



Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2022-2023
COURSE HANDOUT- Laser Science & Technology [PHY F346]

Date: 29.08.2022

Course No.	:	PHY F346
Course Title	:	Lasers Science and Technology
Instructor-in-charge	:	ARANYA B BHATTACHERJEE
Instructor	:	Aranya B Bhattacharjee

1. Course Description: This course is on science and technology of lasers. Initial lectures will cover basic concepts of laser physics and technology. That will be followed by lectures on various types of lasers. After that, there will be lectures covering various applications of lasers in science and engineering. This course will be mostly concept and information based and mathematics will be used only when it helps to explain the concepts better.

2. Course outcome: After completing the course successfully, the students would have a thorough knowledge about the basic concepts related to lasers. They will have a good understanding about various types of lasers. They will have a very good idea as to how lasers can be used for various applications in basic science, applied research as well as in various engineering fields.

3. Text books:

1. Laser Physics, S. Hooker and C. Webb, Oxford Univ. Press.
2. Laser Fundamentals, W. T. Silfvast, Cambridge University Press.
3. Principles of Lasers, O. Swelto and D.C. Hanna, Springer India Pvt. Ltd.

Reference Books:

4. Lasers: Theory and Applications, K. Thyagarajan and A. K. Ghatak, Macmillan Publishers India.
5. Optical Electronics, A. K. Ghatak and K. Thyagarajan, Cambridge Univ. Press.
6. Nonlinear Optics by Robert W. Boyd, Elsevier (Indian Edition).

4. Course Plan:

Lecture Number	Topics to be Covered	
1-5	Laser basics: Laser basics , Theory of radiation , longitudinal modes, optical resonators, transverse modes	
6-14	Pumping of laser media, properties of laser beams, Line broadening mechanisms, Transient behaviour, mode locking.	
15-25	Types of lasers: Masers, solid state lasers, semiconductor lasers, liquid (dye) lasers, gas lasers, x-ray lasers, free electron laser, fibre lasers.	
26-30	Nonlinear optics using lasers: second order nonlinear process	
31-34	Nonlinear third order process	
35-42	Applications of lasers: Telecommunication, Holography, Industry, Defence, Medicine, Thermonuclear fusion.	

5. Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weight age (%)	Date, Time	Nature of Component
1.	Test	30 mins.	20%	TBA	Open Book
2.	Midsem test	90 mins	25%	03/11 1.30 - 3.00PM	Closed Book
3.	Assignment		10%	NA	
4.	Comprehensive Exam	3 Hours	45%	26/12 AN	Closed Book

6. Notices: Notices and solutions for examination's question papers will be displayed on the CMS website.

7. Make-up Policy: Make up may be considered provided a make-up application (for a genuine health issue) forwarded by the appropriate authority is produced. There will be no makeup for Class Test.

Academic honesty and integrity policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Aranya B Bhattacharjee

Instructor-in-charge