



AST 102N Course Syllabus

Course Information

Course Title: Solar System
Course Prefix/Number: AST 102N
Semester: Spring 2022
Class Days/Times: Online
Credit Hours: 4

Instructor Information

Name: Dr. Michael Newberry
E-mail: mnewberry@tocc.edu
Office hours: Online using e-mail.

Course Description

This online course introduces the universe beyond our Solar System. Topics include the nature of matter and light, how astronomers and telescopes work, the properties of stars, galaxies, and the universe, and the possibilities of alien life in the universe. It also covers the lifetime of stars, quasars, pulsars, black holes, and the origin, nature, and future of the entire universe. It also presents science as an application of critical and quantitative reasoning and deduction and compares science with pseudoscience.

Prerequisites

None.

Student Learning Outcomes

After completing this course, students will be able to:

- 1) Rank different types of electromagnetic radiation in terms of their energy, frequency and wavelength and analyze spectral and photometric data to infer temperatures, luminosities, compositions, distances, and velocities of celestial objects.
- 2) Identify the main evolutionary stages of a star's life on an HR diagram, explain how a star's evolution and lifetime depend on its mass, and identify the role each evolutionary stage plays in the synthesis of heavy nuclei.
- 3) Interpret the Hubble diagram and the Cosmic Microwave Background data and explain why these observations support a Big Bang cosmology.
- 4) Recognize the immense spatial scale and time scale of the solar system, compare and



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contrast these with human experience using scientific notation, distance ranking, and scale models.

- 5) Predict the orbital properties of gravitating systems by applying Kepler's laws of planetary motion and Newton's laws of motion and Universal Gravitation.

Course Structure

This online course involves online and offline instruction involving an online textbook and curriculum, the Starry Night software, web pages, and a cultural project on Indigenous use of the Sky. There is also a lab on the new science of "Cosmochemistry" taught by a guest astronomer from the University of Arizona and involving a telescope on Kitt Peak, after which you will write a reflection for credit.

For this course, you will need access to a computer and the Internet to complete all assignments. You are invited to use your own computer or one borrowed from another person. Computers and Internet are also available at the TOCC campus in Room IWK-24 and the Library.

This course uses the Pearson Mastering Astronomy curriculum and Starry Night software. Mastering Astronomy includes an eBook you can view using any web browser, plus course resources including videos, interactive figures, tutorials, and other study aids. Mastering Astronomy includes the main content, homework, and quizzes, while Starry Night is used for most of the lab exercises. used in this course. Optionally, you may purchase a printed textbook which is equivalent to the outstanding eBook included with the Mastering Astronomy package.

One course lesson is completed each week. Lessons consist of some mixture of the activities listed below. Not all of these assignments are found in every lesson:

- Homework, Essays, and Quizzes from the online Pearson Mastering Astronomy.
- Labs, using the Starry Night software and other Web resources.

Office Hours

There be "zoom office hours" every week during which you can ask questions about the course. During the first week of the semester, I will determine the hour of the week when most students can attend.

Course Learning Materials and Textbook Information

The course resources are purchased online:

- 1) Pearson Modified Mastering Astronomy Access Card with e-Text: \$94.99. This item is purchased using a link that appears on your Canvas course page. You can also purchase it from the TOCC bookstore.



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- 2) Starry Night software, [Web Edition \(available from an external website\)](#): \$29.99.

Course Outline

Below is a general outline of AST 102N of course topic. For the course schedule with specific dates, see the Assignments section on the Canvas course page.

- 1) General Introduction
 - a) What is Science?
 - b) The role of mathematics in science
 - i) Quantitative vs. qualitative understanding
 - ii) Linear and angular measurement
 - iii) Unit conversion
 - iv) Equations
 - v) Graphing
 - c) What is Astronomy?
 - d) Value of Astronomy and benefits to the individual
 - e) Scientific method and the central role of skepticism
 - i) Contrasts with pseudoscience
 - ii) Possible pseudoscience related to Astronomy
 - (1) UFO's ("flying saucers")
 - (2) Ancient astronauts
 - (3) Scientific creationism as related to the age and origin of the Universe
- 2) Nature of Starlight
 - a) Magnitude system
 - b) Electromagnetic spectrum
 - c) Physics: what light tells us
 - i) Radiation Laws (Planck, Wien, Stephan-Boltzmann)
 - ii) Doppler effect
- 3) Modern Astronomy
 - a) Major observatories
 - b) Telescopes
 - i) Optics
 - ii) Instruments
 - c) Celestial coordinates
- 4) Stars
 - a) Physical nature
 - b) Distances
 - c) Motions
 - d) Associations
 - e) Clusters
 - i) Open or galactic



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- ii) Globular
 - f) H-R Diagram
 - g) The Sun and stellar evolution
- 5) Galaxies
 - a) Milky Way
 - b) Galaxy morphology
 - c) Quasars
 - d) Clusters, superclusters, and voids
- 6) Universe
 - a) Description of present-day Universe and modern discoveries
 - i) Hubble expansion
 - ii) Superclusters
 - iii) 3K cosmic microwave background
 - b) Theories of origin
 - i) Steady state
 - ii) Big Bang
 - iii) Inflationary
 - c) Future of Universe
- 7) Life in the Universe
 - a) The nature of life
 - b) Probability estimates
 - i) Simple life forms
 - ii) Complex life forms
 - c) Pseudoscience: UFO's and ancient astronauts
- 8) Cosmic Perspective: Beyond Global Awareness
 - a) Our location in space and time
 - b) Astronomical numbers
 - c) Specialized units
- 9) Observation Projects
 - a) Standardized methods of observing and recording sky phenomena
 - b) Circumpolar constellations
 - c) Identifying bright stars and constellations
 - d) The Sun
 - e) Cluster star counts
 - f) Double stars
- 10) Collaborative Exercise and Activities
 - a) Stellar brightness and magnitudes
 - b) Sunspot observation
 - c) Sunspot cycle
 - d) H-R diagram
 - e) Life in the Universe
- 11) Individual Laboratory Exercises



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- a) Tools of the astronomer
- b) Electromagnetic radiation
- c) Constellations
- d) Galaxies

Course Schedule

See the AST 102N Canvas course page.

