Sana'a University
Faculty of Engineering
Mechanical Engineering Department
Mechanical Engineering Program

6. Course Plan of Engineering Physics

I. Information about Faculty Member Responsible for the Course:

Name of Faculty Member	Prof. Dr. Abdu A. Alkelly	**Office Hours**					
Location& Telephone No.		**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail							

II. Course Identification and General Information:

1-	Course Title:	Engineering Physics.				
2-	Course Number & Code:	BR001.				
3-	Credit hours:	C.H				TOTAL Cr. HRS
		Th.	Seminar/Tu.	Pr	Tr.	
		2	2	2	-	4
4-	Study level/year at which this course is offered:	First Year-First Semester.				
5-	Pre –requisite (if any):	Calculus 1.				
6-	Co –requisite (if any):	None.				
7-	Program (s) in which the course is offered	Mechanical Engineering Program.				
8-	Language of teaching the course:	English Language.				
9-	System of Study:	Semesters.				
10-	Mode of delivery:	Lectures, Tutorials and Practical.				
11-	Location of teaching the course:	Faculty of Engineering.				

III. Course Description:

Engineering Physics is a major course of mechanical engineering that helps students to develop their skills of scientific thinking, observations and analysis. It is a required course and a fundamental course for mechanical engineering students. It deals with units measurements and vectors, description of the motion in one and two dimensions, Newton's

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laws, energy and its transfer, linear momentum and collisions, motion of rigid body and universal gravitation. It help student to develop their skills through problem solving and dimensional analysis. This course will include a number of experiments in mechanics and other basic topics in Physics which are designed to help students to develop the basic investigation skills such as data acquisition, graph plotting, data analysis, error analysis, results discussion, and report writing.

IV. Intended learning outcomes (ILOs) of the course:

Brief summary of the knowledge or skill the course is intended to develop**:**

1.	Describe fundamental laws and principles of mechanics and their applications in various practical contexts, carrying through the scientific methodology relevant to Mechanical Engineering.
2.	Identify light matter interaction, fabrication of lasers, light propagation in waveguides, applications of lasers and optical fibers.
3.	Explore the fundamentals of acoustics, and determination of Equilibrium, Center of Gravity.
4.	Investigate the fundamentals of magnetic, electrical and superconducting materials.
5.	Apply the fundamental laws of mechanics practically through scientific experiments.
6.	Assess to appropriate instruments such as lab instruments spread sheets, databases and graphing programs to effectively convey the information.

V. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Week Due	Contact hours
1	Units and measurements.	Physical quantities, Basic units, Derived units, Conversion of Units, Dimensional analysis, Significant Figures, Solved examples, Problems	1st	2
2	Vectors	Vector and scalar quantities, Vector Addition and subtraction, The Position Vector,	2nd	2

		Components of a vector, Vector Multiplication, Solved Problems		
3	Motion in One Dimension	Displacement, Velocity and Speed, Acceleration, Freely Falling Objects, Kinematic Equations, General Problem-Solving Strategy	3rd	2
4	Motion in two Dimension	Projectiles, Circular motion, Tangential and Radial Acceleration, Relative Velocity and Relative Acceleration	4th	2
5	Newton's Laws of motion	Concept of force, Newton's 1st law, Inertial Frames Newton's 2nd law, The Gravitational Force and Weight, Newton's 3rd law	5th	2
6	Applications of Newton's laws, Energy, Potential Energy	Applications of Newton's Laws, Forces of friction And centripetal force	6th and 7th	4
7	Mid-term Exam	The First 6 Chapters.	8th	2
8	Lasers	Introduction to Laser -characteristics of Lasers -Spontaneous and stimulated emissions – Einstein's coefficients – population inversion and lasing action – laser systems: Ruby laser, He-Ne Laser, laser-applications- Holography	9th	2
9	Fiber Optics	Fermat's principle and Snell's law-optical fiber – principle and construction – acceptance cone numerical aperture – V-Number - types of fibers, Fabrication: Double Crucible Technique – fiber	10th and 11th	4

