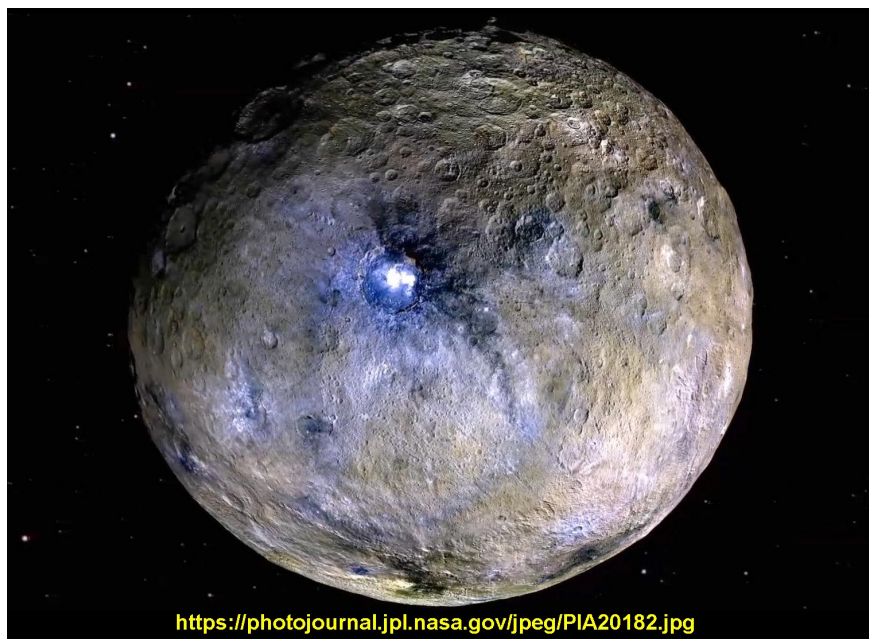

Physics 165x

Introduction to Astronomy 4 Credits

Instructor – Dr. Mark Conde



Breaking news in Astronomy: In August 2020 scientists working with NASA's Dawn spacecraft announced evidence for a slushy salt-water ocean beneath the surface of the dwarf planet Ceres, which is the largest object in our solar system's asteroid belt. Surprisingly, despite its small size, Ceres does not appear to be geologically dormant. There is evidence of an active surface in the current epoch, including liquid water reaching the surface from the ocean below. These characteristics likely result from heat left over from a large impact that occurred as recently as 20 million years ago. This impact left deep fractures that are the pathways by which the water is seeping to the surface. Unlike other ocean worlds in the outer solar system (Europa, Ganymede, Enceladus, for example), Ceres orbits the Sun alone; it does not orbit a giant planet. It is thus far easier for a spacecraft to land on – which, coupled with the presence of water, makes it an attractive outpost for future human colonization.

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
- 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/#generaleducationrequirements>

- 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.

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 additional options for human habitation and resource extraction.
- Appreciate the societal relevance of astronomy and its connection to other fields of science.

My goal as an instructor is to provide every student with maximum possible opportunity for success. This means that I try to be as flexible as possible with the course requirements, to avoid creating needless hurdles. Nevertheless, some penalties for missed or late work are necessary; my policies in this regard are outlined below.

Instructor information

Instructor:	Dr. Mark Conde
	Email: mgconde@alaska.edu
	Office locations: Reichardt room 110.
	Office Phone: 474-7741
	Office hours: 9:30-11:00 Tuesday & Thursday, or immediately after class on these days.

Teaching Assistant: Blake Mino:	Email: bmino@alaska.edu
	Office hours: 2-4 pm on Fridays
Lab Manager: Zak Tourville:	Email: ztourville@alaska.edu
	Office: REIC room 114.
	Phone: 474-7857
Office Manager: Ellen Craig:	Email: eacraig@alaska.edu
	Office: Reichardt room 102.
	Phone: 474-7339

