
PHYS 601

Selected Topics in Astrophysics

Course description

Advanced treatment of the theoretical foundations of astrophysics. Topics will include radiative transfer, magnetohydrodynamics, stellar structure, stellar evolution, planet formation, planetary atmospheres and interiors, and cosmology.

Course Objectives

Upon completion, the student will have gained exposure to the three main areas of astrophysics: stellar, planetary, and extragalactic. The student should be able to understand the physical properties of stars (their structure and evolution) and planets (formation and structure) through detailed theoretical reasoning. The student will also understand and be able to apply the equations of radiative transfer and magnetohydrodynamics. The student will also gain a theoretical understanding of cosmology.

Course Prerequisites

PHYS 375, PHYS 402, and PHYS 410. All pre-requisites will be strictly enforced. None of the pre-requisites can be taken concurrently with this course.

Expanded course description

This course is for graduate students who want to have a thorough understanding of the tools of astrophysical theory and its main pillars.

Grading

The grade will range from 0 to 100, and then converted to letter format. Plus and minus grades (i.e. B+) will be used. The conversion is

A	95-100	C	73-76
A-	90-94	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B-	80-82	D-	60-62
C+	77-79	F	Under 60

Fall 2015 (Class #19589)

Monday and Wednesday 5:00 - 6:15 PM

Location: Live Oak (LO1127)

Instructor: Prof Wladimir Lyra

E-Mail: wlyra@csun.edu

Phone: 818.677.7464

Office: Live Oak, 1119-G

Office Hours: Mondays, 4:00 - 5:00 PM

Materials

- Main Textbook: **An Introduction to Modern Astrophysics**, Carroll & Ostlie, 2nd edition (ISBN-13: 978-0805304022, ISBN-10: 0805304029).
- Scientific calculator (or computer)
- **CSUN Moodle** will be used for lecture notes, pre-lecture check-points, in-class and group uploads.

Milestones – Class Presentations for Extra Credit

Wednesday, 12/9/2015



There will be 7 homework assignments. There will be no make-ups. If homework is not turned in at the due date, you are accepting a grade of zero for it. Each will be worth 1/8 towards the final grade. Homework alone will thus account for 87.5% of your grade. The remaining 12.5% will be determined by class participation. In addition to the homework assignments, a student will be randomly selected to present in the blackboard the solution to one of the problems. Throughout the duration of the course, each student will be called once.

Homework (7 assignments): 87.5%.

In-class problem solution: 12.5%.

Extra credit will be given in most homeworks. Also, by the end of the course each student will be given the chance to earn further extra credit by doing a presentation. The presentation will be worth extra 12.5% points.

The final presentations will be based on recent (typically within 10 years) journal articles that relate to the content of the course. The choice of the article is up to the student, but the instructor must approve the article beforehand. The presentations should be about 20 minutes long (+ 5 minutes for questions), and are informal. Students should introduce the subject clearly and identify where the paper uses what we are studying.

Textbooks

We will use mainly Carroll & Ostlie's "An Introduction to Modern Astrophysics". You do not need to buy the book as it will be made available to you at the Library. However, Carroll & Ostlie is a comprehensive and clear compilation of topics, useful for a student of astronomy coming from a physics background. For those pursuing astrophysics in the future, I recommend having a copy.

Several other books will be used too. Random chapters from the following books may appear in the coursework:

- 1) Radiative processes in Astrophysics, Rybicki & Lightman
- 2) Introduction to Stellar Astrophysics, volume 3, Böhm-Vitense.
- 3) Stellar interiors: Physical Principles, Structure, and Evolution. Hansen & Kawaler.
- 4) Astrophysics for Physicists, Choudhuri, A.
- 5) Astrophysics of Planet Formation, Armitage
- 6) Planetary Sciences, de Pater & Lissauer
- 7) The physics of fluids and plasmas, Choudhuri
- 8) Solar System Dynamics, Murray & Dermott
- 9) An Introduction to Plasma Astrophysics and Magnetohydrodynamics, Goossens

Course notes

Lectures will mainly be standard blackboard lectures with exercises, but slides, images, and videos will be used when appropriate. In such case, they will be posted on Moodle. The notes will be posted on Moodle, but students are encouraged to take their own hand-written notes.

Topics to be covered

This is a preliminary list of the topics that will be covered. The list is dynamic and will be updated as the course goes, based on how in-depth we decide to go on some topics and also the interests of the class.

