

Faculty of Engineering & Technology

Semiconductor Devices

Information :

Course Code : ELE 522

Level : Undergraduate

Course Hours : 3.00- Hours

Department : Specialization of Electronics & Communication

Area Of Study :

Introduce advanced semiconductor devices
 Develop a detailed understanding of the design, operating mechanisms and fabrication technology of semiconductor electronic and optoelectronic devices.
 Introducing the design parameters, performance parameters, CAD models, device scaling theory, etc.

Description :

Metal-Semiconductor junctions (Schottky barriers), Heterojunctions, Solar cells, Light emitting diodes, Photodetector diodes, JFET's, MESFET's, MOSFET's, VLSI bipolar and MOS devices, CCD's power devices (PIN and rectifier diodes, SCR's, power switching transistors).

Course outcomes :

a. Knowledge and Understanding: :

- 1 - Describe the basic operation of advanced semiconductor devices and their characteristics.
- 2 - Define design features that determine the device characteristics.
- 3 - Define the device models for circuit simulation.

b. Intellectual Skills: :

- 1 - Develop analytical models for the advanced semiconductor devices
- 2 - Use compact device models for circuit simulation
- 3 - Use semiconductor devices for material and process characterization.
- 4 - Examine a detailed understanding of the many and diverse aspects that relate to the operation and exploitation of semiconductor devices.

c. Professional and Practical Skills: :

- 1 - Develop a practical circuit simulation using compact device models
- 2 - Develop technical report writing skills
- 3 - Design, model and analyze a number of semiconductor device types.

d. General and Transferable Skills: :

- 1 - Communicate effectively.
- 2 - Demonstrate Efficient IT capabilities using modern software tools

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Metal-Semiconductor junctions	5	3	2
Heterojunctions, Solar cells	5	3	2
Solar cells	5	3	2
Light emitting diodes	5	3	2
Photodetector diodes	5	3	2
JFET's and MESFET's	10	6	4
MOSFET's	10	6	4
VLSI bipolar and MOS devices	10	6	4
CCD's power devices (PIN and rectifier diodes).	10	6	4
SCR's, power switching transistors	10	6	4

Teaching And Learning Methodologies :

Interactive Lecturing
 Problem Solving
 Discussion
 Experiential Learning
 Project

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Quizzes	10.00		
Assignments	5.00		
Final Exam	40.00		
Lab and Project	15.00		
Mid Term I	15.00		
Mid Term II	15.00		

Course Notes :

Taken by the student inside classroom

Recommended books :

- R.F. Pierret, %Semiconductor Fundamentals+ Pearson, 2nd Ed., 1998.
 Chenming Hu, %Modern Semiconductor Devices for Integrated Circuits+ Pearson,
 First edition, 2009.

Periodicals :

- IEEE periodicals, Nanohub.org