Target schedule

<i>Week</i>	<i>Dates</i>	<i>Topics (from the textbook Universe)</i>	<i>Labs</i>
1	Aug 24 - Aug 28	Class introduction, Chapter 1	None
2	Aug 31 - Sep 04	Chapters 2-3	Math Review
3	Sep 07 - Sep 11	Chapters 4-5, Quiz 1	1
4	Sep 14 - Sep 18	Chapters 6-7	2
5	Sep 21 - Sep 25	Chapters 8-9, Quiz 2	3
6	Sep 28 - Oct 02	Chapters 10-11	4
7	Oct 05 - Oct 09	Chapters 12-13, Quiz 3	5
8	Oct 12 - Oct 16	Chapters 14-15	6
9	Oct 19 - Oct 23	Chapters 16-17	7
10	Oct 26 - Oct 30	Chapters 18-19, Quiz 4	8
11	Nov 02 - Nov 06	Chapters 20-21	9
12	Nov 09 - Nov 13	Chapters 22-23, Quiz 5	10
13	Nov 16 - Nov 20	Chapter 24, 25	11
14	Nov 23 - Nov 27	Thanksgiving week, Chapter 26	Make-up
15	Nov 30 - Dec 04	Chapters 27-28, Quiz 6	Telescope
16	Dec 07 - Dec 11	Finals week	None
17	Dec 14 - Dec 18	Grades posted by Dec 16	

Note that this is a rather ambitious schedule, requiring us to cover roughly one chapter from *Universe* per lecture. It is unlikely that we will make it all the way to the end of the book as shown here, but I at least want to complete up to Chapter 24.

Campus-wide Covid-19 Policies

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/uaf-students?authuser=0>

Please note that students are expected to adhere to these policies, practices, and mandates and are subject to disciplinary actions if they do not comply.

Be aware that the covid-19 situation in Alaska will evolve, in currently unknown ways, and on a weekly basis. Procedures and policies will change as needed. For this class, the most likely changes apply to the labs which, at least initially, will be presented in a face-to-face manner. The lecture component of this class is already intended to be delivered 100% online, and so this component of the course is unlikely to change before the end of the semester.

Remember – **it is required that you wear a mask and maintain social distancing in all indoor shared spaces on campus.** This is the most important thing that each of us can do to ensure that our campus is a safe, healthy, and effective learning environment.

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 online via live streaming, on Tuesdays and Thursdays from 11:30 am – 1:00 pm. Lectures will be live-streamed via zoom, and also recorded for later review. Here is the relevant zoom meeting information:

- When Every Tuesday and Thursday from 11:30 AM to 1:00 PM, beginning Aug 25, 2020.
- You can find a link to the zoom meeting on the left side of the blackboard home page for this class.
- Alternatively, you can use this link: <https://alaska.zoom.us/j/93958818093?pwd=SmRlYjE2bjNySjBtV2ozS0FGd3M1QT09>. The meeting ID is Meeting ID: 939 5881 8093, and the passcode is 41800x
- You can also join by telephone, using one of the numbers listed here: https://alaska.zoom.us/join?m=rX1xjgCGvA_teNc5rV-5lXSEv-9P94kJ

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.

I have setup a dedicated video studio in the Reichardt building, and will be live-streaming from there. I am hoping this setup will make for high-quality and engaging live class sessions.

Labs

Generally, each student will be expected to complete one lab session per week. There are currently two sections allocated for this class, corresponding to labs on Tuesday and Wednesday. The labs meet in room 252 of the Reichardt building, and run from 2:15pm to 5:15pm on their respective days. To allow for social distancing, you will attend either the first or second half of this 3 hour block.

² All students should have access to Blackboard. Please let me know if you have difficulties with this.

No regular lab sessions are scheduled during the first week of class, or during the week of Thanksgiving. Labs in the final week of semester will consist of telescope observing sessions and/or recitations in preparation for the final exam.

There will be a total of 11 labs. In a normal semester, lab write-ups would be completed during the lab, and turned in to the TA at the end of the session. However because you will only be in lab for 1.25hrs this semester, writeups are to be completed at home and submitting a scanned version through blackboard. Your worst lab score will be discarded; the remaining 10 scores for your lab participation and write up will contribute to your final grade. Complete lab policies are outlined in more detail in a separate document that will be available from the PHYS165 Blackboard site.

Laboratory sessions are a vital part of this course, and should not be missed. To pass this course, ***there is an absolute requirement that you must attend and write up at least 7 of the labs.*** Any student failing to reach this number will automatically fail.

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

The reason the homework deadlines are on Thursday is to allow both the Tuesday and Wednesday lab groups the chance to speak to the lab instructor 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

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 10, Sep 24, Oct 8, Oct 29, Nov 12, and Dec 3.
- Final: 11:15 a.m. - 2:15 p.m., Tuesday, December 8

Quizzes and the final exam will again be conducted using Gradescope. I will discuss the mechanics of this with the class, to make sure it works for everyone. Quizzes will (most likely) be held at the end of the Thursday lecture, during the last 20 minutes of our regularly scheduled class time.

