

## SYLLABUS

<b>Date/ Revision</b>	10 June 2015
<b>Faculty</b>	Engineering
<b>Approval</b>	Dean of Engineering Faculty

### SUBJECT : PHYSICS 2

#### 1. Identification of Subject:

Name of Subject	: Physics 2
Code of Subject	: PHYS-1120
SKS	: 3
Semester	: 2
Study Program	: B-AVE, B-EE, B-MTE, B-MEE, B-INE
Lecturer	: Alexander Iskandar, PhD.

#### 2. Competency

After taking this course, students are expected to be able 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.

#### 3. Description of Subject:

The purpose of this course is to introduce fundamental concepts of Physics with an emphasis on electricity and magnetism, waves and quantum physics phenomena. The following topics are included; the fundamental concepts and theory of electricity and magnetism, propagation of mechanical wave, electromagnetic wave phenomena, interference and diffraction, wave-particle duality, along with their applications, with emphasis on problem solving. Laboratory experiments supporting the topics are included.

#### 4. Learning Approach

Approach	: Combination of Expository - inquiry and collaborative
Method	: Discussion, question answer, sample problem, group work
Student Task	: Home work, presentation
Media	: LCD projector, film.

## 5. Evaluation

- a) Absence maximum : 25%
- b) Participation in discussion : 5 points
- c) Homework, Classwork : 5 points
- d) Presentation, Simulation : 10 points
- e) Daily Quiz : 20 points
- f) Final Examination : 60 points

Total : 100 points

## 6. Contents/ Topics of Lecturing:

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	<b>Coulomb's Law</b> <ul style="list-style-type: none"> <li>• Coulomb's Law</li> <li>• Charge is Quantized</li> <li>• Charge is Conserved</li> <li>• Exercises</li> </ul>	Ch21  Sec. 21.1 Sec. 21.2 Sec. 21.3	Homework
2	<b>Electric Fields:</b> <ul style="list-style-type: none"> <li>• Electric Field</li> <li>• Electric Field due to a Charged Particles</li> <li>• Electric Field due to a Dipole</li> <li>• Electric Field due to a Line Charge</li> <li>• Electric Field due to a Charged Disk</li> <li>• A Point Charge in an Electric Field</li> <li>• A Dipole in an Electric Field</li> <li>• Exercises</li> </ul>	Ch22 Sec. 22.1 Sec. 22.2 Sec. 22.3 Sec. 23.4 Sec. 23.5 Sec. 22.6 Sec. 22.7	Homework
3	<b>Gauss' Law:</b> <ul style="list-style-type: none"> <li>• Electric Flux</li> <li>• Gauss' Law</li> <li>• A Charged Isolated Conductor</li> <li>• Electric Field due to a Line Charge</li> <li>• Applying Gauss' Law : Cylindrical Symmetry</li> <li>• Applying Gauss' Law : Planar Symmetry</li> <li>• Applying Gauss' Law : Spherical Symmetry</li> <li>• Exercises</li> </ul>	Ch23 Sec. 23.1 Sec. 23.2 Sec. 23.3 Sec. 23.4 Sec. 23.5 Sec. 23.6 Sec. 23.7	Quiz
4	<b>Electric Potential:</b> <ul style="list-style-type: none"> <li>• Electric Potential</li> <li>• Equipotential Surfaces and the Electric Field</li> <li>• Potential due to a Charged Particle</li> <li>• Potential due to a Dipole</li> </ul>	Ch24 Sec. 24.1 Sec. 24.2 Sec. 24.3 Sec. 24.4	Homework

	<ul style="list-style-type: none"> <li>• Potential due to Continuous Charge Distribution</li> <li>• Calculating the Field from the Potential</li> <li>• Electric Potential Energy of a System of Particles</li> <li>• Exercises</li> </ul> <p><b>Capacitors:</b></p> <ul style="list-style-type: none"> <li>• Capacitance</li> <li>• Calculating the Capacitance</li> <li>• Capacitors in Parallel and in Series</li> <li>• Energy Stored in an Electric Field</li> <li>• Capacitors with a Dielectric</li> <li>• Exercises</li> </ul>	<p>Sec. 24.5 Sec. 24.6 Sec. 24.7</p> <p>Ch25 Sec. 25.1 Sec. 25.2 Sec. 25.3 Sec. 25.4 Sec. 25.5</p>	
5	<p><b>Current and Resistance:</b></p> <ul style="list-style-type: none"> <li>• Electric Current</li> <li>• Current Density</li> <li>• Resistance and Resistivity</li> <li>• Ohm's Law</li> <li>• Power</li> <li>• Exercises</li> </ul> <p><b>Circuits:</b></p> <ul style="list-style-type: none"> <li>• Single Loop Circuits</li> <li>• Multi-loop Circuits</li> <li>• The Ammeter and the Voltmeter</li> <li>• RC Circuit</li> <li>• Exercises</li> </ul>	<p>Ch26 Sec. 26.1 Sec. 26.2 Sec. 26.3 Sec. 26.4 Sec. 26.5</p> <p>Ch27 Sec. 27.1 Sec. 27.2 Sec. 27.3 Sec. 27.4</p>	Quiz
6	<p><b>Magnetic Fields:</b></p> <ul style="list-style-type: none"> <li>• Magnetic Fields and Definition of B</li> <li>• Crossed Fields</li> <li>• A Circulating Charged Particle</li> <li>• Magnetic Force on a Current-Carrying Wire</li> <li>• Torque on a Current Loop</li> <li>• Magnetic Dipole Moment</li> <li>• Exercises</li> </ul>	<p>Ch28 Sec. 28.1 Sec. 28.2 Sec. 28.4 Sec. 28.6 Sec. 28.7 Sec. 28.8</p>	Homework
7	<p><b>Magnetic Fields due to Currents:</b></p> <ul style="list-style-type: none"> <li>• Magnetic Fields due to a Current</li> <li>• Force Between Two Parallel Currents</li> <li>• Ampere's Law</li> <li>• Solenoids and Toroids</li> <li>• A Current-Carrying Coil as a Magnetic Dipole</li> <li>• Exercises.</li> </ul>	<p>Ch29 Sec. 29.1 Sec. 29.2 Sec. 29.3 Sec. 29.4 Sec. 29.5</p>	Quiz
8	<b>MIDTERM SEMESTER BREAK</b>		
9	<p><b>Induction and Inductance:</b></p> <ul style="list-style-type: none"> <li>• Faraday's Law and Lenz's Law</li> <li>• Induction and Energy Transfer</li> </ul>	<p>Ch30 Sec. 30.1 Sec. 30.2 Sec. 30.4</p>	Homework

