**PH 505: Nuclear & Particle Physics (4-0-0: 4)**

**Nuclear Properties**

The nuclear radius, mass and abundance of nuclides, nuclear binding energy, nuclear angular momentum and parity, nuclear electromagnetic moments, nuclear excited states. **[6L]**

**The Force between Nucleons and Nuclear Models**

Deuteron, proton-proton and neutron-neutron interaction, properties of the nuclear force, exchange force model, shell model, even–Z, even-N nuclei and collective structure, realistic nuclear models.

**[10L]**

**Radioactive Decay**

Radioactive decay law, production and decay of radioactivity, growth of daughter activities, types of decays, natural radioactivity, alpha decay, beta decay, gamma decay. **[9L]**

**Nuclear Reactions**

Types of reaction and conservation laws, isospin, nuclear fission, nuclear fusion. **[7L]**

**Detectors and Accelerators**

Interaction of radiation with matter, gas filled counters, GM counter, scintillation detectors, semiconductor detectors, electrostatics accelerators, cyclotron accelerators, synchrotrons, linear accelerators, colliding-beam accelerators. **[4L]**

**Particle Physics**

Yukawa’s hypothesis, properties of mesons, symmetries and conservation laws, Standard model, particle classification, quark model, colored quarks, gluons and strong interaction. **[12L]**

**Text Books and References**

1. K. Heyde, “Basic Ideas and Concepts in Nuclear Physics: An Introductory Approach”, 3rd edition, CRC Press, 2004.
2. J. L. Basdevant, J. Rich and M. Spiro “Fundamentals in Nuclear Physics”, 1st edition, Springer, 2005.
3. W. Greiner and J. A. Maruhn “Nuclear Models”, Springer, 2009
4. S. Tavernier, “Experimental Techniques in Nuclear and Particle Physics”, Springer, 2014
5. M. Thomson, “Modern Particle Physics”, Cambridge University Press, 2016.
6. FI. Stancu, “Group Theory in Subnuclear Physics”, 1st edition, Oxford Science Publications, 1996.