Department of General Science

College of Basic Education

University of Salahaddin

Subject: **Sound**

Course Book: **Third Class (One Course)**

Lecturer's name: **Chiman Ibrahim Husain**

Academic Year: 2023/2024

Course Book

1. Course name	**Sound**
2. Lecturer in charge	**Chiman Ibrahim Husain**
3. Department/ College	**General science / Basic Education**
4. Contact	**e-mail: chiman.hussen@su.edu.krd** **Tel: (0750 4727562)**
5. Time (in hours) per Week	**Theory: 3 hours/week**
6. Office hours	Three hours during lessen and other time if necessary
7. Course code	
8. Teacher's academic profile	I accepted as a student in the University of Salahaddin-Erbil / Iraq, college of education / physics department in 1999-2000 in the first stage. After that I passed all stages successfully and I got the first order at all students (I was At the top of series of list of my department in 2002-2003 and I got the certification of Buctular . Also In 2008-2009, I accepted in MSc for the University of Salahaddin-Erbil / Iraq, education physics department and I got the certification of MSc In Astronomy science. I got the order of assistant lecturer. After that I have taught the students in Salahaddin University college of Basic Education till now.
9. Keywords	**Wave Motion, Sound, Simple Harmonic Motion, Lissajous Figures, Resonance.**

10. Course overview:

Throughout the course of the year, the students gain an appreciation of wave motion and Students will study many physical aspects of sound. In this one year course, Students will study a kind of periodic motion called simple harmonic motion and will learn about the relationship between simple harmonic vibrations and waves. Students will learn about the characteristics of SHM,

Lissajous Figures, Undamped and damped vibration, Resonance vibrations, Forced vibration, Velocity of sound, Stationary waves, Interference, Reflection, Refraction, Diffraction, Doppler Effect and practical application.

The general objective of this course is to provide a clear conceptual development with both fundamental of wave motion concepts and problem solving skills. Students will develop abilities necessary to meet the following learning outcomes: understand scientific inquiry, build an understanding of wave motion, differential equation of SHM, composition of two SHM, describe and apply concepts of Frequency, time period, develop an understanding of energy of vibration particle, describe the velocity of sound in air and the velocity of sound in solid material., express and understanding of longitudinal wave and transverse wave.

11. Course objective:

After viewing the program and participating in the various follow up activities, students should be able to do the following:

• Define how energy is propagated by waves.

• Describe the concepts and importance of wavelength, wave frequency, amplitude, and velocity.

• Explain the differences between longitudinal and transverse waves and give examples of both types of waves.

• Demonstrate how longitudinal waves move energy through a medium.

• Explain how the speed of sound waves is dependent on the elasticity of the medium in which they are traveling.

• Describe that Sound waves need a medium through which to travel.

• Describe some of the more common wave distortions such as echoes, reflection, refraction, diffraction, the Doppler Effect, resonance, resonance frequency, and standing waves.

• Explain how waves can interfere with each other creating both constructive and destructive interference.

• Describe how the amplitude and frequency of sound waves shape the nature of the sounds we hear.

12. Student's obligation

The students required to do two closed book exam and four quizzes during the year of course. Besides, Homework's for each chapter, classroom activities also take into considerations.

Semester Exams	30%
Quizzes + Homework + Classroom activities	10%
Final exam	60%
Total Mark	**100%**

13. Forms of teaching

Power Points Software, White Boards

14. Assessment scheme

1. Breakdown of overall assessment and examination
2. Daily student activity with Examinations.
3. Different forms of teaching will be used to reach the objectives: using power point presentation for the head titles, Figures, equation, result of derivation, definitions and discussion.

16. Course Reading List and References:

1- Required book:

1. SUBRAHMANYAM, N. & LAL, B. 1985. *A Textbook of Sound*, Vikas Publishing House.
2. MITTAL P. K., 2010, *Oscillations, Waves and Acoustics*, International Publishing House.

3. GILBERT, P. U. P. A. & HAEBERLI, W. 2011. *Physics in the Arts*: Revised Edition, Elsevier Science.
4. Internet Sites: PhEt project at the University of Colorado. [Online]. Available: https://phet.colorado.edu/ [Accessed].
5. Internet Sites: textsCrocodile Physics V 6.05 [Online]. Available: https://archive.org/details/CrocodilePhysicsV6.05full.engAmirNazir [Accessed].

17. The Topics:	**Week**
Week1,2 and 3: HARMONIC OSCILLATORS	
1.1. Introduction, 1.2. Sound. 1.3. Simple Harmonic Motion.1.4. Differential Equation of SHM.	**Week 1**
1.5. Graphical Representation of SHM.1.6. Average KineticEnergy of Vibrating Particle, 1.7. Total Energy of Vibrating Particle. 1.8. Energy of Vibration.	**Week 2**
Solving Example.	**Week 3**
Week4and5: VELOCITY OF SOUND	
2.1. Origin of Sound. 2.2. Material Medium is a Necessity. 2.3. Velocity of Longitudinal Waves in Gases.	**Week 4**
2.4. Newton's Formula for Velocity of Sound. 2.5. Effect of Temperature. 2.6. Effect of pressure. 2.7. Effect of Density of the Medium.	**Week 5**
Week 6, 7 and 8:	
Solving Example	**Week 6**
. 2.8. Effect of Humidity. 2.9. Effect of Wind. 2.10. Velocity of Sound in Air..	**Week 7**
. Solving Example	**Week 8**
Week 9 , 10 and 11:	

Examination	**Week 9**
2.11. Velocity of Sound in Water. 2.12Velocity of Sound in Isotropic Solids. .	**Week 10**
2.13 Wave Velocity and Molecular Velocity.2.14. Velocity of Sound and Frequency.	**Week 11**
Solving Example	**Week 12**
Week 13, 14 and 15: STATIONARY WAVES,INTERFERENCE AND BEATS	
Stationary Waves. 3.2. Properties of Stationary Longitudinal Waves. 3.3. Tuning Fork. 3.4. Analytical Treatment. 3.5. Energy of Stationary waves. 3.6. Interference of Sound Waves. 3.7. Special Cases.	**Week 13**
3.8. Conditions for Interference of Sound Waves. 3.9. Helmholtz Resonator. 3.10. Theory of Resonator. 3.11. Dependence of the Frequency of Resonator onthe Size ,Shape of the Mouth and Solving Example.	**Week 14**
.6 PRACTICAL APPLICATIONS	**Week 15**
21. Peer review پێداچوونەوەی هاوەڵ	

22. Course Learning Outcomes

1. Students development conceptual understanding and scientific reasoning skills.
2. Students develop rigorous quantitative understanding of core physical theories in waves and sound.
3. Prepare the student for more practical skills in Physics Labs in the s3rd and 4th stage.
4. Develop the practical skills in using musical instruments under the concepts of sound.
5. Preparation the student for the market outcomes of learning methods in Physical of sound and wave motion science
6. The ability of knowing sound and wave natural equipment in logic and educated way according to the learning market's requirements .

Kurdistan Regional Government Iraq
Ministry of Higher Education & Scientific Research
Salahuddin University –Erbil
College of Basic Education
Department: General Science.

Module: Sound
Stage: Third.

Time: 75 minutes

Name:

Q1/ Complete the following: (11 marks)

1-: Types of motion in physics 1----------. 2----------. 3----------.

2- Angular frequency is associated with the----------object performs in ---------.

3- The speed of sound in air is not affected by amplitudes, frequency, ------, --------and--------.

4- Supersonic ($\boldsymbol{Ma}$ >1).manes that ---------.

5-Doppler effect is ----------of a wave for an observer ---------- to its source.

Q2/Answer the following: (2+2+2 Marks)

1- Numerate Types of Acoustics, writ study only two.

2-Prove this equation $\Delta p = B\frac{v_x}{v}$

3-Why the speed of sound is faster in some high-density materials (Copper) is faster than some lower density materials (rubber)?

Q3/ Suppose that a stationary source which emits sound waves of frequency 1600 Hz and an observer approach one another with a relative velocity of (v_0 =80 m/s)
if the temperature is (T= 293K) Find the following: following:

1-Speed of sound.

2-What is the frequency observer(f_o) approach to the source if direction in negative axis (x^-)

3- Increase or decrease in the frequency. **(8 Marks)**

Best wishes **Lecturer / Chiman I. Hussain** Date: 11 - 12 -2021