

BSL-102-A	CLASSICAL MECHANICS & NUCLEAR PHYSICS	L	T	P	Cr.
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**Common for B Sc (General, Electronics, Computer Science and Information
Technology)**

SECTION A

UNIT - I

Mechanics of single and system of particles, conservation laws of linear momentum, angular momentum and mechanical energy, Centre of mass and equation of motion, constrained motion, degrees of freedom

UNIT - II

Generalised coordinates, displacement, velocity, acceleration, momentum, force and potential, Hamilton's variational principle, Lagrange's equation of motion from Hamilton's Principle, Linear Harmonic oscillator, simple pendulum, Atwood's machine

UNIT - III

Rotation of Rigid body, moment of inertia, torque, angular momentum, kinetic energy of rotation, Theorems of perpendicular and parallel axes with proof, Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross-section, Acceleration of a body rolling down an inclined plane

SECTION B

UNIT - IV

Structure of the Nucleus (proton-electron, proton-neutron hypothesis), Basic properties of Atomic Nuclei (charge, mass, size, density, nuclear spin, magnetic dipole moment, electric quadrupole moment, nuclear binding energy), Expression for Binding Energy, B.E curve, Determination of the size of nucleus by Rutherford Back scattering of α -particles, Determination of mass by Bain-Bridge mass spectrograph

UNIT - V

Interaction of α -particles with matter, Energy loss of α -particle in matter

Interaction of β -particles with matter, Origin of continuous β -spectrum (neutrino hypothesis), Types of β -decay

Interaction of Gamma rays, Nature of gamma rays, Energetics of gamma rays. Passage of Gamma radiations through matter (Photoelectric, Compton and pair production effect) electron-positron annihilation, Absorption of Gamma rays (Mass attenuation coefficient) and its application

UNIT - VI

Nuclear Reactions: Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, Photonuclear reaction, Radioactive capture, Direct reaction, Heavy ion reaction and Spallation Reactions, Conservative laws, Q-value and reaction threshold.

Nuclear Radiation Detectors: Detection of charged particles, Gas filled detectors-Ionization chamber, Proportional counter, G.M. Counter

NOTE:

1. The syllabus is divided into 2 sections comprising three units each. Total seven questions would be set. One question would be compulsory that would comprise all the units. Remaining six questions will be set from both the sections taking three questions from each section. Students need to attempt at least two questions from each section. A student has to attempt five questions in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

TEXT BOOKS:

1. Classical Mechanics by V.K.Jain (Ane 2009)
2. Classical Mechanics by Gupta Kumar and Sharma,
3. Classical Mechanics by B D Gupta and Sathya Prakash, Kedar Nath Ram Nath & Co.
4. Atomic and Nuclear Physics, Vol. II by S.N. Ghashal
5. Nuclear Physics by D.C. Tayal, Umesh Prakashan, 125, Goblind Dev Khurja (UP)

REFERENCE BOOKS:

1. Mechanics and Mathematical Methods by R Murugesan, S Chand & Co. Pvt. Ltd., New Delhi, 1990
2. Elements of Mechanics by Gupta
3. Dynamics by Naranamurthi, National Publishing company, Chennai.
4. Mechanics by D S Mathur

5. Classical Mechanics by H. Goldstein (2nd Edition)
6. Berkeley Physics Course, Vol. I, Mechanics by E.M. Purcell
7. Concept of Modern physics by Arther Beiser, Tata McGraw Hill Publications
8. Nuclear Physics by W.E. Burcham
9. Nuclear Radiation Detectors by S.S. Kapoor
10. Experimental Nuclear Physics by M. Singru