



BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE PILANI

Pilani Campus

INSTRUCTION DIVISION

FIRST SEMESTER 2018-2019

Course Handout Part II

Date:02/08/2018

In addition to part -I (General Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course.

Course No. : **EEE/INSTR F 214**
Course Title : **Electronic Devices**
Instructor-in-Charge : **V K CHAUBEY (vkc@pilani.bits-pilani.ac.in)**
Instructors : **Rajneesh Kumar, Arnab Hazra, Kavindra Kandpal ,
Kari Babu Ravi Teja, Pramila Mahala.**

1. Scope and Objective:

The course provides a comprehensive understanding of the basic theory of semiconductors and devices made out of it. Starting by explaining the fundamentals of semiconductors like energy band formation, electron and hole concepts, effect of electric and magnetic fields on charge carriers, the course helps in developing the understanding about excess carriers in semiconductors and its device application. In-depth study on 'junctions' prepares the students for even a detailed study on devices to be studied later like FET and BJT viz. commonly employed in Integrated Circuit (IC) technology . Concepts of some advanced semiconductor devices suitable for high frequency and infrared-optical range will also be discussed.

2. Text Book:

B. G. Streetman, and Sanjay Banerjee, "Solid State Electronic Devices", 6th ed., PHI learning Private Limited, New Delhi, 2009

3. Reference Books:

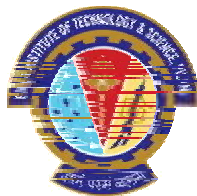
1. D A. Neaman, "Semiconductor Physics and Devices", 3rd edition, Tata Mc Graw Hill, New Delhi
2. M S Tyagi , " Introduction to Semiconductor Materials and Devices" John, NewYork 1991.

4. Course Plan:

Lecture No.	Topic	Learning Outcome	Reference to text
1-3	Introduction to subject and review of semiconductor fundamentals.	Basics of Semiconductor materials, Direct and Indirect semiconductors, Band gap, effective mass.	Class notes and 3.1.3, 3.1.4, 3.2
4-6	Charge carriers in semiconductors,	Fermi level, equilibrium carrier concentrations, temperature dependence, space charge neutrality	3.3
7-8	Effect of electric and magnetic fields on drift of carriers	Conductivity and mobility, Hall effect	3.4-3.5
9-11	Excess carriers in semiconductors	Photon induced carrier generation, generation recombination of excess carriers, quasi-fermi levels in non equilibrium	4.1 – 4.4
12-18	pn Junction	Concepts of Equilibrium conditions, Fermi	5.2 – 5.6



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		levels, I-V characteristics, biasing, transient and AC conditions, secondary effects	
19-22	Metal Semiconductor Junction	Schottky Barrier, Rectifying contacts and ohmic contacts.Heterojunction	5.7
23-26	Field Effect Transistors	To understand the structure and working of JFET, Metal-Semiconductor FET and MISFET, MOS capacitors (ideal and real)	6.2 – 6.4
27-31	Field Effect Transistors	MOSFET, I-V characteristics and secondary effects	6.5 and Lecture notes
32-37	Bipolar Junction Transistors	BJT operations, amplifications, carrier distribution, I-V characteristics etc. and secondary effects	7.3 – 7.5 and Lecture notes
38-40	Optoelectronic devices	Photodiodes, Solar cells, LEDs, Lasers and Semiconductor Lasers	8.1 – 8.4
41-42	High frequency devices	Basic understanding of conduction mechanism of Tunnel diodes and Gunn diodes	10.1 – 10.6

5. Learning outcome of the course: Student will understand physics and circuit model of semiconductor material , junctions and devices. This also enables them to appreciate the functioning of devices and their characteristics in electronic circuit design and is useful to appreciate other courses related to microelectronics and VLSI area.

6. Evaluation Scheme:

Component	Duration	Marks (300)	Date & Time	Evaluation type
Mid Sem. Exam	90 mins	90	13/10 2:00 - 3:30 PM	Closed Book
Assignment	--	30	--	Quiz based on Assignments (Closed Book)
Tutorial Quizzes	10 mins	60		Closed Book
Compre. Exam.	3 hours	120	12/12 FN	Closed Book+ Open Book

7. Tutorials: Tutorial sheets will be distributed in all tutorial hours.

8. Chamber Consultation hours: To be announced in the class.

9. Notices: All notices concerning the course will be displayed on EEE notice board.

10. Make-up Examination: Make-up will be given **ONLY** in cases of sickness (hospitalization) or urgency for going out of station. (no make-up will be given for assignments and surprise quizzes)

Instructor-in-Charge
EEE/INSTR F214



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