

**The Petroleum Institute**  
 Fall Semester 2011  
**PHYS241: Physics II – Electromagnetism & Optics**



<b>Lectures</b>	: 50 minutes (Sun, Tue, and Thu)
<b>Laboratories</b>	: One 3 hours laboratory session per week
<b>Credit hours</b>	: 4 credit hours total
<b>Text</b>	: <b>D. Halliday, R. Resnick &amp; J. Walker</b> , <i>Fundamentals of Physics</i> , 8 <sup>th</sup> edition, John Wiley & Son, Inc.
<b>Course Webpage</b>	: <a href="http://www.pi.ac.ae/elearning/index.htm">http://www.pi.ac.ae/elearning/index.htm</a>
<b>Prerequisites</b>	: MATH161, PHYS191
<b>Co-requisite</b>	: MATH212

<b>Name</b>	Dr. Kofi Agyeman	Dr. Reza NajafZadeh	Dr. Abdellatif Bouchalkha
<b>Office</b>	2105 (Bu Hasa)	2103 (Bu Hasa)	8295 (Arzanah)
<b>Phone Ext.</b>	75256	75447	75016
<b>E-mail</b>	<a href="mailto:kgyeman@pi.ac.ae">kgyeman@pi.ac.ae</a>	<a href="mailto:rnajafzadeh@pi.ac.ae">rnajafzadeh@pi.ac.ae</a>	<a href="mailto:abouchalkha@pi.ac.ae">abouchalkha@pi.ac.ae</a>
<b>Classroom (Time)</b>	8122 (8:00 – 8:50) 2126 (11:00-11:50)	2126 (8:00 – 8:50) 2126 (13:00-13:50)	8120 (10:00 – 10:50)
<b>Office Hours</b>	Refer to Timetable	Refer to Timetable	Refer to Timetable

**Course Description**

This is a second course in physics covering the basic principles of electromagnetism and optics. It gives an introduction to the fundamental laws of electricity and magnetism including electric charges and fields, electric potential difference, electric current and resistance, capacitance, magnetic fields, inductance, Maxwell's equations, and an introduction to optics including reflection, refraction, and polarization.

**Assessment**

Final grades for this course will be calculated from the following nine components:

<b>Laboratory Exercises:</b>	<b>25% (see below)</b>
<b>Homework:</b>	<b>5%</b>
<b>Quizzes:</b>	<b>5%</b>
<b>Attendance</b>	<b>4%</b>
<b>Test 1</b>	<b>8%</b>
<b>Test 2</b>	<b>8%</b>
<b>Mid Semester Exam:</b>	<b>15%</b>
<b>Final Exam:</b>	<b>30%</b>

---

<b>Total:</b>	<b>100%</b>
---------------	-------------

The final letter grade will be assigned as follows:

Letter Grade	Marks	GPA
A	$\geq 90.0$	4.00
A-	$87.5 \rightarrow <90.0$	3.75
B+	$82.5 \rightarrow <87.5$	3.25
B	$80.0 \rightarrow <82.5$	3.00
B-	$77.5 \rightarrow <80.0$	2.75
C+	$72.5 \rightarrow <77.5$	2.25
C	$70.0 \rightarrow <72.5$	2.00
C-	$67.5 \rightarrow <70.0$	1.75
D	$60.0 \rightarrow <67.5$	1.00
F	$< 60.0$	0

### Laboratory

The laboratory component of this course consists of **UP TO TEN** three hour experiments. There will also be a **Final Laboratory Test** (exam) at the end of the semester. The 25% grade for the labs is comprised of: 5% (lab exam) and 20% (lab exercises).

### Continuous assessment:

#### A- Homework

To learn physics well, it is imperative that the student keeps up with the subject matter by carefully reading the assigned chapters and making a serious attempt to do all of the assigned homework problems. Please note the following:

- Up to **TWO** homework assignments per week is to be expected. Your lecturer will give you the due date for each homework assignment; **failure to meet the published deadline will result in zero credit for the assignment.**
- While collaboration and discussion is encouraged, heavy dependence on others will not help your understanding of the material taught and will result in poor performance on quizzes, tests and exams. Straight copying of the work of others is prohibited and will be penalized.
- It is very important that you read the section covered during the lectures. It is also helpful to derive all important expressions step by step. This helps your understanding a great deal.
- The sample problems offer you good opportunities to test your understanding while reading the text. There are many problems at the end of the chapters in your text of which only a fraction will be worked as examples in class. You may wish to work additional problems to gain more practice.

