Faculty of Engineering & Technology

Solid State Physics

Information :

Course Code :	PHY 232	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Department of Electrical Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	AHMED MOHAMED ALI ASHOUR AHMED	13
Assistant Lecturer	SHEROUK SOBHI ABDELSALAM FOUDA	

Area Of Study :

ÅEnrich studentsôknowledge about principles of classical, modern and quantum physics
ÅPrepare students to apply principles of quantum physics on atomic structure and semiconductors.
ÅTrain students to apply solid state physics and semiconductor on applications related to electrical engineering.

Description :

Classification of waves. Max-Planck's principle, photoelectric effect, the wave properties of particles, the quantum particle, uncertainty Heisenberg's principle. Interpretation of quantum mechanics, Schrº dinger equation, electron as a wave, particle in an infinite/finite potential well, tunneling effect. Hydrogen atom: Bohr's model, quantum model and wave function, solids classification and crystalline structure. Energy bands, Fermi-Dirac distribution, Carrier densities and transport, recombination and generation, drift-diffusion model, Intrinsic and extrinsic semiconductors, PN junction: structure and principle of operation, diode current, reverse bias, diode as a circuit element.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Explain the basic theory of semiconductors and its applications.
2 -	Describe the basic principles of atomic physics and crystalline structures.
3 -	Explain fundamentals of quantum mechanics.
4 -	Illustrate the basic principles of Max-Planck and photoelectric effect.
5 -	Explain the basic principles of waves and its applications on light waves.
b.Intellectual Skills: :	
1 -	Investigate the basic characteristics of semiconductors.
2 -	Evaluate the main characteristics of atomic physics.
3 -	Evaluate the expectation values of dynamic variables of electrons using quantum mechanics.
4 -	Apply Max-Planck principle on photoelectric effect to determine the energy of electrons.
c.Professional and Practical Skills: :	
1 -	Sketch the diode characteristic curve.
2 -	Test the characteristics of electrons using a magnetic field.

3 -	Measure the parameters of photoelectric phenomenon.
d.General and Transferable Skills: :	
1 -	Communicate effectively.
2 -	Work effectively in a team.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Classification of waves	5	3	2
Max-Planck's principle, photoelectric effect	10	6	4
The wave properties of particles, the quantum particle, uncertainty Heisenberg's principle	5	3	2
Interpretation of quantum mechanics, Schrº dinger equation, electron as a wave	5	3	2
Particle in an infinite/finite potential well, tunneling effect	5	3	2
Hydrogen atom: Bohr's model, quantum model and wave function equation in one dimension	10	6	4
Solids classification and crystalline structure	8	6	2
Energy bands, Fermi-Dirac distribution,	5	3	2
Carrier densities and transport, recombination and generation	5	3	2
Drift-diffusion model, Intrinsic and extrinsic semiconductors	5	3	2
PN junction: structure and principle of operation, diode current, reverse bias, diode as a circuit element.	12	6	6

Teaching And Learning Methodologies :

Interactive Lecturing
Discussion
Problem solving
Experimental learning
Cooperative Learning

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignment	5.00		
Course Project	5.00		
Final Exam	40.00		
Lab.	10.00		
Mid-Term Exam 1	10.00		
Mid-Term Exam 2	20.00		
Participation	10.00		

Recommended books :

- ñCollege Physicsò, Giambattista and Richardson, Mac gramttill, 3rd edition.
- ñPrinciples of Physicsò, Halliday and Resnick, Jearl Walker, 9th Edition.
- "Physics for Scientists and Engineers with Modern Physics" 9th Edition, Serway / Jewett.