
SFSU Astronomy 400/700: Stellar Astrophysics

Prof. Joseph Barranco
Thornton 308, (415) 338-2450

barranco@sfsu.edu
www.physics.sfsu.edu/~barranco

Lectures & Office Hours

Lectures: MWF 14:10–13:00 in Trailer O-2.

Office Hours: WF 13:10-14:00, 15:10-16:00, Thornton 308

Quick note on e-mail contact

So that I can identify and respond to e-mails from you expeditiously, please put [ASTRO400] or [ASTRO700] at the beginning of the subject line.

Course Overview & Objectives

Astronomy 400/700 is an introduction to the theory of stellar astrophysics: the birth, life and death of stars. Topics include: stellar properties from observation; stellar spectra & atmospheres; equations of state & stellar interiors; energy generation (gravity, nuclear fusion) and energy transport (radiation, convection); star formation; stellar evolution, death, and end states (white dwarfs, neutron stars, black holes). If time permits, we may cover binary evolution, stellar pulsations, and/or the solar cycle.

Course objectives and student learning outcomes include:

- (1) To understand how mechanics, electromagnetism, thermodynamics & statistical mechanics, quantum mechanics, and relativity are all necessary to understand the nature of stars.
- (2) To qualitatively & quantitatively describe the life-cycle of stars: birth, life, and death.
- (3) To develop and apply mathematical tools (vector calculus, linear algebra, differential equations, numerical/computational methods) to solve problems in stellar astrophysics.
- (4) To discuss how experimental observations are used to inform scientific theory, and vice versa.

Learning Resources

- (1) Carroll & Ostlie, “An Introduction to Modern Astrophysics,” 2nd edition (2007),
- (2) Access to computer and mathematical software such as MATLAB, Mathematica, IDL, or Python (for graphing and numerically solving differential equations).

Useful Websites

- (1) ilearn.sfsu.edu – Course website. Please check frequently for new announcements, updates to the syllabus & schedule, tips & tricks on the homework, and links to additional resources.
- (2) <http://www.pas.rochester.edu/~emamajek/sun.txt> – Up-to-date data for the Sun.
- (3) <http://www.astro.wisc.edu/~dolan/constants/calc.html> – Astro-physical calculator: an online calculator with buttons for fundamental constants and astronomical data
- (4) <http://mathworld.wolfram.com/> – Wolfram Mathworld
- (5) <http://scienceworld.wolfram.com/physics/> – Wolfram World of Physics

Recommended Preparation

- (1) Math 228 (Calculus III) & Math 245 (Elementary Differential Equations & Linear Algebra)
- (2) Physics 320 (Modern Physics I)
- (3) Astronomy 300 (Stars, Planets & the Milky Way)

Please see me if you have any concerns about your preparation.

Assignment of Grades

Grades will be determined by your performance on homework (40%), 2 in-class exams (10% each), a final exam (30%), and end-of-semester project (10%).

As required by university policy for paired courses, students enrolled in Astronomy 700 will have additional reading and longer, more challenging homework assignments. The midterm and final exam will also have take-home components for graduate students.

Letter grades will assigned according to the following scheme:

A: 90.0% – 100.0%	A-: 85.0% – 89.9%	
B+: 80.0% – 84.9%	B: 75.0% – 79.9%	B-: 70.0% – 74.9%
C+: 65.0% – 69.9%	C: 60.0% – 64.9%	C-: 55.0% – 59.9%
D+: 50.0% – 54.9%	D: 45.0% – 49.9%	D-: 40.0% – 44.9%

Homework

You cannot learn physics solely from lectures. You must work through many problems, seeing how the theoretical concepts discussed in lecture apply in various contexts. Homework is an integral part of the learning process; how serious you take the homework will ultimately determine how much you will understand physics and how well you will do in the course overall. There will be approximately one homework assignment per week. Most problems will require analytic solutions, however there will usually be one problem per assignment that will involve graphing and numerical solution with computer software such as Microsoft Excel, MATLAB, Mathematica, or Python.

You can turn in one assignment up to one week late for any or no reason, with no penalty. After that, unexcused late homework assignments will be penalized 25% per week (including Thanksgiving week). All requests for excused lateness will require external documentation.

Policy on Collaboration & Academic Integrity

You are strongly encouraged to discuss course material with your fellow classmates. When working on homework, first try to solve the problems on your own. Struggle. Struggle some more. If you get stuck, feel free to discuss overall methods and approaches with your classmates, but not the details! Your written solutions should be solely your own, and should be written-up in isolation from your fellow classmates. Copying is strictly prohibited. Using the internet to download solutions manuals is also considered cheating. Cheating via any method on exams will result in a grade of zero on that exam and being reported to the department chair and/or college dean for possible discipline. Please see the official plagiarism and academic ethics policies for the Department of Physics & Astronomy at: www.physics.sfsu.edu/Academics/Policy.html.

Add, Drop, Withdrawal & Repeat Policy

The add/drop deadline is Wednesday, September 13. You can drop yourself from the class online without any penalty and without any record, for any reason. After September 13, students must petition for an official withdrawal. **The withdrawal deadline is Friday, November 17.** Documents must be provided to support the petition to withdraw. If the petition is approved, the designation "W" will appear on the transcript. Students are only allowed to repeat a class once at SFSU. Note that designations of W, WU, NC count toward this limit.

Expected Code of Conduct

Classroom discussion and participation are strongly encouraged. However, please refrain from unrelated chatter. Also, please remember to place cell phones and other electronic communication devices on silent or vibration mode so as not to distract your fellow classmates. If you must arrive late or leave early, please sit toward the back of the room near the doors so as to minimize disruption.

Disability Access

Students with disabilities who need reasonable accommodations are encouraged to contact me early in the semester. The Disability Programs and Resource Center is available to facilitate the reasonable accommodations process. The DPRC, located in Student Services Building 110, can be reached by phone at 415-338-2472 (voice/TTY) or by e-mail at dprc@sfsu.edu.

Religious Holidays

The faculty of SFSU shall accommodate students wishing to observe religious holidays when such observances require students to be absent from class activities. It is the responsibility of the student to inform the instructor, in writing, about such holidays during the first two weeks of the class each semester. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed.

Student Disclosures of Sexual Violence

SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the Dean of Students. To disclose any such violence confidentially, contact:

The SAFE Place - (415) 338-2208; http://www.sfsu.edu/~safe_plc/

Counseling and Psychological Services Center - (415) 338-2208; <http://psyservs.sfsu.edu/>

For more information on your rights and available resources - <http://titleix.sfsu.edu>