

| | |
|---|----------------------------------|
| PHY 331 - Principles of Modern Electromagnetism | Days: Tuesday, Thursday |
| SPRING 2015 | Time: 10:30 – 11:45 am |
| Instructor: Dr. Igor Shovkovy | Location: TECH 195 (Polytechnic) |
| Office: Wanner Hall 340L | |
| Phone: 480-727-1953 | |
| E-mail: Igor.Shovkovy@asu.edu | |
| Office hours: Mondays & Wednesdays, 10:30 a.m. – 11:30 a.m. & by appointment | |

Course description: A study of the unified description of electromagnetic phenomena provided by Maxwell's equations in differential and integral form. The planned list of topics includes Maxwell's equations, electrostatic fields, Laplace's and Poisson's equations, dielectrics, magnetic fields and materials, electromagnetic induction and Faraday's law, displacement current and Ampere's law, electromagnetic waves, and, if time permits, the photon theory of light.

Objectives: Students develop a sound theoretical understanding of electromagnetism

Prerequisites: APM 270 (Mathematics of Change I), MAT 274 (Elementary Differential Equations) or MAT 275 (Modern Differential Equations). Students should have practical knowledge of using differential equations to solve physics problems.

Textbook: *Introduction to Electrodynamics* (3rd edition) by David J. Griffiths
ISBN-10: 013805326X

Grading policy:

| | |
|-------------------------|-------------|
| Homework | 40% |
| Midterm exams (20%+20%) | 40% |
| Final exam | 20% |
| TOTAL | 100% |

The grades will be determined as follows:

A (90%-100%), **B** (78%-89.99%), **C** (66%-77.99%), **D** (54%-65.99%), **E** (less than 54%)

Attendance policy: Attendance is expected. Students are responsible for all material presented in class, all homework, and for all changes to the schedule or plans announced in class.

Homework. Homework is truly one of the most important components in this course. This is because doing homework is the only way to really learn the material and build a good intuition for physics. Solving physics problems effectively is a skill that students must develop. The only known way to achieve this is by practicing. The lectures will only cover the key concepts. The text will elaborate on these concepts and provide further explanation of their meaning and on how one uses them to solve problems. There is no way to do well in this course if you do not give the homework assignments the effort they require. (Allow about 4 hours per week for reading and homework assignments.)

Your homework assignment should be neatly and clearly written. The front page should list your name, the date and the homework assignment number. Each problem should be clearly labeled. The problem solutions should contain detailed explanations. Late homework will not be accepted.

Midterm tests. There will be two midterm tests on the dates shown below in the tentative schedule. The use of textbook will **not** be permitted during the exams.

Final Exam. A **comprehensive** final exam is *tentatively* scheduled from **9:50 a.m. to 11:40 a.m.** on **May 5, 2015**. The use of textbook will **not** be permitted during the final exam.

Electronic devices. Text messaging, browsing Internet, placing/receiving calls, emails, etc. during class is prohibited. You will be asked to leave the class for this type of disruptive behavior. The use of phones, iPods, and other similar electronic devices is **not** permitted during lectures, tests and exams. The use of laptops is allowed during lectures only for the purpose of taking notes.

Tentative schedule. The exact schedule for lectures, quizzes and examinations will depend on how long it takes to cover the material. The following is my best guess as of now.

| Dates | |
|-----------|---|
| 13-Jan-15 | First class |
| 26-Feb-15 | 1 st midterm test |
| 10-Mar-15 | No class -- Spring break |
| 12-Mar-15 | No class -- Spring break |
| 16-Apr-15 | 2 nd midterm test |
| 30-Apr-15 | Last class |
| May 5 | FINAL EXAM , see https://students.asu.edu/final-exam-schedule |

Selected course materials, handouts, and grades can be obtained from [ASU Blackboard](#).

The course name is **PHY331: Prin Modern Electromagnetism (2015 Spring)**.

For student **rights and responsibilities** see: <http://campus.asu.edu/downtown/rights-and-responsibilities>

Workload Expectations: *The Arizona Board of Regents, the governing board for ASU, NAU, and the U of A, has a policy for how much time students should invest in their courses: "At least 15 contact hours of recitation, lecture, discussion, testing or evaluation, seminar, or colloquium, as well as a minimum of 30 hours of student homework is required for each unit of credit" (<http://azregents.asu.edu/rrc/PolicyManual/2-224-AcademicCredit.pdf>). Therefore, in a 3-credit course, students should expect to invest 45 hours in class meetings (or the online equivalent), as well as 90 hours doing homework and assignments—a total of 135 hours in any given session (A, B, or C). In this course and in other courses in your degree program, your faculty are committed to this standard because it promotes the breadth and depth of learning required in a first-rate university education. As you register for courses, keep this 135-hour standard in mind because during some semesters your work and/or family commitments may prevent you from taking a full load of classes.*

