Physics 520B – Electromagnetic Theory

Spring 2016 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-9:30am, W: 8:30am-12:30pm

**Grader:** N/A

**Course Textbook:**


**Other**

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

**Grading**

- **Homework** *(to be assigned biweekly during Spring 2016)*  
  20%
- **Paper Presentation** *(last week of classes)*  
  20%
- **Midterm Exam** *(tentatively scheduled for week of April 4, 2016)*  
  20%
- **Final Exam** *(compulsory: 10:15am-12:15pm, Thursday, May 12, 2016)*  
  40%

**FINAL GRADE**

A : >90%; B: 75% - 90%; C: 60% - 74.9%; D: 50% - 59.9%; F: <50%
HOMEWORK

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.

- Every homework should include detailed explanations constructed 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 the reference, and explain how this is necessary.

- For Phys 520B (and Phys 520A) 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 6-14 of Jackson's textbook. A tentative outline of the chapters and sections scheduled to be covered are listed here. Those sections below marked by * will be covered if time permits.

Chapter 6 Maxwell's Equations (8 lectures)
   i. Faraday's Law (Chap. 5)
   ii. Maxwell's Equations
   iii. Gauge Transformations
   iv. Wave Equation
   v. Poynting's Theorem

Chapter 7 Plane Waves and Propagation (7 lectures)
   i. Plane Waves
   ii. Polarization
   iii. Fresnel Equations
   iv. Dispersion Theory
   v. *Kramers-Kronig Relations

Chapter 8 Waveguides (2 lectures)
   i. Maxwell's Equations inside Cavities & Waveguides
   ii. Modes in Rectangular Waveguides
   iii. Energy Flow in Waveguides

Chapter 9 Radiation (2 lectures)
   i. Multipole Expansion for Localized Source
   ii. Electric Dipole Field
   iii. *Magnetic Dipole Field

*Chapter 10 Scattering (2 lectures)
   i. Scattering at Long Wavelengths

Chapter 11 Special Relativity (5 lectures)
   i. Review of Special Relativity & Lorentz Transformations
   ii. Lienard-Wiechert Potentials
   iii. Simultaneity
   iv. 4-Vectors
   v. Electrodynamics
   vi. Transformations of the Fields
<table>
<thead>
<tr>
<th>Week of</th>
<th>Homework/Exam</th>
<th>Section (Jackson) / Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 18</td>
<td></td>
<td>Monday, 18th January, MLK Day Chapter 5+6</td>
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<tr>
<td>Jan 25</td>
<td></td>
<td>Chapter 6</td>
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<tr>
<td>Feb 1</td>
<td>\textbf{H/W 1}</td>
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<td>Feb 8</td>
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<tr>
<td>Feb 15</td>
<td>\textbf{H/W 2}</td>
<td>Chapter 7</td>
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<td>Feb 22</td>
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<tr>
<td>Feb 29</td>
<td>\textbf{H/W 3}</td>
<td>“</td>
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<tr>
<td>Mar 7</td>
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<tr>
<td>Mar 14</td>
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<td>Spring Break/APS March Meeting, Mar 12-20</td>
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<tr>
<td>Mar 21</td>
<td>\textbf{H/W 4}</td>
<td>Chapter 8</td>
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<tr>
<td>Mar 28</td>
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<td>Chapter 9</td>
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<tr>
<td>Apr 4</td>
<td>\textbf{Midterm}</td>
<td>Chapter 10</td>
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<tr>
<td>Apr 11</td>
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<td>Chapter 11</td>
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<tr>
<td>Apr 18</td>
<td>\textbf{H/W 5}</td>
<td>“</td>
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<tr>
<td>Apr 25</td>
<td></td>
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<tr>
<td>May 2</td>
<td>\textbf{Class Paper}</td>
<td>Last week of classes</td>
</tr>
<tr>
<td><strong>On May 12</strong></td>
<td>\textbf{FINAL EXAM}</td>
<td><strong>10:15am – 12:15pm, Thursday, 12th May, Neckers 410</strong></td>
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</tbody>
</table>
Please be aware of the SIUC Student Conduct Code available at the SIUC website: http://srr.siu.edu/student_conduct_code

Please also not the following emergency procedures policy. Make sure you review the www.bert.siu.edu emergency response information available at the websites listed below or dotted around campus buildings.

