

AST 210K: Exploring the Physics of the Universe with White Dwarf Stars

Spring 2023, unique # 47925

Class Meets: F 2 – 3pm, PMA 15.201

Research Educator: Mike Montgomery (“Mike”)

Office: PMA 16.230

Email: mikemon@astro.as.utexas.edu

Phone: (512) 471-3451

Lab times: TBD, PMA 15.201 (in-person)

Faculty Stream Leader: Don Winget (“Don”)

Office: PMA 16.236

Email: dew@astro.as.utexas.edu

Phone: (512) 471-3404

Mentors: Bryce Hobbs (brycehobbs@utexas.edu), Abriana Himantog (abriana.himantog@utexas.edu), Emily Wade (emwade101@gmail.com), Galina Bouyer (gbouyer@utexas.edu), Mercury Robertson (garrett.robertson@utexas.edu), Lipika Chatur (chaturlipika@gmail.com), Marissa Perry (mp944@utexas.edu), Rahul Shaji (rahulshaji@utexas.edu), Urvi Thakurdesai (urvitd@hotmail.com), Carolina Navarrete (ca.navarrete01@gmail.com), Colin Johnson (c.johnson115935@gmail.com)

Course Description

We will have weekly “lecture” meetings. There will also be “laboratory” times when you do laboratory/research assignments, either by remotely or in-person logging into computers in the 15th floor computer lab of PMA 15.201.

University Catalog Course Description: Designed for science majors. Prerequisite: Consent of instructor or adviser. Additional hour(s) to be arranged. Restricted to students in the Freshman Research Initiative.

What will I learn?

Main skills and attitudes to be developed:

- Programming (in Python)
- How to conduct independent research
- Presentation of results
- Critical reading of scientific texts

Learning Outcomes

1. Ability to organize and follow through on a research project
2. Increased proficiency in programming
3. Greater confidence in making presentations

How will I learn?

This course is the first semester of the FRI Astronomy Stream. The first part of the course will focus on introductory labs in which you will acquire new knowledge and skills for future work in this stream. The second part of this course will mainly focus on working on an independent research project in a group. There will be a one-hour lecture per week as well as time spent (3-6 hours) in the computer lab working remotely on the labs and research project.

Pre-requisites for the course: Consent of instructor or adviser.

How to succeed in this course:

Since research is, by its very nature, open-ended, you will not be graded on whether you have “finished” or “completed” your project, although that is always the goal. Rather, you will be evaluated on the level of effort and ingenuity that you exhibit as you try to overcome the problems that invariably arise in research. Research takes time and can’t be rushed in the same way that you can cram for a test the night before.

Course Requirements

Required Materials

1. A “notebook.” For the first time, we will be using electronic notebooks instead of physical ones. The notebook is a place where you not only write notes about the techniques you learn in the labs; you also should write general notes from the lecture part of this course. The notebook will be a Google Doc that we help you set up and share with us. These will be graded/looked at online by the mentors during the semester.
2. A textbook is not required for this course. However, in the second semester of this course (which is optional) we will use the following text: *Unlocking the Secrets of White Dwarf Stars*, by Hugh Van Horn, ISBN: 3319093681 (e.g., <https://www.amazon.com/Unlocking-Secrets-White-Astronomers-Universe/dp/3319093681>, ~\$30 new)

Classroom expectations

Class attendance

You are expected to attend the weekly 1-hour lecture (on Zoom initially and later returning to in-person) of this course.

Class participation

You are expected to interact and participate during class and (of course!) during the laboratory times!

Grading for this Course

The table below describes the various contributions of the different parts of this course to your total grade:

Class Participation/Interaction	25%
Labs and Quizzes	25%
Research Project	50%

Course Outline

All instructions, assignments, readings, rubrics and essential information will be on the Canvas website for AST 210K at <https://utexas.instructure.com>. Check this site regularly and use it to ask questions about the course schedule.

The current schedule has the following lab topics. The first lab week will be Jan 16—20:

Week 1 (Jan. 16—20): Introduction to Unix commands and “Jupyter” (Python) notebooks using the 15th floor Macs.

Week 2 (Jan. 23—27): End of Python crash course, data analysis with Python.

Week 3 (Jan. 30—Feb. 3): CCD Data Reduction with Python.

Week 4 (Feb. 6—10): Time series photometry reductions using *Jupyter* notebooks and *Numpy*.

Week 5 (Feb. 13—17): Fourier transforms, effects of sampling and noise.

Week 6 (Feb. 20—24): *Stellarium* and the night sky.

Week 7 (Feb. 27—Mar. 3): Using the MESA stellar evolution program.

Week 8 (Mar. 6—Mar. 10): (optional/makeup lab) Seismology of a string.