#### B- Quizzes

You should expect a number of **announced (or unannounced) weekly quizzes** at the beginning (or end) of the lectures. These quizzes are intended to help you keep up with the course material on a regular basis. Note that Quiz questions could be based directly on your homework.

#### Formula (Equation) Sheet

For both tests, the mid-semester exam and the final exam, you will be provided with a formula sheet that contains most of the important equations that you will cover during the course.

### **C- Class Tests**

There will be two tests and one mid-semester exam. Each test will be given after approximately three to four chapters (Refer to the lecture schedule below). **NO MAKE-UP TEST WILL BE GIVEN** for a missed class test. If you miss a scheduled class test and have a documented valid reason for missing the test, your final mark for the missed test(s) will come from the grade you score in the final examination.

### **Final Examination**

There will be a final **Comprehensive Examination** at the end of the semester worth 30% of the total credit, which will cover all the chapters that have been taught in the semester.

### **Attendance**

Regular attendance at lectures is **EXPECTED** from **ALL** students. The lectures are provided as an opportunity for all students to understand and learn the material presented in the course. Failure to attend any of your Physics II lectures leads to the student falling behind, whilst any prolonged absence from class may ultimately lead to the student's failure in the course.

**IMPORTANT NOTE: Students earn the full 4% attendance credit on their total average with up to a maximum of 6 absences. After that, this credit decreases 0.5% per absence in excess of six.**

### **Academic integrity honor pledge**

When and where appropriate, you will be required to observe (by signing) the Honor Pledge Reaffirmation as follows:

*“I pledge that I have neither given nor received any unauthorized assistance whatsoever on this academic assignment, exercise, examination, project, presentation, report, etc.”*

---

*Signature of Student*

For further information and regulations regarding academic integrity, please follow the link below:

[http://www.pi.ac.ae/PI\\_STU/ro/pdf/2009-2010\\_UGCatalog\\_Oct8.pdf](http://www.pi.ac.ae/PI_STU/ro/pdf/2009-2010_UGCatalog_Oct8.pdf)

**Lecture Schedule**  
**PHYS241: Electromagnetism & Optics**  
**Fall 2011**

Week	Topics	Reading	Tests/Exams
<b>1</b> Sep 4 – Sep 8	<u><b>Chapter 21: Electric Charge</b></u> Electric charge, Conductors and Insulators, Coulomb's law, Charge is quantized, Charge is conserved <u><b>Chapter 22: Electric Fields</b></u> Electric field, Electric field lines, Electric field due to: Point charge - Electric dipole - Line of charge - Charged disk	21-1 to 21-6  22-1 to 22-8	
<b>2</b> Sep 11 – Sep 15	<u><b>Chapter 22: (Continued)</b></u>	As above	
<b>3</b> Sep 18 – Sep 22	<u><b>Chapter 23: Gauss' Law</b></u> Flux of an electric field, Gauss' law, Applications of Gauss' law (worked examples)	23-1 to 23-6	
<b>4</b> Sep 25 – Sep 29	<u><b>Chapter 23: (Continued)</b></u>  <u><b>Chapter 24: Electric Potential</b></u> Electric potential energy, Electric potential, Equipotential surfaces, Electric potential and electric field, Potential due to: Point charge - Electric dipole - Charge distribution - Conductor, Electric potential energy	As above  24-1 to 24-12	
<b>5</b> Oct 2 – Oct 6	<u><b>Chapter 24: (Continued)</b></u>  <u><b>Chapter 25: Capacitance</b></u> Capacitance, Calculating the capacitance, Capacitors in series and in parallel, Energy stored in an electric field	As above  25-1 to 25-5	<b>Test #1</b> (Chapters: 21, 22, 23, 24) Wed Oct 5 <sup>th</sup>
<b>6</b> Oct 9 – Oct 13	<u><b>Chapter 25: Capacitance (Continued)</b></u>  <u><b>Chapter 26: Current and Resistance</b></u> Electric current, Current density. Resistance and resistivity, Ohm's law, Power in electric circuits	As above  26-1 to 26-5 and 26-7	
<b>7</b> Oct 16 – Oct 20	<u><b>Chapter 26: (Continued)</b></u>  <u><b>Chapter 27: Circuits</b></u> Work energy and Emf, Single-loop DC circuits, Potential difference between two points, Multi-loop DC circuits, RC Circuits	As above  27-1 to 27-7 and 27-9	
<b>8</b> Oct 23 – Oct 27	<u><b>Chapter 27: (Continued)</b></u>	As above	<b>Mid-Semester Exam</b> (Chapters: 21, 22, 23, 24, 25, 26, 27) Mon Oct 24 <sup>th</sup>
<b>9</b> Oct 30 – Nov 3	<u><b>Chapter 28: Magnetic Fields</b></u> Magnetic field definition, Motion of a charged particle in a magnetic field and a crossed electric and magnetic fields, Magnetic force and current-carrying wire, Torque on a current loop	28-1 to 28-3 and 28-6, 28-8, 28-9	Mid-Semester Grades due on Mon Oct 31 <sup>st</sup>

