SARDAR PATEL UNIVERSITY
Programme: B.Sc (Physics)
Semester: VI
Syllabus with effect from: November/December-2013

Paper Code: US06CPHY03	Total Credit: 3
Title Of Paper: Nuclear Physics	

Unit	Description in detail	Weighting (%)
I	**General Properties of Nucleus** Constituents of Nuclei and their intrinsic properties, Nuclear size, Nuclear mass – Aston's mass spectrograph and Dempster's mass spectrometer, Angular momentum, Magnetic moment, Electric quadrupole moment, Wave mechanical properties – parity and statistics, Non-existence of electron in nucleus, Neutron-proton hypothesis, Binding energy	
II	**Q Equation and Liquid Drop Model of Nucleus** **Q Equation:** Introduction, Types of nuclear reactions, Balance of mass and energy in nuclear reactions, The Q equation, Solution of Q equation, Centre of mass frame in nuclear physics **Liquid drop model of nucleus:** Weizsacher's semi empirical mass formula, mass parabola-stability against β decay for an isobaric family, stability limits against spontaneous fission, Barrier penetration – decay probability for spontaneous fission, Nucleon emission	
III	**Nuclear Energy and Applications of Nuclear Physics** **Nuclear Energy:** Introduction, Neutron induced fission, Asymmetrical fission-mass yield, Emission of delayed neutron by fission fragments, Energy released in the fission of ^{235}U , Fission of lighter nuclei, Fission chain reaction, Neutron cycle in a thermal nuclear reactor, Nuclear reactors **Applications of Nuclear Physics:** The technique of NMR, Experimental setup of NMR, Some experiments with NMR, Radio isotopes in medicine, Diagnosis, Radio isotopes for therapy, Radio isotopes in archeology	
IV	**Detectors and Accelerators** **Detectors:** Gas filled ionization detectors, Ionization chamber, Proportional counter, Geiger-Mueller Counter, Plateau of G M Counter, Photomultiplier Tube, Cerenkov detector, Photographic Emulsion, Cloud Chamber, Bubble Chamber, Spark Chamber **Accelerators:** Basic components of Accelerators, Cockcroft Walton Generator, Van de Graff Accelerator, Two stage Tandem Van de Graff Accelerators, Pelletron Accelerators, Folded Tandem Accelerators, Linear Accelerators, Cyclotron, Betatron, Elementary particles-an introduction	

Basic Text & Reference Books :-

- Introductory Nuclear Physics
  R K Puri and V K Babar, Narosa Publishers
- Nuclear Physics – An Introduction
  S B Patel, BPB Publications
- Modern Physics
  Frank J Blatt, McGraw Hill
- Fundamentals of Nuclear Physics
  Jagdish Verma, R C Bhandari and D R S Somayajulu
  CBS Publishers & Distributers Pvt. Ltd.