



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Science College  
Semester-2(B.Sc.)

**Subject:** Optics – BSCPH12304

**Type of course:** Major

**Prerequisite:** Concept of inertial and non-inertial frames of reference, Concept of electric flux, Gauss's law in integral & differential form.

**Rationale:** This course has been designed to make the students know about basic principles of Physics. The students learn fundamentals of physics understand the physics applications in real world and developing critical thinking skills. It helps students to develop problem-solving abilities and prepare them to shape career in advanced physics. Ultimately, pursuing a B.Sc. in Physics offers a combination of intellectual stimulation, practical skills, and versatile career opportunities. It equips you with a deep understanding of the physical world and provides a strong foundation for further education or a wide range of professional endeavors

**Teaching and Examination Scheme:**

| Teaching Scheme |   |   | Credits | Examination Marks |           |     |       |     | Total Marks |
|-----------------|---|---|---------|-------------------|-----------|-----|-------|-----|-------------|
| CI              | T | P | C       | SEE               |           | CCE |       |     |             |
|                 |   |   |         | Theory            | Practical | MSE | LWA/V | ALA |             |
| 3               | 0 | 2 | 4       | 75                | 25        | 30  | 20    | 50  | 200         |

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voice; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.*

3 Credits \* 25 Marks = 75 Marks (each credit carries 25 Marks) Theory

1 Credits \* 25 Marks = 25 Marks (each credit carries 25 Marks) Practical

SEE 100 Marks will be converted in to 50 Marks

CCE 100 Marks will be converted in to 50 Marks

It is compulsory to pass in each individual component.



**Continuous Assessment:**

| Sr. No       | Active Learning Activities  | Marks     |
|--------------|---|-----------|
| 1            | <b>Report writing</b><br>Students have to Write Sketch colorful pattern + explain path difference & phase change. and explain null result and upload it to GMIU Web Portal. | 10        |
| 2            | <b>Minor project</b><br>Students prepare a working model based on any topic related to syllabus Prepare a small video on your project and upload it to GMIU Web Portal.     | 10        |
| 3            | <b>Draw and explain</b><br>Students will draw Sketch observed double image + explain o-ray & e-ray. Then upload in PDF format on GMIU web Portal (10 MCQs).                 | 10        |
| 4            | <b>Video Presentation</b><br>Student will prepare short video on the topic given by the faculty and upload on the GMIU web portal.  | 10        |
| 5            | <b>Attendance</b><br>Student should present in class room during lecture.   | 10        |
| <b>Total</b> |   | <b>50</b> |





**Course Content:**

| Unit No | Course content   | Hrs. | % Weightage |
|---------|--|------|-------------|
| 1       | Chapter: 1 Interference and Diffraction<br>Condition of interference, Interference by thin film, Interference due to transmitted light, Interference by variable thickness (wedge-shaped) film, Types of interference : Wave front division and Amplitude division, Wave front division : Fresnel Bi prism, Amplitude division : Newton's ring, Fresnel's Assumptions, Fresnel Half Period Zones and Rectilinear propagation of light, Positive and Negative Zone plate, Fraunhofer diffraction at a single slit, Intensity distribution in diffraction pattern of a single slit in Fraunhofer diffraction, Examples                     | 10   | 25          |
| 2       | Chapter: 2 Optics-1<br>Types of Grating, Criterion for Resolution according to Lord Rayleigh, Resolving power of Optical Instruments : Grating and Prism, Comparison of grating spectra & prism spectra, Introduction to Eye pieces: (1) Keller eyepiece (2) Ramsdens eyepiece (3) Huygens's eyepiece (4) Gauss eyepiece, Comparison of Ramsdens eyepiece and Huygens's eyepiece, Michelson Interferometer and its Applications, Feby - Perot Interferometer and its Applications, Examples  | 10   | 25          |
| 3       | Chapter: 3 Optics-2<br>Production of linearly polarized light a) Reflection : Brewster's Law b) Refraction : Pile of Plates c) Scattering d) Selective Absorption : Dichroism e) Double Refraction : Birefringent, Polarizer and Analyzer : Nicol Prism, Polaroid sheets, Effect of polarizer on natural light, Effect of analyzer on Polarized light : Malus Law, Huygens's Explanation of Double Refraction, e-Ray and o-Ray, Positive crystals and Negative crystals, Quarter wave plate, Half wave plate, Production and Detection of Elliptically Polarized light, Production and Detection of Circularly Polarized light, Examples | 12   | 25          |
| 4       | Chapter: 4 Fiber Optics:<br>Introduction Definition, Principle, Structure, Principle of light transmission in a fiber - critical angle, acceptance angle, numerical aperture, Classification of optical fiber base on the modes of light propagation, Fiber index profile, Modes of Propagation, Losses in fiber, Dispersion, Advantages of Fiber optics system, Uses of Fiber optics system, Examples,  | 13   | 25          |



**Suggested Specification table with Marks (Theory):75**

| Distribution of Theory Marks(Revised Bloom's Taxonomy) |                 |                   |                 |             |              |            |
|--|-----------------|-------------------|-----------------|-------------|--------------|------------|
| Level  | Remembrance (R) | Understanding (U) | Application (A) | Analyze (N) | Evaluate (E) | Create (C) |
| Weightage  | 20 %            | 30%               | 30%             | -           | 20%          | -          |

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

|  |  |
|--|--|
| After learning the course, the students should be able to: |  |
| CO1  | Explain Fresnel's assumptions and half-period zones and apply them to rectilinear propagation of light.  |
| CO2  | State and apply Rayleigh's criterion of resolution.  |
| CO3  | Explain polarization by dichroic materials and birefringence.  |
| CO4  | Define optical fiber and explain the principle of light transmission based on total internal reflection. |

**List of Practical**

| Sr. No. | Descriptions  | Unit No      | Hrs.      |
|---------|---|--------------|-----------|
| 1       | To determine the focal length of a concave lens by a telescope using the relation $1/v - 1/u = 1/f$   | 1            | 4         |
| 2       | To determine the focal length of a combination of two convergent lenses separated by a distance d using nodal slide assembly and to verify the relation $1/F = 1/f_1 + 1/f_2 - d/f_1 f_2$ where the letters have their usual significance | 1            | 2         |
| 3       | To determine the magnifying power of a telescope by the slit method using a microscope.   | 2            | 4         |
| 4       | To verify the expression for the resolving power of a telescope   | 2            | 2         |
| 5       | To find the vertical distance between two points using a sextant.   | 2            | 2         |
| 6       | To compare the illuminating powers (or luminous intensities) of two given sources of light using a Lummer-Brodhum photometer  | 3            | 4         |
| 7       | To find the angle of the prism by rotating the table method.  | 3            | 2         |
| 8       | To find the wavelength of sodium light by measuring the diameters of Newton's rings.  | 3            | 4         |
| 9       | To find the wavelength of sodium light using Fresnel's bi prism.  | 4            | 4         |
| 10      | To determine the diameter of a thin wire by studying the diffraction (and interference) pattern produced by it.   | 4            | 2         |
|         |   | <b>Total</b> | <b>30</b> |





**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**References Books:**

- 1) A textbook of optics by Dr. N. Subrahmanyam & Brij Lal
- 2) Optics by Singh & Agarwal
- 3) Properties of matter by D.S.Mathur Electric circuit analysis by Soni & Gupta
- 4) Principle of electronics by V.K. Mehta
- 5) Advanced practical physics by Chauhan and Singh
- 6) B.Sc. practical physics by C L Arora

