

**SARDAR PATEL UNIVERSITY**  
**Programme: MSC (Applied Science)**  
**Semester: I**  
**Syllabus with effect from: June 2013**

<b>Paper Code:</b> PT01CASC01	<b>Total Credits: 4</b>
<b>Title Of Paper:</b> Elements of Physical Sciences	

Unit	Description in detail	Weightage (%)
<b>1</b>	<p><b>Mechanics:</b>            A motion of a particle in central force field- Kepler problem- Classification of orbits; perigee &amp; apogee of elliptical orbits. Euler angles- the Coriolis effect- equation of motion of a rotation body- Euler equations- Precession of the equinoxes and satellite orbits.            A brief review of Lagrange's &amp; Hamilton's formalism, Applications to Kepler problem and harmonic oscillator problem- Transition to quantum mechanics. Introduction to Statistical Mechanics: Ensembles, Maxwell-Boltzmann statistics, Bose-Einstein statistics, Fermi-Dirac statistics</p>	<b>25 %</b>
<b>2</b>	<p><b>Electrodynamics &amp; Plasma Physics:</b>            Electromagnetic waves in matter: Propagation in linear media, Reflection and Transmission at normal incidence, electromagnetic waves in isotropic linear conducting media, Reflection at conducting surface, Doppler effect, light scattering with respect to atmospheric particulate system.            Bounded waves: TE, TM, TEM modes, Rectangular wave guides, Electromagnetic Radiation, Electromagnetic potentials- Scalar and vector potentials, Radiations from extended sources: Hertzian dipole antenna.            Brief review of plasma state of matter, Plane waves in tenuous plasma, Equations of kinetic theory, Boltzmann equation, Vlasov Equation, fluid equations, Plasma oscillations, and Plasma diagnostics.</p>	<b>25 %</b>
<b>3</b>	<p><b>Spectroscopy:</b>            Spectra of diatomic molecules: rotational, vibrational - rotational and Electronic spectra. X-ray: production, characteristics and applications (industrial, scientific, agriculture, medical, etc.), Diffraction by X-rays, neutrons and electrons, X-ray and radio-isotopes, X-ray spectroscopy, Auger transition.            MASER and LASER- production, characteristics and applications (industrial, scientific, agriculture, medical, etc.), Holography, Raman Effect, hyper Raman effect.</p>	<b>25 %</b>
<b>4</b>	<p><b>Semiconductor Physics and Bio-physics:</b>            Introduction to semiconductors, energy bands and charge carriers; p-n junction diode; bipolar junction transistors- construction, operation; Device- photodiodes, photoconductive cells, solar cells, phototransistors, light-activated SCR.            Introduction to Molecular modelling: Building protein structure (amino acids and the primary structure, the peptide bond and secondary structure, etc.), nucleic acid structure (the chemical structure, the double helical structure of DNA, etc.), displaying and altering the generated model, examples of proteins, molecular and supramolecular switches, biological nanostructure.</p>	<b>25 %</b>



## Basic Text & Reference Books:

- Classical Mechanics, H. Goldstein, 3<sup>rd</sup> Ed.
- Classical Mechanics, G. Aruldhas, PHI, 2008.
- Classical Mechanics- System of particles and Hamiltonian Dynamics, W. Greiner, Springer Student's Ed. 2006.
- Introduction to Statistical Mechanics, S. K. Sinha, Narosa, 2005.
- Statistical Mechanics: An introduction, Evelyn Guha, Narosa, 2008.
- Introduction to Electrodynamics, D. J. Griffiths, 3<sup>rd</sup> Ed., PHI
- Classical Electromagnetic Theory, J. Vanderlinde, John Wiley & Sons, 1993.
- Introduction to Plasma Physics and Controlled Fusion: Plasma physics, F. F. Chen, 2<sup>nd</sup> Ed., Plenum Press. N.Y.
- Molecular Structure and Spectroscopy, G. Aruldhas, 2<sup>nd</sup> Ed., PHI.
- Spectroscopy (Atomic and molecular), G. Chatwal and S. Anand.
- Fundamentals of Molecular spectroscopy, C. N. Banvel.
- LASERS Theory and Applications, K. Thyagarajan and A. K. Ghatak, Macmillan India Ltd., 2008.
- Electronic Devices and Circuits- An Introduction, A. Mottershead.
- Electronic Devices and Circuits Theory, R. L. Boylestad and L. Nashelsky.
- Solid State Electronic Devices, B. G. Streetman and S. Banerjee.
- Biophysics, V. Pattabhi and N. Gautham, 2<sup>nd</sup> Ed., Narosa, 2009.
- Introduction to Nanotechnology, C. P. Poole and Jr. F. J. O.

