**Govt. PG College, Ambala Cantt**

**Session: 2023-24**

**Name of Assistant Professor: Mrs. Neelam**

**Department: Physics**

**Class: B.Sc. II/ 3rd Semester/ Sec: Non-Medical & Computer Science**

**Subject Code & Name: PH-302/ WAVES AND OPTICS I**

**SYLLABUS**

**Max Marks: 50 External: 40**

**Minimum Pass Marks: 14 Internal: 10**

**Time: 3 hours**

**Note:**

1. The syllabus is divided into 4 units. 9 questions will be set.

2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.

3. Four more questions will have to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts. All questions carry equal marks.

4. 20% numerical problems will be set.

5. Use of scientific (non-programmable) calculator is allowed.

**Unit-1: Interference I**

Interference by Division of Wave front: Young’s double slit experiment, Coherence, Conditions of interference, Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, Lloyd's mirror, Difference between Bi-prism and Llyod mirror fringes, phase change on reflection.

**Unit 2: Interference II**

Interference by Division of Amplitude: Plane parallel thin film, production of colours in thin films, classification of fringes in films, Interference due to transmitted light and reflected light, wedge shaped film, Newton's rings, Interferometer: Michelson's interferometer and its applications to (i) Standardization of a meter (ii) determination of wavelength.

**Unit- 3: Diffraction I**

Fresnel’s diffraction: Fresnel’s assumptions and half period zones, rectilinear propagation of light, zone plate, diffraction at a straight edge, rectangular slit and circular aperture, diffraction due to a narrow slit and wire.

**Unit -4: Diffraction II**

Fraunhoffer diffraction: single-slit diffraction, double-slit diffraction, N-slit diffraction, plane transmission granting spectrum, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating. Differences between prism and grating spectra.

**REFERENCE BOOKS:**

1. Hecht, Optics, Pearson Education, New Delhi
2. Brooker G, Modern Classical Optics, Ane Books Pvt Ltd, New Delhi
3. Chaudhuri R N, Waves and Oscillations, New Age International Publishers, New Delhi
4. Khandelwal D P, Text Book of Optics and Atomic Physics, Himalaya Publishing House, Bombay
5. Subrahmanyam N, Lal B, Avadhanulu M N, A Text Book of Optics, S Chand & Co, New Delhi
6. Barton A w, a text Book on Light, Longmans Green & Co London.
7. Longhurst R S, Geometrical and Physical Optics, University Press India Pvt. Ltd. Hyd.

**COURSE OBJECTIVES:**

* The students will understand about the phenomena of Interference and Diffraction from day-to-day life examples.
* Understand the laws governed by Interference and Diffraction phenomena.
* They will learn about the Interference by division of Wavefront and Interference by Division of Amplitude.
* Understand about the working of Fresnel’s Biprism and Lloyd’s mirror.
* Course will give them detailed knowledge about Newton’s rings, Michelson’s Interferometer and make them compatible to solve numerical problems based on these topics.
* Students will acquire knowledge about Fresnel’s Diffraction and Fraunhoffer diffraction and their types and usage in daily life and for future purpose also.
* Equip the students about practical knowledge gained by them in Course so that they may be able to use this information in future.
* Students will become aware about zone plate and its working and usage.
* Understand the idea behind Transmission Grating, its formation and its use in Scientific world.
* Students will become able to apply the knowledge gained in the course for their bright future and can pursue higher studies in this field too.

**COURSE OUTCOMES:**

This course delves into fundamental topics related to waves and optics, providing students with a solid foundation in these areas. The specific course outcomes for **Waves and Optics I** are as follows:

1. **Understanding Interference of Light**:
   * Explain the phenomenon of interference of light.
   * Discuss the methods for minimizing aberrations in lenses.
   * Explore interference effects using Lloyd’s single mirror.
2. **Thin Films and Newton’s Rings**:
   * Understand the formation of interference patterns in thin films.
   * Investigate Newton’s rings due to the division of amplitude.

These outcomes equip students with essential knowledge about wave phenomena, optics, and practical applications.

**LESSON PLAN**

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| **Sr. No.** | **Schedule of Weeks** | **Topics to be covered** |
|  | **26.07.23 to 29.07.23** | Interference by Division of Wave front: Young’s double slit experiment, Coherence, Conditions of interference. |
|  | **31.07.23 to 5.08.23** | Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, Lloyd's mirror. |
|  | **07.08.23 to 12.08.23** | Difference between Bi-prism and Llyod mirror fringes, phase change on reflection. |
|  | **14.08.23 to 19.08.23** | **Numerical problems will be discussed followed by Assignment and test.** |
|  | **21.08.23 to 26.08.23** | Interference by Division of Amplitude: Plane parallel thin film, production of colours in thin films |
|  | **28.08.23 to 02.09.23** | Classification of fringes in films, Interference due to transmitted light and reflected light, wedge shaped film. |
|  | **04.09.23 to 09.09.23** | Newton's rings, Interferometer: Michelson's interferometer and its applications to (i) Standardization of a meter (ii) determination of wavelength. |
|  | **11.09.23 to 16.09.23** | **Numerical problems will be discussed followed by test.** |
|  | **18.09.23 to 23.09.23** | Fresnel’s diffraction: Fresnel’s assumptions and half period zones. |
|  | **25.09.23 to 30.09.23** | Rectilinear propagation of light, zone plate, diffraction at a straight edge. |
|  | **02.10.23 to 07.10.23** | Diffraction at a rectangular slit and circular aperture, diffraction due to a narrow slit and wire. |
|  | **9.10.23 to 14.10.23** | **Numerical problems will be discussed followed by Assignment and test.** |
|  | **16.10.23 to 21.10.23** | Fraunhoffer diffraction: single-slit diffraction, double-slit diffraction, N-slit diffraction. |
|  | **23.10.23 to 28.10.23** | Plane transmission granting spectrum, dispersive power of grating, limit of resolution. |
|  | **30.10.23 to 04.11.23** | Rayleigh's criterion, resolving power of telescope and a grating. Differences between prism and grating spectra. |
|  | **6.11.23 to 9.11.23** | **Numerical problems will be discussed followed by test.** |
|  | **10.11.23 to 16.11.23** | **DIWALI BREAK** |
|  | **17.11.23 to 18.11.23** | **REVISION AND TESTS.** |
|  | **20.11.23 to 25.11.23** | **REVISION AND TESTS.** |

**(NEELAM)**

**ASSISTANT PROFESSOR**

**PHYSICS DEPARTMENT**

**GOVT. PG COLLEGE, AMBALA CANTT**