



University of Management and Technology

School of Science

Department of Physics

Course Code: PH-204

Course Title: MODERN PHYSICS

Program: BS (Phy., Math., Chem)

Course Outline (Spring 2021)

Schedule	Monday ----Thursday	Pre-requisite	Mechanics, Electricity and Magnetism
Resource Person	Hira Yaseen	Contact	hira.yaseen@umt.edu.pk
Course Description	Motivation for Non--Classical Physics, Wave-Particle Duality, Special Theory of Relativity, Quantum Mechanics in One Dimension, Quantum Mechanical Tunneling, Quantum Mechanics in Three Dimensions, From Atoms to Molecules and Solids, Nuclear Structure.		
Expected Outcomes	Students will be able to understand the non-classical aspects of Physics; the emphasis will be on the applications of Quantum Physics in microscopic-scale Physics, atomic and molecular structure and processes.		
Text Book	1. R.A. Serway, C.J. Moses and C.A. Moyer, "Modern Physics", Brooks Cole, 3rd ed. 2004. 2. Arthur Beiser, "Concepts of Modern Physics", McGraw-Hill, 6th ed. 2002. 3. Paul A. Tipler and Ralph A. Llewellyn, "Modern Physics", W H Freeman and Company 6th ed. 2012.		
Ref. Book	R. M. Eisberg and R. Resnick, "Quantum Physics of Atoms, molecules, Solids, Nuclei and Particles", John Wiley, 2nd ed. 2002.		
Assignment & Projects	Problems will be assigned at regular intervals as an assignment.	Quizzes	All quizzes will be announced well before time. No make-ups will be offered for missed quizzes.
Mid - Term Examination	A 60-minutes exam will cover all the material covered during the first 15 lectures	Final Examination	A 120-minutes exam will cover all the material covered during the semester.
Attendance Policy	Students missing more than 20% of the lectures will receive an "SA" grade in the course and will not be allowed to take final exam.		



Modern Physics

Lecture Plan (Spring 2021)

Week	Lecture #	TOPICS	Book
1	1 2	Blackbody radiation and ultraviolet catastrophe Planck's quantization	Serway, Beiser
2	1 2	Photoelectric effect Compton effect	Serway, Beiser
3	1 2	Special Theory of Relativity (Continue) Special Theory of Relativity	Serway, Beiser
4	1 2	Concept of matter waves De Broglie relationship	Serway, Beiser
5	1 2	Electron diffraction Particulate nature of matter	Serway, Beiser
6	1 2	Rutherford (nucleus exists) and Bohr (quantization of energies inside an atom) Wave packets and wave groups	Serway, Beiser
7	1 2	Dispersion Heisenberg uncertainty principle	Serway, Beiser
8	1 2	Direct confirmation of quantization through Franck-Hertz experiment and spectroscopy Working of electron microscopes.	Serway, Beiser
9	1 2	The concept of a wave function, time independent Schrodinger equation and interpretation of the equation Solving the Schrodinger equation for a free particle, for a particle inside an infinite box	Serway, Beiser
10	1 2	Concept of tunneling Reflection and transmission of wave functions from barriers	Serway, Beiser
11	1 2	Radioactivity The Hydrogen atom	Serway, Beiser
12	1 2	Orbitals Angular momentum and its quantization	Serway, Beiser
13	1 2	Zeeman effect Concept of spin	Serway, Beiser
14	1 2	Pauli's exclusion principle Magnetic resonance and MRI	Serway, Beiser
15	1 2	Bands in solids, Semiconductors Radioactivity and nuclear reactions, Radiocarbon dating	Serway, Beiser