BSP605					LASER AND ITS APPLCATIONS					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To provide the basic understanding of interaction of radiation with matter
- To develop understanding and to provide comprehensive knowledge in the field Lasers.
- To introduce the working of various Laser systems
- To understand the importance of Lasers in various fields

UNIT 1 INTRODUCTION **14 Hrs.**

Review of elementary quantum physics, Schrodinger equation, Interaction of radiation with matter: absorption, spontaneous and stimulated emission, Einstein Coefficients and Light Amplification, population inversion, pumping, gain, optical resonators, different types of broadening mechanism.

20 Hrs.

UNIT 2 LASER FUNDAMENTALS

Semiclassical Theory of the Laser, Main components of Laser, principle of Laser action, Three & four level Lasers, Laser Rate equations, Properties of Laser radiation, Introduction to general lasers and their types. CW & Pulsed Lasers, atomic, ionic, molecular, excimer and solid state Lasers. Laser pulse generation: Q-switching: theory and various methods; mode locking: methods of mode locking, ultrashort (nanosecond, picosecond and femtosecond) laser pulse generation.

10 Hrs.

UNIT 3 SOME LASER SYSTEMS

Working and construction of various Laser systems: Ruby Lasers, Neodymium-Based Lasers Nd:YAG Laser, Nd:Glass Laser, Titanium Sapphire Laser, The He:Ne Laser, The Argon Ion Laser, The CO_2 Laser, Dye Lasers, Semiconductor LASER.

12 Hrs.

UNIT 4 SOME APPLICATIONS OF LASER

Spatial Frequency Filtering, Introduction to Holography, Laser-Induced Fusion, Fibre optics, Light Wave Communications, Laser spectroscopy, Lasers in Science, Lasers in Industry, Laser applications in medicine and surgery.

Max. <56> Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Acquire basic knowledge about interaction of radiation with matter.

CO2 - Understand and correlate the semi-classical theory of laser with its working of Lasers.

CO3 – Understand and explain the various properties associated with the Laser beam.

CO4 - Differentiate between continuous and pulsed Laser beams and describe the techniques used to generate Laser pulses.

CO5 - Correlate the concepts learned so far with the different types of Lasers.

CO6 - Develop the skills to apply Laser in various real-world applications.

TEXT/REFERENCE BOOKS

1. W. T. Silfvast, Laser Fundamentals, Second Edition.
2. O. Svelto, Principles of Lasers, 5th ed. 2010 Edition.
3. K. Thyagrajan and Ajoy Ghatak, LASER fundamentals and its applications, Springer 2nd ed. 2010
4. K. R. Nambiar, Laser Principles, Types and Application, New Age International.
5. S. A. Ahmad, Laser concepts and Applications, New Age International.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A/Question: 3 Questions from each unit, each carrying 3 marks	36 Marks
Part B/Question: 2 Questions from each unit, each carrying 8 marks	64 Marks