



भौतिकी विभाग  
मोतीलाल नेहरू राष्ट्रीय प्रौद्योगिकी संस्थान इलाहाबाद  
प्रयागराज - 211004 (उ०प्र०), भारत  
Department of Physics  
Motilal Nehru National Institute of Technology Allahabad  
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**Syllabus**  
*for*  
**Engineering Physics - II**

<b>Program</b>	: B.Tech.
<b>Year</b>	: First
<b>Branch</b>	: Mechanical Engineering, Production and Industrial Engineering
<b>Course Code</b>	: PHN11502 (in first semester) or PHN12502 (in second semester)
<b>L-T-P</b>	: 2-1-2
<b>Credit</b>	: 4

### Physical Optics

Interference: Condition of observing interference. Fresnel's Biprism. Stoke's treatment. Interference in thin films. Newton's rings.

Diffraction: Fraunhofer's diffraction - Single slit, Double slit and N-slit or plane transmission grating. Rayleigh's criterion of resolution. Resolving power of grating and telescope.

Polarisation: Polarisation by reflection. Double refraction. Half wave and quarter wave plates. Production and analysis of plane, elliptical and circularly polarised light. Optical activity. Specific rotation. Laurent half-shade polarimeter.

### Laser

Characteristics of Laser light, Stimulated and spontaneous emission. Population inversion. Einstein's coefficients. Laser emission, Nd-YAG and He-Ne lasers. Applications of laser in engineering.

### Special Theory of Relativity

Frame of reference. Inertial and non-inertial frames. Postulates of special theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Addition of velocities. Energy Mass equivalence.

### List of experiments in practicals

1. To measure height of a building using Sextant.
2. Interference of light: Newton's ring.
3. Interference of light: Fresnel's Biprism .
4. Diffraction by a plane transmission grating.
5. Specific rotation of sugar using Polarimeter.
6. Resolving power of a telescope.
7. Surface tension measurement.
8. Variation of magnetic field along the axis of a current carrying coil.
9. Magnetic field distribution due to Helmholtz coil setup.

## Reference Books

1. R. Resnick, *Introduction to Special Relativity* (John Wiley & Sons, New York, 1968)
2. A. Ghatak, *Optics* (McGraw Hill Education, New Delhi, 2017)
3. E. Hecht, *Optics* (Addison-Wesley, New York, 2002)
4. A. Beiser, *Concepts of Modern Physics* (McGraw-Hill, New York, 2003)
5. B. B. Laud, *Lasers and Non-Linear Optics* (Wiley, New York , 1991)

## Course outcomes from the course

- CO-1** Basics of optics are introduced to understand many related technologies e.g., interference, polarization and diffraction, etc.
- CO-2** Laser is a powerful tool and is used in several applications relevant to mechanical and production engineers. Fundamentals of lasers are introduced to explain the working and use of lasers.
- CO-3** Make students familiar with the unexpected outcomes in the regime of extremely high-speed objects. The topic is introduced to help them understand many technical objects and phenomena such as GPS technology, the physics of astronomical objects, etc.