

PHY7209: OPTICAL & LASER PHYSICS

1. Course Name: Optics & Laser Physics

2. Course Code: PHY7209

3. Credit Units: 3

4. Course Description:

This course discusses the dispersion theory of dielectric media and gives the interaction of radiation with matter. Properties of laser light are also discussed.

5. Course Objectives:

At the end of the course, the students should be able to:

- Discuss dispersion theory of dielectrics.
- Operate different types of laser.
- Apply laser safety techniques.

6. Course Outline:

Content	Hours
Overview of wave propagation phenomena; EM waves in various media (dielectrics, semiconductors, and conductors).	7
Oblique incidence problems in dielectrics and conductors; Polarisation-ellipsometry.	7
Dispersion theory of dielectric media; Normal and anomalous dispersion.	5
Emission and absorption of light; Interaction of radiation with matter; Spontaneous and stimulated emission.	7
Laser fundamentals; Attainment of population inversion; Optical resonator; Threshold gain coefficient; Line shape function; Laser modes.	6
Operation of lasers: gas, ion-doped solid-state, excimer and semiconductor diode lasers; Frequency stabilisation; Mode-locking; Q-	7

switching.	
Properties of laser light; Modulation of light; Birefringence; Electro-optical, magnet-optic and acousto-optic effects; Non-linear effects; Optical frequency conversion.	5
Laser safety.	3
Total	45

7. Mode of Delivery:

This course will consist of lecture sessions and there will also be data analysis using theories learnt.

8. References:

1. Jordan, E. C. and K. G. Balman. Electromagnetic waves and Radiating systems (2nd Edition(1968). Prentice Hall.
2. Agrawal G. P. Nonlinear Fiber Optics. Elsevier/Academic Press, 2007
3. Hecht, Jeff. Understanding Fiber Optics. Upper Saddle River, N.J. : Prentice Hall, 1999.