PHYS 1311
Elements of Astronomy
Syllabus

SMU Department of Physics
SMU-IN-TAOS, AUG. 2016

Professors Jodi Cooley and Stephen Sekula
Syllabus for PHYS 1311

General Information
A descriptive survey of astronomy from the sun and planets to the outer galaxies, and to the ultimate structure and origin of the cosmos. Associated laboratory work provides experience in making measurements and working with real astronomical data. Prerequisite: high-school algebra.

Pure and Applied Sciences Pillar Student Learning Outcomes

• Students will be able to demonstrate basic facility with the methods and approaches of scientific inquiry, hypothesis development, and/or problem solving.

• Students will be able to explain how the concepts, advancements, and findings of science or technology in general, or of particular sciences or technologies, shape our world.

Quantitative Reasoning Student Learning Outcomes

• Students will be able to solve problems using algebraic, geometric, calculus, statistical and/or computational methods.

• Students will be able to interpret and/or draw inferences from mathematical models, data, graphs or formulas.

Course-Specific Goals

The students should be able to:

• Describe the paradigm shift produced by the work of Copernicus, Galileo and Kepler.

• Describe the basic composition of the solar system, the galaxy, and the larger cosmos, and explain how information is gathered about these structures.
• Describe what the H-R diagram revealed about stars.
• Describe what the properties of stars have revealed about larger structure of the cosmos.

Textbook


Plan of Activities

The course meets for 3.5 hours; 1.5 hours are used for lecture, 1.5 hours for laboratory work, and 30 minutes are used as a break and for reflection between lecture and laboratory.

<table>
<thead>
<tr>
<th>DAY</th>
<th>LECTURE TOPIC (90 minutes)</th>
<th>LAB TOPIC (90 Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foundations of Astronomy; Historical Survey;</td>
<td>Measurement and Measurement Errors</td>
</tr>
<tr>
<td>2</td>
<td>Light and Matter; Telescopes, the Solar System</td>
<td>Study of the Electromagnetic Spectrum</td>
</tr>
<tr>
<td>3</td>
<td>Earth and Moon</td>
<td>Properties of Lenses</td>
</tr>
<tr>
<td>4</td>
<td>Example Planets: Venus and Mars; Jupiter</td>
<td>Study of Mars using Rover/Orbiter Data</td>
</tr>
<tr>
<td>5</td>
<td>The Sun</td>
<td>Measuring the Solar Constant</td>
</tr>
<tr>
<td>6</td>
<td>Measuring Stars</td>
<td>Plot the H.R. Diagram</td>
</tr>
<tr>
<td>7</td>
<td>Stellar Evolution</td>
<td>Parallax and the Measurement of Distance</td>
</tr>
<tr>
<td>8</td>
<td>Extreme Stars: Neutron Stars and Black Holes</td>
<td>The Crab Nebula</td>
</tr>
<tr>
<td>9</td>
<td>Galaxies; The Milky Way; Kinds of Galaxies</td>
<td>Stars, Dust, and Gas in the Milky Way</td>
</tr>
<tr>
<td>----</td>
<td>------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>10</td>
<td>Dark Matter and Galaxy Formation</td>
<td>Measuring Rotation Curves</td>
</tr>
<tr>
<td>11</td>
<td>Cosmology; The Accelerating Expansion of the Universe</td>
<td>Measure the Expansion of the Universe</td>
</tr>
<tr>
<td>12</td>
<td>FINAL EXAM</td>
<td></td>
</tr>
</tbody>
</table>

In addition, we plan to host two non-mandatory movie nights on the two Saturdays during the term:

- Second Saturday: “Interstellar,” a 2014 work of fiction with the most precise computer simulations of extreme gravitational phenomena ever visualized by human beings.

We also plan to host viewing parties each night of the week and possibly on weekends, as viewing conditions allow. These will allow students to get first-hand experience in utilizing telescopes to find, focus, and track celestial objects including, but not limited to, the Moon and Saturn. Attending at least 1 viewing night is mandatory, and part of the final grade.

**Assessment**

Student performance will be assessed as follows:

- Daily lecture-based take-home homework assignments (30% of total grade) and in-class quizzes (10% of total grade)
- In-class Laboratory Exercises (30% of total grade)
- Attending 1 Out-of-class Star Viewing Night (5% of total grade)
- A final examination (25% of total grade)
University Honor Code

The student honor code can be found on page 32 of the 2014-2015 student handbook\(^1\). All students will be expected to adhere to it. Any student found cheating or plagiarizing another's work will be given a zero for that work and a complaint will be filed through the Vice President for Student Affairs Office. If you are uncertain of the definition of plagiarism as it regards independent works of mathematical and physical computation, documentation, and demonstration, it is your responsibility to speak with the instructor and understand these rules.

Disability Accommodations

Students needing academic accommodations for a disability must first be registered with Disability Accommodations & Success Strategies (DASS) to verify the disability and to establish eligibility for accommodations. Students may call 214-768-1470 or visit the DASS website\(^2\) to begin the process. Once registered, students should then schedule an appointment with the professor to make appropriate arrangements.

Please find detailed information about DASS at the end of this syllabus.

University Policy on Religious Holidays

Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

\(^1\) [http://www.smu.edu/StudentAffairs/StudentLife/StudentHandbook](http://www.smu.edu/StudentAffairs/StudentLife/StudentHandbook)

\(^2\) [http://www.smu.edu/ALEC/DASS](http://www.smu.edu/ALEC/DASS)
Excused Absences for University Extracurricular Activities

Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)