

# Course Syllabus

## Physics 212 Electromagnetism

### Fall Semester 2017

**Lecture:** MWF: 1:30 pm - 2:20 pm, Jorgensen Hall 136

**Instructor:** Alexey Kovalev (Jorgensen Hall 310K, 472-2880, alexey.kovalev@unl.edu)

**Office Hours:** Monday 10 am to 12 pm noon (JH 310K) or by appointment via email

### Course Goals and Objectives:

Physics 212 is part of the calculus-based introductory physics sequence. This course focuses on the topics of electromagnetism involving phenomena such as electricity, magnetism, and light. We will use scientific methods and knowledge of the physical world to address various problems in electricity and magnetism. We will emphasize developing both conceptual understanding and problem-solving skills for these topics and understanding how they fit into the broader picture of science.

**Pre-requisites:** Physics 211, or 211H, or permission.

### Textbook (required)

Title: *University Physics*, 14th Edition, Volume II (which starts with Chapter 21)

Authors: Young and Freedman

### CANVAS, On-line Mastering Physics, and *i>*Clickers (Required)

**CANVAS:** Class information including the syllabus, announcements, etc. will be posted on CANVAS.

**Homework:** Weekly homework assignments will be done online using Mastering Physics, for which you must purchase an access code. Mastering Physics "Student Access Kits" come with new textbooks, they can be purchased separately at the bookstore, or they can be purchased through the Mastering Physics website (<http://www.MasteringPhysics.com>) which is reachable via the course website on Canvas under the "Assignments" tab. To register for this course, use the class ID:

*UNLPhys212KovalevFall2017*

Unless otherwise specified, homework assignments will be posted on Monday (or Wednesday) of each week and will be due by 5 pm, Monday (or Wednesday) of the next week. Follow the course web site for any changes to the homework schedule. Your weekly MP homework will constitute 10% of your final grade.

### **Daily Planner and Course Calendar**

The above due times for homework are tentative and may change based on course schedule. Please check the daily planner and course calendar in MasteringPhysics for the assignments of the week. The due times may be changed without separate announcements.

**i>Clickers:** We will be using clickers in every lecture. If you do not already have a clicker, please purchase a clicker at the University Bookstore and record your clicker number either at the Bookstore or via BlackBoard. For those who already have clickers, please register your clicker number on BlackBoard. Each student must have his or her own clicker. That will allow us to give you credit for your in-class responses.

### **Grading**

I will use the following weightings in determining your grades:

Homework	10%
Recitations	10%
In-class quizzes	10%
Two midterms (each 20%)	40%
Final Examination	30%

Course grades will be assigned according to the following point scale (total: 100 points):

100-95	A+
94.9-90	A
89.9-85	A-
84.9-80	B+
79.9-75	B
74.9-70	B-
69.9-65	C+
64.9-60	C
59.9-55	C-
54.9-50	D+
49.9-45	D

44.9-40                      D-

less than 40 points        F

### **Tentative Class Schedule**

<b>Lecture</b>	<b>Date</b>	<b>Topics</b>
<b>1</b>	Aug. 23	Ch. 21. Introduction; Electric charges; Coulomb's law
<b>2</b>	Aug. 25	Ch. 21. Electric field and forces; Superposition principle
<b>3</b>	Aug. 28	Ch. 21. Electric flux and field lines
<b>4</b>	Aug. 30	Ch. 21. Electric flux and field lines
<b>5</b>	Sep. 1	Ch. 21. Electric flux and field lines
	Sep. 4	
	Sep. 6	Ch. 22. Gauss's law
<b>7 (quiz)</b>	Sep. 8	Ch. 22. Gauss's law
<b>8</b>	Sep. 11	Ch. 23. Electric potential energy
<b>9</b>	Sep. 13	Ch. 23. Electric potential
<b>10</b>	Sep. 15	Ch. 23. Electric potential

<b>11</b>	Sep. 18	Ch. 24. Conductors and capacitance
<b>12</b>	Sep. 20	Ch. 24. Conductors and capacitance
<b>13</b>	Sep. 22	Ch. 24. Capacitors
<b><i>First midterm</i></b>	Sep. 25	
<b>14</b>	Sep. 27	Ch. 25. Currents, Resistance
<b>15</b>	Sep. 29	Ch. 25. Currents, Resistance
<b>16</b>	Oct. 2	Ch. 26. Currents, Resistance
<b>17</b>	Oct. 4	Ch. 26. DC circuits
<b>18</b>	Oct. 6	Ch. 26. Kirchhoff's Rules
<b>19</b>	Oct. 9	Ch. 27. Kirchhoff's Rules
<b>20</b>	Oct. 11	Ch. 27. Magnetic Fields
<b>21 (quiz)</b>	Oct. 13	Ch. 27. Magnetic Fields
<b>Fall break</b>	Oct. 16	
<b>22</b>	Oct. 18	Ch. 28. Magnetic Fields
<b>23</b>	Oct. 20	Ch. 28. Magnetic Fields
<b>24</b>	Oct. 23	Ch. 28. Bio-Savart Law, Ampere's Law

