

## SYLLABUS: PHYSICS AND LABORATORY 2

**Date / Revision** 23 May 2015 / 02 May 2017 / PP  
**Faculty** Engineering and Lifesciences  
**Study Programs** All Engineering-and Lifesciences Study Programs

### SUBJECT: Physics and Laboratory 2

#### 1 Basic Information

<b>1.01</b>	<b>Subject Name</b>	<b>Physics and Laboratory 2</b>
<b>1.02</b>	<b>Semester</b>	2
<b>1.03</b>	<b>Level</b>	2
<b>1.04</b>	<b>SKS</b>	3
<b>1.05</b>	<b>Mandatory / Curriculum</b>	F-05
<b>1.06</b>	<b>Subject Code</b>	PHYS
<b>1.07</b>	<b>Subject Code</b>	ENG-F-PHYS-225
<b>1.08</b>	<b>Year</b>	2017 (7)
<b>1.09</b>	<b>Quality Control</b>	Final Test, see evaluation
<b>1.10</b>	<b>Limitations</b>	Min 12 and Max 32 students in one class
<b>1.11</b>	<b>Combined with</b>	all engineering and Lifesciences study programs
<b>1.12</b>	<b>Perquisite</b>	Physics and Laboratory 1
<b>1.13</b>	<b>Responsible</b>	Dean of Engineering- and Lifesciences Faculty
<b>1.14</b>	<b>Revision</b>	15-08-2017/MaS

#### 2 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

### 3 Objectives

- to learn the properties of electrostatics and the electrodynamics
- to learn the properties of optics and light
- 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

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

## 7 Text Book and Reference

<b>1</b>	<b>Main Text Book:</b> “Principles of Physics 10th Edition”, <b>Authors:</b> Halliday, Resnick, and Walker, <b>Publisher:</b> John Wiley & Son Inc.; <b>ISBN:</b> 978-1-118-23072-5
<b>2</b>	<b>Supplement Textbooks:</b> <ul style="list-style-type: none"> <li>• “Physics for Scientists and Engineers 9th Edition”, Author: Serway Jewett, Publisher: Thomson Brooks/Cole; ISBN: 978-1133947271</li> <li>• “General Physics”, <b>Author:</b> D.C. Giancoli, <b>Publisher:</b> Prentice Hall Inc; ISBN: 978-0133509847</li> </ul>

## 8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book	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, a Dipole, a Line Charge, 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	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 :on Cylindrical Symmetry, Planar Symmetry, and 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> <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> </ul>	Ch24 Sec. 24.1 Sec. 24.2 Sec. 24.3 Sec. 24.4 Sec. 24.5 Sec. 24.6 Sec. 24.7	Homework

	<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>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> <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>	<p>Ch30 Sec. 30.1 Sec. 30.2 Sec. 30.4 Sec. 30.5 Sec. 30.6 Sec. 30.7 Sec. 30.8 Sec. 30.9</p>	Homework

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> <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>	Ch35 Sec. 35.1 Sec. 35.2 Sec. 35.3  Ch36 Sec. 36.1 Sec. 36.2 Sec. 36.4	Homework

15	<p><b>Photons and Matter Waves:</b></p> <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>	<p>Ch38 Sec. 38.2 Sec. 38.3 Sec. 38.4 Sec. 38.5 Sec. 38.6 Sec. 38.7 Sec. 38.8</p>	<p>Quiz</p>
16	<b>FINAL EXAMINATION</b>		