
Physics 165x

Introduction to Astronomy 4 Credits

Dr. Mark Conde



6fYU_b['bYkg]b'5ghfcbc a m: The James Webb Space Telescope (JWST) launched on December 25, 2021, after more than 20 years of planning and development. It arrived at its operational location (Earth's L2 Lagrangian point) in January 2022. After months of deployment, alignment, and commissioning, the first science images were released to the public in July of 2022. This is one of those first images, showing the edge of a young nearby star-forming region – NGC 3324 in the Carina Nebula, roughly 7,600 light years away. Thi

Overview

Description

This will be a standard 100-level undergraduate introduction to astronomy for non-science majors. It covers the science of astronomy and its societal consequences, with an emphasis on the interrelationships between astronomy and other sciences. As listed in the UAF Catalog, the topics to be covered are:

- Astronomical concepts and tools
- Earth-based and satellite observation of light
- The solar system
- Stellar astronomy
- Galaxies & Cosmology

There is an associated lab component, in which we will undertake some practical hands-on investigation of the tools and techniques used by astronomers to observe and understand the universe around us. When the weather permits, we may offer additional evening opportunities to use telescopes on the roof of the Reichardt building to observe some interesting sky objects. This part of the course is contingent upon covid-19 restrictions. It is offered solely for your interest and enjoyment, so participation in these possible sky observing sessions is voluntary.

Bachelor's degrees at UAF incorporate a common set of learning experiences known as the General Education Requirements (GER). Requirements to meet the GER in Natural Sciences can be found [here](#) or summarized [here](#). PHYS165X can be used by students to meet the University of Alaska's General Education Requirement (GER) in Natural Sciences, subject to the following stipulations:¹

Students must earn a C- grade or higher in each course used to meet a baccalaureate GER.

Natural science and mathematics credits used to satisfy general education requirements can also be used to satisfy major requirements.

GER courses are required to address some or all of the following specific requirements:

Build knowledge of human institutions, sociocultural processes, and the physical and natural world through the study of the natural and social sciences, technologies, mathematics, humanities, histories, languages and the arts.

Develop intellectual and practical skills across the curriculum, including inquiry and analysis, critical and creative thinking, problem-solving, written and oral communication, information literacy, technological competence, and collaborative learning.

Acquire tools for effective civic engagement in local through global contexts, including ethical reasoning, intercultural competence, and knowledge of Alaska and Alaska issues.

Integrate and apply learning, including synthesis and advanced accomplishment across general and specialized studies, adapting them to new settings, questions and responsibilities, and forming a foundation for lifelong learning.

In order to meet these requirements, this course will include substantial emphasis on major concepts in natural science, including:

- Consideration of the scientific method, as it applies to astronomy

¹ See <https://catalog.uaf.edu/bachelors/general-education-requirements/#generaleducationrequirementstext>

An experimental/laboratory component

Consideration of the societal relevance of astronomy, and how it interacts with public policy

Major concepts and the scientific method will be discussed in lectures during the first few weeks, and you will apply these ideas in practice during the labs. The societal importance of astronomy will also be discussed in lectures, and a number of homework questions ask you to discuss issues of societal relevance. This course is not designated as Alaska Native Themed.

GER Natural Science courses are required to undergo regular Student Learning Outcomes Assessments. One of the consequences of this is that the University may request additional feedback from you regarding your assessment of the conduct and value of this course.

The course will be closely linked to the assigned textbook (*Universe*, 9th, 10th, or 11th editions) although at times we may cover the topics in a slightly different order.

Course goals and student learning outcomes

Upon completion of this course students will:

Understand the tools and techniques of scientific study, and how these have been used to establish our current knowledge of the universe.

Be familiar with the hierarchy of objects that make up the universe, how they are distributed through space, and how Earth is placed in this universe.

Understand the basic nature of these objects – how they formed, how they behave, and what their ultimate fates are likely to be.

Be familiar in particular with the solar-system objects that are our near neighbors in space and may one day provide us with resources.

