FUTURE UNIVERSITY IN EGYPT جامعة المستقبل

Faculty of Engineering & Technology

Electronic Devices

Information :

Course Code :	ELE 420	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Specialization of Electronics & Communication

Instructor Information :

Title	Name	Office hours
Professor	Mohamed Abdelhamid Abualata Ibrahim	18
Assistant Lecturer	Mostafa Mohamed Salaheldin Abdelkhalek	1

Area Of Study :

Improve student's foundational background, theories and mechanism of operation of principle semiconductor devices with emphasis on physical concepts.
Develop the student skills in modeling and characterization of semiconductor devices.
Improve students understanding of the link between device physics and circuit design by introducing design parameters, performance parameters, CAD models, device scaling theory, etc.

Description :

Crystal Structure and Reciprocal Lattice, Energy Bands, Carrier Concentration at Thermal Equilibrium, Generation, Recombination, and Carrier Lifetimes, Carrier Transport Phenomena, Drift, High Field Transport, Impact Ionization, Diffusion Basic Equations and Examples PN Junction and Depletion region I V characteristics, and Non-ideal Effects, PSpice Models for PN Junctions Silicon MOS Capacitor, MOSFET Characteristics and Behavior, MOSFET PSpice model, BJT PSpice model.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Explain mechanisms of principle operation of semiconductor devices.
2 -	Explain physical phenomena and implications of downscaling of semiconductor devices.
3 -	Define compact models for circuit simulation.
b.Intellectual Skills: :	
1 -	Develop analytical models for semiconductor devices
2 -	Use compact device models for circuit simulation
3 -	Use semiconductor devices for material and process characterization.
c.Professional and Practical Skills: :	
1 -	Build practical circuit simulation using compact device models.
2 -	Develop technical report writing skills
d.General and Transferable Skills: :	
1 -	Solve analytical Problem
2 -	Develop ideas and share with others

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Crystal Structure and Reciprocal Lattice	5	3	2
Energy Bands	5	3	2
Carrier Concentration at Thermal Equilibrium ,	5	3	2
Generation, Recombination, and Carrier Lifetimes	5	3	2
Carrier Transport Phenomena, Drift, High Field Transport, Impact Ionization, Diffusion	10	6	4
PN Junction and Depletion region I V characteristics	15	9	6
Silicon MOS Capacitor	15	9	6
MOSFET Characteristics and Behavior,	5	3	2
MOSFET Pspice model	5	3	2

Teaching And Learning Methodologies :

Lectures
Tutorials
Laboratories

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Attendance	10.00		
Final-term examination	40.00	15	to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied.
Mid-term exams	30.00	7	to assess the skills of problem solving, understanding of related topics.
Project	10.00		or technical report to access: the ability to apply knowledge gained in the course in a real design case.
Quizzes	10.00		

Course Notes :

-Taken by the student inside classroom

Recommended books :

-S.M. Sze, ñSemiconductor Devices: Physics and Technologyò, J. Wiley, 2001.
R.F. Pierret. ñSemiconductor Device Fundamentalsò, Prentice-Hall, 1995.
-Edward Yang, ñMicroelectronics Devicesò, McGraw Hill, 1988.
-R.F. Pierret. ñSemiconductor Device Fundamentalsò, Prentice-Hall, 1995.
-Edward Yang, ñMicroelectronics Devicesò,McGraw Hill.1988.

Periodicals :
-N.A.

Web Sites :
-N.A.