Physics 520A – Electromagnetic Theory

Fall 2017 TR at 11:00am – 12:15pm in Neckers 410

Lecturer:  Professor Leo Silbert
Office:  Neckers 489
Tel.:  453 1062
email:  lsilbert_at_siu_dot_edu
Office Hours:  T&R: 8:30am-10:00am, W: 9:00am-12:00pm
Grader:  N/A

Course Textbook:


Other
Introduction to Electrodynamics, D. J. Griffiths, 3rd Ed. (Prentice Hall).

Grading

Homework (list of homework problems will be assigned but NOT graded) 0%
Class Participation (includes working through problems in class) 10%
Paper Presentation (last week of classes) 20%
2 x Midterm Exam (tentatively scheduled for week of Sep 25 & Oct 30, 2017) 40%
Final Exam (compulsory: 10:15am-12:15pm, Thursday, December 14, 2017) 30%

FINAL GRADE
A : >90%; B: 75% - 90%; C: 60% - 74.9%; D: 50% - 59.9%; F: <50%
HOMEWORK – NOT Graded

It is your responsibility to write your question answers with the following in mind:

• Homework is for your benefit. It helps you learn the material, develop technical skills, and practice applying the theory.

• Read the textbook(s), discuss problems with your class colleagues, grader, and instructor.

• Work through problems using standard English language sentences at a level so that anyone can follow your answers.

• If you use a textbook or other material for reference then fully cite this reference, and explain how this is necessary.

• For Phys 520A (and Phys 520B) Jackson problems are notoriously difficult and long. Jackson is widely regarded as the hardest graduate class at beginning level graduate physics.
  • Dedicate time during the week to look over your notes and textbooks.
  • You will not be able to complete homework assignments the night before.
  • The better you learn your subject the better your final grade.
**Course Outline**

We will cover in part, Chapters 1-5 (inclusive) of Jackson’s textbook. A tentative detailed outline of the chapters and sections scheduled to be covered are listed here. Sections below marked by * may or may not be covered. Some classes will be used to go over example questions and homework problems.

**Chapter 1 Introduction** (5 lectures)

i. Mathematical Preliminaries
ii. Coulomb’s Law
iii. Gauss’ Law
iv. Poisson and Laplace Equation
v. Green Function of Electrostatics
vi. Variational Technique*

**Chapter 2 Boundary Value Problems I** (5 lectures)

i. Method of Images
ii. Point Charge Problem
iii. Green Function
iv. Separation of Variables

**Chapter 3 Boundary Value Problems II** (5 lectures)

i. Laplace Equation in Spherical Coordinates
ii. Legendre Polynomials
iii. Azimuthal Symmetry
iv. Spherical Harmonics
v. Poisson Equation and Green Function Technique*

**Chapter 4 Multipoles & Dielectrics** (5 lectures)

i. Multipole Expansion
ii. Ponderable Media
iii. Polarizability

**Chapter Magnetostatics & Faraday’s Law** (5 lectures)

i. Biot-Savart Law
ii. Ampere Law
iii. Vector Potential
iv. Forces & Torques*
  v. Magnetized Sphere*

**Paper Presentation:**

Choose a topic related to class material or a question from the textbook and present a 15-20 minute, technical discussion using PowerPoint (or equivalent) or on the white-board.

Plus: (i) classes devoted to working through problems sets and (ii) paper presentations.
## Tentative Schedule

<table>
<thead>
<tr>
<th>Week of</th>
<th>Homework/Exam</th>
<th>Section (Jackson) / Comments</th>
</tr>
</thead>
</table>
| Aug 21  |               | Monday, 21st August – eclipse day (no classes)  
Chapter 1 |
| Aug 28  |               | “                          |
| Sep 4   |               | Monday, 4th September, Labor Day  
Chapter 2 |
| Sep 11  |               | “                          |
| Sep 18  |               | “                          |
| Sep 25  |               | Chapter 3                   |
| Oct 2   | Midterm 1     | “                          |
| Oct 9   |               | Fall Break, Oct. 9-10       |
| Oct 16  |               | Chapter 4                   |
| Oct 23  |               | “                          |
| Oct 30  |               | “                          |
| Nov 6   | Midterm 2     | Chapter 5                   |
| Nov 13  |               | “                          |
| Nov 20  |               | Thanksgiving Break, Nov 22-24 |
| Nov 27  |               | “                          |
| Dec 4   | Class Paper   | Last week of classes        |
| Dec 11  | FINAL EXAM    | 10:15am – 12:15pm, Thursday, 14th December, Neckers 410 |
MISSON STATEMENT FOR SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

SIU embraces a unique tradition of access and opportunity, inclusive excellence, innovation in research and creativity, and outstanding teaching focused on nurturing student success. As a nationally ranked public research university and regional economic catalyst, we create and exchange knowledge to shape future leaders, improve our communities, and transform lives.

