Department of General Science

College of Basic education

University of Salahaddin

Subject: Waves

Course Book – *For example* **(Year)**

Lecturer's name: Dr Abbas Hussein Rostam

Academic Year: 2023-2024

Course Book

1. Course name	**Waves**
2. Lecturer in charge	**Abbas Hussein Rostam**
3. Department/ College	**General Science / Basic education**
4. Contact	**e-mail: abbas.rostam@su.edu.krd** **Tel: (optional): 07504847714**
5. Time (in hours) per week	**Theory: 3** **Practical: No practical**
6. Office hours	**Two hours during lessen and other time if necessary**
7. Course code	
8. Teacher's academic profile	**I am Abbas Hussein Rostam and I am born at 1963 in bngrd, I started primary school in bngrd, and then completed the secondary in the bngrd, then I start and continuous in the study for the two stages (fourth and fifth) in the preparatory rania school , and then I am finished sixth stage in Sulaimani I am accepted in the University of Mosul in physic department in the 1982,** **I have been completed baccalaureate in the 1986** **I have been completed Msc in the 2004 in Salahaddin University** **In the finally I have been completed Ph.D in the University of Mosul in the 2014,** **now I am studied in the General science / Basic education / in Salahaddin University**
9. Keywords	Topics include wave and parts of wave electromagnetic waves and mechanics wave, each of parts consist of the other subparts, characteristic of wave

10. Course overview:

   wave, propagation of disturbances from place to place in a regular and organized way. Most   familiar   are   surface waves that   travel   on water,   but sound, light,   and the motion of subatomic particles all exhibit wavelike properties. In the simplest waves, the   disturbance   oscillates   periodically   (*see* periodic   motion)   with   a

fixed <u>frequency</u> and <u>wavelength</u>. Mechanical waves, such as sound, require a medium through which to travel, while electromagnetic waves (*see* <u>electromagnetic radiation</u>) do not require a medium and can be <u>propagated</u> through a <u>vacuum</u>. Propagation of a wave through a medium depends on the medium's properties. *See also* <u>seismic wave</u>.

11. Course objective:

Course Objectives for wave can be step as following

- **Assignment 1:**
  o The student should be able to describe the nature of a wave and explain the distinction between wave motion and particle motion.
  o The student should be able to identify and distinguish between contrasting types of waves.
- **Assignment 2:**
  o The student should be able to describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed.
  o The student should be able to utilize mathematical relationships related to wave characteristics.
- **Assignment 3:**
  o The student should be able to define wave speed and identify the variables which effect wave speed.
  o The student should be able to utilize the definition of wave speed to solve simple computational problems involving speed, distance and time.
- **Assignment 4:**
  o The student should be able to perform straight-forward calculations using the wave equation.
  o The student should be able to interpret textual information and diagrams in order to perform mathematical analyses using the wave equation.
- **Assignment 5:**
  o The student should be able to predict how alterations in the medium through which a wave is traveling will effect the properties of that wave.
  o The student should be able to predict the orientation of the reflected pulse at the boundary between two media.
- **Assignment 6:**
  o The student should be able to recognize the distinction between constructive and destructive interference.
  o The student should be able to utilize the principle of superposition to predict the shape and amplitude of a wave form resulting from the interference of two waves.
- **Assignment 7:**
  o The student should be able to identify key concepts regarding the anatomy of a standing wave.
  o The student should be able to relate the length of a medium to the wavelength of a standing wave established in that medium.
- **Assignment 8:**
  o The student should be able to mathematically analyze standing wave patterns.
  o The student should be able to utilize a combination of textual information and diagrams to mathematically analyze standing wave patterns.

12. Student's obligation

The important role of students for interest the lecture and understanding must be attendance in all lecture, and then write notes through their lecture, and contribute question and their answer, for preparing for examination
Students as well must be doing all homework and reading all home works.

13. Forms of teaching
I am using the following method for teaching
1- Power point   2- white board for writing most important explanation solve problem

14. Assessment scheme
Breakdown of overall assessment and examination
For assessing the students by applying the following steps

1- 1 st Examination   16
2- daily Activity   2
3- 2nd Examination   16
4- daily Activity   2
5- attendance of students   4
6- **Final Exam**   60

15. Student learning outcome:
At the completion of this course the successful student will be able to do the following:
If the students trying responsibility for understanding during lecture, may be benefit for their mission, and then successful in their studies in school.

The students understand more term, which relate to their environment surrounding the life, as well as the term according to the programs in the basic characteristic of all types of wave.

