



## SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
PHY	240	Waves & Optics	3	2	0	2	5	PHY 105, MAT 102	4	English

### A. Course Description

This course is an introduction to waves and optics associated with physical phenomena. It is designed to analyze various situations or phenomena associated with waves, optics and modern physics using basic principles. Topics covered in waves and geometrical optics include: laws of geometric optics and image formation, interference of light waves, diffraction patterns and polarization, wave motion, sound waves, superposition and standing waves.

### B. Course Outcomes

At the end of this course the student will be able to:

1. Analyze various situations or phenomena associated with waves and optics.
2. Understand the laws of geometrical optics.
3. Apply the characteristics of waves to light phenomena.
4. Provide the fundamental concepts of wave motion, sound waves, waves interference, and superposition of standing waves.
5. Develop critical thinking and analytical problem-solving skills.

### C. References

#### Required Textbook

Serway R.A. and Jewett J.W., *Physics for Scientists and Engineers with Modern Physics*, 9<sup>th</sup> Edition, Brooks/Cole, Belmont, CA, USA (2014).

#### Other references

- Jenkins F.A. and White H.E., *Fundamentals of Optics*, 4<sup>th</sup> edition, McGraw-Hill (2001).
- Hecht E., *Optics*, 4<sup>th</sup> Edition, Addison-Wesley (2004).

**Course Website:** <http://www.imamm.org/>

### D. Topics Outline

1. **The Laws of Geometric Optics and Image Formation:** Reflection, refraction, dispersion and prism, total internal reflection, images formed by flat mirror, images formed by spherical mirrors, Images formed by refraction, thin lenses (Contact hours: 12).
2. **Interference of Light Waves:** Conditions for interference, Young's double-slit experiment, Intensity distribution of the double-slit interference pattern, change of phase due to reflection, Interference in thin films (Contact hours: 10).
3. **Diffraction Patterns and Polarization:** Introduction to diffraction patterns, diffraction patterns from narrow slits, resolution of single-slit and circular apertures, the diffraction grating, polarization of light waves (Contact hours: 10).
4. **Wave Motion:** Propagation of a disturbance, sinusoidal waves, The speed of waves on strings, reflection and transmission, rate of energy transfer by sinusoidal waves on strings, the linear wave equation (Contact hours: 10).



5. **Sound Waves:** Speed of sound waves, periodic sound waves, intensity of periodic sound waves, the Doppler effect (Contact hours: 10).
6. **Superposition and Standing Waves:** Superposition and interference, standing waves, standing waves in a string fixed at both ends, resonance, standing waves in air columns, standing waves in rods and membranes (Contact hours: 8).

### E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

### F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6<sup>th</sup> or 7<sup>th</sup> week.
- **Midterm 2:** 11<sup>th</sup> or 12<sup>th</sup> week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam:** 16<sup>th</sup> week.

Your course grade will be based on your semester work as follows:

<b>Midterm 1:</b> 20 %	<b>Midterm 2:</b> 20 %	<b>Final Exam:</b> 40 %
<b>Quizzes, Homework, Attendance &amp; Participation:</b> 20 %		

The grading distribution:

A <sup>+</sup>	A	B <sup>+</sup>	B	C <sup>+</sup>	C	D <sup>+</sup>	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

### G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](#)

[goo.gl/ykm7t3](http://goo.gl/ykm7t3)

