Add on Course

Department of Physics

ABN Seal College

OPTICS OF REFRACTING SYSTEMS

Syllabus

Theory:

Topic: 1. Aberration phenomena for Light: Seidel aberration : (only qualitative discussion) Nature and cause of different Seidel aberrations, methods of reducing these. Chromatic Aberration

2. Fermat's Principle: Explaining light in context of Euler Lagrange Equation and Least action Principle. Applications.

3. Concept of Thin Lenses.

4. Cardinal points of an optical system: two thin lenses separated by a distance, equivalent lens, introduction to matrix methods in paraxial optics – simple application

5. Optical instruments: Field of view, entrance and exit pupil microscope, telescope, Human Eye and Development of Camera

Practical:

Verification of Len's formulas and demonstration/measurement of Aberration.

Assignment: Thought provoking Reading project

Reference Books:

1. **Fundamentals of Optics - F. A. Jenkins and H. E. White (Mc Graw Hill, Kogakusha).**
2. **Geometrical and Physical Optics - B. S. Longhurst (Orient Longmans).**
3. **Optics – A. K. Ghatak (Tata Mc Graw Hill).**

DEPARTMENT OF PHYSICS

ADD ON COURSE

Optics of Refracting Systems

Course Outcomes

Optics of thin Lenses:
Understanding the lens maker's equation. Analyse image formation through thin lenses using ray diagrams and equations, giving the concepts of focal length and magnification, and applying the lens formula in various optical systems.

Matrix Method Proficiency:
Understand the principles and applications of the matrix method in geometrical optics. Apply matrix methods to analyse complex optical systems, including those found in various instruments.

Cardinal Points Mastery:
Define and explain the concept of cardinal points and their significance in optical design. Apply cardinal points to analyse and optimize optical systems, including those in cameras and other instruments.

Aberration Analysis and Correction:
Identify and categorize aberrations in optical systems. Develop strategies for minimizing and correcting aberrations to enhance optical performance.

Optics of Cameras:
Explore the optics of cameras, including lens characteristics, image formation, and factors affecting image quality. Understand how camera optics contribute to the design and functionality of imaging systems.

Optical Instrumentation and Design:
Gain insights into the optical principles underlying microscope, telescope functionality. Analyse their configurations, magnification, and resolution for various applications in astronomy and other fields.
Design optical systems for various instruments, considering specific requirements and constraints. Integrate theoretical knowledge with practical considerations for optimal instrument performance.

Real-World Applications:
Apply learned concepts to real-world scenarios in scientific research, medical imaging, and other practical applications. Demonstrate an understanding of how geometrical optics is crucial in various industries.

Hands-on Laboratory Experience:
Engage in laboratory experiments to reinforce theoretical concepts. Gain practical experience in using and aligning optical instruments.

Interdisciplinary Understanding:
Recognize the interdisciplinary nature of optics and its integration with physics, engineering, and other scientific disciplines. Explore how optical principles are applied in diverse fields, from healthcare to astronomy.

Communication and Presentation Skills:
Effectively communicate complex optical concepts and solutions. Present findings and analyses in a clear and articulate manner, both in writing and orally.

By the end of this course, participants will have a well-rounded understanding of geometrical optics, encompassing the matrix method, aberration correction, cardinal points, camera optics, microscopes, telescopes, and various optical instruments. This knowledge will prepare them for careers in optical design, research, and related fields.

Department of Physics
ABN Seal College, Cooch Behar