Only your best 5 quiz scores will contribute to your final grade. Your lowest quiz score will be discarded and will make no contribution. 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.

Course policies

Grading

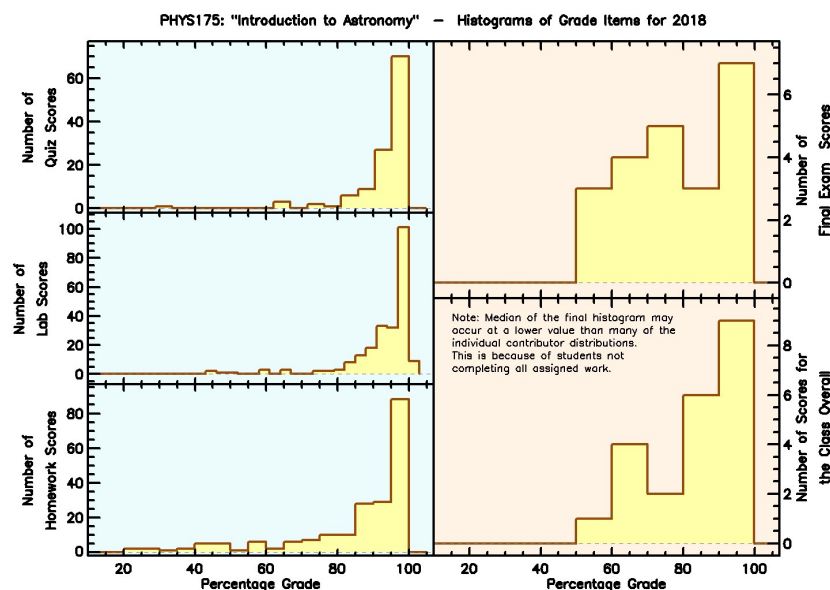
The course grade will consist of the following components

- Homework: 24% (2% each for 12 assignments)
- Best 10 out of 11 labs: 30% (3% each for 10 labs)
- Best 5 out of 6 quizzes: 25% (5% each for 5 quizzes)
- One two-hour final exam: 21% (Makes up 100%)

I will post all grades online, using the UAF's "Blackboard" system (<http://classes.alaska.edu>). All registered students have access to this system for checking their grades. Please do *check that we have posted all your grades correctly*, and let me know if you think there is an error. Also, please retain all work that we return after grading, in case an error does appear. Returned graded work is proof of your scores.

Final grades will be returned as letter grades with plus/minus modifiers. These will be derived from your overall percentage grade. The approximate conversions for each letter grade will be as follows. A: $\geq 90\%$; B: 75% to 90%; C: 60% to 75%; D: 50% to 60%; F: $< 50\%$. Plus/minus modifiers will subdivide each main grade into three equally spaced sub-levels.

For those who are interested in actual data on how difficult this class might be, the figure below shows histograms of overall scores for the various course components for the class of 2018 – which is the last time I taught this course (it was numbered PHYS175 then):



(These results are very typical of all of the eight years that have taught the course previously.) As you can see, submitted work usually scores highly. **By far the strongest risk factor for a low grade in this class is due to failure to complete and submit assigned work.** Even so, two-thirds of the final grades for 2018 were 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. However, I understand that this semester is likely to be anything but normal. **UAF policy requires that we record attendance for all in-person classes** (which, in this case, means all lab classes.) This record is for possible contact tracing, in the event that a class member tests positive for covid-19. I will also be recording attendance during our online class sessions. 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, for this purely online class I will 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.

Consequences of Low Grades

It is important to understand the implications of receiving a letter grade of “C” or below for this course. The table below (published in 2013) is the most recent statement I can find regarding these policies. I am reasonably certain that the information in this table is still current. However, the source document from which it was taken has been moved or deleted from UAF’s web site, and I have not been able to locate a more current replacement. So be aware that policies may have changed (although, again, I do not think this is very likely).

This course follows the University of Alaska Fairbanks Incomplete Grade Policy: “The letter “I” (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student’s control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an “I” grade.”

Needless to say, a grade of “F” represents a failure. Zero grade points will be awarded, and the course must be re-taken to receive credit.