Class #	Dates	Topic
1	8/24	General overview.
2-3	8/26,31	Radiative transfer
4-5	9/2,9	Radiative transfer.
6-7	9/14,16	Stellar structure.
8-9	9/21,23	Stellar evolution.
10-11	9/28,30	Planet formation.
12-13	10/5,7	Planetary interiors.
14-16	10/12,14,19	Magnetohydrodynamics.
17-18	10/21,26	Magnetohydrodynamics.
19-20	10/28, 11/2	Parker wind. Planetary interiors.
21-22	11/4,9	Planetary atmospheres. Icy moons.
23-24	11/16,18	Galaxies – overview.
25-26	11/23,25	Cosmology.
27-30	11/30–12/7	Cosmology.

Student Responsibility

You, as the student, are responsible for all material presented in class and in assignments, and for any announcements made during class time (which may include changes to the schedule), whether you are present or absent. It is your responsibility to attend and keep up with the rhythm of the class.

Class attendance is essential for the understanding of the material. If you should decide to drop the class, you must do so before the deadline listed in the schedule of classes, or a grade will be assigned. Dropping the class is the student's responsibility, not the instructors.

Use of Laptop Computers & Mobile Phones

You may use a laptop computer in the classroom only for class purposes. You may not surf the web, play games, or engage in any activity, which I would consider disruptive to you, or students around you. Mobile phones must be turned to silent mode, and can only be used to participate in class. You may not use your portable phone in lieu of a scientific calculator.

Use of Listening, Video, or Other Recording Device

The use of any electronic listening, or recording devices by anyone in class are not permitted. If you need to use a recording device as an authorized disability accommodation, you must provide me with verification from the Disability Resources and Educational Services (DRES) prior to the use. The DRES office is located in Bayramian Hall, room 110 and can be reached at 818.677.2684.

Disability Accommodation Statement

If you have a disability and need accommodations, please register with the DRES office or the National Center on Deafness (NCOD). NCOD is located on Bertrand Street in Jeanne Chisholm Hall and can be reached at 818.677.2611. If you would like to discuss your need for accommodations with me, please contact me to set up an appointment.

Academic Dishonesty Policy

Violations of Academic Integrity include, but are not limited to: cheating on an exam, plagiarism, working together on an assignment, paper, or project when the instructor has specifically stated students should not do so, submitting the same piece of work to more than one instructor, or allowing another individual to assume one's identity for the purpose of enhancing one's grade. Cheating will result in a letter grade of "F" equivalent to zero points for that particular assignment and/or test, any previous assignments will be called into question, and may result in a final grade of "F" for the course. Dishonesty will be dealt with along the University's guidelines and reported to the office of Student Affairs.

Support Services for Students

- . Learning Resource Center: <http://www.csun.edu/lrc/>, 818.677.2033, Bayramian Hall 408. The mission of the LRC is to enable students to improve their academic performance through a variety of learning programs including workshops, one-on-one and group tutoring, Supplemental Instruction classes and interactive subject area computer programs and videos. Students who use LRC learning programs will develop and strengthen their critical thinking skills, study strategies, writing skills and performance in subject matter courses.
- . Academic Advisement: <http://www.csun.edu/ugs/advisement.html>. The college-based academic advisement centers are available to assist students in selecting courses and programs of study and in choosing or declaring a major or minor. Visit the website to locate the advising center for your major, or for undeclared majors.
- . University Counseling Services: <http://www.csun.edu/counseling/>, 818.677.2366, Bayramian Hall 520. UCS provides resources and information to assist students in dealing with a variety of large and small psychological obstacles that may interfere with academic progress and/or relationship satisfaction. Services include individual, group and crisis counseling.
- . Center on Disabilities: <http://www.csun.edu/cod/studentservices.htm>, 818.677.2684, Bayramian Hall 110. The Center on Disabilities serves students with a wide range of visible and hidden disabilities, in a confidential environment. Students are encouraged to meet with the professional staff and explore the services available to support their academic, career and personal goals. Discover accommodations and strategies for help with disabilities in an academic setting.
- . The Career Center: <http://www.csun.edu/career/students/>, 818.677.2878, University Hall 105. Need some help in deciding on a career? Or do you know your career and need to meet employers? Perhaps your resume needs some sprucing up? The Career Center offers a variety of services for students, from those new to the University to those about to graduate into the world of work.

This syllabus may be subject to change.