Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: ASTR 101 **Year: 2025-2026**

Course Title: Introductory Astronomy **Credit Hours: 3**

I. Course Description: This course is a general study of the fundamental principles of astronomy. Topics include the motions of the earth, members of the solar system, stars, galaxies and universe. ASTR 101 fulfills the SUNY General Education Natural Sciences requirement, but is not a laboratory science course. Students do not need a background in science or mathematics to take this course. Prerequisites: MATH 090 and RDNG 099 or INTD 095 if required by placement testing. 3 Cr. (3 Lec.) Fall and spring semesters.

II. Additional Course Information:

1. ASTR 101 may be completed to fulfill a Liberal Arts Elective or Science Elective.
2. This course uses an Open Educational Resource (OER) text so there is no need to purchase a textbook. There is a ten dollar fee for the OER text/materials.

III. Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Describe the historical development of astronomy including the contributions of the ancient Greeks and Arabs.
2. Explain the apparent motions of the objects observed in the night sky.
3. Explain the physical nature of light.
4. Describe several types of telescopes, and their differences and uses.
5. Describe the characteristics and evolution of stars, galaxies, and the universe as a whole.

IV. Tompkins Cortland General Education & SUNY Competency Goals

☒ Critical thinking (Tompkins Cortland GE Goal; SUNY Competency)
Students will be presented problems in which they have to use the basic principles of astronomy to solve the problem. For example, students will be asked to determine the approximate time (sunrise, noon, sunset, midnight) using the rising of a celestial object given its position relative to the earth and sun.

☐ Social/Global Awareness

☐ Information Management

☐ This course does not address either of these Tompkins Cortland or SUNY General Education Goals.

V. Essential Topics/Themes

1. History and Fundamental Laws: Upon completion of this topic, the student should be able to: a) Diagram and explain retrograde motion of the planets according to the Ptolemaic theory. b) Explain the change in positions, rising times and maximum altitude of the sun throughout the year. c) Define: celestial sphere, Polaris, zenith, ecliptic, zodiac, parallax, opposition, conjunction, sidereal period, circumpolar constellation, heliocentric, geocentric d) Understand Kepler's three laws of motion e) List Galileo's contributions to astronomy f) Understand Newton's first and third laws of motion and the law of universal gravitation g) Define: ellipse, eccentricity, astronomical unit, inertia, mass velocity, density, weight, momentum. h) Explain the cause of the earth's precession and the astronomical significance of this. j) Explain how and why the weight of an object changes with position on the earth's surface j) Explain the cause of and the action of the earth's tides k) Explain the phenomenon of weightlessness in an orbiting space capsule l) Explain the launching and observation of artificial earth satellites m) Define: perihelion, aphelion, apogee, perigee, precession.
2. Sky: Upon completion of this topic, the student should be able to: a) Explain how latitude can be determined by celestial observation. b) Diagram and explain the difference between a solar and a sidereal day c) Explain why the apparent solar day is not constant d) Explain the causes of the seasons e) Define: rotation, revolution, meridian, Tropic of Cancer, Tropic of Capricorn, celestial poles, celestial equator, celestial meridian, equinox, altitude, vernal equinox, universal time, ecliptic, summer solstice, Arctic Circle f) Explain the phases and eclipse of the moon g) Describe the moon regarding: diameter, rotation rate, orbital inclination, atmosphere, distance for the earth, apparent angular diameter h) Explain why only one side of the moon is visible from earth i) Predict the times of rising, setting and crossing of the local meridian for the moon in the phase of : new, full. j) Define: gibbous, earthshine, occultation, transit, solar lunar month, lunar day k) List the planets that exhibit the maximum and minimum: diameter, distance from the sun, mass, apparent brightness l) Define: "shooting star", meteor, asteroid, comet, parsec, light year.
3. Light and Telescopes: Upon completion of this topic, the student should be able to: a) Explain: inverse square law, refraction, Doppler effect, Bohr atomic model b) Define: wavelength, frequency, spectrum c) Explain how the Doppler effect is useful in astronomy d) Compare the construction and advantages of refracting and reflecting telescopes e) Define: resolving power, radio telescope f) List the major limitations to optical astronomy caused by the atmosphere g) List the advantages of large objective telescopes.
4. Stars, Galaxies, and the Universe: Upon completion of this topic, the student should be able to: a) Discuss the evolution of a star including: main sequence, white dwarf, red giant, black dwarf, supernova b) Explain how astronomical distances are determined using the H-R diagram c) Discuss how the sun compares to other stars in all of the major stellar characteristics d) List the two most abundant elements in the sun e) Describe the energy process of the sun: the solar wind, and the sunspot cycle f) Define: corona, sunspot, solar wind, sunspot cycle g) Describe the general shape of our galaxy and list the approximate number of stars in our galaxy h) Recognize in the night sky the Big Dipper and a few other constellations i) Define: neutron star, pulsar, quasar, black hole, Big Bang.

VI. Methods of Assessment/Evaluation

Method	% Course Grade
Quizzes	33%
Tests (mid-term and final)	67%

VII. Texts

1. **Required:** *OER Astronomy*
Creative Commons Attribution License 4.0
Attribution: OpenStax College, Astronomy. OpenStax CNX. Oct 13, 2016
https://openstax.org/details/books/astronomy
2. **Recommended:** *Astronomy Study Guide* by Frank Bickford

Editions listed are current as of date of syllabus. More recent editions may be used.

VIII. Bibliography of Supplemental Materials

None specified

Editions listed are current as of date of syllabus. More recent editions may be used.

IX. Other Learning Resources

Audiovisual: None specified
Electronic: http://apod.nasa.gov/astropix.html
Other: Appendix M in the OER Astronomy text lists several online resources

Attendance Policy: *To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.*

Services for Students with Disabilities: *It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for accommodations. All course materials are available in alternate formats upon request.*

Academic Integrity: *Every student at Tompkins Cortland Community College is expected to act in an academically honest fashion in all aspects of his or her academic work: in writing papers and reports, in taking examinations, in performing laboratory experiments and reporting the results, in clinical and cooperative learning experiences, and in attending to paperwork such as registration forms.*
Any written work submitted by a student must be his or her own. If the student uses the words or ideas of someone else, he or she must cite the source by such means as a footnote. Our guiding principle is that any honest evaluation of a student's performance must be based on that student's work. Any action taken by a student that would result in misrepresentation of someone else's work or actions as the student's own — such as cheating on a test, submitting for credit a paper written by another person, or forging an advisor's signature — is intellectually dishonest and deserving of censure.
Several degree programs offer student learning opportunities (such as internships, field work, and clinical experiences) outside the standard classroom setting. As part of the learning process, students must understand and engage in conduct that adheres to principles guiding employment within the professional workplace. These behaviors include, but are not limited to, academic integrity, accountability, reliability, respect, use of appropriate language and dress, civility, professional ethics, honesty, and trustworthiness. Disciplinary action may be initiated for inappropriate conduct occurring while participating in any course-related project or event.