Modern Physics Lab  
PHYS 3133. 022

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Office: STEM 207G or Miller Science 126/128  
Office Hours: MWF (10-11) TR (1-2) PM or by appointment or via Zoom. 
Department: Physics, Engineering and Astronomy

Class meeting time and place: STEM 305 or Miller Science RM 125 & Other labs in Miller Science.  
W (3:00 - 5:00)PM sec. 022 (1 hr lecture every other week + lab times)  
Labs will meet periodically throughout the week as scheduled for you and your lab partner.

Course Description

An introduction to scanning electron microscopy, energy dispersive spectroscopy, scanning tunneling microscopy, atomic force microscopy and X-ray diffraction, based on topics discussed in the Modern Physics lectures.

Course Credit Hour Justification

Meets 3 hrs/wk for 15 weeks, and also meets for a 2-hour final examination. This is a problem oriented class and lab with homework problems. The lecture and lab combine for 6 hours of contact time each week and the work outside of classes each week for the combined courses averages much more than 12 hours in working homework problems, reading the book to understand the theories used in lecture and in homework problems and exams, reading the lab manual to prepare for the lab experiments done each week, writing up the lab experiments, and studying for exams which include major exams and possibly short lecture quizzes.

Program Learning Outcomes

1. Knowledge: The student will demonstrate knowledge and comprehension of the basic and applied fields of physics.

2. Problem Solving: The student will develop independent problem solving skills.

3. Laboratory Work: The student will develop good experimental technique, including proper setup and care of equipment, conducting experiments and analyzing results in order to observe physical phenomena, assess experimental uncertainty, and make meaningful comparisons between experiment and theory.

4. Written Communications: The student will develop effective written communication skills by clear and concise problem solving, well-structured laboratory reports, and accepted formatting of research papers.

5. Oral Communications: The student will develop effective oral communication skills in oral presentations of problem solution, seminars, and oral presentations at scientific meetings.

6. Professional Development: The student will discover the protocols of the professional physicist by attending meetings and giving papers.
Text and Materials
Authors: Friedfeld, Timmons

Course Requirements

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<tr>
<th>Exp</th>
<th>Experiment</th>
<th>Dates</th>
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<tbody>
<tr>
<td>Exp. 1</td>
<td>Electrostatic Deflection (STEM 305)</td>
<td>Sept 04 – Sept 15</td>
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<tr>
<td>Exp. 2</td>
<td>Blackbody Radiation (STEM 305)</td>
<td>Sept. 18 – Sept. 29</td>
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<td>Exp. 3</td>
<td>X-Ray Diffraction (XRD) (Miller Science)</td>
<td>Oct. 02 – Oct. 13</td>
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<td>Exp. 4,5</td>
<td>Scanning Electron Microscopy (SEM) &amp; Energy Dispersive Spectroscopy (EDS) (Miller Science)</td>
<td>Oct. 16 – Oct. 27</td>
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<td>Exp. 6</td>
<td>Electron Diffraction (STEM 305)</td>
<td>Oct. 30 – Nov. 10</td>
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<tr>
<td>Exp. 7,8</td>
<td>Scanning Tunneling Microscopy (STM) and Atomic Force Microscopy (AFM) (Miller Science)</td>
<td>Nov. 13 – Nov. 30</td>
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The chart below indicates the core objectives addressed by this course, the assignment(s) that will be used to assess the objectives in this course and uploaded to the Brightspace Empirical and Quantitative Skills dropbox this semester. The date the assignment(s) should be uploaded to the Brightspace dropbox are also shown in the chart. Not every assignment will be submitted for core assessment every semester. Your instructor will notify you which assignment(s) must be submitted for assessment in the Brightspace Empirical and Quantitative Skills dropbox.

<table>
<thead>
<tr>
<th>Core Objective</th>
<th>Definition</th>
<th>Course Assignment Title</th>
<th>Date Due in D2L</th>
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<tr>
<td>Critical Thinking Skills</td>
<td>To include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.</td>
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<td>Communication Skills</td>
<td>To include effective development, interpretation and expression of ideas though written, oral, and visual communication.</td>
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<tr>
<td>Empirical and Quantitative Skills</td>
<td>To include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.</td>
<td>Measurements Lab (Lab 2)</td>
<td>Please see the lab syllabus for the due date.</td>
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<td>Teamwork</td>
<td>To include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.</td>
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<td>Personal Responsibility</td>
<td>To include the ability to connect choices, actions and consequences to ethical decision-making.</td>
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<tr>
<td>Social Responsibility</td>
<td>To include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities.</td>
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**Grading Policy**

The lab grade will be based upon your lab report grades, as outlined in the lab manual.

**Attendance Policy**

Students are expected to attend ALL classes.

**Academic Integrity (4.1)**

Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.
Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at http://www.sfasu.edu/policies/student-academic-dishonesty-4.1.pdf

Withheld Grades Semester Grades Policy (5.5)
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.