

MGSC – B.Sc. – Physics Curriculum 2024 OBE Pattern
Multidisciplinary (MDC) Course-114T.
MDC Course – 2 Credits)

Semester: 1 NEP-2020	Course No.: 114	Course Category: MDC paper Course Code: PHMDC 114(T) Credits: 2 Course Title: : Laser and Plasma Physics
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Course Objective

Focus on providing students with a deep understanding of the fundamentals of laser physics, laser oscillation principles, laser beam properties.

Understanding the basics of laser oscillation, light-matter interaction, and photon properties.

Exploring various types of lasers (gas, solid state, semiconductor, etc.) and their characteristics.

Plasma physics course is generally to provide students with a fundamental understanding of plasma as the fourth state of matter, its properties, behaviours, and applications.

Understand the basic concepts and characteristics of plasma, plasma parameters, and the criteria defining plasmas.

Explore plasma waves, instabilities, and transport phenomena such as diffusion and mobility.

Outcomes: On successful completion of the course, learners will be able to

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CO1	Understand the Einstein's excitation theory of atoms also understand type of emission of radiation. Remember Study of properties of laser and also different type of lasers and their applications.	Remember Understand
CO2	Remember composition and characteristics of plasma and understand different phenomenon related to plasma. Also study different applications of natural and man-made plasma .	Remember Understand

Syllabus:

Unit Contents	Lectures (Hours)
Unit 1:LASERS: Introduction, Attenuation of light in an optical medium, Thermal equilibrium, Interaction of light with matter, Einstein coefficients and their relations, Light amplification, Meeting the three requirements, Components of Laser, Lasing action, Principal pumping schemes, Type of lasers (excluding Carbon Dioxide Laser), Ruby laser ,Nd-YAG lase,He-Ne laser and Semiconductor laser, Laser beam characteristics, Applications.	15
Unit 2:PLASMA PHYSICS: Introduction, Composition & characteristics of a plasma, Collisions, Surface phenomena, Transport (or transfer) phenomena, Diffusion & Mobility : Ambipolar Diffusion, Viscosity : Conductivity, Recombination, Ohm's law, Gas Discharge, Comparison of various natural & man-made plasma, Plasma diagnostics, plasma waves & Instabilities confinement of plasma, space plasma.	15

Text Books/Reference books:

For unit 1:

A textbook of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhanulu, S. Chand
Publication: Chapter 22, articles 22.1 to 22.12.1, 22.16.1 ,22.16.2,22.16.3 ,22.17. 23rd
edition, 2006, S. Chand and company Ltd.

For unit 2:

Element of Plasma physics by S. N. Goswami, , chapter 1 , articles 1.1 to 1.14 , 1st edition
1995 , New Central Book Agency (P) Ltd.

Reference Books:

1. Optics by Ajoy Ghatak, 7th Edition, 2020, McGraw Hill.
2. Introduction to Plasma Physics and controlled fusion, F. F Chen , second edition
,1984 , Springer Science Business Media L.