

West Chester University
Department of Physics
Physics 390 – Astrophysics

Lecture: MWF 10:00 - 10:50 am
Meeting Place: SEC 208
Instructor: Jeffrey J. Sudol (Dr. Jeff)
Office: SEC 362
Office Phone: 610-436-2572
Office email: jsudol@wcupa.edu
Office Hours: M2-3, W11-12, R3-4, F11-12, F2-3

Course Description

This is an introductory course in astrophysics. Content areas include gravitational attraction between massive bodies and orbits, the interaction of light and matter, stellar structure, and cosmology.

Required Course Materials

- ✓ *An Introduction to Modern Astrophysics, Second Edition.* Carroll & Ostlie.
- ✓ A scientific calculator.

Attendance Policy

Attendance is required. If an event beyond your control prohibits you from attending class, contact the instructor as soon as possible to discuss options. Failure to contact the instructor within two calendar days of an absence will result in zero credit for any assessment missed during the absence.

Website

This course has a D2L website associated with it. I will post all course documents and announcements on the D2L website. Please check D2L frequently.

Course Goals

The goals of this course are as follows:

1. The student will be able to ...

The lectures and lecture activities, which include lecture tutorials, think-pair-share questions, ranking tasks, and interactive problem solving, are all designed to help you meet these goals.

Program Goals

The lecture portion of this course supports the following Physics Program goal with regard to the application of the knowledge of physics applied to astronomical objects and phenomena.

Knowledge and Understanding of the Concepts and Principles of Physics

B.S. Physics majors who graduate from West Chester University will possess a firm foundation of basic physics principles, as well as general knowledge of physical phenomenon and applications of these phenomenon. Knowledge areas will include classical mechanics, electricity and magnetism, thermodynamics, statistical physics, and quantum mechanics.

Assessment

Your "grade" in this course will be based on your performance in the following categories of assessment with the following weights.

Homework..... 15% total
Computational Project..... 10% total
Exams..... 75% total

I reserve the right to introduce different forms of assessment as needed and to alter the weight of each of the categories of assessment in the event of some unforeseen circumstance having an adverse effect on the results of the assessments or the schedule of assessments.

Homework

I will assign problems of my own design and from the textbook at the start of each week. You must submit your solutions to those problems on D2L before 5:00 pm on Saturday of that week.

When presenting the solution to a problem, your fundamental goal is to convince me that you understand the problem and its solution. For complex problems, a running narrative (brief statements to describe each significant step) is helpful in this regard.

I encourage you to consult one another on the homework but you must adhere to the following protocols. (1) You complete the homework on your own first. (2) You then compare your solutions to those of your classmates. (3) You resolve any discrepancies through discourse and inquiry. (4) If you cannot resolve any discrepancies, you consult a faculty member. (5) If you are ever "stuck" on a problem - meaning you cannot advance the solution without help - consult a faculty member first. In other words, your classmates are your consultants, and you consult with them when you have finished your work. You check each other's work; you do not do the work for one another. Moreover, no homework problem should require more than 20 minutes of your time, an hour at most for some of the more complex problems. If you reach that time limit without making progress, ask me or another faculty member for help.

Exams

I will administer four exams during the semester. The exams will consist of a mix of conceptual problems and mathematical problems to test if you have met the learning objectives for the course.

