

AST 201: Introduction to Indigenous Astronomy

General Information

- Department: Astronomy and Planetary Science
- Course: AST 201: Introduction to Indigenous Astronomy
- Term: Fall 2024
- Total Units of Course Credit: 3
- Pre- and Co-Requisite(s): None
- Mode of Instruction: In-Person

Lecture Instructor Information

- Instructor: Jasmine Garani
- Preferred Contact Method: Canvas Messaging, please allow 24 hours for a reply, messages received on the weekend or after 5pm on weekdays will be answered the following weekday
- Email: jasmine.garani@nau.edu
- Office Hours: TBD
- Office Location: Physical Sciences, Room 225B
- Zoom office hours may be requested if needed

Lab Instructor Information

- Lab Instructor: Pedro Camacho
- Email: pedro.camacho@nau.edu
- Please contact the lab instructor with questions about the lab.

Lecture Information

- Meeting Time: MW 9:00-9:50am
- Location: Liberal Arts Rm 120

Lab Information

Lab Section Details

Section 9	Mon 6:00 to 6:50 pm	Science Annex, Rm 105
Section 10	Mon 7:00 to 7:50 pm	Science Annex, Rm 105
Section 11	Tue 6:00 to 6:50 pm	Science Annex, Rm 105
Section 12	Tue 7:00 to 7:50 pm	Science Annex, Rm 105
Section 13	Wed 6:00 to 6:50 pm	Science Annex, Rm 105
Section 14	Wed 7:00 to 7:50 pm	Science Annex, Rm 105
Section 15	Thu 6:00 to 6:50 pm	Science Annex, Rm 104
Section 16	Thu 7:00 to 7:50 pm	Science Annex, Rm 104

Lab includes:

- **Indoor activities**, with or without online resources, requiring creative designs, qualitative analysis, and real-life applications
- **Outdoor observations** during class
- **Observations outside of class time** such as observing the solar activities, moon phases, or meteor showers

Course Purpose

When we think of astronomy, we often think of western modern astronomy. However, Indigenous Peoples have been developing complex systems of understanding the heavens all around the world since before the development of modern astronomical thinking. The course will introduce ancient and living astronomies of native peoples and compare those systems with modern astronomy and planetary science. We will examine how Indigenous cultures reference the skies and how they integrate humans into the cosmos. We will examine the importance of worldview and how it affects a person's perception of the universe. The course will focus on observation-based astronomy and the use of technology in the study of Indigenous astronomy. It will also examine the use of cultural ethics in the study of space science and traditional native astronomy. The primary cultural focus will be on astronomies of the American Southwest.

Key themes that we will examine throughout the course are— **Valuing the diversity of human experience**, **Environmental consciousness**, and **Technology and its impact**. We will

accomplish this by examining the astronomies of different Indigenous cultures, their connection to the environment, and the use of technology in the past and present-day study of astronomy. This course satisfies *Scientific Literacy— Physical, Life, Earth, and Space Sciences Knowledge Area and the Indigenous Peoples Diversity Perspectives*. This requirement will be addressed through the comparisons of (a) ancient and living astronomies of native peoples with western astronomy and modern advances in space science exploration and of (b) the cultural ethics of traditional native astronomy with those of modern space science. This course will address several of the General Studies skills— *Critical Thinking, Information Literacy*, and the *Essential Skills of Application(s) and Quantitative Reasoning*.

Course Student Learning Outcomes

This course has several objectives and learning outcomes that will be addressed during the lecture and in the assigned reading. By the end of the semester, students will be able to:

SLO1. Describe the role of diverse cultures in understanding the relationship of people to the universe we live in;

SLO2. Use critical reasoning to understand the ways of knowing and resulting narratives associated with indigenous cosmologies, cosmologies widely accepted in the western pre-scientific era, and those of modern science;

SLO3. Use knowledge gained from direct observation, critical thinking and technology-based observations and analyses to locate the moon, planets, and stars that are important to indigenous peoples and describe their cycles, phases, physical characteristics, and significance in diverse cultural settings;

SLO4. Learn how ancient and modern indigenous cultures often practiced observational astronomy in ways that resemble scientific practice;

SLO5. Evaluate how influences of inequality, power, and privilege— including systems of oppression— affect Indigenous and non-Indigenous perspectives and ideologies.

This course is designed to be fully transparent, inclusive, and accessible to all students.

