

# TOHONO O'ODHAM COMMUNITY COLLEGE



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**Syllabus: *AST 102N: Stars, Galaxies, Universe.***  
*(hybrid format)*

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## Course Information

**Course Prefix/Number:** AST 102N  
**Semester:** Fall 2018  
**Class Days/Times:** Hybrid format  
(mixed classroom and online):  
Tuesday 3—5:30 (optional, in-  
person session).  
Thursday 3—5:30 (no meeting but  
room reserved for computer use).

**Credit Hours:** 4 (3 lecture + 3 lab  
periods).  
**Course Title:** “Stars, Galaxies,  
Universe”  
**Room:** Computer Lab, MB 24

## Instructor Information:

**Name:** Michael V. Newberry, Ph.D.

**Phone text & voice mail:** 520-241-1525

**E-mail:** ast102tocc@gmail.com

**Office location:** On-line

**Office hours:** On-line or by appointment

## Course Description

AST 102N: Stars, Galaxies, Universe: Introduction to the universe beyond the solar system. Includes the nature of light, how astronomers and telescopes work, and the possibilities of alien life in the universe. Also includes the lifetime of stars, quasars, pulsars and black holes, and the origin, nature and future of the universe. Also includes scientific thinking as an application of critical and quantitative thinking and science in contrast to pseudoscience.

## Prerequisite

Completion of MAT 092 Elementary Algebra, assessment at or completion of WRT 101 or signature of instructor.

## Credits

4 credit hours. Lecture and lab are integrated.

## Student Learning Outcomes

After completion of the 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 and time scales of the universe, compare and contrast these with human scales using scientific notation, distance ranking and scale models.
5. Predict orbital parameters for gravitating systems by applying Kepler's laws of planetary motion and Newton's laws of motion and Universal Gravitation.

## Course Structure

This course is an integrated lab/lecture course where the labs are integrated into the regular class periods. This class is delivered online, with an optional, but recommended, meeting one day per week. This course consists of ten units. Each unit consists of assignments in Pearson "Mastering Astronomy", "SkyGazer" Labs and other assignments.

## Course Assessment

Course assessment consists of four exams, on-line Pearson assessments, labs and one written project.

## Texts and Materials:

- "Mastering Astronomy with Pearson eText -- ValuePack Access Card" for *The Cosmic Perspective*, 8<sup>th</sup> Edition, Jeffrey O. Bennett, Megan O. Donahue, Nicholas Schneider, Mark.
- Textbook: *The Cosmic Perspective, Stars and Galaxies*, 8th Edition.
- *Lecture Tutorials for Introductory Astronomy*, 3<sup>rd</sup> Edition, Edward E. Prather, Tim P. Slater, Jeff P. Adams, Gina Brissenden.
- SkyGazer Software (available in MB 24 or you may purchase a copy online for own computer).

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- Portable Telescopes (to be checked out).
- Binoculars (to be checked out).

## **Himdag Cultural Component**

This course includes a written project in which each student must interview an elder to learn more about how the traditional uses of astronomy by the Tohono O'odham.

## **Policies and Expectations**

### **Course Policies Requirements**

- 1) Attend class regularly on Tuesdays;
- 2) Complete in-class and on-line assignments and submit to the instructor;
- 3) Attend all class observing nights;
- 4) Take all 4 exams Complete all class projects and presentations.

### **Attendance**

You are expected to arrive to class meetings on time and actively participate each class period.

### **Make-up policy**

Missed exams can be made up within two days of the exam date. Late assignments that can be made up will be accepted but will be penalized 25%. At the instructor's discretion, extra credit opportunities and optional activities may be provided.

### **Academic Integrity**

Violations of scholastic ethics are considered serious offenses by Tohono O'odham Community College, the Student Services Department, and by your instructor. Students may consult the TOCC Student Handbook sections on student code of conduct, on scholastic ethics and on the grade appeal procedure. Copies are available at Tohono O'odham Community College.

All work done for this class must be your own. While you may discuss assignments with other class members, the written assignments must clearly be your own. You may use work from other materials if it is properly cited. Copying from a book without proper reference or from a person under any circumstances will result in an "F" for the assignment, and at the instructor's discretion, possibly an "F" for the course.

### **ADA Compliance**

Tohono O'odham Community College strives to comply with the provisions of the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. If

you have a learning problem, physical disability, or medical illness that requires you to have any special arrangements, please contact the Disability Resource Office (520-383-0033) at the beginning of the semester so your academic performance will not suffer because of the disability or handicap.

