PPH315: ACCELERATOR TECHNOLOGY

L	T	P	Cr
3	1	3	5.0

Course Objectives: Aim is to expose students to different theoretical design and usage of various particle accelerators.

Charged Particle Dynamics: Particle motion in electric and magnetic fields, Beam transport system, Beam pulsing and bunching techniques, microbeams, Particle and ion sources, secondary beams, Measurement of beam parameters.

Radiofrequency Accelerators: Linear accelerators - Resonance acceleration and phase stability, electron and proton Linacs. Circular accelerators- Cyclotron, Frequency Modulated Synchrocyclotron, AVF Cyclotron, Alternating-gradient accelerators.

Electrostatic and Heavy Ion Accelerators: Van de Graff voltage generator, Cockcroft-Walton voltage generator, insulating column, voltage measurement, Acceleration of heavy ions, Tandem electrostatic accelerator, Production of heavy negative ions, Pelletron and Tandetron, Cluster beams, Superconducting Heavy Ion Linear Accelerators.

Synchrotron Radiation Sources: Electromagnetic radiation from relativistic electronbeams, Electron synchrotron, dipole magnet, multipole wiggler, noncoherent and coherent, Undulator, Characteristics of synchrotron radiation.

Radioactive ion Beams: Production of Radioactive ion beams, Polarized beams, Protonsynchrotron, Colliding accelerators.

Case Studies: Use of accelerators for AMS and Ion-beam Analysis Techniques, Relativistic heavy ion accelerator, Large hadron collider, Stanford linear accelerator, J-Parc, Fair facilities.

Laboratory Assignments: Visits to various accelerator sites and related case studies

Course Learning Outcomes (CLO):
Students will have understanding of:

1. various theoretical techniques to accelerate particles
2. technical details of accelerator technology
3. the latest accelerator available around the world

Recommended Books:

1. *Wiedman, H.J., Particle Accelerator Physics, Vol I and II, Springer Verlag, (1998).*
2. *Livingston, M.S., and Blewel, J.P., Particle Accelerators, McGraw-Hill Book Press, (1962).*
3. *Cerny, J., Nuclear Spectroscopy and Reactions Part-A, Academic Press, (1974).*
4. *Lee, S.Y., Accelerator Physics, World Scientific, Singapore, (2004).*

.