	<ul style="list-style-type: none"> <li>• Inductors and Inductance</li> <li>• Self-Induction</li> <li>• RL Circuits</li> <li>• Energy Stored in a Magnetic Field</li> <li>• Energy Density of a Magnetic Field</li> <li>• Mutual Inductance</li> <li>• Exercises.</li> </ul>	Sec. 30.5 Sec. 30.6 Sec. 30.7 Sec. 30.8 Sec. 30.9	
10	<b>Electromagnetic Oscillations and Alternating Current:</b> <ul style="list-style-type: none"> <li>• Electromagnetic Oscillations</li> <li>• Damped Oscillation in an RLC Circuit</li> <li>• Forced Oscillations of Three Simple Circuits</li> <li>• The Series RLC Circuits</li> <li>• Power in Alternating Current Circuits</li> <li>• Transformer</li> <li>• Exercises.</li> </ul>	Ch31 Sec. 31.1 Sec. 31.2 Sec. 31.3 Sec. 31.4 Sec. 31.5 Sec. 31.6	Homework
11	<b>Waves I:</b> <ul style="list-style-type: none"> <li>• Transverse Wave</li> <li>• Wave Speed on a Stretch String</li> <li>• Energy and Power of a Wave on a String</li> <li>• Interference of Waves</li> <li>• Phasors</li> <li>• Standing Waves and Resonance</li> <li>• Exercises;</li> </ul>	Ch16 Sec. 16.1 Sec. 16.2 Sec. 16.3 Sec. 16.5 Sec. 16.6 Sec. 16.7	Quiz
12	<b>Waves II:</b> <ul style="list-style-type: none"> <li>• Speed of Sound</li> <li>• Travelling Sound Waves</li> <li>• Interference</li> <li>• Intensity and Sound Level</li> <li>• Sources of Musical Sound</li> <li>• Doppler Effect</li> <li>• Exercises;</li> </ul>	Ch17 Sec. 17.1 Sec. 17.2 Sec. 17.3 Sec. 17.4 Sec. 17.5 Sec. 17.7	Homework
13	<b>Electromagnetic Waves:</b> <ul style="list-style-type: none"> <li>• Electromagnetic Waves</li> <li>• Energy Transport and the Poynting Vector</li> <li>• Reflection and Refraction</li> <li>• Total Internal Reflection</li> <li>• Polarization</li> <li>• Exercises.</li> </ul>	Ch33 Sec. 33.1 Sec. 33.2 Sec. 33.5 Sec. 33.6 Sec. 33.4	Quiz
14	<b>Interference:</b> <ul style="list-style-type: none"> <li>• Light as a Wave</li> <li>• Young's Interference</li> <li>• Interference and Double Slits Intensity</li> <li>• Exercises.</li> </ul> <b>Diffraction:</b>	Ch35 Sec. 35.1 Sec. 35.2 Sec. 35.3  Ch36	Homework

	<ul style="list-style-type: none"> <li>• Single Slit Diffraction</li> <li>• Intensity in Single Slit Diffraction</li> <li>• Diffraction by a Double Slits</li> <li>• Exercises.</li> </ul>	Sec. 36.1 Sec. 36.2 Sec. 36.4	
15	<b>Photons and Matter Waves:</b> <ul style="list-style-type: none"> <li>• The Photons, the Quanta of Light</li> <li>• The Photoelectric Effect</li> <li>• Photons have Momentum, the Compton Effect</li> <li>• Light as a Probability Wave</li> <li>• Electrons and Matter Waves</li> <li>• The Schrodinger Equation</li> <li>• Heisenberg's Uncertainty Principle</li> <li>• Exercises;</li> </ul>	Ch38 Sec. 38.2 Sec. 38.3 Sec. 38.4 Sec. 38.5 Sec. 38.6 Sec. 38.7 Sec. 38.8	Quiz
16	<b>FINAL EXAMINATION</b>		

## 7. Book Reference:

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

b) **Supplementary Textbooks:**

- "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