LECTURE ARRANGEMENTS

There will be 19 lectures, starting on Fri. 23 April 2010
Lecturers: (Combined & Advanced) Don Melrose; (Normal) Alex Samarian
Lecture place and times: LT 2 at Tue. 9 am, Thurs. 9 am, Fri. 1 pm

ASSIGNMENTS

There will be two assignments one, and together they will count 25% and the examination will count 75%.
Assignment 1 due Friday 21 May
Assignment 2 due Friday 4 June
There is no objection to students discussing the assignments with each other, but copying the solutions from one another is not acceptable. You must write your answers to the assignments independently of other students. Copying may result in a reduction in marks for both students.

LECTURE NOTES

This course has been completely rewritten this year with a significantly different emphasis, concentrating on the dispersive properties of plasmas. The course content is defined by lecture notes that will be distributed before the lectures and which will be available on the web.

COURSE DEFINITION

All students will be expect to understand the basic concepts of plasma physics discussed in the lecture notes. Understanding a term or concept means that you should be able to:
  0. explain its meaning in writing and give examples,
  0. interpret it correctly when you read or hear it,
  0. use it correctly in your own writing,
  0. apply it correctly to examples and problems.
These skills will be tested in the examination.

ADVANCED & NORMAL

The parts of the course that are common for both Advanced and Normal streams cover the following topics.

*Dispersion in isotropic plasmas:* plasma frequency, Debye screening, Coulomb interactions (collisions).
*Waves in isotropic plasmas:* longitudinal and transverse waves, Langmuir waves, Landau damping
*Orbit theory:* the spiraling motion of a charge in a magnetic field, the concept of a drift motion, the concept of an adiabatic invariant, and trapping in a magnetic bottle.
*Magnetohydrodynamics (MHD):* The continuity equation and the equation of fluid motion, ideal MHD, frozen-in condition, magnetic pressure and tension, parametric equations for a field line, Alfvén waves, fast and slow MHD modes
*Magnetoionic theory:* dispersion equation for waves in a magnetoionic medium, ordinary and extraordinary modes, cutoff frequencies, Faraday rotation.

ADVANCED

The Advanced stream will cover the following topics:

*Response of isotropic thermal plasma:* the equivalent dielectric tensor, the plasma dispersion function, Langmuir waves, Debye screening.
*Plasma instabilities:* The concept of an instability, reactive and kinetic instabilities, bump-in-tail instability.
NORMAL
The Normal stream will cover the following topics:

*Basics of weakly ionised plasma:* production and decay of charged particles, kinetic equation for electrons in a weakly ionised gas placed in an electric field,

*Basics of gas discharges:* breakdown of gases, types of gas discharges,

*Plasma Diagnostic:* electrostatic or Langmuir probes, double probe, magnetic probes, plasma spectroscopy, microwave interferometry, microwave reflectometry, laser interferometry.

*Plasma application* This topic will not be examinable.