Emergency Procedures. Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT's website at , Department of Safety's website www.dps.siu.edu and in Emergency Response Guideline pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency. The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.
IMPORTANT DATES *

Semester Class Begins: ..........................................01/19/2016
Last day to add a class (without instructor permission):.................01/24/2016
Last day to withdraw completely and receive a 100% refund: ............01/31/2016
Last day to drop a course using SalukiNet: .................................04/03/2016
Last day to file diploma application (for name to appear in Commencement program): .........................................................02/12/2016

Final examinations: ........................................................................05/09-05/13/2016

Note: For outreach, internet, and short course drop/add dates, visit Registrar’s Academic webpage http://registrar.siu.edu/

SPRING SEMESTER HOLIDAYS
Martin Luther King, Jr.’s Birthday Holiday 01/18/2016
Spring Break 03/12—03/20/2016

WITHDRAWAL POLICY ~ Undergraduate only

Students who officially register for a session may not withdraw merely by the stopping of attendance. An official withdrawal form needs to be initiated by the student and processed by the University. For the proper procedures to follow when dropping courses and when withdrawing from the University, please visit http://registrar.siu.edu/catalog/undergraduatetcatalog.html

INCOMPLETE POLICY ~ Undergraduate only

An INC is assigned when, for reasons beyond their control, students engaged in passing work are unable to complete all class assignments. An INC must be changed to a completed grade within one semester following the term in which the course was taken, or graduation, whichever occurs first. Should the student fail to complete the course within the time period designated, that is, by no later than the end of the semester following the term in which the course was taken, or graduation, whichever occurs first, the incomplete will be converted to a grade of F and the grade will be computed in the student's grade point average. For more information please visit: http://registrar.siu.edu/grades/incomplete.html

REPEAT POLICY

An undergraduate student may, for the purpose of raising a grade, enroll in a course for credit no more than two times (two total enrollments) unless otherwise noted in the course description. For students receiving a letter grade of A,B,C,D, or F, the course repetition must occur at Southern Illinois University Carbondale. Only the most recent (last) grade will be calculated in the overall GPA and count toward hours earned. See full policy at http://registrar.siu.edu/catalog/undergraduatetcatalog.html

GRADUATE POLICIES

Graduate policies often vary from Undergraduate policies. To view the applicable policies for graduate students, please visit http://gradschool.siu.edu/about-us/grad-catalog/index.html

DISABILITY POLICY

Disability Support Services provides the required academic and programmatic support services to students with permanent and temporary disabilities. DSS provides centralized coordination and referral services. To utilize DSS services, students must come to the DSS to open cases. The process involves interviews, reviews of student-supplied documentation, and completion of Disability Accommodation Agreements.

http://disabilityservices.siu.edu/

PLAGIARISM

Student Conduct Code http://srr.siu.edu/student_conduct_code/
MORRIS LIBRARY HOURS
http://www.lib.siu.edu/about

SAFETY AWARENESS FACTS AND EDUCATION

Title IX makes it 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, students and 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: (618) 453-5714, or siucares@siu.edu, http://salukicares.siu.edu/index.html

EMERGENCY PROCEDURES

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INCLUSIVE EXCELLENCE

SIU contains people from all walks of life, from many different cultures and subcultures, and representing all strata of society, nationalities, ethnicities, lifestyles, and affiliations. Learning from and working with people who differ is an important part of education as well an essential preparation for any career. For more information please visit: http://www.inclusivexcellece.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/

