



*Yogoda Satsanga Mahavidyalaya*

(Established in 1967)

NAAC Accredited B++ (CGPA 2.89)

Affiliated to Ranchi University & registered under 2 (F) & 12 (B) of UGC Act



## **COURSE PLAN**

**NAME OF THE DEPARTMENT: PHYSICS**

**NAME OF THE FACULTY: PROF. SANTOSH KUMAR SINGH**

**ACADEMIC SESSION: 2023-2024**

**YEAR: 2024**

**PROGRAMME: B.Sc.**

**SEMESTER: III**

**COURSE TYPE: MAJOR**

**COURSE: WAVES AND OPTICS**

**COURSE CODE: MJ-4**

**TOTAL CREDIT: 4**

**Prepared by:**

**HoD:**



## **PROGRAMME OUTCOME (POs)**

**Student should be able to,**

**PO1:** Apply the knowledge of physical laws and to design a scientific and computational model that illustrates and explains the different laws.

**PO2:** Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classroom

**PO3:** Develop scientific temperament, an ability to merge, interconnect and extrapolate information and knowledge across various streams.

**PO4:** Design solutions for complex scientific problems and design processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural societal, legal, constitutional and environmental consideration.

**PO5:** Realize the given scientific data critically and systematically and the ability to draw the objective conclusions.

**PO6:** Communicate effectively on complex scientific activities with the science community and at society at large, such as, being able to comprehend and write effective reports and design documents, make effective presentations, and give and receive clear instructions.

**PO7:** Demonstrate knowledge and understanding of the scientific principle and apply these to one's own work, as a member and leader in a team, to manage projects and multidisciplinary environments.

**PO8:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of scientific development, technological advancement and global changes.

**PO9:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

**PO10:** Value and foster physical physiological and physiological wellbeing by staying committed through personal practice and conduct. Apply the learning for life-long commitment to ethics to fulfilment of professional and social obligations.

**PO11:** Apply academic to promote higher studies, sustainable living through employment and initiation of entrepreneurial advents to create opportunities and wealth for self and society.



**PO12:** Value and Support social causes and rural development through service and philanthropic activities.

## **Program Specific Outcomes**

**Student should be able to,**

**PSO 01:** Apply the rigorous understanding of the core theories & principles of Physics, which includes Classical Physics, Mathematical Physics, Quantum Physics, Statistical Physics, Electrodynamics, and Relativity while pursuing higher education or in real life situations e.g., knowledge of Electronics and Instrumentation shall be helpful to design and develop several devices and sensors etc.

**PSO 02:** Analyse the applications of interdisciplinary learning especially Mathematics and computational methods using MATLAB, PYTHON, SCILAB etc. to solve the problems in Physics & develop suitable mathematical and computational methods for new formulation of Physical theories.

**PSO 03:** Demonstrate a solid foundation about the fundamental interactions of nature (gravity, electromagnetic, weak, strong) and develop a solid foundation of atomic and nuclear structure, i.e., understand the fundamental theories to unravel nature at atomic and sub-atomic level as well as at large astrophysical length scale.

## **COURSE OUTCOMES (COs):**

On successful completion of this course the student should know:

1. Formulate and solve mathematical oscillator and wave equations for specific physical systems, demonstrating a deep understanding of their derivation and applications.
2. Design and conduct experiments using foundational principles and theories of light behavior and physical environment interactions, critically analyzing experimental results.
3. Synthesize knowledge of wave superposition to describe and predict the formation of standing waves, demonstrating the ability to apply theoretical concepts to practical scenarios.
4. Apply and analyze everyday wave phenomena, like motion of coupled oscillators, study of Lissajous figures and behaviour of transverse, longitudinal waves, through a comprehensive understanding of wave principles, explaining observations with scientific accuracy.
5. Integrate principles of wave motion and superposition to elucidate complex wave behaviors, such as polarization, interference, and diffraction, in various contexts.
6. Critically assess the functioning and applications of advanced optical instruments, including biprisms, interferometers, diffraction gratings, and holograms, enhancing practical understanding through hands-on experience.



## A. CORRELATION BETWEEN POs AND COs

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	3	-	3	-	-	3	-	-	-	3	-	3		
CO2	-	3	-	3	-	3	-	-	3	-	-	-	3		
CO3	-	-	3	-	-	3	3	-	3	-	-	-	3		
CO4	3	-	-	-	-	3	-	3	-	-	3	-	3	3	
CO5	-	3	-	-	-	-	3	3	3	-	-	-			3
CO6	3	-	3	3	-	-	-	3	-	-	-	-			3

1. Weak

2. Moderate

3. Strong

## COURSE TEACHING AND LEARNING ACTIVITIES

### A. PEDAGOGY

- i. Whiteboard
- ii. Flipped Class
- iii. PPT

### B. COURSE COMPLETION PLAN

UNIT	NO. OF LECTURES		TEST	QUIZ	ASSIGNMENT
	Lectures	Tutorial Lectures			
1	05		01		
2	05				
3	07				
4	07				
5	08				
6	03		01		
7	04				
8	05				
9	10		01		
10	06		01		

### B. COURSE OUTCOME ASSESSMENT PLAN

#### a. DIRECT ASSESSMENT

(Please tick the appropriate column)

COURSE OUTCOME	ASSESSMENT				REMARKS
	QUIZ	TEST	MID SEMESTER	Term Exam	
CO1		3	3		
CO2		3	3		
CO3		2	2		
CO4		2	2		
CO5		3	3		
CO6		2	2		



Rate the following aspects of course outcomes. Use the scale 1-3

S. No	Course Outcome	1	2	3
1.	CO1			3
2.	CO2		2	
3.	CO3		2	
4.	CO4			3
5.	CO5			2
6.	CO6		2	

1. Average
2. Good
3. Very Good

## C. SUGGESTED READINGS

### a. TEXT BOOKS:

1. Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
2. Fundamental of Optics, A. Kumar, H.R. Gulati and D.R. Khanna, 2011, R. Chand Publications.

### b. REFERENCE BOOKS:

1. Optics by Eugene Hecht

### c. VIDEO-RESOURCE:

<https://www.compadre.org/books/?ID=70&FID=63361>  
<https://vtputkal.odisha.gov.in/subjectwise/waves-and-optics-core-iv/>

### d. WEB-RESOURCES:

<https://www.eshiksha.mp.gov.in/mpdhe/mod/resource/view.php?id=12095&forceview=1>  
<https://online.rice.edu/courses/physics-waves-optics-specialization>

### e. E-RESOURCES:

<https://www.uou.ac.in/sites/default/files/slm/BSCPH-202.pdf>  
[https://www.zarm.uni-bremen.de/fileadmin/user\\_upload/space\\_science/gravitational\\_theory/waves.pdf](https://www.zarm.uni-bremen.de/fileadmin/user_upload/space_science/gravitational_theory/waves.pdf)