25	Oct. 25	Ch. 28. Bio-Savart Law, Ampere's Law
26	Oct. 27	Ch. 29. Faraday's Law
27	Oct. 30	Ch. 29. Faraday's Law
28	Nov. 1	Ch. 29. Faraday's Law
29	Nov. 3	Ch. 29. Electromagnetic Induction
<b>Second midterm</b>	Nov. 6	
30	Nov. 8	Ch. 29. Electromagnetic induction
31	Nov. 10	Ch. 30. Inductance and RL Circuits
32	Nov. 13	Ch. 30. Inductance and RL Circuits
33	Nov. 15	Ch. 30. Inductance and RL Circuits
34 (quiz)	Nov. 17	Ch. 31. AC Circuits: Resonance and Power
35	Nov. 20	Ch. 31. Phasor diagrams
<b>Holiday</b>	Nov. 22	
<b>Thanksgiving</b>	Nov. 24	
36	Nov. 27	Ch. 31. Phasor diagrams

37	Nov. 29	Ch. 31. Transformers
38	Dec. 4	Class review
39	Dec. 6	Class review
40	Dec. 8	Exam preparation

**FINAL EXAMINATION:** Tue. Dec. 12, 6:00 pm to 8:00 pm (AVH106)

### **ACE Certification for PHYS 212**

(i) the ACE Outcome(s) for which the course is certified

Student Learning Objective 4: Use scientific methods and knowledge of the natural and physical world to address problems through inquiry, interpretation, analysis, and the making of inferences from data, to determine whether conclusions or solutions are reasonable.

(ii) the opportunities the course will give students to acquire the knowledge or skills necessary to achieve the Learning Outcome(s)

The students will have the opportunity to learn how to analyze physical systems through a combination of exposition, directed inquiry, and problem solving. The main focus of the course is on the appraisal of physical systems to arrive at a thorough understanding of the relationship between the system and its behavior. This process can be separated into four distinct phases. The first phase consists of an inquiry into what is the system and its essential components, what are the available data (which are given in the statement of the problem, or in diagrams, graphs, or reference tables, or some combination of these), and what are the key physical principles and laws governing the system. The second phase is to interpret the physical principles and laws and data in order to develop a plan – what inferences can be drawn from the data, what is the best way to approach the problem, what mathematical relations and methods are required, what intermediate information must be obtained -- and define goals for a solution. This plan is implemented in the third phase through detailed analysis, with careful attention to accurate execution of the mathematical relations representing the underlying physical principles. Critical evaluation of the reasonableness of the solutions and conclusions is the essential fourth and final phase of problem solving. This evaluation includes

checking units, recalculating some quantities by a different route, and judging whether the magnitude of the answer is within reasonable physical limits.

(iii) the graded assignments which the instructor(s) will use to assess the student's achievement of the Outcome(s).

Student abilities for appraising physical situations is assessed in several ways. The course grade is based on a cumulative score that is derived from the following components, which are all graded and weighted according to the breakdown given in the syllabus. For each lecture assessment activities include student responses to (i) pre-lecture quizzes, (ii) Peer Instruction (PRS) questions posed during the lectures, and (iii) follow-up homework exercises and problems. For the weekly recitations students are assessed based on their performance in (iv) team problem-solving exercises, and (v) occasional quizzes. Progress in the course as a whole is assessed with (vi) midterm exams and (vii) a comprehensive final exam. The pre-lecture quizzes, PRS questions, and some of the homework exercises focus on specific knowledge, basic computational skills, and grasp of key concepts. The students' integrative understanding of physical principles and problem-solving is assessed with the more complex homework problems, recitation group problems, recitation quizzes, and the exams.

(iv) sampling of outcomes for purposes of curriculum review

The purpose of this review is to help faculty improve student learning outcomes. A small sampling of student work will be selected, identifying information removed, and archived for later review. Any students in ACE courses do not wish their work selected should notify their instructor.

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.