NACE Competencies

The National Association of Colleges and Employers (NACE) is a leading source of information on employment for the college educated. They identified eight Career Readiness Competencies (CRC) that are “a foundation from which to demonstrate requisite core competencies that broadly prepare the college educated for success in the workplace and lifelong career management.” More information can be found at <https://www.nacweb.org/career-readiness/competencies/career-readiness-defined>. The following are the CRCs that apply to this course.

1. **Career & Self Development:** Proactively develop oneself and one's career through continual personal and professional learning, awareness of one's strengths and weaknesses, navigation of career opportunities, and networking to build relationships within and without one's organization.
2. **Communication:** Clearly and effectively exchange information, ideas, facts, and perspectives with persons inside and outside of an organization.
3. **Critical Thinking:** Identify and respond to needs based upon an understanding of situational context and logical analysis of relevant information.
4. **Equity & Inclusion:** Demonstrate the awareness, attitude, knowledge, and skills required to equitably engage and include people from different local and global cultures. Engage in anti-oppressive practices that actively challenge the systems, structures, and policies of racism and inequity.
5. **Teamwork:** Build and maintain collaborative relationships to work effectively toward common goals, while appreciating diverse viewpoints and shared responsibilities.
6. **Technology:** Understand and leverage technologies ethically to enhance efficiencies, complete tasks, and accomplish goals.

Required Materials & Technology

All reading materials and assessments are on Canvas course page. However, you need to have stable internet connection and reliable hardware in order to participate **in-class TopHat** Questions, and finish **online Reading Quizzes and Exams** outside of classroom. Intermittently throughout the semester, we will be using many [astronomy simulations and animations](#) on the Astronomy Education at the University of Nebraska-Lincoln website, to enhance learning. It is essential to your understanding and **required** to answer TopHat Questions and Reading Quizzes on Canvas. In the lab, you will also learn to use another interactive planetarium website called [Stellarium Web](#).



In the navigation bar on the left side of the Canvas course, click the link labeled “Top Hat 1.3” and follow the instructions. The first time you access Top Hat, you must go through Canvas. After it is set up, you may go through Canvas or directly from the Top Hat website. A Top Hat mobile app is also available. Top Hat is now FREE for all NAU students. You should not be asked to pay when you sign up. If you are, please contact me immediately.

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in-app support button, or by calling 1-888-663-5491.

Assignments/Assessments

Top Hat Questions: In each Section of each Unit in class, there is a small portion of questions based on the lectures. They are designed to increase interaction in class, and you can discuss with your classmates for most of the questions. They will be answered in class. There are 11 Units, and there are 12 to 19 Points in each Unit. No TopHat Questions points are dropped, and total is 170 points. Top Hat questions will be on Mondays.

Labs: **Attendance is required for the labs.** The Labs are designed to strengthen your understanding of lecture materials, and will provide the opportunity to investigate or relate to astronomical phenomena as many ancient cultures once did. Some Labs align with specific astronomical events and thus will **require time-sensitive participation or outdoor observations** (see schedule below or on Canvas). Labs will be posted on Canvas and usually will be **due at the beginning of the following lab meeting**. Completing all work during lab time is very much encouraged. If you must miss your section, you **MUST** contact your instructor and attend another section to make it up. An absence is an additional 3 points deduction. **Labs that are turned in late will be assessed 20% off (2 points) penalty per day that it is late.** Please work closely with your lab instructors and read the Lab syllabus carefully, which clearly lists the Lab policy in detail. There are 11 labs, and each is 10 points. The last week will be for an optional makeup lab. One lowest Lab score is dropped, so the total of Lab points counted are 110 points.

Canvas Reading Quizzes: Reading quizzes are posted on Canvas, which will test students' comprehension of the material covered in the assigned reading. You have 2 attempts, and the timer is set to 60 minutes. The highest grade is counted before the due date, and you can review the correct answers after the due date. There are 10 questions, and thus 10 points, in each quiz. One lowest Reading Quiz score is dropped, so total points are 100 points. Check Canvas course page or the schedule constantly for **Monday 11:59pm dues**. **Late submission are assessed 20% of penalty per day.**

Exams: The exams are all on Canvas with multiple choice questions, fill-in-the-blanks, matching, and sorting questions. All exams will be open for a week (including Sat and Sun), and will be closed at the due date/time listed below. If you encounter any technical difficulties during your exams, please contact Professor Garani on Canvas or at jasmine.garani@nau.edu immediately.

