

SYLLABUS: PHYSICS AND LABORATORY 1

Date / Revision 15 August 2017 / Rev 03-15-08-17 / MaS
Faculty Engineering
Study Programs AVE, AUE, COS, MEE, INE, ELE, MTE, FTE, CHE, BME

SUBJECT: Physics & Laboratory 1

1 Basic Information

1.01	Subject Name	Physics and Laboratory 1
1.02	Semester	1
1.03	Level	1
1.04	SKS	3
1.05	Mandatory / Curriculum	F-05
1.06	Subject Code	PHYS
1.07	Subject Code	MTE-F-PHYS-115
1.08	Year	2017 (7)
1.09	Quality Control	Final Test, see evaluation
1.10	Limitations	Min 12 and Max 32 students in one class
1.11	Combined with	AVE, AUE, COS, MEE, INE, ELE, MTE, FTE, CHE, BME
1.12	Perquisite	None
1.13	Responsible	Dean of Engineering Faculty and Dean of Lifesciences Faculty
1.14	Revision	15-08-2017/MaS

2 Description of Subject

The purpose of this course is to introduce fundamental concepts of Physics with an emphasis on mechanics and thermodynamics. The following topics are included; the principles and applications of classical kinematics and dynamics of a particle, work and energy, momentum, harmonic motion, circular motion, static fluids and ideal fluid in motion, and thermodynamics with emphasis on problem solving. Laboratory experiments supporting the topics are included.

3 Objectives

- Introduce fundamental engineering physics.
- Develop ability for solving problems involving mechanics, optics, electro-dynamics.
- To analyze different physical situations and phenomena of interest to engineers and scientists using the fundamental laws and to use computers to execute laboratory experiments.
- Impart relevant skills and knowledge for independent learning of other subjects that require such skills and knowledge.

4 Competency

After having the course, students are expected to:

- Explain the fundamental concepts, laws and theories of Physics as a basis for students to engineering study;
- Apply these principles to realistic situations.
- Develop a sense of logic that will benefit students in their future professional pursue
- Develop skills and understanding in attacking mechanical problems by solving and analyzing problems given in the book.

5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers;
- Circuit simulation using Electronic Workbench Software;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.

6 Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	05 Points
5.3	Homework / Classwork	05 Points
5.4	Presentation /Simulation	10 Points
5.5	Daily Quiz	20 Points
5.6	Final Examination	60 Points
	Total	100 Points

7 Text Book and Reference

- 1 Main Text Book:**
"Principles of Physics 10th Edition", **Authors:** Halliday, Resnick, and Walker, **Publisher:** John Wiley & Son Inc.; **ISBN:** 978-1-118-23072-5

2	<p>Supplement Textbooks:</p> <ul style="list-style-type: none"> • “Physics for Scientists and Engineers 9th Edition”, Author: Serway Jewett, Publisher: Thomson Brooks/Cole; ISBN: 978-1133947271 • “General Physics”, Author: D.C. Giancoli, Publisher: Prentice Hall Inc; ISBN: 978-0133509847
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8	Content / Topics of Lecture
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Week	Content/ Topics of Lecturing	Text Book	Remark
1	<p>Introduction and a Review on Vector Analysis and Calculus</p> <ul style="list-style-type: none"> • Vectors and Scalars, Vectors addition, Vectors components, Unit Vectors, Vectors and the Law of Physic, • Multiplying Vectors • Exercises <p>Measurement:</p> <ul style="list-style-type: none"> • Measurements, International System of Units, Changing Units, Length, Time, Mass; • Exercises 	<p>Ch3</p> <p>Sec. 3.1 Sec. 3.2 Sec. 3.3</p> <p>Ch1</p>	Homework
2	<p>Motion Along a Straight Line:</p> <ul style="list-style-type: none"> • Motion, Position & Displacement, and Average Velocity • Instantaneous Velocity and Speed • Acceleration, • Special Case : Constant Acceleration • Free Fall motion • Exercises 	<p>Ch2</p> <p>Sec. 2.1 Sec. 2.2 Sec. 2.3 Sec. 2.4 Sec. 2.5</p>	Homework
3	<p>Motion in Two and Three Dimensions :</p> <ul style="list-style-type: none"> • Position and Displacements, • Average velocity and instantaneous velocity, • Average acceleration and instantaneous acceleration; • Projectile motion, • Uniform circular motion, • Relative motion in two dimensions. • Exercises 	<p>Ch4</p> <p>Sec. 4.1 Sec. 4.2 Sec. 4.3 Sec. 4.4 Sec. 4.5 Sec. 4.7</p>	Quiz
4	<p>Force and Motion - I:</p> <ul style="list-style-type: none"> • Newton’s First and second Laws, • Some Particular Forces, • Applying Newton’s Laws. • Exercises 	<p>Ch5</p> <p>Sec. 5.1 Sec. 5.2 Sec. 5.3</p>	Homework
5	<p>Force and Motion - II:</p> <ul style="list-style-type: none"> • Friction • The Drag Force and terminal Speed, • Uniform circular motion; • Exercises 	<p>Ch6</p> <p>Sec. 6.1 Sec. 6.2 Sec. 6.3</p>	Quiz