AFFIRMATIVE ACTION & EQUAL OPPORTUNITY

Our office's main focus is to ensure that the university complies with federal and state equity policies and handles reporting and investigating of discrimination cases. For more information visit: http://diversity.siu.edu/

Additional Resources Available:

SALUKINET: https://salukinet.siu.edu/cp/home/displaylogin

ADVIEMENT: http://advisement.siu.edu/

PROVOST & VICE CHANCELLOR: http://pvcaa.siu.edu/

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

Spring 2016 R.O'Rourke
## SPRING 2016 FINAL EXAM SCHEDULE INFO as of 12/3/2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Sunday 5/08</th>
<th>Monday 5/09</th>
<th>Tuesday 5/10</th>
<th>Wednesday 5/11</th>
<th>Thursday 5/12</th>
<th>Friday 5/13</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00-10:00</td>
<td>ENGL Common Exam: 101, 102 and 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>
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<tr>
<td>10:15-12:15</td>
<td>FIN 330 Common Exam</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>
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<tr>
<td>12:30-2:30</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>PSYC 102 Common Exam</td>
<td>1:00 or 1:30 on T and/or R</td>
<td>1:00 or 1:30 on M and/or W and/or F</td>
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<tr>
<td>2:45-4:45</td>
<td>2:00 or 2:30 on M and/or W and/or F</td>
<td>2:00 or 2:30 on T and/or R</td>
<td>KIN 101 Common Exam</td>
<td>3:00 or 3:35 on T and/or R</td>
<td>3:00 or 3:30 on M and/or W and/or F</td>
<td></td>
</tr>
<tr>
<td>5:00-7:00</td>
<td>MATH Common Exam: 101, 107, 108, 109, 111, 125, 139, 140, 150, 250, and 282</td>
<td>4:00 or 4:30 on T and R</td>
<td>Tuesday only after 5:00 but before 7:00</td>
<td>4:00 or 4:30 on M and W, M and F, or W and F</td>
<td>Wednesday only after 5:00 but before 7:00</td>
<td>5:00, 5:30, 6:00 or 6:30 on M and W, M and F, or W and F</td>
</tr>
<tr>
<td>7:15-9:15</td>
<td>7:00, 7:30, 8:00, or 8:30 on M and W, M and F, or W and F</td>
<td>Monday only after 7:00</td>
<td>7:00, 7:30, 8:00, or 8:30 on T and R</td>
<td>Tuesday only after 7:00</td>
<td>Wednesday only after 7:00</td>
<td>Thursday only after 7:00</td>
</tr>
</tbody>
</table>

### Study-Sessions
- Monday 5/9: 3:00-5:00
- Tuesday 5/10: 8:00-10:00
- Wednesday 5/11: 12:00-2:00
- Thursday 5/12: 12:00-1:00
- Friday 5/13: 12:00-1:00

### Notes
- MATH Common Exam: Monday only after 5:00 but before 7:00
- Make-up Exam Period

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**SIU**

Southern Illinois University
The Spring 2016 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 Spring 2016 final exams is listed below (and is current as of Dec. 3, 2015):

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 Spring 2016 Final Exam Schedule grid, it is determined that this course’s final exam period is **Tuesday, May 10, 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 Spring 2016 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.html](http://registrar.siu.edu/faculty/webgradinginfo.html).

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, 5/9</td>
<td>8:00 AM - 10:00 AM</td>
</tr>
<tr>
<td>FIN 330</td>
<td>Mon, 5/9</td>
<td>10:15 AM - 12:15 PM</td>
</tr>
<tr>
<td>KIN 101</td>
<td>Wed, 5/11</td>
<td>2:45 PM - 4:45 PM</td>
</tr>
<tr>
<td>MATH 101, 107, 108, 109, 111, 125, 139, 140, 150, 250, and 282</td>
<td>Mon, 5/9</td>
<td>5:00 PM - 7:00 PM</td>
</tr>
<tr>
<td>PSYC 102</td>
<td>Wed, 5/11</td>
<td>12:30 PM - 2:30 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.