First Midterm Exam: due Friday, 10/4, 11:59pm | Unit 1 to 3, 43 points

Second Midterm Exam: due Friday 11/8, 11:59pm | Unit 4 to 7, 54 points

Final Exam: due Wed, 12/11, 11:59 pm | Unit 8 to 11, 62 points

Below is a summary of the Assignments and Assessments:

Assignment Points Distribution

Category	Due	Points Distribution	Total Points	Includes:
TopHat Questions	Mondays	12-19 points each Unit	170	All Questions, None Dropped
Lab	Normally in 1 week	10 points each Lab	100	1 Lowest Dropped
Canvas Reading Quiz	Mondays	10 points each Unit	100	1 Lowest Dropped
Canvas First Midterm Exam	Due Friday 10/4, 11:59pm		43	Unit 1 to 3
Canvas Second Midterm Exam	Due Friday, 11/8, 11:59pm		54	Unit 4 to 7
Canvas Final Exam	Due Wed 12/11, 11:59pm		62	Unit 8 to 11
Total	-	-	529	-

Grading Distribution:

Grades Distribution Details

Midterm Total Points (Unit 1-3, Lab 1-3, Canvas First Midterm Exam)	Midterm Grade	Semester Total Points	Final Grade
105 to 117	A	476 to 529	A
93 to 104	B	423 to 475	B
81 to 92	C	370 to 422	C
70 to 80	D	317 to 369	D
0 to 89	F	0 to 316	F

Grades will be kept up to date in Canvas. It is the student's responsibility to frequently check their scores in Canvas for accuracy. Any score in question must be discussed with me within two weeks of the due date. After two weeks, I will not entertain any challenges to the scores in Canvas.

Sometimes instructors make mistakes, and I am no exception: exams end up being harder than expected, or assignments are just too ambitious for the time available. In these (hopefully rare) cases, I reserve the right to modify the final course grades upwards. This modification is subject to the following policies: (1) the same modification will be

applied to the grades of all students, and (2) the modification may never result in a lower grade, but always a higher one.

Makeup and Late Work

Students must obtain permission in advance of a regularly scheduled examination in order to take a make-up examination. An institutional excuse is required to get an extension for all other assignments. In addition, if unforeseen sickness or technical issues occur, please reach out to me and I will do my best to accommodate you in a reasonable manner. Missed exams and missed Top Hat questions count as 0 points. Points will be deducted from Canvas Reading Quizzes and Labs at a rate of 20% per day. Additionally, being absent from a lab will result in the loss of 3 points.

Extra Credit

Extra credit is built into the Top Hat questions. Some questions will be graded for credit and some for participation. All questions graded for participation count as extra credit.

Administrative Drop

As a professor, I am required to administratively drop students from the course who do not participate in the first week of classes. To determine if you have participated in the first week, I will be checking your Canvas attendance and activity. To not be dropped from the course please participate in Top Hat questions and access this course through Canvas during the first week of classes.

AI Statement: No use of generative AI tools permitted

This course (or assignment) expects that any work submitted by students that contributes toward the course grade, including all process work, drafts, brainstorming artifacts, and final work, will be generated entirely by the students themselves, working individually or in groups as directed by class assignment instructions. Any use of generative artificial intelligence tools, such as ChatGPT, constitutes an academic integrity violation.

Class Tentative Schedule: Any changes made during the semester will be with the consultation of the class and only to the students benefit and not to their detriment.

Tentative Schedule

Week	Date	Day	Topic	TopHat DUE	Reading Quiz DUE	AST201 Lab
1	8/26	M	Course Intro			#1: Connecting Western & Indigenous Astronomy
	8/28	W	Unit 1: Connecting With the Sky			
2	9/2	M	NO CLASS	-	-	NO LABS
	9/4	W				
3	9/9	M	Unit 2: Cultural History if Indigenous People in North & Central America	-	-	#2: Origins of the World
	9/11	W				
4	9/16	M	Unit 3: Cosmogony and Cosmology in Native & Western Astronomies	Unit 1	Unit 1	#3: Equinox & Calendar (Fall Equinox: 9/22)
	9/18	W				
5	9/23	M		Unit 2	Unit 2	#4: Moon Phases
	9/25	W	Unit 4: Celestial Sphere & Sidereal Motion			
6	9/30	M		Unit 3	Unit 3	#5: Figures in the Sky
	10/2	W	Unit 5: Moon & the Lunar Cycle			
	10/4	F	Canvas First Midterm Exam DUE 11:59pm (Unit 1-3)			
7	10/7	M		-	-	#6: Maya & the Wandering Stars I
	10/9	W				
8	10/14	M	Unit 6: Planets	Unit 4	Unit 4	#7: Maya & the Wandering Stars II
	10/16	W				
9	10/21	M	Unit 7: Stars	Unit 5	Unit 5	#8: Polynesian Wayfinding I
	10/23	W				
10	10/28	M		Unit 6	Unit 6	#9: Polynesian Wayfinding II
	10/30	W	Unit 8: Constellations			
11	11/4	M		Unit 7	Unit 7	