16. Course Reading List and References:
1- ▪ Key references:
   1- Physics of scientist and engineering with modern physics, nine edition, Serway and JEWETT.(2014).
   2- University physics with modern physics,(2007) .. ROGER A. FREEDMAN. Edidtion(12).
▪ Useful reference
   1- Uuniversity Physics With modern Physics, 14tH Edition lobal Edition. Hugh D. Young Roger A. Freedman, University of California, Santa Barbara (2016).
   2- **Fundamental of physics ‚Jearal Walker (2011).**
   3- **Principle of physics:** Raymond A. Serway
    and John W. Jewett, Jr.(2002)>

17. The Topics:	Lecturer's name

1ˢᵗ , 2ⁿᵈ and 3ʳᵈ
 	
 Chapter one
 Basic introduction of waves
    1-1- Vibrations and wave
    1-2- Original type of waves
    1-3- Compare between electromagnetic wave and mechanical waves
    1-4- Electromagnetic spectrum
    1-5- Properties of wave
    1-6- Wave functions
 1-7 What is meant by a mechanical wave, and the different varieties of mechanical waves.
 1-8 How to use the relationship among speed, frequency, and wavelength for a periodic wave.
 1-9 How to interpret and use the mathematical expression for a sinusoidal periodic wave.
 1-10 How to calculate the speed of waves o
 1-11- Some problems
 	
 4ᵗʰ, 5ᵗʰ and 6ᵗʰ weeks
 	
 Chapter Two
 	
 Oscillatory Motion(Oscillations and Mechanical Waves
 	
 2-1 (Periodic Motion
 How to describe oscillations in terms of amplitude, period, frequency, and angular frequency.
 2-2 How to do calculations with simple harmonic motion, an important type of oscillation.
 2-3: For a spring–block oscillator, apply the relationships between spring constant k and mass m and either period T or angular frequency f.
	Lecturer's name
	 ex: (3 hrs)
	
	 ex: 14/9/2023

2-4 Displacement, velocity, and acceleration in SHM

2-5-**Energy of the Simple Harmonic Oscilla23- 6-** For a simple harmonic oscillator, apply the relationship between position x and time t..

2-6: Sketch a graph of the oscillator's position x versus time
2-7: velocity versus time, or acceleration versus time,
of the plot and the value of the phase constant.
2-8: On a graph of position x versus time t describe the effects of changing period T, frequency f, amplitude
2-9: Some problems.

Chapter Three
7ᵗʰ, and 8ᵗʰ weeks

Types features and Wave behaviour of waves

    3-1   Type of waves
    3-2   Transverse and Longitude waves
    3-3   The speed on a stretch string
    3-4   Wave intensity
    3-5   Speed of travelling wave
    3-6   : Speed of longitudinal waves

    3-7   Principle of superposition for waves
    3-8   Interference of waves
    3-9   [Reflection](), Refraction, Diffraction, reflection, and transmission
    3-10 Standing wave
    3-11 Some problems

Chapter Four
10ᵗʰ, 11ᵗʰ and 12ᵗʰ weeks

    4-1   Resonance
    4-2   Doppler effect in electromagnetic wave
    4-3   normal modes of the string
    4-4   Some problems

18. Practical Topics (If there is any)

wave don't have practical

19. Examinations:

Kurdistan Regional Government Iraq   **Subject: Waves and motion**
Ministry of Higher Education & Scientific Research   **Stage: Second**
Salahaddin University –Erbil   **Time: 2 hours**
Department: General science   **Trial   First**
                           Date: 13/ 12/ 2023

Q1; A 0.2 kg toy is undergoing SHM on the end of a horizontal spring   **2 Marks** **with force constant $100 \frac{N}{m}$ When the object is 0.12 m from its equilibrium position, it is observed to have a speed of $0.4 \frac{m}{S}$ What are (a) the total energy of the object at any point of its motion; (b) the amplitude of the motion; (c) the maximum speed attained by the object during its motion?**

Q2 :A- Draw diagram the resonant frequencies of a tube open at both ends, including the fundamental and the first three overtones.   **6 Mark**

B-Explain position, velocity and acceleration of object motion in simple harmonic motio when $t = \pi$.
                                                     6 Marks

C-Write equation for these statement   **6 Marks**

1- **Frequency of observer moving toward sources and Sours moving away from Observer.**
2- **The frequency of stationary observer and Sours moving toward observer**
3- **Wave function for sinusoidal wave propagation in x direction.**

Q3 : Choose correct answer (only five)   **10 Mark**

1- **All higher resonant frequencies are called**
    (A- Fundamental   **B-Harmonic**   **C- Overtones)**

2- **Waves transmit   (A- energy**   **B-matter**   **C-both.)**

3- **The motion of particle in SHM from maximum displacement to zero acceleration is**
    (A- decrease   **B- increase**   **C- constant)**

4- **Waves travel very quickly through   (A- Gas**   **B-Liquid**   **C- Solid).**

5- **Fundamental frequency for tube open in one side is 200 Hz the fourth overtone is (A 200-**   **B- 800**   **C-1800)Hz.**

6- **Visible light of higher energy lower wavelength is**
    (A- Blue   **B- orange**   **C- Red) color).**

Q4   Fill the following blanks   (answer only five) space)   **10 Marks**

    1- At the antinode displacement is----------- and   interface is -----------.

    2- Gamma ray have higher ------------ and shortest ----------.

    3- The high point and the low point of a wave are called --------   and --------respectively.

    4- Waves transmit -----------------, not -------------------- .

    5- Sound and light are -------------- and --------------- waves.

Q5 ; The fundamental frequency of a pipe that is open at both end   **10 Marks**

is 400 Hz. At $temperature = 30 \, k^0$ (a) How long is this pipe? If one end is now closed, find (b) the wavelength and (c) the frequency of the new fundamental.

Best wish

Dr Abbas H Rostam

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21. Peer review   پێداچوونەوەی هاوەڵ

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject). .