Astronomy 220: New Discoveries in Astronomy

Winter 2021 (3 credit hours)

INSTRUCTOR: Mark T. Reynolds

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Office Hours: T/Th 1700-1900 and by appointment.

COURSE WEBSITE: https://umich.instructure.com/courses/419289

COURSE PREREQUISITES: Any one of PHYSICS 112, ASTRO 101/102/104/105/105/142/101, or permission of instructor (don't be shy!).

TEXTBOOK: ** Optional **

There is no assigned textbook. Reading assignments will be announced each week, using material from web sites, or downloadable from the Canvas site. However, unless you consider yourself to be knowledgeable in the field, you may acquire a general astronomy text of the type used in ASTRO 101 and 102, to use as a reference. A used copy of any recent edition of such a text can be purchased cheaply. For example;

"The Cosmic Perspective" (5th, 6th, 7th Editions are good) – Bennett et al. (Amazon link)

Additional texts and reference material may be mentioned on an as needed basis

<u>CLASS and ATTENDANCE:</u> The class will meet on Tuesday and Thursday **on Zoom** from 13:00 to 14:20 for lectures and discussions.

Reading assignments will be announced promptly in class and posted on the Canvas site. You are expected to have read the assigned material **before** arriving to class on the day it is to be considered. Class time will be devoted to the consideration of issues that either amplify the material presented in the text and/or clarify the text's treatment of a given topic. Active discussion of the astrophysics under consideration will be a crucial part of this class.

You are encouraged to ask questions about anything that you have read in the text and/or any ancillary references or that was discussed previously. It is your responsibility to bring to light issues that you believe to require additional explanation.

COURSE DESCRIPTION

In this class you will learn about and discuss the latest discoveries in astronomy with leading scientists from around the nation. In this course, our weekly professional visitors will make in-class presentations on their research. You will have the opportunity to discuss the techniques, significance, and scientific context of their work with both the visitor and the instructor.

For the winter 2021 semester, we will learn about a wide array of astronomical research, ranging from the current status of, and prospects for the ELT, exploring the solar system, the evolution of proto-planetary systems, to billion solar mass black holes feeding at feverish rates and their impact on the galaxies in which they reside and the mysterious dark energy component that dominates the energy budget of the Universe. You will also get the opportunity to hear about the frontier research being carried out by the world class faculty in the University of Michigan.

COURSE OUTLINE (Winter 2021):

Date	Activity
Week 1 – Jan 19	**Introduction (N.B: no class on Thur Jan 21st)**
Week 2 – Jan 26/28	**#1 Ted Bergin – The ELT**
Week 3 – Feb 2/4	**#2 Pat Seitzer – Low Earth Orbit**
Week 4 – Feb 9/11	**#3 tbd**
Week 5 – Feb 16/18	**#4 Dani Atkinson – Instrumentation & Exoplanets**
Week 6 – Feb 23/25	**#5 Ian Roederer – Searching for Gold**
Week 7 – Mar 02/04	**#6 Dragan Huterer – Dark Energy**
Week 8 – Mar 9/11	**#7 Phil Hughes – Jets**
Week 9 – Mar 16/18	**#8 Abdu Zoghbi – BHs and AGN**
Week 8 – Mar 25	Re-charging… (I.E: Enjoy no class today)
Week 10 – Mar 30/Apr 01	**#9 Xianzhe Xia – JUICE/Europa-Clipper**
Week 11 – Apr 6/8	**#10 Jane Huang – Proto-planetary Disks**
Week 12 – Apr 13/15	**Presentations I/II**
Week 13 – Apr 20	**Presentations III, Project Paper Submission**

***** Please Note: You cannot receive credit for this class if you have already *****
***** taken 6 credits of Astro 220 or Astro 420 *****

ASSESSMENT/GRADING: Your knowledge and expertize will be demonstrated through the satisfactory completion of in-class reading quizzes, homework assignments, an independent project, and presentations.

The following assessment plan will be used to establish your overall performance in the course:

One(1) Presentation:	20%
One(1) Independent Project:	25%
Homework Assignments:	55% (class/homework, weighting tbd.)

Total:	100%

Your final grade for the course will be determined by your overall average for the various assessment components according to the following absolute assessment scale:

$85 \leq A \leq 100$
$70 \leq B < 85$
$55 \leq C < 70$
$40 \leq D < 55$
$E < 40$

Grade modifiers (pluses and minuses) may be determined by suitably sub-dividing each of these letter grade ranges, i.e., 84.99 == B+.

Homework assignments of varying length will be made throughout the term to accompany each major topic of the course, and will generally be due the following week. I will be happy to consult with you during office hours, by e-mail or at the start of our regularly scheduled class periods about any questions or difficulties you may have concerning the homework exercises.

In addition to the previously mentioned elements of the assessment plan for the course, you will be required to complete an independent project and make a presentation. The purpose of the project is to permit you to pursue in more depth topics we may touch upon in class or to investigate issues related to frontier astronomical research that we will not have had time to consider explicitly in class.

The nature and scope of the activities that may be undertaken within the framework of the project are quite broad, and you are encouraged to consider ones that can profit from collaboration with one (or more) of your colleagues in class. I will have more specific suggestions and recommendations to make about these projects as the term progresses, but you should bear in mind that: (1) all projects must be approved in consultation with the instructor on or before **Mar 2nd** ("Decision Day"); (2) a rough draft/outline of your project must be provided to the instructor **by Mar 18th** ("Draft Day") so that appropriate feedback and guidance may be given on the format, content, and plan for the project; and (3) all project reports must be received by the instructor at the start of our final class day of the term, **Apr 20th** ("Display Day").