	11/6	W				#10: Star & Time
	11/8	F	Canvas Second Midterm Exam DUE 11:59pm (Unit 4-7)			
12	11/11	M	NO CLASS	-	-	NO LABS
	11/13	W	Unit 9: Sun & the Diurnal Cycle			
13	11/18	M		Unit 8	Unit 8	#11: The Winter Count
	11/20	W				
14	11/25	M	Unit 10: Seasons & the Annual Cycle	Unit 9	Unit 9	NO LABS
	11/27	W				
15	12/2	M	Unit 11: Comets, Asteroids, & Meteors	Unit 10	Unit 10	#12: MAKEUP LAB (optional)
	12/4	W				
16	12/9	M		Unit 11	Unit 11	
	12/11	W	Canvas Final Exam DUE 11:59pm (Unit 8-11)			

- ADD/DROP deadline (without "W"): 9/5

Respect for Diversity and Inclusion

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

Syllabus Policy Statements

COVID-19 REQUIREMENTS AND INFORMATION Additional information about the University's response to COVID-19 is available from the Jacks are Back! web page located at <https://nau.edu/jacks-are-back>.

ACADEMIC INTEGRITY NAU expects every student to firmly adhere to a strong ethical code of academic integrity in all their scholarly pursuits. The primary attributes of academic integrity are honesty, trustworthiness, fairness, and responsibility. As a student, you are expected to submit original work while giving proper credit to other people's ideas or contributions. Acting with academic integrity means completing your assignments independently while truthfully acknowledging all sources of information, or collaboration with others when appropriate. When you submit your work, you are implicitly declaring that the work is your own. Academic integrity is expected not only during formal coursework, but in all your relationships or interactions that are connected to the educational enterprise. All forms of academic deceit such as plagiarism, cheating, collusion, falsification or fabrication of results or records, permitting your work to be submitted by another, or inappropriately recycling your own work from one class to another, constitute academic misconduct that may result in serious disciplinary consequences. All students and faculty members are responsible for reporting suspected instances of academic misconduct. All students are encouraged to complete NAU's online academic integrity workshop available in the E-Learning Center and should review the full Academic Integrity policy available at <https://policy.nau.edu/policy/policy.aspx?num=100601>.

COPYRIGHT INFRINGEMENT All lectures and course materials, including but not limited to exams, quizzes, study outlines, and similar materials are protected by copyright. These materials may not be shared, uploaded, distributed, reproduced, or publicly displayed without the express written permission of NAU. Sharing materials on websites such as Course Hero, Chegg, or related websites is considered copyright infringement subject to United States Copyright Law and a violation of NAU Student Code of Conduct. For additional information on ABOR policies relating to course materials, please refer to ABOR Policy 6-908 A(2)(5).

COURSE TIME COMMITMENT Pursuant to Arizona Board of Regents guidance (ABOR Policy 2-224, *Academic Credit*), each unit of credit requires a minimum of 45 hours of work by students, including but not limited to, class time, preparation, homework, and studying. For example, for a 3-credit course a student should expect to work at least 8.5 hours each week in a 16-week session and a minimum of 33 hours per week for a 3-credit course in a 4-week session.

DISRUPTIVE BEHAVIOR Membership in NAU's academic community entails a special obligation to maintain class environments that are conducive to learning, whether instruction is taking place in the classroom, a laboratory or clinical setting, during course-related fieldwork, or online. Students have the obligation to engage in the educational process in a manner that does not interfere with normal class activities or violate the rights of others. Instructors have the authority and responsibility to address disruptive behavior that interferes with student learning, which can include the involuntary withdrawal of a student from a course with a grade of "W". For additional information, see NAU's *Disruptive Behavior in an Instructional Setting* policy at <https://nau.edu/university-policy-library/disruptive-behavior>.

