

SYLLABUS :-

Main industrial lasers: He-Ne, CO<sub>2</sub>, Excimer, Nd:YAG, Diode, Fiber and Ultra-short pulse lasers and their output beam characteristics; laser beam delivery systems. Overview of Industrial & Scientific Applications of laser: Metrological applications, Holography, Laser Isotope Separation, Laser fusion. Laser processing fundamentals: Laser beam interaction with metal, semiconductor and insulator, Ultra-short laser pulse interaction, heat flow theory and metallurgical considerations. Laser Material Processing Applications: Laser cutting and drilling: Process characteristics, material removal modes, practical performances. Laser welding: Process mechanisms like keyhole and plasma effect, operating characteristics and process variation. Laser surface modifications: Heat treatment, surface remelting, surface alloying and cladding, surface texturing, LCVD and LPVD. Laser rapid manufacturing. Laser metal forming: Mechanisms involved including thermal temperature gradient, buckling, upsetting. Laser peening: Fundamentals of Laser Shock Processing, Effects of various laser and process parameters, Mechanical effects and microstructure modification during laser shock processing. Theoretical modelling of laser material processing. On-line Process monitoring & control: Laser and process parameters, and workpiece characteristics. Economics of Laser Applications in Manufacturing. Laser Safety: Laser safety standards and safety procedures.