Jordan University of Science and Technology

Faculty of Science & Arts

Physics Department

PHY251 Modern Physics - JNQF Level: 7
Second Semester 2023-2024

Course Catalog
3 Credit Hours. Special relativity, structure of matter: Atomic structure: models of the atom. Quantum theory of radiation: Planck?s radiation law, Compton effect. Wave nature of matter: X-ray diffraction, particle diffraction, DeBroglie postulate. Introduction to quantum mechanics: Schrodinger equation, some applications.
Teaching Method: Blended

Text Book	
Title	Concepts of Modern Physics
Author(s)	Arhur Beiser
Edition	6th Edition
Short Name	1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref. 1	Modern Physics for Scientists and Engineers	John Morrison	2nd Edition	
Ref. 2	Concepts of Modern Physics	Sachs Mendel	3rd Edition	

Instructor	
Name	**Dr. Noura AlZoubi**
Office Location	-
Office Hours	Sun : 11:30 - 13:00 Mon : 13:00 - 14:00 Tue : 11:30 - 13:00 Wed : 13:00 - 14:00 Thu : 11:30 - 12:30

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Class Schedule & Room
Section 1: Lecture Time: Sun, Tue : 10:30 - 11:30 Room: M1304

Prerequisites		
Line Number	**Course Name**	**Prerequisite Type**
922010	PHY201 Mathematical Physics(1)	Pre./Con.

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	1.1 Special Relativity, 1.2 Time dilation	**Chapter 1** From **1**
Week 2	1.3 Doppler Effect, 1.4 Length Contraction, 1.5 Twin Paradox,	**Chapter 1** From **1**
Week 3	1.6 Electricity and Magnetism, 1.7 Relativistic Momentum, 1.8 Mass and Energy	**Chapter 1** From **1**
Week 4	1.9 Energy and Momentum, 1.10 General Relativity	**Chapter 1** From **1**
Week 5	2.1 Electromagnetic Waves, 2.2 Black Body Radiation, 2.3 Photoelectric Effect	**Chapter 2** From **1**
Week 6	2.4 What Is Light, 2.5 X-Rays, 2.6 X-Ray Diffraction	**Chapter 2** From **1**
Week 7	2.7 Compton Effect, 2.8 Pair Production, 2.9 Photons and Gravity	**Chapter 2** From **1**
Week 8	3.1 De Broglie Waves, 3.2 Waves of What?, 3.3 Describing a wave, 3.4 Phase and Group Velocity, 3.5 Particle Diffraction	**Chapter 3** From **1**
Week 9	3.6 Particle in a Box, 3.7 Uncertainty Principle I, 3.8 Uncertainty Principle II, 3.9 Applying the Uncertainty Principle	**Chapter 3** From **1**
Week 10	4.1 The Nuclear Atom, 4.2 Electron Orbits, 4.3 Atomic Spectra	**Chapter 4** From **1**
Week 11	4.4 The Bohr Atom, 4.5 Energy Levels and Spectra, 4.6 Correspondence Principle.	**Chapter 4** From **1**
Week 12	4.7 Nuclear Motion, 4.8 Atomic Excitation, 4.9 The Laser.	**Chapter 4** From **1**
Week 13	5.1 Quantum Mechanics, 5.2 The Wave Equation, 5.3 Schrodinger Equation: Time-Dependent Form	**Chapter 5** From **1**

Week 14	5.4 Linearity and Superposition, 5.5 Expectation Values, 5.6 Operators	**Chapter 5** From **1**
Week 15	5.7 Schrodinger Equation: Steady-State Form, 5.8 Particle in a Box, 5.9 Finite Potential Well.	**Chapter 5** From **1**
Week 16	5.10 Tunnel Effect, 5.11 Harmonic Oscillator.	**Chapter 5** From **1**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	**Course Outcome Weight (Out of 100%)**	**Assessment method**
Ability to understand the principles of special relativity and the particle properties of the waves [3SLO1(K1S1)] [1L7K1, 1L7S1]	33%	
Ability to understand the wave properties of particles and atomic structure [3SLO1(K1S1)] [1L7K1, 1L7S1]	33%	
Introducing quantum mechanics and the quantum theory of H-like atoms [3SLO1(K1S1)] [1L7K1, 1L7S1]	34%	

Relationship to Program Student Outcomes (Out of 100%)					
SLO1(K1S1)	SLO2(S23C1)	SLO3(C24)	SLO4(C3)	SLO5(C4)	SLO6(S2C3)
100					

Relationship to NQF Outcomes (Out of 100%)	
L7K1	L7S1
50	50

Evaluation	
Assessment Tool	**Weight**
1st	25%
Final	40%
Participation	10%
2nd	25%

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