

SSP-5402

2000-2001

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
II M.Sc. PHYSICS & II M.Sc.(Tech.) ELECTRONICS
IV SEMESTER
P402: LASER PHYSICS

SYLLABUS

1. Einstein coefficients and light amplification. Plancks law for cavity radiation. Relationship between cavity radiation and black body radiation. Absorption and stimulated emission coefficients. 8 Hrs.
Chapter : 6. Section : 3, 4.
2. **Broadening mechanisms:** Classical emission line width of radiating electron, natural emission line width as deduced by quantum mechanics. Other broadening process: Broadening due to non-radiative decay , due to dephasing collisions, collision broadening , Doppler broadening. Homogeneous versus inhomogeneous broadening. Effect of broadening mechanism on laser operation. 14 Hrs.
Chapter.4. Section:2,3.
Absorption and gain on homogeneously and inhomogeneously broadened radiative Transistion, Development and growth of a laser beam, Threshold requirements for a Laser, Laser oscillations above threshold. *Chapter:7, Section:1,4,5,6,7.*
3. **Laser rate equations:** Inversions and two level systems. Steady state inversions in three level and four level systems. 10 Hrs.
Chapter : 8. Section.:1,2.
Pumping threshold requirements. *Chapter : 9. Section : 1.2.*
4. **Laser Cavity Modes :** 18 Hrs.
 - i. Longitudinal Cavity Modes: requirement for the development of longitudinal laser modes longitudinal mode number.
 - ii. Transverse Cavity modes: a) with plane parallel mirror. B) Curved mirrors. Transverse mode spatial distribution and mode frequencies, properties of Laser modes.
 - iii. Stable laser resonators and Gaussian beams:Curved mirror criteria. ABCD Matrices, stability criteria properties of laser beams. Propagation of Gaussian Beams using ABCD matrices. Optimisation of output coupling for a laser cavity.
 - iv. Control of laser output: unstable resonators, Q switching , Laser spiking, pulsed lasing, mode locking and Wave length selection.
Chapter : 10. Section. : 1, 2, 3.
Chapter : 11. Section : 1, 2, 4, 5.
Chapter : 12. Section : 1, 2, 3.

BOOKS :

1. "Laser Fundamentals " - W.T.Silfvast. (Cambridge University – Press)