NONDISCRIMINATION AND ANTI-HARASSMENT NAU prohibits discrimination and harassment based on sex, gender, gender identity, race, color, age, national origin, religion, sexual orientation, disability, veteran status and genetic information. Certain consensual amorous or sexual relationships between faculty and students are also prohibited as set forth in the *Consensual Romantic and Sexual Relationships* policy. The Equity and Access Office (EAO) responds to complaints regarding discrimination and harassment that fall under NAU's *Nondiscrimination and Anti-Harassment* policy. EAO also assists with religious accommodations. For additional information about nondiscrimination or anti-harassment or to file a complaint, contact EAO located in Old Main (building 10), Room 113, PO Box 4083, Flagstaff, AZ 86011, or by phone at 928-523-3312 (TTY: 928-523-1006), fax at 928-523-9977, email at equityandaccess@nau.edu, or visit the EAO website at <https://nau.edu/equity-and-access>.

TITLE IX Title IX of the Education Amendments of 1972, as amended, protects individuals from discrimination based on sex in any educational program or activity operated by recipients of federal financial assistance. In accordance with Title IX, Northern Arizona University prohibits discrimination based on sex or gender in all its programs or activities. Sex discrimination includes sexual harassment, sexual assault, relationship violence, and stalking. NAU does not discriminate on the basis of sex in the education programs or activities that it operates, including in admission and employment. NAU is committed to providing an environment free from discrimination based on sex or gender and provides a number of supportive measures that assist students, faculty, and staff.

One may direct inquiries concerning the application of Title IX to either or both the Title IX Coordinator or the U.S. Department of Education, Assistant Secretary, Office of Civil Rights. You may contact the Title IX Coordinator in the Office for the Resolution of Sexual Misconduct by phone at 928-523-5434, by fax at 928-523-0640, or by email at titleix@nau.edu. In furtherance of its Title IX obligations, NAU promptly will investigate or equitably resolve all reports of sex or gender-based discrimination, harassment, or sexual misconduct and will eliminate any hostile environment as defined by law. The Office for the Resolution of Sexual Misconduct (ORSM): Title IX Institutional Compliance, Prevention & Response addresses matters that fall under the university's Sexual Misconduct policy. Additional important information and related resources, including how to request immediate help or confidential support following an act of sexual violence, is available at <https://in.nau.edu/title-ix>.

ACCESSIBILITY Professional disability specialists are available at Disability Resources to facilitate a range of academic support services and accommodations for students with disabilities. If you have a documented disability, you can request assistance by contacting Disability Resources at 928-523-8773 (voice), 928-523-8747 (fax), or dr@nau.edu (e-mail). Once eligibility has been determined, students register with Disability Resources every semester to activate their approved accommodations. Although a student may request an accommodation at any time, it is best to initiate the application process at least four weeks before a student wishes to receive an accommodation. Students may begin the accommodation process by submitting a self-identification form online at <https://nau.edu/disability-resources/studenteligibility-process> or by contacting Disability Resources. The Director of

Disability Resources, Jamie Axelrod, serves as NAU's Americans with Disabilities Act Coordinator and Section 504 Compliance Officer. He can be reached at jamie.axelrod@nau.edu.

RESPONSIBLE CONDUCT OF RESEARCH Students who engage in research at NAU must receive appropriate Responsible Conduct of Research (RCR) training. This instruction is designed to help ensure proper awareness and application of well-established professional norms and ethical principles related to the performance of all scientific research activities. More information regarding RCR training is available at <https://nau.edu/research/compliance/research-integrity>.

MISCONDUCT IN RESEARCH As noted, NAU expects every student to firmly adhere to a strong code of academic integrity in all their scholarly pursuits. This includes avoiding fabrication, falsification, or plagiarism when conducting research or reporting research results. Engaging in research misconduct may result in serious disciplinary consequences. Students must also report any suspected or actual instances of research misconduct of which they become aware. Allegations of research misconduct should be reported to your instructor or the University's Research Integrity Officer, Dr. David Faguy, who can be reached at david.faguy@nau.edu or 928-523-6117. More information about misconduct in research is available at <https://nau.edu/university-policy-library/misconduct-in-research>.

SENSITIVE COURSE MATERIALS University education aims to expand student understanding and awareness. Thus, it necessarily involves engagement with a wide range of information, ideas, and creative representations. In their college studies, students can expect to encounter and to critically appraise materials that may differ from and perhaps challenge familiar understandings, ideas, and beliefs. Students are encouraged to discuss these matters with faculty.

<https://nau.edu/university-policy-library/syllabus-requirements/>

The information contained in this syllabus, other than this course's grade and attendance policies, may be subject to change with reasonable advance notice."