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		optic communication principle – fiber optic sensors.		
10	Linear momentum and collisions	Linear Momentum, Impulse and Momentum, Collisions in One and two Dimensions, The Center of Mass, Motion of a System of Particles, Rocket Propulsion	12th	2
11	Acoustics .	Introduction –reverberation – reverberation time – Sabine's formula – acoustics of buildings –ultrasonics – production of ultrasonics using piezoelectric method – magnetostriction method applications	13th	2
12	Static equilibrium	The Conditions for Equilibrium, Center of Gravity, Examples of Rigid Objects in Static Equilibrium	14th	2
13	Universal gravitation	Universal Gravitation, Free-Fall Acceleration, Kepler's Laws and the Motion of Planets, The Gravitational Field, Gravitational Potential Energy, Planetary and Satellite Motion	15th	2
14	Final Exam.		16th	2
Number of Weeks /and Units Per Semester			**16**	**32**

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours
1	Determining an Equation for a Function from a Graph**.**	**1st**	**2**
2	Data Analysis with Excel and Estimation of Errors**.**	**2nd**	**2**
3	Forces and Equilibrium (Springs and Equilibrium**,** Forces and Liquids)**.**	**3rd**	**2**
4	Laser characteristics of Lasers Spontaneous and stimulated emissions.	**4th , 5th**	**4**
5	Mid-Term Exam (Practical).	**6th**	**2**

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6	Air Track Apparatus (Newton's First, Second, and Third Laws and the Gravitational Acceleration).	**7th , 8th**	**4**
7	Potential Energy (Elastic & Gravitational Energy **and** Pendulum**)**	**9th**	**2**
8	Oscillations **(**Measuring Spring Constants**,** Oscillation Frequency of an Extended System, Simple Pendulum)	**10th**	**2**
9	Young's Modulus Apparatus (Stretching Method)	**11th**	**2**
10	Predicting Non-repetitive Motion **(**Motion in a Fluid**,** Circular Motion**,** and Two-Dimensional Motion**)**	**12th**	**2**
11	**Final Exam (Practical).**	**13th**	**2**
12	**Review**	**14th**	**2**
Number of Weeks /and Units Per Semester		**14**	**28**

C - Tutorial Aspect:

Order	Tasks/ Tutorial	Number of Weeks	Contact hours
1	Units and Measurements.	1st	2
2	Vectors.	2nd	2
3	Motion in One Dimension.	3rd	2
4	Motion in Two Dimension.	4th	2
5	Newton's Laws of Motion.	5th	2
6	Applications of Newton's laws, Energy, Potential Energy.	6th , 7th	4
7	Lasers.	8th	2
8	Fiber Optics.	9th ,10th	4
9	Linear Momentum and Collisions.	11th	2
10	Acoustics.	12th	2
11	Static Equilibrium.	13th	2
12	Universal Gravitation.	14th	2
Number of Weeks /and Units Per Semester		**14**	**28**

VI. Teaching strategies of the course:

1. Lecture.
2. Examples.
3. Discussion.
4. Laboratory.
5. Individual and Group Projects.

VII. Assignments:

No.	Assignments	Week Due	Mark
1.	Homework -1	2nd	1
2.	Homework -2	3rd	1
3.	Homework -3	4th	1
4.	Homework -4	5th	1
5.	Homework -5	6th	1
6.	Homework -6	7th	1
7.	Homework -7	8th	1
8.	Homework -8	9th	1
9.	Homework -9	10th	1
10.	Homework -10	11th	1
11.	Homework -11	12th	1
12.	Homework -12	13th	1
13.	Homework -13	14th	2
Total			**14**

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Assignments.	3 rd,6 th,9 th,12 th	14	7 %
2	Attendance & Participation.	1 st-14 th	10	5 %
3	Essay/Report.	14 th	8	4 %

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4	Quizzes.	Every 2 weeks	8	4 %
5	Mid-Term Exam.	8th week	20	10 %
6	Lab Test.	15 th week	20	10 %
7	Final Exam.	16 th week	120	60 %
Total			**200**	**100 %**

IX. Learning Resources:

I. *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1- Serway and Jewett, 2014, Physics for Scientists and Engineers, 9th edition, Cengage Learning.
2-David Halliday, Robert Resnick and Jearl Walker, 2011, Fundamentals of physics, , 9 th Ed., John Wiley.

2- Essential References.

1- Jearl Walker, 2007, Fundamentals of Physics-8th Edition, John Wiley & Sons.

3- Electronic Materials and Web Sites *etc*.

1- https://www.abebooks.com
2-https/www.goodreads.com
3-https://books.google.com

X. Course Policies:

1.	**Class Attendance:** -A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic
2.	**Tardy:** - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	**Assignments & Projects:**

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	- The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating**: - For cheating in exam, a student will be considered as failure. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy