Physics 0081 - Fall 2016
Light & Matter, Space & Time

Professor: James A Mueller

Office: 413 Allen Hall

Phone: 412-624-1566

email: mueller@pitt.edu

Office hours: M 2-4, or by appointment.


LONCAPA: Homework will be assigned online. To access the homework, you need to go to the following web site:
http://homework.phyast.pitt.edu
A page describing how to use the site is available at
http://fafnir.phyast.pitt.edu/LON/loncapa.msu.edu/student/getting_started.html
(This may be out of date.)

Exams: Three in class exams will be given during the term.

• Thursday September 29.
• Thursday November 3.
• Thursday December 8.

If you can’t be at an exam, let me know as soon as possible. An unexcused absence will result in failure for the exam.

Grading: The course grade will be assigned based on the homework+class participation (15 points) and the three in-class exams (30 points each). Grades will be assigned as

A 90-105 points
B 75-90 points
C 60-75 points
D 45-60 points
Description of Course: This course attempts to introduce you to the physics of the very small (particle physics) and the very large (Astrophysics). We will try to emphasize the connections between the two. As preparation for this, we will cover some other parts of physics to provide a basis for our later discussions. Over the first 1.5 months, we will rapidly cover the classical physics. We will then spend the rest of the time on more esoteric topics. In all this I want you to remember the prime directive of physicists in their classes.

Don’t Memorize, Understand.

I will try to give you insight into the scientific method. I will try to do demonstrations in class to elucidate certain points. Physics is an experimental science, or as Tony Rothman said,

“One good experiment is worth a century of bad philosophy.”

Warning: We will use some basic math in this course. I will try to keep this simple, but one cannot avoid it entirely. To quote Rothman again: “…although students often approach teachers … with the tearful plea that they are interested in ‘concepts’, not math, to the physicist the distinction is not obvious. …the natural language of physics is mathematics and many of the laws cannot be expressed precisely in English, or even Sanskrit.”

Course Objectives: Students successfully completing this course will be able to

- describe what physics is, what natural phenomena are explained by the science of physics, and what physicists study.
- Describe current topics in Particle Physics and Cosmology and the experimental devices used to study them.
- identify the basic physical laws of nature.
- explain where scientific knowledge comes from.
- describe Newton’s laws of motion and gravity.
- outline the atomic theory of matter.
- describe the nature of energy and the laws of thermodynamics.
- describe the nature of light, electricity, and magnetism.
- outline relativity and quantum theory.
- explain the structure of matter based on fundamental building blocks.
- apply the fundamental laws and principles of physics to simple problems.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic(s)</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction: Stars and Atoms</td>
<td>Ch 1-2</td>
</tr>
<tr>
<td>Week 2</td>
<td>How and Why things move</td>
<td>Ch 3-4</td>
</tr>
<tr>
<td>Week 3</td>
<td>Gravity and Energy</td>
<td>Ch 5-6</td>
</tr>
<tr>
<td>Week 4</td>
<td>Energy and Thermodynamics</td>
<td>Ch 6-7</td>
</tr>
<tr>
<td>Week 5</td>
<td>ElectroMagnetism + Review + First Exam</td>
<td>Ch 8</td>
</tr>
<tr>
<td>Week 6</td>
<td>Electromagnetism and waves</td>
<td>Ch 8-9</td>
</tr>
<tr>
<td>Week 7</td>
<td>Special Relativity</td>
<td>Ch 10</td>
</tr>
<tr>
<td>Oct 18</td>
<td>NO CLASS</td>
<td></td>
</tr>
<tr>
<td>Week 8</td>
<td>Quantum</td>
<td>Ch 12</td>
</tr>
<tr>
<td>Week 9</td>
<td>Quantum</td>
<td>Ch 13</td>
</tr>
<tr>
<td>Week 10</td>
<td>Quantum + Review + Second Exam</td>
<td></td>
</tr>
<tr>
<td>Week 11</td>
<td>Nuclear Physics</td>
<td>Ch 14-15</td>
</tr>
<tr>
<td>Week 12</td>
<td>Particle Physics</td>
<td>Ch 17</td>
</tr>
<tr>
<td>Week 13</td>
<td>Particle Physics &amp;Thanksgiving</td>
<td></td>
</tr>
<tr>
<td>Week 14</td>
<td>Particle Physics and General Relativity</td>
<td>Ch 11</td>
</tr>
<tr>
<td>Week 15</td>
<td>Cosmology + Review + Third Exam</td>
<td></td>
</tr>
</tbody>
</table>
Course Policies:

- **Academic Integrity:**

  Students in this course will be expected to comply with University of Pittsburgh’s Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

- **Disabilities:**

  If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and the Disability Resources and Services no later than the 2nd week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services, call 648-7890 (Voice or TTD) to schedule an appointment. The Office is located in 216 William Pitt Union.

- **Statement on Classroom Recording:**

  To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the students own private use.