Course Schedule

| Week | Starting | Topics |
|------|----------|--|
| | | Part I: Gravitation |
| 1 | Jan. 22 | The Content of the Universe, The Scale of the Universe |
| 2 | Jan. 29 | Lookback Time, Newton's Law of Gravitation (orbits) |
| 3 | Feb. 05 | Kepler's Laws (orbits), Field Theory, Shell Theorem |
| 4 | Feb. 12 | Virial Theorem |
| | | Part II: Light and Matter |
| 5 | Feb. 19 | Photon Model, Light and Matter, Types of Spectra |
| 6 | Feb. 26 | Doppler Shift, Blackbody Radiation |
| 7 | Mar. 04 | Line Splitting, Line Profiles, Spatial and Spectral Resolution |
| 8 | Mar. 11 | - |
| | | Part III: Stellar Structure |
| 9 | Mar. 18 | Parallax, The Magnitude System, The Distance Modulus |
| 10 | Mar. 25 | Spectral Types, Spectral Parallax, Mass-Luminosity-Radius |
| 11 | Apr. 01 | Hydrostatic Equilibrium, Radiation Pressure, Stellar Structure |
| 12 | Apr. 08 | Equations of State: White Dwarfs, Neutron Stars, Black Holes |
| | | Part IV: Cosmology |
| 13 | Apr. 15 | |
| 14 | Apr. 22 | |
| 15 | Apr. 29 | |
| | | End |
| 16 | May 06 | <i>Final Exam Week</i> |

The following statements were prepared by the Office of the Provost to be included in the syllabi for all courses offered on campus.

Academic and Personal Integrity

It is the responsibility of each student to adhere to the university's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Undergraduate Handbook, the Undergraduate Catalog, the Ram's Eye View, and the University website at.

Students with Disabilities

If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University's Services for Students with Disabilities (OSSD), please visit them at 223 Lawrence Center. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is ossd@wcupa.edu, and their website is at <https://www.wcupa.edu/universityCollege/ossd/>. In an effort to assist students who either receive or may believe they are entitled to receive accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, the University has appointed a student advocate to be a contact for students who have questions regarding the provision of their accommodations or their right to accommodations. The advocate will assist any student who may have questions regarding these rights. The Director for Equity and Compliance/Title IX Coordinator has been designated in this role. Students who need assistance with their rights to accommodations should contact them at 610-436-2433.

Excused Absences Policy

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Undergraduate Catalog. In particular, please note that the "responsibility for meeting academic requirements rests with the student," that this policy does not excuse students from completing required academic work, and that professors can require a "fair alternative" to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

Reporting Incidents of Sexual Violence

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to comply with the requirements of Title IX of the Education Amendments of 1972 and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. **Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University Protection of Minors Policy.** Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at: <https://www.wcupa.edu/admin/diversityEquityInclusion/sexualMisconduct/default.aspx>

Inclusive Learning Environment and Anti-Racist Statement

Diversity, equity, and inclusion are central to West Chester University's mission as reflected in our [Mission Statement](#), [Values Statement](#), [Vision Statement](#) and [Strategic Plan: Pathways to Student Success](#). We disavow racism and all actions that silence, threaten, or degrade historically marginalized groups in the U.S. We acknowledge that all members of this learning community may experience harm stemming from forms of oppression including but not limited to classism, ableism, heterosexism, sexism, Islamophobia, anti-Semitism, and xenophobia, and recognize that these forms of oppression are compounded by racism. Our core commitment as an institution of higher education shapes our expectation for behavior within this learning community, which represents diverse individual beliefs, backgrounds, and experiences. Courteous and respectful behavior, interactions, and responses are expected from all members of the University. We must work together to make this a safe and productive learning environment for everyone. Part of this work is recognizing how race and other aspects of who we are shape our beliefs and our experiences as individuals. It is not enough to condemn acts of racism. For real, sustainable change, we must stand together as a diverse coalition against racism and oppression of any form, anywhere, at any time.

Resources for education and action are available through WCU's [Office for Diversity, Equity, and Inclusion](#) (ODEI), DEI committees within departments or colleges, the student [ombudsperson](#), and centers on campus committed to doing this work (e.g., [Dowdy Multicultural Center](#), [Center for Women and Gender Equity](#), and the [Center for Trans and Queer Advocacy](#)). Guidance on how to report incidents of discrimination and harassment is available at the University's [Office of Diversity, Equity and Inclusion](#).

Emergency Preparedness

All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

Electronic Mail Policy

It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.