ADA policy: *ASU provides equal opportunity to qualified employees and students, and to members of the general public who have a disability and provides reasonable accommodation as appropriate in employment, the application for employment, services, programs, and activities. Individuals with a disability are those who have a physical or mental impairment that substantially limits one or more major life activity, have a record of such impairment, or are regarded as having such impairment. ADA coordinator must be contacted for assistance in all matters pertaining to compliance with this policy. The Disability Resource Center contact numbers are 480-965-1234 (Voice), 480-965-9000 (TTY).*

Academic Integrity: *Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see <http://provost.asu.edu/academicintegrity>.*

This course is offered by the *College of Letters and Sciences*. For more information about the college, visit our website: <https://cls.asu.edu/>. If you have questions or concerns, please send your inquiry to cls@asu.edu.

Last modified January 5, 2015

SCHEDULE of Lectures, Exams, and Homework assignments

PHY 331 - Principles of Modern Electromagnetism

Spring 2015

Instructor: Igor Shovkovy

Tue, Th

10:30 a.m. – 11:45 a.m.

TECH 195 (Poly)

| Lect. | Date | Description | Reading material | Homework | weekday |
|-------|-----------|---|---|----------|---------|
| 1 | 13-Jan-15 | Class introduction, syllabus, etc.; Vectors | Sec. 1.1 | | Tue |
| 2 | 15-Jan-15 | Differential calculus | Sec. 1.2 | (hw 1) | Th |
| 3 | 20-Jan-15 | Integral calculus | Sec. 1.3 | | Tue |
| 4 | 22-Jan-15 | Curvilinear coordinates | Sec. 1.4 | (hw 2) | Th |
| 5 | 27-Jan-15 | Coulomb law | Sec. 2.1.1 - 4 | | Tue |
| 6 | 29-Jan-15 | Gauss law | Sec. 2.2.1 - 3 | | Th |
| 7 | 3-Feb-15 | Applications of Gauss's law | Sec. 2.2.3 - 4 | (hw 3) | Tue |
| 8 | 5-Feb-15 | Electric potential | Sec. 2.3.1 - 2 | | Th |
| 9 | 10-Feb-15 | Poisson's equation | Sec. 2.3.3 - 4 | (hw 4) | Tue |
| 10 | 12-Feb-15 | Electrostatic boundary conditions | Sec. 2.3.5 | | Th |
| 11 | 17-Feb-15 | Work & energy in electrostatics | Sec. 2.4.1 - 4 | (hw 5) | Tue |
| 12 | 19-Feb-15 | Conductors | Sec. 2.5.1 - 3 | | Th |
| 13 | 24-Feb-15 | Capacitors | Sec. 2.5.4 | | Tue |
| | 26-Feb-15 | 1st midterm test (lectures 1-13) | | | Th |
| 14 | 3-Mar-15 | Laplace's equation | Sec. 3.1.1 - 6 | (hw 6) | Tue |
| 15 | 5-Mar-15 | The method of images | Sec. 3.2.1 - 2 | | Th |
| | 10-Mar-15 | Spring break - No class | | | Tue |
| | 12-Mar-15 | Spring break - No class | | | Th |
| 16 | 17-Mar-15 | Application of the method of images | Sec. 3.2.3 - 4 | | Tue |
| 17 | 19-Mar-15 | Separation of variables | Sec. 3.1.1 - 4 | (hw 7) | Th |
| 18 | 24-Mar-15 | Electric dipole | Sec. 3.4.1 - 2, 4 | | Tue |
| 19 | 26-Mar-15 | Polarization; Field of a dielectric | Sec. 4.1, 4.2.1 - 3 | | Th |
| 20 | 31-Mar-15 | Electric currents, magnetic fields, Lorentz force | Sec. 5.1.1 - 3 | (hw 8) | Tue |
| 21 | 2-Apr-15 | The Biot-Savart law | Sec. 5.2 | | Th |
| 22 | 7-Apr-15 | Applications of Biot-Savart law | Sec. 5.2 | | Tue |
| 23 | 9-Apr-15 | Ampere's law | Sec. 5.3.1-2 | | Th |
| 24 | 14-Apr-15 | Application of Ampere's law | Sec. 5.3.3 | (hw 9) | Tue |
| | 16-Apr-15 | 2nd midterm test (lectures 14-24) | | | Th |
| 25 | 21-Apr-15 | The vector potential | Sec. 5.4 | | Tue |
| 26 | 23-Apr-15 | Ohm's Law | Sec. 7.1 | (hw 10) | Th |
| 27 | 28-Apr-15 | Faraday's Law | Sec. 7.2 | | Tue |
| 28 | 30-Apr-15 | The full set of Maxwell's equations; Review | Sec. 7.3.1 - 3 | | Th |
| | 5-May-15 | Final Exam (9:50 a.m. - 11:40 a.m.) | https://students.asu.edu/final-exam-schedule | | Tue |