<b>10</b> Nov 6 – Nov 10 Eid Al-Adha	<b>EID AL ADHA</b>		
<b>11</b> Nov 13 – Nov 17	<b>Chapter 28: (Continued)</b>  <b>Chapter 29: Magnetic Fields Due to Currents</b> Magnetic field due to a current, Force between two parallel currents, Ampere’s law, Solenoids and Toroids	As above  29-1 to 29-5	
<b>12</b> Nov 20 – Nov 24	<b>Chapter 29: (Continued)</b>  <b>Chapter 30: Induction and Inductance</b> Faraday’s law of induction, Lenz’s law, Induction and energy transfers, Induced electric fields, Inductors and inductance, Self-induction, RL circuits, Energy stored in a magnetic field	As above  30-1 to 30-5 and 30-7 to 30-10	
<b>13</b> Nov 27 – Dec 1	<b>Chapter 30: (Continued)</b>  <b>Chapter 31: Electromagnetic Oscillations and Alternating Current</b> LC oscillations, Damped oscillations in an RLC circuit, Alternating current (AC), Forced oscillations, Series RLC circuit, Power in AC circuits	As above  31-1 to 31-9	
<b>14</b> Dec 4 – Dec 8	<b>Chapter 31 (Continued)</b>	As above	<b>Test #2</b> (Chapters: 28, 29, 30, 31) Wed Dec 7 <sup>th</sup>
<b>15</b> Dec 11 – Dec 15	<b>Chapter 33: Electromagnetic Waves</b> Maxwell’s Rainbow, Polarization, Reflection and Refraction, Total internal reflection, Polarization by reflection	33-1 to 33-2 33-7 to 33-10	
<b>16</b> Dec 18 – Dec 22	<b>Chapter 33 (Continued)</b>  <b>Review &amp; Final Exam Preparation</b>	As above	
<b>17</b> Dec 25 – Dec 29	<b>STUDY WEEK</b> (NO CLASSES)		
<b>18</b> Jan 1 – Jan 5	<b>Final Exams</b> Final Exams start: Mon Jan 2 Final Exams end: Sat Jan 7 Make-up day: Sun Jan 2		<b>Final Examination</b> (All chapters covered)  Final grades due on Mon Jan 9 <sup>th</sup> 2012

*Note: The information above is for guideline purposes only and is subject to change.*

## PHYS 241 Lab Schedule - Fall 2011

Week 1	<b>NO LAB</b>
Week 2	Exp 01: Coulomb's Law
Week 3	<b>Tutorial Session / Activities</b>
Week 4	Exp 02: Electric field Lines and equipotential lines
Week 5	<b>Tutorial Session / Activities</b>
Week 6	Exp 03: The Parallel Plate capacitor
Week 7	<b>Tutorial Session / Activities</b>
Week 8	Exp 04: Ohm's Law and Resistivity
Week 9	Exp 09: The Oscilloscope and Charging/Discharging a Capacitor
Week 10	<b>NO LAB - EID AL ADHA</b>
Week 11	Exp 06: Effects of force in a magnetic field
Week 12	<b>Tutorial Session / Activities</b>
Week 13	Exp 07: Induction by means of a Variable Magnetic Field
Week 14	Exp 08: The ideal transformer
Week 15	<b>Tutorial Session / Activities</b>
Week 16	<b>Last opportunity for a Make-Up Lab &amp; written Lab test (60 min)</b>
Week 17	<b>STUDY WEEK (NO CLASSES)</b>
Week 18	<b>FINAL EXAMS WEEK</b>

*Note: The information above is for guideline purposes only and is subject to change.*