Physics 3337 – Modern Physics Lecture

Class Schedule: 16 weeks starting Jan 19th, 2017

Room: ROB 118 conference room
Times: Tue, Thurs 4:10-5:25 pm

Instructor: Dr. Birgit Mellis
Phone: 713-525-2129
email: mellisb@stthom.edu
Office: Robertson Hall, Room 112
Office Hours:

Mon: 12:00pm-1:00pm
Tue: 9:00am-12:00pm
Wed: 12:00pm-2:00pm
Fri: 1:00pm-2:00pm by appointment

Instructor: Dr. James Clarage
Phone: 713-525-6979
email: claraj@stthom.edu
Office: Robertson Hall, Room 109
Office Hours:

Mon/Wed/Fri 11:00am -12:30pm
Tues/Thurs 3:00 – 4:00pm
Other times: by appointment.

(please put the course name in the Subject line of your emails, e.g., "Modern Phys Lec", and note we do not read email on weekends or late at night)

Course Description:
A quantitative survey of the 20th century revolution of special relativity and quantum mechanics. Applications will be included from the fields of atomic and molecular structure, statistical mechanics, solid state, materials science, biophysics and bioengineering, nuclear physics, elementary particles, astrophysics and cosmology. Prerequisites: PHYS 2333 and 2334.

Course Objectives and Student Outcomes:
This course is required for students pursuing the physics minor. Further, it serves students in the cooperative engineering program (especially in electrical and chemical engineering), so they are competent in the modern ideas behind contemporary technologies and research.

As a serious Catholic liberal arts University interested in integrating the highest ideas in philosophy and science, the 20th century revolution termed "Modern Physics" needs to be taught and learned on the campus. Most modern debates on e.g., the Big Bang, the nature of time, quantum mechanics, etc., arise from questions posed from this modern physics revolution begun by Planck, Einstein, Heisenberg, Bohr, etc.

Students will gain theoretical understanding of the basic principles of special relativity and elementary quantum mechanics. They will be able to model and solve problems drawn from the applications listed in the course description. And furthermore know the historical narrative giving rise to of the 20th century revolution in physics.

Required Text and Supplies:

- Modern Physics for Scientists and Engineers by Thornton and Rex, 4th edition
- Access to Mathematica, available in the physics lab, and room used for Modern Physics computer labs.
- Access to a method for storing your files (USB drive, dropbox, email etc.)
Blackboard:
Blackboard (http://gregory.stthom.edu) will be used to post instructions, assignments, announcements etc. throughout the course. Therefore you need access to the internet during the semester! Please check blackboard frequently to look for new postings.

All computer and blackboard problems or any technical questions should go to:
University Help Desk, Robertson B112, 713-525-6900

Grading:
The final semester grade will be calculated as follows:
45% semester exams (two exams)
25% final exam (comprehensive)
25% homework and quizzes
5% attendance and participation

Frequent absence or poor participation in class may result in a decrease in the class grade.

The letter grade for the course is based on the following Grading Scale:

A: (94-100) % , A-: (93-90)%
B+: (87-89)%, B (84-86), B- (80-83)%
C+ (77-79)%, C (74-76)%, C- (70-73)%
D+ (67-69)%, D (60-66)%
F (0-59)%

Exam Policy:

Students are expected to be present for each of the exams as scheduled. Make-ups are only allowed in serious circumstances. If for some reason you must miss an exam you are required to: i) let the instructor know BEFORE the regularly scheduled exam time that you will not be able to make the exam; ii) be prepared to document why you missed the exam. Use the email and/or phone information above to contact the instructor.

Exam Schedule (tentative)

Exam 1 – 2 Mar (Th)
Exam 2 – 20 Apr (Th)
Final – 16 May (T) 3:00-5:30pm
**Homework and Quizzes:**
Homework will be assigned for each chapter. To receive credit you must:

- hand in at the beginning of class
- show all your work (not just final answers)
- be neat and legible (if I can't read it I can't grade it)
- put a box or circle around your final result
- start a fresh page (front or back) for each problem (except for Conceptual Questions)
- staple pages together
- put your name on your work

**Attendance:**

“The University expects all students to be regular and punctual in class attendance. Frequent unexplained absences may result in a student being administratively withdrawn from the course or in a grade reduction or failing grade, at the discretion of the faculty member” (Page 67 Undergraduate Catalog 2007-2009). Each unexcused absence from class, including absence at the start of the lecture, may result in a one-point decrease in the final semester numerical grade, or in dropping one homework or quiz score.