**** Late projects will not be accepted and will receive no credit. ****

Class Plan:

Tuesday class

- A reading assignment will be set a week before each presentation, and should be completed by the Tuesday class. Your report on the previous weeks' speaker is due.
- In class each Tuesday we will discuss the background, concepts and some technical details of the upcoming presentation; this might include taking time out to write a short summary of some facet of the material, including the assigned reading, and formulate potential questions for Thursday. Brief presentations on these will be made by selected members of the class.

Thursday class

- In class each Thursday the visitor will present a shortened version of the colloquium that they will give later in the day, and you will have the opportunity to ask questions and interact with the speaker. Your report on the reading assignment is due.

Homework (ongoing - 55%)

- Typically, your reading report/homework will be due in class on Thursday and your report on our guest speaker is due the following Tuesday.

Project Report (25%)

- You can choose any of these reports (but the subjects could be quite different) and expand it into a paper (worth 25% of the course grade); this paper is due by **5pm on Tuesday, Apr 20th (end of term). Late projects will not be accepted and will receive no credit.**

Presentation (20%)

- During the final classes, each student will make a 10+2min presentation (10min talk + 2min for questions) on the topic presented in the above report.

Classroom Culture of Care

LSA is committed to delivering our mission while aiming to protect the health and safety of the community, which includes minimizing the spread of COVID-19. Our entire LSA community is responsible for protecting the collective health of all members by being mindful and respectful in carrying out the guidelines laid out in our Wolverine Culture of Care and the University's Face Covering Policy for COVID-19. Individuals seeking to request an accommodation related to the face covering requirement under the Americans with Disabilities Act should contact the Office for Institutional Equity.

In our classrooms all students are expected to adhere to the required safety measures and guidelines of the State of Michigan and the University of Michigan, including sanitizing their work areas, maintaining 6 feet or more of personal distance, wearing a face covering that covers the mouth and nose in all public spaces, and not coming to class when ill or in quarantine. This course will also limit group gatherings while being thoughtful about classroom activities and exercises that require collaboration.

Any student who is not able and willing to comply with campus safety measures for this [in-person/hybrid] course should contact the course instructor or their academic advisor to discuss alternate participation or course options. Students who do not adhere to these safety measures while in a face-to-face class setting, and do not have an approved exception or accommodation, may be asked to [participate on a remote basis or - include if available option] disenroll from the class.

For additional information refer to the LSA Student Commitment to the Wolverine Culture of Care and the OSCR Addendum to the Statement of Student Rights and Responsibilities on the OSCR website.

While the above details may not be as relevant in the online-only setting, the sentiment expressed therein applies broadly to all we do here as members of the University of Michigan community.

Commitment to Equal Opportunity

We are committed to a policy of equal opportunity for all persons and do not discriminate on the basis of race, color, national origin, age, marital status, sex, sexual orientation, gender identity, gender expression, disability, religion, height, weight, or veteran status. Please feel free to contact us with any problem, concern, or suggestion. We ask that all students treat each other with respect.

Student Mental Health and Wellbeing

University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at (734) 764-8312 and https://caps.umich.edu/ during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult University Health Service (UHS) at 734-764832 and https://www.uhs.umich.edu/mentalhealthsvcs, or for alcohol or drug concerns, see www.uhs.umich.edu/aodresources. For a listing of other stress & mental health resources available on and off campus, visit: https://uhs.umich.edu/stressresources.

Students with Learning Disabilities

The University will make reasonable accommodation for persons with documented disabilities that affect learning. If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Services for Students with Disabilities (SSD) office to help us determine appropriate academic accommodations. SSD (734-763-3000; http://ssd.umich.edu) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. Any information you provide is private and confidential and will be treated as such.

Academic Integrity

The LSA undergraduate academic community, like all communities, functions best when its members treat one another with honesty, fairness, respect, and trust. The College holds all members of its community to high standards of scholarship and integrity. To accomplish its mission of providing an optimal educational environment and developing leaders of society, the College promotes the assumption of personal responsibility and integrity and prohibits all forms of academic dishonesty and misconduct. Academic dishonesty may be understood as any action or attempted action that may result in creating an unfair academic advantage for oneself or an unfair academic advantage or disadvantage for any other member or members of the academic community. Conduct, without regard to motive, that violates the academic integrity and ethical standards of the College community cannot be tolerated. The College seeks vigorously to achieve compliance with its community standards of academic integrity. Violations of the standards will not be tolerated and will result in serious consequences and disciplinary action.

In ASTR0 220, while group work and honest collaboration between class participants is encouraged, it is expected that each class member will submit their own solutions reflecting her/his understanding of the assigned exercises. It is also expected that, on the projects, students will adhere strictly to the published guidelines for completion of these components of the assessment plan. Deviations from the stated regulations, if discovered, will result in a zero grade for the offending piece of work. Multiple infractions of the guidelines will constitute grounds for my issuing a failing grade for the course to the violator(s).

Safety

All students are encouraged to register in the campus Emergency Alert System to receive notifications during an emergency situation. The following link includes information on registering, as well as general safety and emergency tips and procedures: http://www.dpss.umich.edu/emergency-management/alert/. In case of an emergency, dial 911. Each classroom displays a poster describing procedures to be followed in the event of an emergency (fire, chemical spill, weather, etc.). You are encouraged to familiarize yourself with the location and content of these posters early in the term. If you have any questions, please consult with your instructor.