Faculty of Science and Humanities
B.Sc. (Physics) (Semester - 5)
In Effect from Academic Year 2023-24

Branch Name:	Physics
Program Code:	SC105
Course Name:	Physics 503
Course Code:	**2SC1050503**
Pre-requisite Course:	Basic knowledge of radioactivity and nuclear physics.

Course Objectives:

1. To develop an actual understanding of the Radio Activity.
2. To know the basic concept of Nuclear Physics.
3. To understand the concept of Laser Molecular Spectra.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory (Marks)		Practical (Marks)		
Lecture (L)	Tutorial (T)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total (Marks)
3	--	--	3	70	30	--	--	100

Subject Contents:

Sr. No	Topic	Total Hours	Weight (%)
1	**RADIO ACTIVITY** **(a) Alpha Rays : Spectra and Decay** Range of Alpha Particles, Disintegration energy of the Spontaneous Alpha-Decay, Alpha-Decay Paradox-Barrier Penetration. **(b) Beta Rays : Spectra and Decay** Introduction, Continuous Beta ray spectrum-Difficulties in understanding it, Pauli's Neutrino Hypothesis, Fermi's theory of Beta-decay, The Detection of Neutron. **(c) Gamma-Ray Emission:** Introduction, Gamma - ray emission - selection rules, Internal conversion.	15	33
2	**NUCLEAR PHYSICS** **(a) Nuclear Energy:** Introduction, Neutron Induced Fission, Asymmetrical Fission-Mass Yield, Emission of Delayed Neutrons by Fission Fragments, Energy Released in the Fission of U^{235} , Fission of Lighter Nuclei, Fission Chain Reaction, neutron cycle in a Thermal Nuclear Reactor, Nuclear Reactors. **(b) Elementary Particles:** Leptons, Hadrons, Elementary particle quantum numbers, Isospin, Symmetries and- conservation principles, Quarks, fundamental Interactions.	15	33
3	**MOLECULAR SPECTRA** **Laser Spectroscopy:** Emission and absorption spectroscopy: UV-visible-IR absorption (introduction),Classical view of Einstein coefficients; two-level	15	34

	system, Three-level Laser system, Variation of Laser power around threshold.NH3 maser, He-Ne Laser (energy level diagram), CO2 Laser, Semiconductor Lasers, Rayleigh and Raman scattering, Stimulated Raman effect, Hyper-Raman effect: Classical treatment, Quantum mechanical treatment, Coherent anti-stokes Raman scattering (CARS), Spin- flip Raman Laser, Free-electron Laser.		

Reference Books:

1. Nuclear Physics by S. B. Patel, Willey Eastern Ltd.
2. Concept of Modern Physics by A.Beiser, 5th edition , McGraw-Hill.
3. Atomic & Molecular-Spectra by Raj Kumar, KedarNath RamNath, Delhi.
4. Molecular spectroscopy by Herz-Berg.
5. Molecular spectroscopy by Banewell.

List of Open Source Software/learning website:

1. https://www.youtube.com/watch?v=3sgbHwi_UvA
2. https://www.youtube.com/watch?v=6joildn5lqY&list=PLRN3HroZGu2n_j3Snd_fSYNLvCkao8HIx
3. https://www.youtube.com/watch?v=VEJLVYjC3Fo&list=PLdKnE1hStPK8BNTo0MPMH0IM69yFQagc_

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the Alpha and Beta Rays: Spectra and Decay.	1 Remembering
CLO2	Discuss the Gamma-Ray Emission.	2 Understanding
CLO3	Solve the numerical based on Nuclear Energy	3 Applying
CLO4	Explain Elementary Particles.	4 Analyzing
CLO5	Justify the use of laser in various fields.	5 Evaluating
CLO6	Explain Elementary Particles.	4 Analyzing

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)									Programme Specific Outcome (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CLO1					M					M	
CLO2		L									
CLO3						H				H	
CLO4				H							
CLO5	H										
CLO6			M							L	

H: High, M: Medium, L: Low