SAFETY AWARENESS FACTS AND EDUCATION

Title IX makes clear that violence and harassment based on sex and gender is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. If you or someone you know has been harassed or assaulted, you can find the appropriate resources here:

http://safe.siu.edu

SALUKI CARES

The purpose of Saluki Cares is to develop, facilitate and coordinate a university-wide program of care and support for students in any type of distress—physical, emotional, financial, or personal. By working closely with faculty, staff, and students at their families, SIU will continue to display a culture of care and demonstrate to our students and their families that they are an important part of the community. For Information on Saluki Cares: call(618) 453-1492, email siucares@siu.edu, or http://salukicares.siu.edu/

SIU’S EARLY WARNING INTERVENTION PROGRAM (EWIP)

Students enrolled in courses participating in SIU’s Early Warning Intervention Program might be contacted by University staff during a semester. More information can be found at the Core Curriculum’s Overview webpage:

http://corecurriculum.siu.edu/program-overview/

EMERGENCY PROCEDURES

We ask that you become familiar with Emergency Preparedness @ SIU. Emergency response information is available on posters in buildings on campus, on the Emergency Preparedness @ SIU website, and through text and email alerts. To register for alerts visit: http://emergency.siu.edu/

STUDENT MULTICULTURAL RESOURCE CENTER

The Student Multicultural Resource Center serves as a catalyst for inclusion, diversity and innovation. As the Center continues its work, we are here to ensure that you think, grow and succeed. We encourage you to stop by the Center, located in Grinnell Commons, to see the resources available and discover ways you can get involved on the campus. Visit us at http://inclusiveexcellence.siu.edu/

LEARNING AND SUPPORT SERVICES

Help is within reach. Learning support services offers free tutoring on campus and math labs. To find more information please visit the Center for Learning and Support Services website:

Tutoring: http://tutoring.siu.edu/
Math Labs: http://math.siu.edu/courses/course-help.php

WRITING CENTER

The Writing Center offers free tutoring services to all SIU students and faculty. To find a Center or Schedule an appointment please visit:

http://write.siu.edu/

DIVERSITY

Southern Illinois University Carbondale’s goal is to provide a welcoming campus where all of our students, faculty and staff can study and work in a respectful, positive environment free from racism and intimidation. For more information visit: http://diversity.siu.edu/

MILITARY COMMUNITY

There are complexities of being a member of the military community and also a student, and military and veteran related developments can complicate academic life. If you are a member of the military community and in need of accommodations please visit Veterans Services at http://veterans.siu.edu/

SIU ONLINE: https://online.siu.edu/

Need help with an issue? Please visit SALUKI SOLUTION FINDER at http://solutionfinder.siu.edu/

Office of the Provost http://pvcaa.siu.edu/  Fall 2017
<table>
<thead>
<tr>
<th>Time</th>
<th>Sunday 12/10</th>
<th>Monday 12/11</th>
<th>Tuesday 12/12</th>
<th>Wednesday 12/13</th>
<th>Thursday 12/14</th>
<th>Friday 12/15</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8:00-10:00</strong></td>
<td>ENGL Common Exam: 101, 102, 120H</td>
<td>8:00 or 8:30 on T and/or R</td>
<td>8:00 or 8:30 on M and/or W and/or F</td>
<td>9:00 or 9:35 on T and/or R</td>
<td>9:00 or 9:30 on M and/or W and/or F</td>
<td></td>
</tr>
<tr>
<td><strong>10:15-12:15</strong></td>
<td>MATH Common Exam: 101, 106, 107, 108, 109, 111, 125, 139, 140, 150, 151, 250, 282</td>
<td>10:00 or 10:30 on T and/or R</td>
<td>10:00 or 10:30 on M and/or W and/or F</td>
<td>11:00 or 11:30 on T and/or R</td>
<td>11:00 or 11:30 on M and/or W and/or F</td>
<td></td>
</tr>
<tr>
<td><strong>12:30-2:30</strong></td>
<td>12:00 or 12:30 on M and/or W and/or F</td>
<td>12:00 or 12:35 on T and/or R</td>
<td>1:00 or 1:30 on M and/or W and/or F</td>
<td>1:00 or 1:30 on T and/or R</td>
<td>2:00 or 2:30 on M and/or W and/or F</td>
<td></td>
</tr>
<tr>
<td><strong>2:45-4:45</strong></td>
<td>Study Sessions</td>
<td>3:00 or 3:30 on M and/or W and/or F</td>
<td>2:00 or 2:35 on T and/or R</td>
<td>4:00 or 4:30 on M and/or W and/or F</td>
<td>3:00 or 3:35 on T and/or R</td>
<td>Make-up Exam Period</td>
</tr>
<tr>
<td><strong>5:00-7:00</strong></td>
<td>5:00 or 5:30 on M and/or W and/or F</td>
<td>4:00 or 4:30 on T and R</td>
<td><strong>Make-up Exam Period</strong></td>
<td>5:00, 5:30, 6:00, or 6:30 on T and R</td>
<td>6:00 or 6:30 on M and/or W and/or F</td>
<td></td>
</tr>
<tr>
<td><strong>7:15-9:15</strong></td>
<td>7:00 or 7:30 PM on M and/or W and/or F</td>
<td>7:00, 7:30, 8:00, or 8:30 PM on T and R</td>
<td>8:00 or 8:30 PM on M and/or W and/or F</td>
<td>Thursday only after 7:00 PM</td>
<td>Thursday only after 7:00 PM</td>
<td></td>
</tr>
</tbody>
</table>
**Important Information Related To The Fall 2017 Final Exam Week (December 11 through 15, 2017) At SIU Carbondale**