6,7	Kinetic Energy and Work: <ul style="list-style-type: none"> • Kinetic Energy, • Work and Kinetic Energy, • Work done by the gravitational Force, • Work done by a spring Force, • Work done by a general variable Force • Power • Exercises 	Ch7 Sec. 7.1 Sec. 7.2 Sec. 7.3 Sec. 7.4 Sec. 7.5 Sec. 7.6	Homework
	Potential Energy and Conservation of Energy: <ul style="list-style-type: none"> • Potential Energy; • Conservation of Mechanical Energy; • Reading a Potential Energy Curve; • Work done on a system by an external Force; • Conservation of Energy; • Exercises. 	Ch8 Sec. 8.1 Sec. 8.2 Sec. 8.3 Sec. 8.4 Sec. 8.5	Quiz
8	MIDTERM SEMESTER BREAK		
9	Center of Mass and Linear Momentum: <ul style="list-style-type: none"> • Center of Mass; • Newton's Second Law for a System of Particles; • Linear Momentum; • Collision and Impulse; • Conservation of Linear Momentum; • Momentum and Kinetic Energy in Collision; • Elastic Collision in one Dimension; • Collision in two Dimensions; • Exercises. 	Ch9 Sec. 9.1 Sec. 9.2 Sec. 9.3 Sec. 9.4 Sec. 9.5 Sec. 9.6 Sec. 9.7 Sec. 9.8	Homework
10	Rotation: <ul style="list-style-type: none"> • Rotation variables; • Rotation with constant angular acceleration; • Relating the Linear and Angular variables; • Kinetic Energy of Rotation; • Calculating the Rotational Inertia; • Torque; • Newton's Second Law for Rotation; • Exercises. 	Ch10 Sec. 10.1 Sec. 10.2 Sec. 10.3 Sec. 10.4 Sec. 10.5 Sec. 10.6 Sec. 10.7	Homework
11	Rolling, Torque, and Angular Momentum: <ul style="list-style-type: none"> • Rolling as Translation and Rotation Combined; • Forces and Kinetic Energy of Rolling; • Torque Revisited / Torque as a Vector; • Angular Momentum; • Newton's Second Law in Angular Form; • Work and Rotational Kinetic Energy; • Conservation of Angular Momentum; • Exercises. 	Ch11 Sec. 11.1 Sec. 11.2 Sec. 11.4 Sec. 11.5 Sec. 11.6 Sec. 11.7 Sec. 11.8	Quiz

12	<p>Equilibrium and Elasticity:</p> <ul style="list-style-type: none"> • Elasticity; • Exercises; <p>Oscillations:</p> <ul style="list-style-type: none"> • Simple Harmonic Motion; • Energy in Simple Harmonic Motion; • An Angular Simple Harmonic Motion; • Pendulums, Circular Motions; • Damped Simple Harmonic Motion; • Forced Oscillation and Resonance; • Exercises; 	<p>Ch12 Sec. 12.3</p> <p>Ch15 Sec. 15.1 Sec. 15.2 Sec. 15.3 Sec. 15.4 Sec. 15.5 Sec. 15.6</p>	Homework
13	<p>Fluids:</p> <ul style="list-style-type: none"> • Fluid density and pressure; • Fluid at rest; • Measuring pressure; • Pascal principle; • Archimedes principle; • Equation of Continuity; • Bernoulli's Equation; • Exercises. 	<p>Ch14 Sec. 14.1 Sec. 14.2 Sec. 14.3 Sec. 14.4 Sec. 14.5 Sec. 14.6 Sec. 14.7</p>	Quiz
14	<p>Temperature, Heat and the First Law of Thermodynamics:</p> <ul style="list-style-type: none"> • Temperature; • Thermal Expansion; • Absorption of Heat; • The First Law of Thermodynamics; • Heat Transfer; • Exercises. 	<p>Ch18 Sec. 18.1 Sec. 18.3 Sec. 18.4 Sec. 18.5 Sec. 18.6</p>	Homework
15	<p>Kinetic Theory of Gas:</p> <ul style="list-style-type: none"> • Ideal Gas; • Pressure and Temperature; • Translational Kinetic Energy; • Molar Specific Heat of an Ideal Gas; • Degrees of freedom and Molar Specific Heat • Adiabatic Expansion of an Ideal Gas • Exercises; <p>Second Law of Thermodynamics and Processes:</p> <ul style="list-style-type: none"> • Irreversible process and Entropy, the Second Law of Thermodynamics; • Engines; • Refrigerator and Real Engines • Exercises; 	<p>Ch19 Sec. 19.2 Sec. 19.3 Sec. 19.4 Sec. 19.7 Sec. 19.8 Sec. 19.9</p> <p>Ch20 Sec. 20.1 Sec. 20.2 Sec. 20.3</p>	Quiz
16	Final Examination		