Jordan University of Science & Technology
Faculty of Science & Art
Department of Physics

Title & Instructors		
Course Title	**Premedical Physics**	
Course Number	**Phys 104**	
Instructor	**Prof. Ahmad Omari**	
Office Location	**PH 3 L1**	
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List of Lecturers	**Lecturer**	**E-mail**
	Prof. Ahmad Omari	**sema@just.edu.jo**
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Course Description

This premedical general course of physics introduces the students to mechanical aspects of physics such as force, gravitation, Density, Newton's first and third laws, equilibrium, Newton's second law, Friction, torque, static equilibrium, center of gravity, Levers and muscles. Elasticity including Stress, Strain and Young's Modulus are also presented. The students will understand the temperature scales, molecular masses, pressure, and the principle of ideal gas law. Human metabolisms, Radiation, Temperature regulation in warm – blooded animals are other phrases need for the premedical student. Fluid mechanics including Archimedes' Principle, Continuity Equation, Streamline Flow, and Bernoulli's Equation will be presented. The role of gravity in the circulation, Blood pressure using the sphygmomanometer will be given. Viscosity, Flow in the circulatory systems and Centrifugation are applications on fluids. The structure of nerve cells, the resistance and the capacitance of an axon, electroencephalography and electrocardiograph are given as applications. Sound waves including the nature and speed of sound, sound detectors, auditory response, and ultrasound are presented. Light including the index of reflection, reflection and refraction, total internal reflection principles will be given. Concentration on the X-Ray diffraction and the structure of biological molecules are given as applications. In geometric optics; Mirrors, lenses, and the power of the lenses will be given. The aberrations, human eye, tomography, imaging a slice, optical defects of the eye will be given as applications. The students will be faced to some applications in radioactivity, half-life, dating in archaeology and geology, radioactive decays as part of their knowledge in physical phenomena. Ionizing radiation will also be explained including the interaction radiation with matter, radiation units, harmful of radiation, chronic radiation exposure and radiation in medicine.

Student Learning Outcomes (SLOs) Upon successful completion of this course, students should be able to:			
SLOs	**Related ILOs**	**Evaluation Criteria**	
		Type of Criteria	**Weight (%)**
1. Understand the physical meaning of the mechanical quantities including the basic principles of laws governing the kinematics and dynamics, including applications in elasticity and fluids.	**1, 2, 3**	**MCQ**	**15%**
2. Explain the nature of temperature on the microscale and macroscale in relevance to pressure including application in human and animal bodies.	**1,2**	**MCQ**	**20%**
3. Point out the medical outcomes, such as nerve cells and axons including Electroencephalography and Electrocardiograph applications.	**1,2**	**MCQ**	**20%**
4. Understand the nature of sound and Ultrasound; their applications (auditory response and micrograph) as application to the vibrations and waves.	**1**	**MCQ**	**15%**
5. Know the principles (geometric and wave natures) governing the light including its applications in diagnostic and treatment of human eye function.	**1,2**	**MCQ**	**15%**
6. Understand radiation and ionizing radiation in their nature and their benefit and harmfulness in human life.	**2, 3**	**MCQ**	**15%**

COURSE CONTENT:

Unit	Topic	Type of Activity	Outline
1	Lecture 1: General mechanics Lecture 2: Newton's Laws (1st. and 3rd.) Lecture 3: Newton's Laws (2nd.) Lecture 4: Equilibrium Lecture 5: Applications with friction.	Lecture 5	1- Understand the mechanics of force, weight, and gravitational mass 2- Know the nature of Density 3- Understand Newton's first law 4- Apply on Equilibrium phenomena 5- Understand Newton's third law 6- Introduce Newton's second law 7- Give Some examples of newton's law 8- Apply Newton's Laws with Friction
2	Lecture 1: Torque Lecture 2: Application of torques and forces Lecture 3: Center of gravity and levers Lecture 4: Human Muscles Lecture 5: Levers and human body	Lecture 5	1- Understand the nature of force and torque 2- Apply total torque and total force vanishes at equilibrium of rigid bodies 3- Understand the Center of gravity in objects 4- Apply forces and torques in Stability and balance 5- Levers as application: mechanical advantage 6- Applications in human Muscles 7- Application of levers in the body
3	Lecture 1: Elasticity concept Lecture 2: Stress and Strain Lecture 3: Young's Modulus and its applications	Lecture 3	1- Understand the General aspects of Stress and Strain in elasticity 2- Summarize the Young's Modulus and its applications in elasticity
4	Lecture 1: Temperature Scales and Molecular masses Lecture 2: Pressure and 1st. law of gasses Lecture 3: Temperature and Molecular Energies	Lecture 3	1- Understand the temperature scales 2- Know about Molecular masses 3- Discuss pressure in relevance to the law of ideal gas 4- Applications in temperature and molecular energies
5	Lecture 1: Human metabolism and Radiation Lecture 2: Temperature regulation in the body	Lecture 2	1- Understand the metabolism process in the human 2- Know what is Radiation is about 3- Application in temperature regulation in warm –blooded animals
6	Lecture 1: Archimedes' Principle Lecture 2: Continuity equation Lecture 3: Bernoulli's Equation Lecture 4: The role of gravity in the circulation Lecture 5: Blood pressure and the sphygmomanometer	Lecture 5	1- Define the Static Fluids in terms of Archimedes' Principle 2- Understand the dynamic fluids in terms of Equation of Continuity and Streamline Flow motion. 3- Apply Bernoulli's Equation for stream flow motion 4- Understand Static Consequences of Bernoulli's Equation. 5- Define the role of gravity in the circulation 6- Apply on Blood pressure: using the sphygmomanometer
7	Lecture 1: Viscosity Lecture 2: Flow in the circulatory system	Lecture 2	1- Define the viscosity for fluids 2- Apply the flow motion in the circulatory system
8	Lecture 1: Nerve Cell Lecture 2: The axon	Lecture 3	1- Understand the structure of nerve cells 2- Define the resistance and capacitance of an axon

	Lecture 3: Electroencephalography and Electrocardiography		3- Apply the idea in terms of Electroencephalography and Electrocardiography
9	Lecture 1: The nature and speed of sound Lecture 2: Standing sound wave and Intensity of sound wave Lecture 3: Sound detectors Lecture 4: Auditory response Lecture 5: Ultrasound	Lecture 5	1- Understand the nature and speed of sound 2- Define the standing sound wave 3- Define the Intensity and the intensity level of sound wave 4- Apply the idea on Sound detectors 5- Apply the sound wave characteristics on Auditory response 6- Illustrate the use of Ultrasound in terms of practical uses in medicine
10	Lecture 1: The index of refraction Lecture 2: Reflection and refraction of light Lecture 3: total internal reflection Lecture 4: X-Ray diffraction and the structure of biological molecules	Lecture 4	1- Understand the index of reflection in materials 2- Define the Reflection of light 3- Describe the refraction of light in different media 4- Illustrate the ideas to the total internal reflection 5- Apply the X-Ray diffraction to the structure of biological molecules
11	Lecture 1: Mirrors and Lenses Lecture 2: Formation of images Lecture 3: The human eye and defects Lecture 4: Tomography	Lecture 4	1- Understand the function of Mirrors and lenses 2- Describe how the image is formed in either mirror or lens 3- Define the power of the lens: Aberrations 4- Apply to ideas to the Human Eye 5- Apply to the Tomography, Imaging a slice. 7- Understand the optical defects of the eye
12	Lecture 1: Radioactivity Lecture 2: Half-life and decay Lecture 3: Dating in archaeology and geology	Lecture 3	1- Understand the nature of the Radioactivity process 2- Define the Half-life and Radioactive decays decay 3- Apply the principle of radioactivity to dating in archaeology and geology
13	Lecture 1: Ionizing radiation and its units. Lecture 2: The interaction of radiation with matter Lecture 4: Harmful effects of radiation in medicine Lecture 5: Chronic radiation exposure	Lecture 5	1- Understand the nature of ionizing radiation with the its units 2- Define how the radiation interact with matter 3- Define the harmful effects of radiation on the body 4- Illustrate how the chronic radiation exposure occur 5- Apply the ideas of Radiation in medicine applications
	Total lectures	49	

Assessment		
Assessment Type	**Expected Due Date**	**Weight**
Evaluation		
Quizzes		
Research Activity		
OSCE		
Mini-OSCE		
Final Exam (Theory)		**100**

Final Exam (Oral)		
Total		**100**

List of Intended Learning Outcomes (ILOs):

1. Demonstrate sufficient understanding of the structural organization and functions of the following systems of the human body: circulatory, respiratory, gastrointestinal, endocrine, hematopoietic and lymphatic, musculoskeletal, nervous, and genitourinary systems.

2. Conceptualize the cellular, molecular, genetic and biochemical mechanisms that maintain the body's homeostasis and their derangements in disease states.

3. Apply their knowledge of human physiology to solve questions regarding major clinical cases and diseases.

4. Attain appropriate and systematic clinical history of different medical conditions and settings.

5. Demonstrate proficiency in performing clinical skills and procedures.

6. Perform relevant physical examination on patients professionally and ethically.

7. Identify the major signs and symptoms of disease states, recognizing risk factors and etiologies, in an interdisciplinary approach to differentially diagnose patients.

8. Order and interpret results of relevant basic diagnostic procedures, such as laboratory investigations and conventional image procedures.

9. Apply safe and accurate methods of pharmacotherapy of major disease states.

10. Critically appraise research studies guided by evidence-based medicine.

11. Demonstrate ability to work in diverse settings and communities.