**The Fall 2017 Final Exam Schedule** attempts to avoid conflicts and keep exam times during their normal semester class meeting day(s) and period, while providing preparation time to be used for study-sessions. Other information about Fall 2017 final exams is listed below *(and is current as of 07/21/2017)*:

1. The class final exam period is based on the meeting pattern listed on the first line of the class entry of the Schedule of Classes. For example, a class section is listed in the Schedule of Classes on two lines in the following manner:

   - **T R** 8:00 – 8:50
   - **W** 9:00 – 10:50

   The starting time listed for the first line of the meeting pattern is **8:00**. The days listed for the first line of the meeting pattern are **TR**, and therefore are in the category **8:00 or 8:30 on T and/or R**. Using the Fall 2017 Final Exam Schedule grid, it is determined that this course’s final exam period is **Tuesday, 12/13, from 8:00 – 10:00 a.m.**

2. Classes should plan to hold their final exams in their regularly scheduled classrooms. The Academic Scheduling Office will forward departments information relative to the location of their exams for those classes that cannot hold their final exams in their regularly scheduled rooms due to a space conflict. This will be done in advance of the Final Exam week to provide adequate notice for all.

   **Classes that meet less than the entire semester should hold their exams during the last regularly scheduled class session prior to the formal Final Exam week.**

   **It is a policy of the University that no final exam be given prior to the scheduled final exam period, and that students be given their exams at the designated times listed on the Fall 2017 Final Exam Schedule grid. Any deviation from this policy must be approved by the Dean of the College.**

3. Students who find they have **more than three exams on the same day** may petition, and students who have two exams scheduled at the same time should petition, their Dean for approval to take an exam during the make-up exam period on the last day of Final Exam week. Provision for such a make-up exam period does not mean that students may decide to miss the scheduled exam time to make it up during this make-up period. This period is to be used only for students whose petitions have been approved by their Dean.

4. Students who must miss a final exam may not take the exam before the time scheduled for the class exam. Information for faculty and instructors relative to the proper grade to be given to those students who miss a final exam and are not involved in a situation covered in Section 3 above can be found on the Registrar’s Office web site at [http://registrar.siu.edu/faculty/webgradinginfo.php](http://registrar.siu.edu/faculty/webgradinginfo.php).

5. **Classes with a special common exam time.**

<table>
<thead>
<tr>
<th>Class Code</th>
<th>Exam Date</th>
<th>Exam Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 101, 102, and 120h</td>
<td>Mon, 12/11</td>
<td>8:00 AM - 10:00 AM</td>
</tr>
<tr>
<td>MATH 101, 107, 108, 109, 111, 125, 139, 140, 150, 250, and 282</td>
<td>Mon, 12/11</td>
<td>10:15 AM – 12:15 PM</td>
</tr>
</tbody>
</table>

6. One credit hour courses and classes that meet for less than the full semester should hold their exams during the last regularly scheduled class session prior to the formal Final Exam week.
Important Information for SIUC Faculty and Instructors re. the Fall 2017 Final Exam Schedule:

Please note that the Final Exam schedule for Fall 2017 differs slightly from Final Exam schedules of recent Fall semesters. This change represents an intermediate step in the process of creating a more equitable Final Exam schedule for students.

Faculty and instructors who may be used to having certain time slots for their Fall final exams should pay attention to this revised schedule as they prepare their Fall 2017 syllabi.

A campus working group is in the process of doing data analysis that should result in more significant changes for the Spring 2018 Final Exam schedule. The goal is that such a schedule will allow for a better distribution of exam times for students, particularly students in certain disciplines whose normal class schedules seem to result in them having their final exams bunched too closely together.

We hope to unveil the Spring 2018 Final Exam schedule by the middle of the Fall 2017 semester.

SIUC Registrar’s Office
July 21, 2017