Fall 2020

**PHYS 202-001: Introductory Astronomy and Cosmology**

Ian Gatley

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SYNCHRONOUS ONLINE COURSE using Webex:
Mondays  11:00 a.m. to 12:20 p.m.  at:  http://njit.webex.com/join/gatley
Wednesdays 11:00 a.m. to 12:20 p.m.  at:  http://njit.webex.com/join/gatley

Instructor
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ian.gatley@njit.edu

Textbook: The electronic version of the textbook is available online at no cost

*Astronomy* (Yes, the name of the book is *Astronomy*)
Senior Contributing Authors: Andrew Fraknoi, David Morrison & Sidney C. Wolff
https://openstax.org/details/books/astronomy

Grade

Your final grade will be based upon homework, two written reports, four in-class examinations, and one Final Examination. The in-class examinations will be held using Canvas on the following dates.

<table>
<thead>
<tr>
<th>Examination</th>
<th>Date</th>
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<tbody>
<tr>
<td>First Examination</td>
<td>Wednesday, September 23, 2020</td>
</tr>
<tr>
<td>Second Examination</td>
<td>Wednesday, October 14, 2020</td>
</tr>
<tr>
<td>Third Examination</td>
<td>Monday, November 9, 2020</td>
</tr>
<tr>
<td>Fourth Examination</td>
<td>Monday, December 7, 2020</td>
</tr>
</tbody>
</table>

Instructions for the two written reports will posted on Canvas.
The date and time of the Final Examination will be announced later.

There will be no “make-up” examinations. If you miss an examination, you will receive a grade of zero for that examination. The scores you earn will determine your final grade based on the following table.

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>85% to 100%</td>
<td>A</td>
</tr>
<tr>
<td>80% to 84%</td>
<td>B+</td>
</tr>
<tr>
<td>70% to 79%</td>
<td>B</td>
</tr>
<tr>
<td>65% to 69%</td>
<td>C+</td>
</tr>
<tr>
<td>50% to 64%</td>
<td>C</td>
</tr>
<tr>
<td>40% to 49%</td>
<td>D</td>
</tr>
<tr>
<td>0% to 39%</td>
<td>F</td>
</tr>
</tbody>
</table>

The homework grades will not be “curved,” nor will the scores on the written reports be “curved.” The examination grades will not be “curved,” nor will the final grades be “curved.” The homework and the examinations will cover topics discussed in class and/or topics discussed in the textbook. The Final Examination will cover the entire course’s material.

Introductory Astronomy and Cosmology (Phys 202) and Introductory Astronomy and Cosmology Laboratory (Phys 202A) are two separate courses for which you will receive two separate and independently-determined grades. Moreover, you are free to be registered for either one of these courses without being registered for the other course. If you are registered for both courses, withdrawal from one course does not mean you must withdraw from the other course.
Academic Integrity

Any student who is disruptive in the online session will be in violation of the Academic Honor Code and will be reported to the Dean of Student Services.

Any student who cheats during an examination or in the writing of a report will be in violation of the Academic Honor Code. The student will automatically fail the course and will be reported to the Dean of Student Services so that further action may be taken. Examples of cheating during an examination include, but are not limited to, talking with another student, copying work from another student’s work, or allowing another student to copy work from your own work.

Syllabus

Wed 2-Sep Observing the Sky (Chapters 1 and 2)
Mon 7-Sep No Class: Labor Day. Class meets tomorrow (Tuesday).
Tues 8-Sep Orbits and Gravity (Chapter Three)
Wed 9-Sep Earth, Moon, and Sky (Chapter Four)
Mon 14-Sep Radiation and Spectra (Chapter Five)
Wed 16-Sep Astronomical Instruments (Chapter Six)
Mon 21-Sep Introduction to the Solar System (Chapter Seven)
Wed 23-Sep Exam 1 (Chapters 1-7)
Mon 28-Sep Earth and Other Cratered Worlds (Chapters 8 and 9)
Wed 30-Sep Venus and Mars (Chapter Ten)
Mon 5-Oct Giant Planets, Rings, Moons (Chapters 11 and 12)
Wed 7-Oct Comets, Asteroids, Samples (Chapters 13 and 14)
Mon 12-Oct The Sun (Chapters 15 and 16)
Wed 14-Oct Exam 2 (Chapters 8-16)
Mon 19-Oct Starlight and Stars (Chapters 17 and 18)
Wed 21-Oct Distances. Gas & Dust in Space (Chapters 19 and 20)
Mon 26-Oct Star & Planet Formation (Chapter Twenty-one)
Wed 28-Oct Stars' Adolescence to Old Age (Chapter Twenty-two)
Mon 2-Nov Death of Stars (Chapter Twenty-three)
Wed 4-Nov Review of Chapters 17-23
Mon 9-Nov Exam 3 (Chapters 17-23)
Wed 11-Nov Black Holes, Curved Spacetime (Chapter Twenty-four)
Mon 16-Nov The Milky Way Galaxy (Chapter Twenty-five)
Wed 18-Nov Galaxies (Chapter Twenty-six)
Mon 23-Nov QSOs, Black holes, Galaxy Evolution (Chapters 27 & 28)
Wed 25-Nov No Class: Friday classes meet
Mon 30-Nov The Big Bang (Chapter Twenty-nine)
Wed 2-Dec Review of Chapters 24-29
Mon 7-Dec Fourth Examination
Wed 9-Dec Review of Chapters 1-29
New Jersey Institute of Technology
College of Science and Liberal Arts
Department of Physics
Introductory Astronomy and Cosmology (Phys 202)
Learning Objectives and Outcomes

Comprehend our place in the universe.
Describe the size of the universe, and relate this size to everyday human experience.
Describe the age of the universe, and relate this age to everyday human experience.
Understand various astronomical coordinate systems.
Analyze the changes in the sky from different locations on the Earth.
Recall the brightest stars in the sky and several constellations in the sky.
Comprehend the electromagnetic spectrum.
Use the Doppler effect to analyze redshifts and blueshifts.
Understand the laws of optics, and use them to construct telescopes.
Comprehend atomic theory, including subatomic particles.
Analyze different types of spectra.
Describe the changes in perspective that led to the Copernican revolution.
Apply Kepler’s laws to explain observations of planetary motion.
Describe Newton’s model of the universe, including Newton’s laws and Newton’s theory of gravitation.
Describe the origin of the solar system, and explain how this model explains the properties of planets.
Comprehend the geology and the atmospheric processes of the terrestrial planets.
Analyze the Jovian planetary systems as microcosms of the entire solar system.
Discuss the minor objects of the solar system, including asteroids, meteoroids, comets, and dust.
Describe the properties of the Sun.
Analyze the interior of the Sun, including the nuclear reactions in its core.
Analyze other stars in the context of the Hertzsprung-Russell diagram.
Use the Hertzsprung-Russell diagram to discuss the birth, evolution, and death of stars.
Evaluate various Hertzsprung-Russell diagrams for different types of star clusters.
Analyze the evolution of binary star systems.
Describe Einstein’s model of the universe (both the special relativity and the general relativity theories).
Describe the properties of the Milky Way galaxy.
Analyze other galaxies in the context of the Hubble sequence.
Discuss various theories of the birth, evolution, and death of galaxies.
Describe the large-scale structure of the universe.
Explain the evidence, both theoretical and observational, for the expansion of the universe.
Calculate the age of the universe from the Hubble law.
Formulate the Big Bang model of cosmology.
Comprehend theories on the frontiers of theoretical physics.
Explain the history of the universe.