Evaluations and Grading & Assignments

- 89% or above is an A
- 78 – 88% is a B
- 67 – 77% is a C
- 56 – 66% is a D
- Under 56% is Failing

Your final course grade will be determined by your performance using the following criteria:

Assignments
This course has 12 lessons, 2 exams, and a cultural project due at the end of the semester.
Each lesson has homework with around 10 to 18 questions. Each question is worth 1 point.
Each lesson has a “reading quiz” with around 10 to 24 questions. Each question is worth 1 point.
Each lesson has an extra-credit “visual quiz” with 10 questions. Each question is worth 1 point.
Most lessons include a lab. Each lab is worth 30 points.
Cosmochemistry lab with reflection: 50 points.
There are 4 short “getting started” assignments worth 5 points each.
A Cultural project is assigned for a topic related to "Indigenous use of the Sky". You will choose your topic after clearing it with the professor. The graded assignment is a PowerPoint or PDF presentation you submit at the end of the semester. This is worth 100 points.
Exam 1 covers the first half of the course and is worth 150 points.
Exam 2 covers the second half of the course and is worth 150 points.
Extra Credit at the end of the semester: Participation points for completing assignments on time.



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Cultural Component

A cultural project for a topic related to "Indigenous use of the Sky" is due as a Powerpoint or PDF on the last day of the course. For Tohono O'odham students, this is the Himdag component of the course. Your topic must be approved by the professor.

Policies and Expectations

Expectations of the Student

1. Students are expected to complete each assignment on time.
2. Class participation and preparation are essential to student success. In this online course, attendance is assessed by submitting assignments for grading. For example, if you submit the homework for Lesson 3, you are considered present for Lesson 3.
3. Students must read textual material, prepare for projects, complete required research as stated on the course schedule.
4. Late work will be penalized by a 10% deduction for each day past due.
5. No work accepted after the due date for the final lesson.

Attendance Policy

Four (4) unexcused absences may result in withdrawal, and a W or Y grade will be recorded for the course. You may request a due date extension on assignments for religious observances and practices, illness, a personal family emergency, or for school or work-related travel. When requesting a due date extension, please notify your professor as soon as possible (this policy approved by the TOCC Faculty Senate, April 2014).

Incomplete Policy

Incomplete (I) grades are not available in this online course.

45th Day Instructor Withdrawal Policy

Students who have missed four (4) consecutive course due dates for learning activities, participation, assignments, quizzes, exams, by the 45th - day census report, due on March 4, 2022, are assumed NOT to be participating in the class and may be withdrawn at the faculty member's discretion. After the 45th - day census, if a student needs to stop attending a course, they must withdraw from the course (see Student Withdrawal Policy).



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Student Withdrawal Policy for “W” Grade

Students may withdraw from class at any time during the first two-thirds of the semester without instructor permission and without incurring any grade penalty. If you do not expect to complete the class, be sure to withdraw yourself by March 30, 2022; otherwise you may receive an "F" letter grade for the course. For more information on the student withdrawal process email admissions@tocc.edu.

Special Withdrawals (Y) Grade

The “Y” grade is an administrative withdrawal given at the instructor’s option when no other grade is deemed appropriate. Your instructor must file a form stating the specific rationale for awarding this grade. “Y” grades are discouraged since they often affect students negatively. Your instructor will not award a "Y" grade without a strong reason.

Equal Access Statement/Disability Accommodations

Tohono O’odham Community College seeks to provide reasonable accommodations for qualified individuals with disabilities. The College will comply with all applicable regulations, and guidelines with respect to providing reasonable accommodations as required to ensure an equal educational opportunity. This process includes self-identifying as a student with a disability, providing supporting documentation of their disability, and being approved for services through the Disability Resources Office (DRO). It is the student's responsibility to make known to their instructor(s) the student’s specific needs within the context of each class in order to receive appropriate accommodations. We will work together to develop an accommodation plan specifically designed to meet the individual student's requirements.

For more information or to request academic accommodations, please contact Anthony Osborn, TOCC Disabilities Resource Coordinator, aosborn@tocc.edu, or 520-383-0033 for additional information and assistance.

Title IX

Tohono O'odham Community College encourages each student to have the knowledge and skills to be an active bystander who intervenes when anyone is observed or being harassed or endangered by sexual violence. Sexual discrimination and sexual violence can undermine students’ academic success and quality of life on campus and beyond. We encourage students who have experienced or witnessed any form of sexual misconduct to talk about their experience and seek the support they need.

Confidential support and academic advocacy can be found with Student Services Title IX Coordinator/Counselor, Alberta Espinoza, M.Ed., located in I-We:mta Ki: Room 18. Phone 520-383-0033 e-mail: aespinoza@tocc.edu



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Conduct: Bias, Bullying, Discrimination, and Harassment

Tohono O'odham Community College faculty and staff are dedicated to creating a safe and supportive campus environment as a core value. Harassment based on age, class, color, culture, disability and ability, ethnicity, gender, gender identity and expression, immigration status, marital status, political ideology, race, religion/spirituality, sex, sexual orientation, and tribal sovereign status are not tolerated.

DISCLAIMER

This syllabus is designed to evolve and change throughout the semester based on class progress and interests. You will be notified of any changes as they occur.