: (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4
CO-1	2	1	1	
CO-2	3	2	3	1
CO-3	2	2	2	1
CO-4	3		3	
CO-5	2	1	2	