Spring Break (Mar. 13—17): *We plan to take a few students observing at McDonald Observatory during this time*

After Spring Break, you will begin your research projects, which are due at the end of the semester.

The last class day is **April 21st**. All assignments and projects will be due on this day.

Policies

Astronomy Policies

As a general orientation to Astronomy policy and classes at UT you should check out

<https://astronomy.utexas.edu/academics/undergraduate-program/memo-to-undergraduate-astronomy-student>

Classroom Policies

Grading Scale

Grade	Cutoff
A	>92%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D	60-69%
F	<60%

Late work

Late work will be handled on a case-by-case basis. Unless arrangements were made in advance, you will most likely lose points.

Absences

Class attendance is 5% of your grade. You will start to lose points after your second absence.

Student Rights & Responsibilities

- You have a right to a learning environment that supports mental and physical wellness.
- You have a right to respect.
- You have a right to be assessed and graded fairly.
- You have a right to freedom of opinion and expression.
- You have a right to privacy and confidentiality.
- You have a right to meaningful and equal participation, to self-organize groups to improve your learning environment.
- You have a right to learn in an environment that is welcoming to all people. No student shall be isolated, excluded or diminished in any way.



With these rights come responsibilities:

- You are responsible for taking care of yourself, managing your time, and communicating with the teaching team and with others if things start to feel out of control or overwhelming.
- You are responsible for acting in a way that is worthy of respect and always respectful of others.
- Your experience with this course is directly related to the quality of the energy that you bring to it, and your energy shapes the quality of your peers' experiences.
- You are responsible for creating an inclusive environment and for speaking up when someone is excluded.
- You are responsible for holding yourself accountable to these standards, holding each other to these standards, and holding the teaching team accountable as well.

Personal Pronoun Preference

Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

University Policies

Academic Integrity

Each student in the course is expected to abide by the University of Texas Honor Code: *"As a student of The University of Texas at Austin, I shall abide by the core values of the University and uphold academic integrity."*

Plagiarism is taken very seriously at UT. Therefore, if you use words or ideas that are not your own (or that you have used in a previous class), you must cite your sources. Otherwise you will be guilty of plagiarism and subject to academic disciplinary action, including failure of the course. You are responsible for understanding UT's Academic Honesty and the University Honor Code which can be found at the following web address: http://deanofstudents.utexas.edu/sjs/acint_student.php

Q Drop Policy

If you want to drop a class after the 12th class day, you'll need to execute a Q drop before the Q-drop deadline, which typically occurs near the middle of the semester. Under Texas law, you are only allowed six Q drops while you are in college at any public Texas institution. For more information, see:

<http://www.utexas.edu/ugs/csacc/academic/adddrop/qdrop>

University Resources for Students

Your success in this class is important to me. We will all need accommodations because we all learn differently. If there are aspects of this course that prevent you from learning or exclude you, please let me know as soon as possible. Together we'll develop strategies to meet both your needs and the requirements of the course. There are also a range of resources on campus:

Services for Students with Disabilities

This class respects and welcomes students of all backgrounds, identities, and abilities. If there are circumstances that make our learning environment and activities difficult, if you have medical information that you need to share with me, or if you need specific arrangements in case the building needs to be evacuated, please let me know. I am committed to creating an effective learning environment for all students, but I can only do so if you discuss your needs with me as early as possible. I promise to maintain the confidentiality of these discussions. If appropriate, also contact Services for Students with Disabilities, 512-471-6259 (voice) or 1-866-329- 3986 (video phone). <http://ddce.utexas.edu/disability/about/>

Counseling and Mental Health Center

Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available

on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. <http://www.cmhc.utexas.edu/individualcounseling.html>

The Sanger Learning Center

Did you know that more than one-third of UT undergraduate students use the Sanger Learning Center each year to improve their academic performance? All students are welcome to take advantage of Sanger Center's classes and workshops, private learning specialist appointments, peer academic coaching, and tutoring for more than 70 courses in 15 different subject areas. For more information, please visit <http://www.utexas.edu/ugs/slc> or call 512-471-3614 (JES A332).

Undergraduate Writing Center: <http://uwc.utexas.edu/>

Libraries: <http://www.lib.utexas.edu/>

ITS: <http://www.utexas.edu/its/>

Student Emergency Services: <http://deanofstudents.utexas.edu/emergency/>

Important Safety Information:

If you have concerns about the safety or behavior of fellow students, TAs or Professors, call BCAL (the Behavior Concerns Advice Line): 512-232-5050. Your call can be anonymous. If something doesn't feel right – it probably isn't. Trust your instincts and share your concerns.

The following recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767, <http://www.utexas.edu/safety/>

Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.

- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- Link to information regarding emergency evacuation routes and emergency procedures can be found at: www.utexas.edu/emergency
- For any concerns concerning a discriminatory or racist climate, contact the [Campus Climate Response Team](#).