COURSE TITLE	**BASICS OF ELECTRONICS ENGINEERING**
COURSE CODE	**01EC2101**
COURSE CREDITS	**4**

Objective:

1 The objective of this Course is to provide the students with an introductory and broad treatment of semiconductors and components like diode, transistor, FET, MOSFET, and operational amplifier. It will build mathematical and numerical background for design of electronics circuit & component value.

Course Outcomes: After completion of this course, student will be able to:

1 Analyze the voltage and current operation of semiconductor devices and circuits.

2 Apply basic fundamentals of semiconductor devices to illustrate/show the operation of application.

3 Apply the basic knowledge of simulation tool & Circuit level concepts to synthesize real lifeproblems.

4 Analyze the behavior of Electronics circuits containing Semiconductor device or Verify using Modern tools.

5 Design, implement and analyze of electronic circuits to solve the problem with in society

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Fundamentals of Semiconductor Material** Energy Band Diagram of conductor, semiconductor and insulator; Bhor Atomic Model for Atom, Crystal Structure of Semiconductor Materials, Intrinsic and Extrinsic Semiconductor Materials.	2
2	**Semiconductor Diodes:** Symbol and Construction, Operating Characteristics in Forward and Reverse Bias, Applications of Diode as Switch, Clipper, Clamper and Rectifier; Special Purpose Diodes : Zener Diode; Optical Diodes like LED, Photo Diode, Laser Diode, Seven Segment Display; Other Diodes like Varactor Diode, Schottkey Diode, PIN Diode, Tunnel Diode, Step Recovery Diode, Latest diodes with high surge current capacity and fast switching speed for applications in switched mode power supply	6

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Contents : Unit	Topics	Contact Hours
3	**Bipolar Junction Transistor(BJT):** History of BJT invention; Types, Symbol and Construction of BJT; Basic Operation of BJT; BJT Configurations : Common Base, Common Emitter, Common Collector with Operation, Input/Output Characteristics; Applications of Transistors as Switch and Amplifier.	6
4	**BJT Biasing:** DC Operating Point, Fixed (Base) Biasing, Emitter Biasing, Voltage Divider Bias, Emitter Feedback Bias, Collector Feedback Bias, Collector and Emitter Feedback Bias, Analysis of CE amplifier	8
5	**Field Effect Transistor:** Types, Symbol, Construction, Operation, Input/Output Characteristics and Applications of Junction Filed Effect Transistor (JFET), Metal Filed Effect Transistor(MOSFET), Introduction to FinFET, Its working principle and its importance	6
6	**Transistor Amplifiers:** Small signal operation, AC and DC equivalent circuits of amplifier, loading effect of input impedance, multistage amplifiers, CC amplifiers, Cascading CE-CC amplifiers, Darlington connections, power amplifier, negative feedback and feedback amplifier	8
7	**Introduction to power electronics** Power transistors, SCR, TRIAC, DC-DC converter concepts, Buck converter, Boost converter, DC to AC conversions (Inversion)	6
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment 1** Interpret the key parameters like threshold voltage, static resistance, dynamic resistance of silicon diode	2
2	**Experiment 2** To design and evaluate a Zener Diode based Voltage Regulator under varying input and load conditions.	2
3	**Experiment 3** To design and implement Clipper and Clamper circuits using Silicon Diodes for signal conditioning.	2
4	**Experiment 4** To analyze and compare the performance of Half Wave, Full Wave and Bridge Rectifiers for power supply applications.	2
5	**Experiment 5** To extract and analyze the Input and Output characteristics of a BJT for parameter estimation.	2
6	**Experiment 6** To design and implement a BJT as an electronic switch for controlling practical loads.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
7	**Experiment 7** To analyze and evaluate CE, CB and CC amplifier configurations in terms of gain, bandwidth and impedance.	2
8	**Experiment 8** To analyze and evaluate the variation of transistor current gain with temperature under different biasing conditions.	2
9	**Experiment 9** Design a two-stage amplifier to meet specific specifications by selecting appropriate resistor values and coupling	2
10	**Experiment 10** Design and analyze Darlington amplifier and demonstrate high current gain and high input impedence	2
11	**Experiment 11** To analyze and evaluate the impact of negative feedback on amplifier gain and bandwidth.	2
12	**Experiment 12** To design and implement a Wien Bridge Oscillator for sinusoidal signal generation.	2
13	**Experiment 13** To design and evaluate an Integrated Circuit (IC) based Voltage Regulator.	2
14	**Experiment 14** To design and implement a Full Wave Bridge Rectifier for a specified DC output.	2
15	**Experiment 15** To design and evaluate a Zener Diode based regulated power supply under variable input conditions.	2
16	**Experiment 16** To analyze and determine the saturation current and surface leakage current of a Silicon Diode under temperature variation.	2
17	**Experiment 17** To design and demonstrate an Automatic Street Light Control System using LED and sensor.	2
18	**Experiment 18** To design and develop a Variable DC Power Supply ranging from +5V to +25V.	2
19	**Experiment 19** To design, implement and evaluate Power Amplifier circuits for practical applications.	2
20	**Experiment 20** To design and analyze DC–DC Converter circuits for power electronics applications.	2
Total Hours		**40**

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Textbook :

1 Electronics Principles, Albert Malvino and David Bates, Tata McGraw-Hill, 2006

References:

1 Electronic Devices and Circuit Theory, Electronic Devices and Circuit Theory, Robert Boylestad and Louis Nashelsky, Pearson Education, 2009

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	20.00	30.00	15.00	10.00	5.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of the students. The teacher in addition to conventional teaching method (Chalk and Talk) may use any of the tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc. for effective teaching.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of the semester for evaluation of performance of students in laboratory.

4 Students may use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory, etc.

5 The course delivery method will depend upon the requirement of content and need of the students. The teacher in addition to conventional teaching method (Chalk and Talk) may use any of the tools such as demonstration, role play, Quiz, brainstorming, Flipped class, Project based learning, Collaborative learning, MOOCs etc. for effective teaching.

Supplementary Resources:

1 http://textofvideo.nptel.iitm.ac.in/video.php?courseId=117103063

2 https://www.coursera.org/course/eefunlab

3 https://www.coursera.org/course/introtoelectronics

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