Course Title:	**Fundamentals of Semiconductor Devices**	Semester	**I/II**
Course Code:	**BETCK105N /205N**	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03

Course Learning objectives:

CLO1: Describe the basic physical properties of semiconductors and what material parameters affect these properties

CLO2: To make students understand the fundamentals of electronic devices.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Lecture method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various analog and digital circuits.
3. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recallit.
4. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
5. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1: Introduction to semiconductor devices and Technology (8 Hours)

Self-study: Band structure of various semiconductors, tunneling

Device building blocks, major semiconductor devices, key semiconductor technologies, technology trends, semiconductor materials, basic crystal structures, valence bands, energy bands, intrinsic carrier concentration, donors & acceptors, carrier drift, carrier diffusion, generation & recombination process.

(RBT levels: L1, L2, L3)

Module-2: Light emitting diodes & lasers (8 Hours)

Self-study: semiconductor lasers

Radiative Transitions and Optical Absorption, Light-Emitting Diodes, Various Light-Emitting Diodes, Opto-isolators(basic working only),Semiconductor Lasers Photo detectors & Solar cells: Photodetectors, Solar Cells, Silicon and Compound-
Semiconductor Solar Cells, Third-Generation Solar Cells

(RBT levels: L1, L2, L3)

Module-3: Bipolar transistors & related devices (8 Hours)

Self-study: fabrication of various devices

Transistor Action, Static Characteristics of Bipolar Transistors, Frequency Response and Switching of Bipolar Transistors, Nonideal Effects, Heterojunction Bipolar Transistors, Thyristors and Related Power Devices

(RBT levels: L1, L2, L3)

Module-4: Integrated Devices (8 Hours)

Self-study: Nano devices
Passive Components, MOSFET Technology, MESFET Technology, Challenges for Nanoelectronics
(RBT levels: L1, L2, L3)

Module-5: Special semiconductor devices (8 Hours)

Self-study: Dual gate MOSFET
Thermistors, senistors, Barretters, Gunn diode, Zener diode, Tunnel diode, PIN diode, Schottky diode, SCR, TRIAC, DIAC, DIAC as lamp dimmer, IGBT, LCD- basic principle of operation and characteristics (Text book 2: chapter 5)(basic structure and operation only)
(RBT levels: L1, L2, L3)

Course outcomes:

At the end of the course the student will be able to:

CO1: Apply the knowledge of basic semiconductor material physics
CO2: Analyze the characteristics of various electronic devices like LEDs and Lasers
CO3: Classify and analyze the various circuit configurations of Bipolar Transistors and related devices.
CO4: Analyze the various circuit configurations of FETs and related devices.
CO5: Illustrate the qualitative knowledge of Power electronic Devices. Become aware of the latest technological changes in Display Devices.

Course Assessment and Evaluation Details (both CIE and SEE)

Continuous Internal Evaluation: 50 marks		
Theory Assessment Tool	**Marks**	**Reduced marks**
IAT-1	25	25
IAT-2	25	
Assessment -1(activity based)	25	25
Assessment-2(activity based)	25	
Semester End Examination (SEE) : 50 marks		
SEE	**Marks**	**Reduced marks**
Course end examination (Answer any one question from each unit – Internal choice)	100	50

Activity based learning:

1. Hands-on: To visualize the atomic structure of semiconductors, guide students to conduct small group activities using a molecular structure model.
2. Problem-based activities: In-class worksheet problems
3. Computer modeling: Computer simulations and incorporation of computer programs in teaching activities are also an effective way of improving the learning outcomes

Suggested Learning Resources:

Text books :

1.S.M.Sze, M K Lee, “Semiconductor Devices-Physics & Technology”, John wiley & Sons
2. Sanjeev Gupta & Santosh Gupta, “Electronic Devices & Circuits”, Dhanpat Rai publications, 2017 edition)

Reference Books:

1. Donald Neamen, Semiconductor Physics and Devices, 3rd Edition

e-resources:

1. https://archive.nptel.ac.in/courses/108/108/108108122
2. https://youtu.be/k6ZxP9Yr02E
3. https://youtu.be/JA3sCmrv11M
4. https://youtu.be/mHAyQhz0ILE
5. https://youtu.be/N01BYteinzE
6. https://www.classcentral.com/course/swayam-fundamentals-of-electronic-device-fabrication-14080

Course articulation matrix

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO2
CO1	3												3	
CO2	2	3											3	
CO3	2	3											3	
CO4	2	3											3	
CO5	2	3										1	3	