BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
HYDERABAD CAMPUS
INSTRUCTION DIVISION
FIRST SEMESTER 2016 – 2017
Course Handout Part II

Date: Mon 1st Aug 2016

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 / ECE / INSTR F214**
Course Title	:	**ELECTRONIC DEVICES**
Instructor-in-Charge	:	Dr. Surya Shankar Dan
Lecture Instructor	:	Dr. Surya Shankar Dan
Tutorial Instructors	:	Dr. Surya Shankar Dan & Prof. Sanket Goel

1. Scope and Learning Outcome:

i. Understanding the relationship between atomic structure and physical properties of semiconductors with semiconductor devices of modern VLSI technology.
ii. Interpreting electronic band structure using quantum mechanics.
iii. Identifying the semiconductor properties that determine the performance of electronic devices.
iv. Calculating the carrier concentrations and conductivity of a semiconductor using given doping concentrations.
v. Understanding the basic physics of charge carriers in solids and carrier transport in semiconductors.
vi. Deriving equations of charge transport in semiconductors under normal operating conditions.
vii. Applying the charge diffusion equation to electronic devices and deriving their I-V characteristics.
viii. Utilizing defect densities and carrier recombination processes to calculate generation and recombination rates in semiconductor devices.
ix. Understanding the basics of optoelectronic devices.

2. Text Book:

B. G. Streetman & S. Banerjee, "Solid State Electronic Devices", 6th Ed., PHI, 2006

3. Reference Book:

D. A. Neamen & D. Biswas, "Semiconductor Physics and Devices", 4th Ed., MGH, 2013

4. Course Plan:

Lect. #	Topic	Learning Objectives	Text Ref.
1	Introduction to the subject and course details		
2-4	Crystal Structure	Cubic Lattices, Planes & Directions	1.2.1 – 1.2.3
5-8	Review of semiconductor fundamentals.	Fundamentals of quantum physics, Schrödinger wave equation, tunneling, uncertainty principle	3.1.3, 3.1.4, 3.2
9-11	Charge carriers in semiconductors,	Fermi level, equilibrium carrier concentrations, temperature dependence, space charge neutrality	3.3

12-14	Effect of electric and magnetic fields on drift of carriers	Conductivity and mobility, Hall effect	3.4-3.5
15-19	Excess carriers in semiconductors	Interaction of photons with semiconductors, generation and recombination mechanisms of excess carriers, quasi-fermi levels in non-equilibrium	4.1 – 4.4
20-27	Junctions	PN junctions, I-V characteristics, biasing, breakdown diodes, Metal semiconductor junctions, Tunnel Diode, Varactor diode	5.2 – 5.7, 10.1
28-32	Field Effect Transistors	To understand the structure and working of JFET, MOSFET, I-V characteristics and secondary effects	6.2,6.3.1,6.3.3, 6.4.1-6.4.5, 6.5.1-6.5.4, 6.5.6,6.5.8
33-38	Bipolar Junction Transistors	BJT operations, amplifications, carrier distribution, I-V characteristics etc. and secondary effects,	7.1, 7.3 –7.7, 7.9
39-42	Optoelectronic devices	Photoelectric effect, Solar cells, Photodiodes, Light Emitting Diodes(LED), Lasers and Semiconductor Lasers	2.2.1, 8.1–8.4

5. Evaluation Scheme:

Component	Evaluation	Duration	Marks (% out of 300)	Date & Time
Test I	Closed Book	60 min	90 (30%)	9/9 & 4:00-5:00 PM
Test II	Open Book	60 min	90 (30%)	24/10 & 4:00-5:00 PM
Comprehensive	Closed Book	180 min	120 (40%)	10/12 & 2:00-5:00 PM

6. Chamber consultation hours: To be announced in the class.

7. Notices & Announcements: All notices for the course will be **announced in the class** and displayed on the **CMS ONLY**

8. Make-up Examination:
Requests for make-up examination will be entertained ONLY for extremely serious cases where:
(i) Parents of the concerned student have to request the course IC for the makeup for their ward
(ii) Written & signed documentary evidence needs to be provided from the Hostel Warden confirming the reason for absence from scheduled examination.
(iii) In case of medical emergencies students must produce a documentary evidence from the surgeon.

Instructor-in-Charge
EEE / ECE / INSTR F214