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Target schedule

| <i>Week</i> | <i>Dates</i> | <i>Topics (from the textbook Universe)</i> | <i>Labs</i> |
|-------------|-----------------|--|-------------|
| 1 | Aug 29 - Sep 02 | Class introduction, Chapter 1 | None |
| 2 | Sep 05 - Sep 09 | Chapters 2-3 | Math Review |
| 3 | Sep 12 - Sep 16 | Chapters 4-5, Quiz 1 | 1 |
| 4 | Sep 19 - Sep 23 | Chapters 6-7 | 2 |
| 5 | Sep 26 - Sep 30 | Chapters 8-9, Quiz 2 | 3 |
| 6 | Oct 03 - Oct 07 | Chapters 10-11 | 4 |
| 7 | Oct 10 - Oct 14 | Chapters 12-13, Quiz 3 | 5 |
| 8 | Oct 17 - Oct 21 | Chapters 14-15 | 6 |

Course components and instructional methods

Instructional materials

Material for this course will be prepared electronically and will be available *over the web via the "Blackboard"² system* at <https://classes.alaska.edu>. Material to be posted this way includes:

- Course syllabus (this document)
- Lecture notes (see comments below)
- Homework problem sets
- Lab notes
- Supplementary handouts
- Online student grades

Lectures

Lectures will be held face-to-face, on Tuesdays and Thursdays from 11:30 am – 1:00 pm in Reichardt room 203.

I will be presenting lectures using a combination of computer slides and additional notes, diagrams etc. drawn by hand on a whiteboard. I will post printable versions of the electronic lecture notes online ahead of time. You should read the lecture notes and the relevant chapter from *Universe* beforehand. Many students may find it helpful to annotate these notes with your own supplemental notes during the lecture.

In the (hopefully) unlikely event that we need to move to 100% online delivery, I have a dedicated video studio in the Elvey building, and would be live-streaming from there. Should this be required, I expect this setup would make for high-quality and engaging live-streaming class sessions.

Labs

Generally, each student will be ex

Homework

Homework will be assigned each week during the Thursday lecture, and will be due by 5:00 pm on Thursday of the following week. **All homework will be assigned, submitted, and graded using UAF's "Gradescope" tool.** This means your completed work must be either scanned or photographed, and uploaded to Gradescope. Here is a link to a short video explaining the homework submission process in Gradescope:

https://youtu.be/KMPoby5g_nE

There are two reasons for using Gradescope to submit homework. First, it provides verification that your work has been submitted, along with secure storage to prevent any work getting lost. Second, it allows you to submit work at any time, without needing to be on campus or have access to a physical submission box. The reason the homework deadlines are on Thursday is to allow you to speak to your lab instructor during the Tuesday lab session if you need help with the homework problems. Further, since you will already be on campus to do the lab, this is also an opportunity to use the campus network for your homework submission if you have limited or no internet access from your home.

Please realize that even if you submit a correct solution to a problem, your grader may not recognize it as correct if it's poorly presented. To maximize your chance of scoring well, your homework should:

- Be neatly laid out

- Be largely free from crossing-out and over-writing

- Include some verbal description explaining the approach and reasoning that you used to solve the problem

- Use grammatically correct English and be well enough written that the grader can understand what you're trying to say

If necessary, I may decide to delay the homework deadline dates, to ensure that we have covered the relevant material in class before tackling it as homework.

Exams and Quizzes

There will be six 20-minute quizzes during the semester and one two-hour final exam. The preliminary dates for these are

- Quizzes: Sep 15, Sep 29, Oct 13, Oct 27, Nov 10, and Dec 1.
- Final: 1:00 - 3:00 p.m., Tuesday, December 13

Quizzes will (most likely) be held in-person, at the end of every second Thursday's lecture, during the last 20 minutes of our regularly scheduled class time. However, if we are required to move online, then the quizzes will be conducted using Gradescope. I will discuss the mechanics of this with the class, to make sure it works for everyone. Only your best 5 quiz scores will contribute to your final grade. Your lowest quiz score will be discarded and will make no contribution. If necessary, I may decide to delay the dates when we do quizzes, to ensure that we have covered the relevant material in class before tackling it in a quiz. Quizzes and the final exam make a large contribution to your final grade. I try to make these as easy as possible, and past experience has been that most students perform well on these tests.