## **Classroom Behavior**

- Because of insurance limitations, non-registered visitors are not allowed at class sessions or on field trips.
- Possession of drugs, alcohol or firearms on college property is illegal.
- Food and beverages are allowed in classrooms.
- Pets, telephones, pagers and other electronic devices that distract students are not allowed in classrooms.
- Students creating disturbances that interfere with the conduct of the class or the learning of others will be asked to leave.

## **Course Feedback**

All assignments, written papers and quizzes will be graded and returned to the students one week after the assignment is due. E-mail and phone messages will be returned within two days. A student or the instructor may request a student conference at any time during the semester. Students should regularly check Canvas to monitor their grades.

## **Instructor Withdrawals**

Students who have missed four consecutive classes, not submitted any assignments nor taken any quizzes by the 45th day census report, due on October 5, 2018 are assumed NOT to be participating in the class and will be withdrawn. Students may withdraw from class at any time during the first 2/3 of the semester without instructor permission and without incurring any grade penalty. Please be sure to withdraw yourself by November 2, 2018 if you do not expect to complete the class, otherwise you may receive an "F" grade.

## **Incomplete (I) grades**

An "I" grade (incomplete) is not available for this class.

## **Special Withdrawal (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.

## **Final Grades**

Students will receive a grade transcript from the college mailed to the address given with registration materials at the end of the semester when all grades have been recorded.

## **SPECIAL NOTE TO STUDENT**

For privacy and security reasons, instructors are advised **NOT** to give grades over the telephone. Grades will only be emailed with written permission from the student.

Your instructor will make every attempt to follow the above procedures and schedules, but they may be changed in the event of extenuating circumstances.

Students submitting assignments through the mail or by email are advised to make copies for their own protection.

If you move during the semester, please file a change of address form with the *Student Services Office* and inform your instructor.

GOOD LUCK!

## **Course Outline** (see the Course Schedule for specific dates):

- I. General Introduction
  - A. What is Science?
  - B. The role of mathematics in science
    1. Quantitative vs. qualitative understanding
    2. Linear and angular measurement
    3. Unit conversion
    4. Equations
    5. Graphing
  - C. What is Astronomy?
  - D. Value of Astronomy and benefits to the individual
  - E. Scientific method and the central role of skepticism
    1. Contrasts with pseudoscience
    2. Possible pseudo sciences related to Astronomy
      - a. UFO's ("flying saucers")
      - b. Ancient astronauts
      - c. Scientific creationism as related to the age and origin of the Universe
- II. Nature of Starlight
  - A. Magnitude system
  - B. Electromagnetic spectrum
  - C. Physics: what light tells us
    1. Radiation Laws (Planck, Wien, Stephan-Boltzmann)
    2. Doppler effect

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- III. Modern Astronomy
  - A. Major observatories
  - B. Telescopes
    - 1. Optics
    - 2. Instruments
  - C. Celestial coordinates
- IV. Stars
  - A. Physical nature
  - B. Distances
  - C. Motions
  - D. Associations
  - E. Clusters
    - 1. Open or galactic
    - 2. Globular
  - F. H-R Diagram
  - G. The Sun and stellar evolution
- V. Galaxies
  - A. Milky Way
  - B. Galaxy morphology
  - C. Quasars
  - D. Clusters, superclusters, and voids
- VI. Universe
  - A. Description of present-day Universe and modern discoveries
    - 1. Hubble expansion
    - 2. Superclusters
    - 3. 3K cosmic microwave background
  - B. Theories of origin
    - 1. Steady state
    - 2. Big Bang
    - 3. Inflationary
  - C. Future of Universe
- VII. Life in the Universe
  - A. The nature of life
  - B. Probability estimates
    - 1. Simple life forms
    - 2. Complex life forms
  - C. Pseudoscience: UFO's and ancient astronauts
- VIII. Cosmic Perspective: Beyond Global Awareness
  - A. Our location in space and time
  - B. Astronomical numbers
  - C. Specialized units
- IX. Observation Projects
  - A. Standardized methods of observing and recording sky phenomena
  - B. Circumpolar constellations
  - C. Identifying bright stars and constellations
  - D. The Sun

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- E. Cluster star counts
- F. Double stars
- X. Collaborative Exercise and Activities
  - A. Stellar brightness and magnitudes
  - B. Sunspot observation
  - C. Sunspot cycle
  - D. H-R diagram
  - E. Life in the Universe
- XI. Individual Laboratory Exercises
  - A. Tools of the astronomer
  - B. EM radiation
  - C. Constellations
  - D. Galaxies
- XII. Videos Related to Lecture Topics

**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.