ASTR 288C

Special Projects in Astronomy: Astronomy Research Techniques

Fall 2016 Syllabus

Time/Place: Monday 3:30-5:15pm, in ATL 0224

Course Website:
http://userpages.umbc.edu/~alien/ASTR_288C/Index.html
(Regularly updated with lecture and homework info; check frequently)

Instructor: Dr. Amy Lien
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301-286-3624

Office Hours: Friday 4:30-5:30pm or by appointment
in ATL 0251A

Textbook: none

Course Description

Astronomy 288C is a two-credit course designed as a hands-on introduction to astrophysical research. This course is an intermediate level course for astronomy majors. Students should have basic computer skills, and be familiar with first-year mathematics and physics, and basic astronomical concepts. The research projects in modern astrophysics are generally computationally intensive, but we will work to ensure all students gain proficiency in the necessary computing skills. The objective of the course is to introduce students to how real astrophysical research is conducted.

Topics that will be discussed include:

- scientific method and high energy astrophysics basics
- X-ray and γ-ray instrumentation and characteristics
- catalogs, databases, and data formats
- simulations and programming
- science communication and literature searches
- statistics and signal detection
- data and error analysis
- spectroscopic and timing studies of X-ray and γ-ray sources
- independent research

Typically, each class will consist of short lecture followed by a lab during which students will gain direct experience with astrophysical data analysis. The labs are meant to demonstrate how the material in the lecture is applied. Each lab will have a short task to complete. The labs build upon each other, thus it is important to complete the labs in order. If a student run out of time or get stuck on a particular lab task, we will be happy to assist them during office hours. The computer lab is open throughout the semester.

In addition to normal class discussions and labs, each student will work on a final research project, which will include written and oral components. The last two classes are reserved for final research projects.

Coursework and Grading

There are no exams. The course grade is composed from the following:
• Lab/Participation (15%)
• Homework (45%)
• Research Project (20% Paper, 20% Presentation)

Lab/Participation

There is one class per week: we expect you to attend. **No more than one unjustified absence is permitted**; please use this free pass wisely.

Students need to complete a worksheet during each lab session. We expect you to turn in the worksheet at the end of the lab. However, if you run out of time, you may notify the instructor during the lab and turn in the worksheet at the beginning of the next lab. We will be happy to assist you during office hours.

If absent from class, you would need to familiarize yourself with the class material, complete and turn in the worksheet at the beginning of the following class. The class material will be needed for future labs, homework assignments, and the research project.

Please notify us of any projected absence within three weeks.

Homework

Each class has an accompanying assignment that delves into the subject matter in more detail than the lab. **It is due at 3:30pm on the Monday (beginning of the class)** of the following week.

You are expected to complete and submit the assignment even if you did not attend the class. It is your responsibility to make sure that your assignment is delivered.

Late assignments will be accepted within one week after the original due date, but the grade will be decreased by 50%. Your lowest homework grade will be dropped when calculating your final grade for the course.

Research Project

Each student will work on an original research project, culminating in a written report and oral presentation. Projects are designed to enable students to apply and integrate the skills covered in the lectures, labs, and homework. This requires a significant part of the course will be devoted to working intensively on the projects, with instructors available for feedback. Drafts of the papers will be reviewed, and you will receive a written referee report prior to final submission. Your final paper and response to the referee are due during the Finals Week session (date and time, to be determined). An oral report of your project results will be presented at that time.

Academic Integrity and Plagiarism

It is the responsibility of the students to be aware of, and comply with, all University policies, including those which are not explicitly mentioned in this syllabus. Students must be fully familiar and comply with the University Code of Academic Integrity, as detailed at http://www.president.umd.edu/policies/iii100a.html.

There is a zero tolerance policy with respect to incidents of academic dishonesty, including cheating, fabrication, facilitation, and plagiarism.

Schedule (tentative)

Week	Date	Lecture	Lab
1	08/28/2017	Introduction and overview, astronomy basics	UNIX environment
2	09/04/2017	Labor day	
3	09/11/2017	Stellar explosion	Literature search and reference
4	09/18/2017	Gamma-ray bursts	Latex
5	09/25/2017	The research process	Proposal discussion
6	10/02/2017	Gamma-ray and X-ray astronomy	BAT and XRT database
7	10/09/2017	Simulation and programming I	Python I
8	10/16/2017	Simulation and programming II	Python II
9	10/23/2017	Statistical analysis	Likelihood analysis
10	10/30/2017	Temporal analysis	Burst duration and light curve
11	11/06/2017	Spectral analysis	Making spectrum and rsp files
12	11/13/2017	Spectral modelling	Spectral fitting
13	11/20/2017	Scientific proposal	Discussion of student proposals
14	11/27/2017	Science communication	Project discussion
15	12/04/2017	Dedicated time for research project	Individual research
16	12/11/2017	Dedicated time for research project	Individual research
17	TBD	Final exam (oral presentation)	