(These results are very typical of all of the ten years that have taught the course previously.) As you can see, submitted work usually scores highly. **6m'ZUf'h\Y'ghfcb [Ygh' f]g_ZUWhcf'Zcf'U`ck' [fUXY]b'h\]g'WUgg'jg'XiY'hc'ZU] i fY'hc'Wc a d'YhY'UbX'g i V a]h' Ugg][bYX'k cf_"** Even so, it is typical for two-thirds or more of the final grades to be above 80%.

Attendance

UAF policy³ states that “you are expected to adhere to the class attendance policies set by your instructors.” In normal times, I expect at least 90% attendance from all students. In cases of low attendance, I will follow-up with relevant students to see if any accommodations could help. Students not turning in work and with very low attendance may be subject to an instructor-initiated withdrawal (depending on extenuating circumstances.)

Class participation

There is no requirement for you to participate actively in class by asking questions or joining discussions, and there is no grade component based on this. Nevertheless, I encourage discussion questions at any time during the lectures. Because we have a large amount of material to cover, I may defer answering lengthy or numerous questions until after class.

Student responsibilities

It is the responsibility of all students to be aware of the various requirements of the class. This includes knowing what work is required, when the deadlines are, and how this work should be turned in. These requirements are clearly outlined in the syllabus, and multiple reminders will be given in class. Lack of awareness of a requirement will not be regarded as an acceptable rationale for failing to meet it.

The department takes great care to ensure that all submitted work is graded fairly and that

UAF Level MATH F202X Minimum Grade of C or Undergraduate UAF Level MATH F253X Minimum Grade of C)

Textbooks

Required:

Universe, 9th, 10th, or 11th Editions, by Freedman, Geller, & Kaufmann (W.H. Freeman & Co.)

Recommended additional reading: There are numerous excellent 100-level astronomy books available now. Any of the recent ones would likely be helpful for this course.

Note that online notes will be provided. However, these will make frequent reference to the more extensive treatment of topics that appears in the book.

Calculators

You will need access to a calculator to complete some of the homework problems. Calculators will also be permitted during quizzes and the final exam, although I rarely pose problems on these tests that require one. You will not need anything elaborate; an easy-to-use scientific calculator is all that you will need. Remember that it is much more important to present the correct reasoning for solving a problem than it is to arrive at the correct numerical value. Please, explain your reasoning when presenting solutions to homework and exam problems. I will award partial points for correct reasoning, if presented, even if the final answer is incorrect or incomplete.

Support Services

permissible by the instructor's written course policies. Studen

Syllabus Addendum (Revised 8/22/2022)

Information : Students should keep up to date on the university's policies, practices, and mandates related to COVID 19 by regularly checking this website:

<https://sites.google.com/alaska.edu/coronavirus/uaf?authuser=0>

Further, students are expected to adhere to the university's policies, practices, and mandates and are subject to disciplinary actions if they do not comply.

Sexual Harassment and Discrimination : UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site:

https://catalog.uaf.edu/academics_regulations/students_rights_responsibilities/.

Disability Services : I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities.

Student Advocacy : The Associated Students of the University of Alaska Fairbanks, the student government of UAF, offers advocacy services to students who feel they are facing issues with staff, faculty, and/or other students specifically if these issues are hindering the ability of the student to succeed in their academics or go about their lives at the university. Students who wish to utilize these services can contact the Student Advocacy Director by visiting the ASUAF office or emailing asuaf.office@alaska.edu.

Student Services :

- Speaking Center (907 474 5470, uaf_speakingcenter@alaska.edu, Gruening 507)
- Writing Center (907 474 5314, uaf_writing_center@alaska.edu, Gruening 8th floor)
- UAF Math Services, uaf_traccloud@alaska.edu, Chapman Building (for math fee paying students only)
- Developmental Math Lab, Gruening 406
- The Debbie Moses Learning Center at CTC (907 455 2860, 604 Barnette St, Room 120, https://www.ctc.uaf.edu/student_services/student_success_center/)

For more information and resources, please see the Academic Advising Resource List (https://www.uaf.edu/advising/1r/SKM_364e19011717281.pdf)

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UAF Department of Equity and Compliance
1692 Tok Lane, 3rd floor, Constitu