IISER Pune- PHY-362 - Plasma Physics- Fall 2015

1	Course code	PHY 641
2	Course Title	Plasma Physics
3	Credits	3 (4 credits for PhD students: extra project to justify extra credit)
4	Course Coordinator	Prasad Subramanian
5	Nature of Course	L- lectures alone X
6	Pre requisites	**Essential**: Electrodynamics, classical mechanics. **Preferable**: Knowledge of fluid dynamics (or willingness to learn the basics on one's own)
7	Objectives (goals, type of students for whom useful, outcome etc)	Plasmas in various forms constitute over 95 % of the observable universe. An understanding of plasma physics in the laboratory context is key to the important push towards harnessing energy from nuclear fusion. This course will provide an overview of the theory of magnetohydrodynamics and plasma physics with a view to applications in astrophysics and in the laboratory.
8	Course contents (details of topics with no of lectures for each)	Basics of plasma physics: Kinetics: Particle orbits, guiding center theory, the BBGKY hierarchy, Moments of the distribution function, wave-particle interactions (e.g., Landau damping), transport coefficients Transition to the fluid description: Magnetohydrodynamics: basic governing equations, instabilities (sausage instability, kink instability, two stream instability, etc), waves in plasmas, applications to astrophysics (the solar dynamo, the solar wind, jets from compact objects) and laboratory plasma (column pinches, confinement)
9	Evaluation /assessment (evaluation components with weightage, Pl keep equal weightage for end sem and mid sem exams)	a. End-sem examination- 35 % b. Mid-sem examination- 35 % c. 2 quizzes- 15 % each d. Project work/term paper- PhD students taking the course for 4 credits will be assigned project work e. Assignments- problem sets will be put up, but not graded

10	Suggested readings (with full list of authors, publisher, year, edn etc.)	Text Book(s) 1. Plasma Physics: An Introduction to the theory of astrophysical, geophysical and laboratory plasmas: Peter A Sturrock (Cambridge) 2. The physics of plasmas: T J M Boyd, J J Sanderson (Cambridge) 3. The Physics of Fluids and Plasmas; Arnab Rai Choudhuri (Cambridge)