**Accessibility and Accommodations:**

Reasonable accommodations will be made for students with disabilities according to the University’s policy. If you need special accommodations please see the instructor and the Office of Counseling and Disability Services (C&DS) located on the second floor of Crooker Center.

**Academic Honesty:**

All students are subject to the university’s Policy on Academic Dishonesty and the UST Student Handbook. This extends to any quizzes taken online via Blackboard. Cheating will be punished in accordance with University procedures.

**Some last advice…**

- Come to class
- Read, as best you can, textbook chapters before coming to class.
- Do all assigned homework problems—and then some. Physics is solving problems, not memorizing facts. To say “I understand the concepts but not the problems” is to delude oneself since problems are solved by understanding and applying concepts.
- Find something good, true or beautiful in the subject.

We hope you all have a great semester and enjoy Modern Physics!
Class Schedule S17 (The instructors reserve the right to make reasonable changes to the syllabus during the course. In this event, any necessary changes will be posted online and/or announced during class.)

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<thead>
<tr>
<th>Week of</th>
<th>Wednesday (Lab)</th>
<th>Tuesday (Lecture)</th>
<th>Thursday (Lecture)</th>
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<tbody>
<tr>
<td>16-Jan</td>
<td></td>
<td></td>
<td>Ch.1 Birth of Modern Physics</td>
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<tr>
<td>23-Jan</td>
<td>Safety Instructions. /Basic Relativity R117/R118</td>
<td>Ch.3 Experimental basis of quantum physics</td>
<td>Ch.3</td>
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<td>30-Jan</td>
<td>Intro to scientific computing (computer lab) Doherty DOH3O</td>
<td>Ch.3</td>
<td>Ch.4 Structure of the atom</td>
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<td>6-Feb</td>
<td>X-Rays (lab) R118 (Group 1) Wave-Particle Duality (lab) R117 (Group 2)</td>
<td>Ch.4</td>
<td>Ch.5 Quantum Mechanics I: wave/particle duality</td>
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<td>13-Feb</td>
<td>Waves, wave packets, Fourier theory (computer lab) DOH3O</td>
<td>Ch.5</td>
<td>Ch.6 Quantum Mechanics II</td>
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<td>20-Feb</td>
<td>Wave-Particle Duality (lab) R117 (Group 1) X-Rays (lab) R118 (Group 2)</td>
<td>Ch.6</td>
<td>Ch.6</td>
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<td>27-Feb</td>
<td>Exam-1 review session R118</td>
<td>Ch.7 Hydrogen atom</td>
<td>Exam-1</td>
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<td>6-Mar</td>
<td>Atomic Orbitals (computer lab) DOH3O</td>
<td>Ch.9 Statistical Physics (classical)</td>
<td>Ch9 (Fermi Dirac, Bose Einstein) (Instructor Change)</td>
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<td>13-Mar</td>
<td>Spring Break</td>
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<td>20-Mar</td>
<td>Physics minor standardized exam R118</td>
<td>Ch.9</td>
<td>Ch10 Molecules, Lasers, Solids</td>
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<td>27-Mar</td>
<td>Special Topics (computer lab) DOH3O</td>
<td>Ch.10</td>
<td>Ch.10</td>
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<td>3-Apr</td>
<td>Laser (lab) R117(Group1&amp;2)</td>
<td>Ch.11 Semiconductors</td>
<td>Ch.11</td>
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<td>10-Apr</td>
<td>High Tc Superconductors (lab) R118 (Group1&amp;2)</td>
<td>Ch11</td>
<td>Easter Break</td>
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<td>17-Apr</td>
<td>Exam-2 review session R118</td>
<td>Ch2 Special Relativity</td>
<td>Exam-2</td>
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<td>24-Apr</td>
<td>Semester review Final (Clarage) R118</td>
<td>Ch. 2</td>
<td>Ch2</td>
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<td>1-May</td>
<td>Semester review Final (Mellis) R118</td>
<td>Ch. 15 General Relativity</td>
<td>Ch15</td>
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