Syllabus:

Subject

Laser Fundamentals and Fabrication. Phenomenon of population inversion. The Nature of Electromagnetic Radiation. Interaction of Electromagnetic Radiation with Matter. Absorption and Emission of Radiation by atoms, ions and molecules.

Laser medium (solid state medium: srystals, glass, semiconductor, gaseous medium). Types of lasers: He-Ne laser, CO2 laser, Argon laser, Nd:YAG, Excimer laser, Diode laser, Fiber laser etc. Application of lasers, Optical parametric oscillator (OPO), Laser Electronics.

Laser Beam Characteristics, Wavelength, Coherence, Mode and Beam Diameter, Polarisation.

Laser Material Processing e.g. machining, welding, sintering, forming etc. Laser Fracture & Damage.

Laser Communication.

Research Methodology

Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Scientific Methods, Research Process,Selecting the Problem, Developing a Research Plan,

Measurement and Scaling Techniques, Sources of Error in Measurement, Methods of Data Collection, Processing and Analysis of Data, Interpretation of Results and Report Writing, Role of computer in Research

Statistics in Research, Regression Analysis, Analysis of Variance (ANOVA), DOE, Taguchi Methodology,

Measurements of operating parameters and response in laser processing, microscopy, SEM, TEM, Spectroscopic techniques

HRTEM, UV-vis absorption spectrophotometer, Steady state and Time resolved Spectroscopic techniques, Nuclear Magnetic Resonance (NMR) spectrophotometer, Time correlated single photon counting technique to measure fluorescence lifetimes of the organic/inorganic samples using different excitation sources of LEDs and diode lasers.