Bangladesh University of Engineering and Technology
Department of Physics

Course Teacher: Dr. Mehnaz Sharmin

Course Outline

Program:	**Civil Engineering (**CE)
Course Title:	Physical Optics, Waves & Oscillations and Heat & Thermodynamics
Course Code:	PHY-101
Semester:	July 2021
Level:	1st year 1st semester
Credit Hour:	3.0
Name & Designation of the Teacher:	Dr. Mehnaz Sharmin
	Associate Professor
	Department of Physics
Office/Room:	OAB 136F, Department of Physics, BUET, Dhaka-1000
Class Hours:	Monday: 10:00 - 10:50 AM CE(B)
	Wednesday: 10:00 - 10:50 AM CE(A)
	Wednesday: 12:00 - 12:50 PM CE(C)
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Rationale: Waves and oscillations is a branch of physics that is related to almost every sphere of our everyday life. It covers a wide area of knowledge extending from microscopic systems (Example: vibrations of atoms in a solid, motion of an electron in an atom, etc.) to macroscopic systems (Example: motion of a fan or a wheel, human body, solar system, etc.). The objective of this course is to clarify the basic knowledge of different type of waves and oscillations and to present some real- life examples of the applications of this subject.

Pre-requisite (if any)**:** None

Course Synopsis: Differential equation of a Simple Harmonic Oscillator, total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, spring- mass system, Calculation of time period of torsional pendulum, Damped oscillation, Determination of damping co-efficient. Forced oscillation, Resonance, Two-body oscillations, Reduced mass, Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity, Architectural acoustics, Reverberation and Sabine's formula.

Course Objectives:

The learning objectives of this course are to-

1. Clarify the knowledge about different types of oscillations.
2. Develop the capability to establish the equation of motion of different oscillating systems.
3. Build up the skill to solve problems related to oscillating systems.
4. Acquire knowledge to analyze the combination of simple harmonic oscillations.
5. Enrich the acquaintance of various type of waves.
6. Build up the skill to solve problems related to wave motions.
7. Clarify the fundamental concept of reverberation.

Tentative Lecture Plan

Lectures	Topics
1-4	Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, Spring- mass system, Calculation of time period of torsional pendulum, Two-body oscillations, Reduced mass.
5-7	Damped oscillation, Determination of damping co-efficient, Forced oscillation, Resonance.
8-10	Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity.
11-12	Architectural acoustics, Reverberation and Sabine's formula.

Learning Resources

1. Physics – David Halliday, Robert Resnick, and Jearls Walker
2. Vibrations and Waves- A. P. French
3. Physics for Engineers (Part-1) - Dr. Gias Uddin Ahmad
4. Waves and Oscillation – Brij Lal and N. Subramanium
5. Lecture notes: available in “class materials” of the respective MS Teams classroom.

Program Outcomes (POs)

After finishing this course, a student will be capable to -

- Solve the equation of motion for different types of oscillatory systems.
- Analyze the Lissajous figures using the principle of superposition.
- Distinguish different types of waves and the phenomena related to them.
- Analyze problems related to wave motion.
- Explain Reverberation in terms of Sabine's formula.

Teaching Methods:

1. Lecture
2. Discussion
3. Question & Answer
4. Demonstration
5. Problem Solving

Assessment Policies:

Attendance: Class attendance is very important since by missing a class you may miss a class test that may be equivalent to a failed class test and it carries 10% weight of your grade, cannot be recovered unless the absence is appropriately justified and excused.

Class Test/Quizzes: There will be a total of four class tests in this course. Three teachers will be teaching this course and each teacher will be taking at least one class tests. Lowest score of the (four) CT will be dropped. If you miss any class test, it will count at the lowest score, and will be dropped. **So, no make-up for any class test.** You can expect one/two class test from Modern Physics.

Conduct: Please turn off your cell phones before entering class, and please don't have any sidebar conversations during class. There will be ample opportunity for you to talk during class at certain times. However, it is imperative that the class is quiet at all other times so that your fellow students are not distracted. I encourage you to raise your hand and ask relevant questions in class.

Collaboration Policy: Collaboration during exams is strictly prohibited. Exams will be of the usual closed-book, closed-notes type. On the other hand, in order to learn the materials, collaboration and group discussions outside of classroom are highly encouraged.

Calculators and Laptops: A non-graphic, non-programmable calculator Calculators may be used for exams. While in the class any calculators can be used. You may take notes on a laptop. However, you may not use your laptop for Facebook, web surfing, or other activities not directly related to class.

You will not be allowed to use your cellphone as a calculator in the test.

Grading System:

The total performance of a student in a given course is based on a scheme of continuous assessment. For theory courses this continuous assessment is made through a set of quizzes/in class evaluation, class participation, homework assignments, and a term final examination. Thirty per cent of marks of a theoretical course shall be allotted for continuous assessment i.e., quizzes and homework assignments, in class evaluation and class participation. The remainder of marks will be allotted to Term Final examination of 3-hour duration, which will be conducted centrally by the university. There will be internal and external examiners for each course in the term final examination. The distribution of marks for a given theoretical course will be as follows:

Items	Marks (%)
Class Attendance	10 %
Quizzes	20 %
Term final examination: Internal (Section A) External (Section B)	 35 % 35 %
Total	100 %

All students are expected to attend classes regularly. The university believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly, and one is required to attend at least 60% of all classes held in every course. Basis for awarding marks for class participation and attendance will be as follows:

Attendance	Marks
90% and above	10
85% to less than 90%	9
80% to less than 85%	8
75% to less than 80%	7
70% to less than 75%	6
65% to less than 70%	5
60% to less than 65%	4
Less than 60%	0

Letter grades and corresponding grade points will be awarded in accordance with the provisions shown below:

Numerical Grade	Letter Grade	Grade Point
80% or above	A+ (A plus)	4.00
75% to less than 80%	A (A regular)	3.75
70% to less than 75%	A- (A minus)	3.50
65% to less than 70%	B+ (B plus)	3.25
60% to less than 65%	B (B regular)	3.00
55% or less than 60%	B- (B minus)	2.75
50% to less than 55%	C+ (C plus)	2.50
45% to less than 50%	C (C regular)	2.25
40% to less than 45%	D (D regular)	2.00
Less than 40%	F	0.00