³See <http://catalog.uaf.edu/academics-regulations/attendance/>

Grade / Grade Points	Definition and academic implications
C+ (2.3) C (2.0) C- (1.7)	<p>“C” (including C+ and C-) indicates a satisfactory level of acquired knowledge and performance in completion of course requirements.</p> <p>C- (1.7) is the <u>minimum</u> acceptable grade that undergraduate students may receive for courses to count toward the major or minor degree requirements, or as a prerequisite for another course. A minimum grade of C (2.0), however, MAY be required by specific programs for prerequisite and / or major / minor courses. Please consult specific program listings in the UAF Catalog.</p> <p>C- (1.7) is the <u>minimum</u> acceptable grade required for all Core (X) Courses.</p>
D+ (1.3) D (1.0) D- (.7)	<p>“D” (including D+ and D-) indicates a minimal level of acquired knowledge and minimal performance in completion of course requirements. This grade does not satisfy requirements for courses in the major, minor, Core, or graduate programs.</p>

Table updated 5/21/2013

Missed or late work

A make-up quiz will be offered if a student misses a quiz due to illness, clash with another UAF commitment, or a genuine emergency. Determination of whether circumstances justify this make-up will be at the discretion of the instructor. An unexcused absence will lead to 0 points earned on that quiz.

Due to covid-19 restrictions, we are not currently planning to offer opportunities for students to perform in-person make-ups for any labs(s) that they may miss. Rather, it is likely that any make-up options will be offered purely online.

Problem sets will generally not be accepted after the due date, without evidence of illness or genuine emergency. Students having documented clashes with other UAF commitments may pre-arrange alternate homework submission deadlines with me. All decisions regarding late homework or alternate deadlines will be at the discretion of the instructor.

Student conduct and academic honesty

It is the responsibility of each student to be informed about the policies for student conduct and safety at the University of Alaska. You are encouraged to read these policies at <https://uaf.edu/csrr/student-conduct/> and links therein. It should go without saying that students are expected to do their own original work for all assignments. Copying from other students or indeed from any source that is not your own work constitutes plagiarism. Failure to comply with UAF policies may be considered academic misconduct and may result in a failing grade (either for individual portions of work, or for the entire course, depending on severity.) Serious cases will be referred to university authorities for possible further disciplinary action.

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 the resulting scores are correctly credited to the students who submitted the work. Nevertheless, scores occasionally do get entered incorrectly or missed altogether. **It is the responsibility of students to check their scores in Blackboard frequently**, and to notify the instructor and/or TA immediately any discrepancy is noted. As discussed earlier, students are also responsible for keeping all graded work returned to them, as evidence of the grade received, should any disparity arise later.

Course requirements and materials

Prerequisites

Placement in WRTG F111X; placement MATH F105, or permission of instructor.

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

Homework help

I have set the weekly homework deadline to be on Thursday evening. This was chosen so that you can (and should) speak to your lab TA during your lab class (either on Tuesday, or Wednesday) if you need additional homework help. The TA will have seen my solution to each problem, so they know what I am expecting. They can help you understand what is being asked, how to tackle the problem, and how to present your solution.

Complaints and concerns

You are always welcome to discuss your concerns with me. However, if you have a concern that you feel cannot be resolved by discussion with me, you may wish to contact the Physics Department chair, Dr. Truffer. The University also has an Academic Advising Center on the 5th floor of the Gruening building, open Monday to Friday, 8 am to 5 pm and contactable via phone at 907-474-6396. The advising center can help with all student matters, from study tips to help with understanding the University's formal mechanisms for academic appeals. (See also <http://www.uaf.edu/advising/>)

Student Health and Counseling Center

The University provides health and counseling services through its Student Health and Counseling Center, which is located at 612 N. Chandalar Drive, on the 2nd floor of the Whitaker Building (the same building as Fire and Police, across from the bus turn around.) Their web site is at <http://www.uaf.edu/chc/>. The center will see students on an appointment basis. The number to call for an appointment is 474-7043. It is best to do so at 8:00 AM in the morning, because they are scheduled daily on a first come first serve basis.

Disabilities and/or Special Needs

Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations. Disability services are provided free of charge, and are available to any student who qualifies as a person with a disability. Student seeking special accommodations for a disability must first discuss their needs with Disability Services. Call 474-5655 to schedule an appointment.

UAF Disability Services is located in the Whitaker Building, room 208. Extensive support is available, as described at <http://www.uaf.edu/disability/>

Effective communication: Students who have difficulties with oral presentations and/or writing are strongly encouraged to get help from the UAF Department of Communication's Speaking Center (907-474-5470, speak@uaf.edu) and the UAF English's Department's Writing Center (907-474-5314, Gruening 8th floor), and/or CTC's Learning Center (604 Barnette Street, 907-455- 2860).

Sexual Harassment and Discrimination

Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/.

UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: <https://alaska.edu/nondiscrimination/>.