

Plasma Physics: Fundamentals and Applications - Video course

COURSE OUTLINE

The course would be a basic course in plasma physics with focus on techniques of plasma production and measurements, waves and instabilities, single particle motion in electric and magnetic fields, plasma confinement, and applications to medium and short wave communication, plasma processing of materials, laser driven fusion and magnetic fusion.

COURSE DETAIL

A video course shall consist of 40 or more lectures with 1 hour duration per lecture.

Sl.No	Topic/s	No. of Lectures
1.	Basics of plasmas: Plasma as a state of matter, Debye length, plasma frequency, collisions, dc conductivity, ac conductivity.	4
2.	Plasma production and measurements: dc discharge, rf discharge, photo-ionization, tunnel ionization, avalanche breakdown, laser produced plasmas, Langmuir probe.	6
3.	Waves and instabilities: Electromagnetic waves, Langmuir wave, ion acoustic wave, surface plasma wave, ionosphere propagation, two stream instability, Weibel instability.	12
4.	Plasma confinement : Single particle motion in a magnetic field, motion in magnetic and electric fields, motion in inhomogeneous and curved magnetic fields, magnetic moment invariance, mirror confinement, tokamak confinement.	10
5.	Applications: Medium and short wave communication, plasma processing of materials, laser ablation, laser driven fusion, magnetic fusion.	10



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Physics

Pre-requisites:

A basic course in electromagnetic theory.

Additional Reading:

1. Electromagnetic theory for telecommunications, C.S. Liu and V.K. Tripathi, Cambridge University Press (2008).
2. The theory of plasma waves, T.H. Stix, Mc Graw Hill (1962).

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References:

1. Introduction to plasma physics and controlled fusion, F.F. Chen, Plenum Press (1984).
2. Interaction of electromagnetic waves with electron beams and plasmas, C.S. Liu and V.K. Tripathi, World Scientific (1994).
3. Principles of Plasma Physics, N.A. Krall and A.W. Trivelpiece, Mc Graw Hill (1973).