HORRY GEORGETOWN TECHNICAL COLLEGE

INSTRUCTIONAL PACKAGE

AST 101
Solar System Astronomy

Effective Term

Fall 2023/Spring 2024/Summer 2024

INSTRUCTIONAL PACKAGE

Part I: Course Information

Effective Term: 2023-2024

COURSE PREFIX: AST 101 COURSE TITLE: Solar System Astronomy

CONTACT HOURS: 3-3 CREDIT HOURS: 4

RATIONALE FOR THE COURSE:
AST 101 introduces scientific processes such as analysis of light spectra, planetary system formation, techniques for searching for extra-solar planets and summarizing scientific laws that govern these processes. By critically evaluating information presented, students prepare for scientific fields in which they will be expected to apply scientific principles in their careers.

COURSE DESCRIPTION:
This course is a descriptive survey of the universe with emphasis on basic physical concepts and the objects in the solar system. Related topics of current interest are included in the course.

PREREQUISITES/CO-REQUISITES:
((Credit level MAT 101 Minimum Grade of C or Credit level MAT 101 Minimum Grade of TC or Credit level MAT 102 Minimum Grade of C or Credit level MAT 102 Minimum Grade of TC or Credit level MAT 110 Minimum Grade of C or Credit level MAT 110 Minimum Grade of TC or Credit level MAT 120 Minimum Grade of C or Credit level MAT 120 Minimum Grade of TC or Credit level MAT 155 Minimum Grade of C or Credit level MAT 155 Minimum Grade of TC or New SAT Mathematics 420 or ACT Math 15 or New ACCUPLACER Arithmetic 220 or New ACCUPLACER Adv Algebra 200) or (Multiple Measures Math 1))

*__Online/Hybrid__ courses require students to complete the DLi Orientation Video prior to enrolling in an online course.

REQUIRED MATERIALS:
Please visit the BOOKSTORE online site for most current textbook information.

Enter the semester, course prefix, number and section when prompted and you will be linked to the correct textbook.

ADDITIONAL REQUIREMENTS:
Registration with the Starry Night Learning System is a required component of this course.

For Hybrid/Online Students Only: Each student will be required to view an orientation PowerPoint presentation during the first week of class. This presentation can be found on the course homepage in D2L under News. After viewing the presentation, all online students must complete the Attendance Verification quiz, which can be found under the dropdown assignment menu. A student will not be considered officially enrolled in the course until the presentation has been viewed and the quiz completed with a 100% score.

Failure to view the presentation and take the quiz before midnight on the last day to add/drop classes will result in the student being automatically dropped from the course.

TECHNICAL REQUIREMENTS:

Access to Desire2Learn (D2L), HGTC's learning management system (LMS) used for course materials.
Access to myHGTC portal for student self-services.
College email access – this is the college's primary official form of communication.

STUDENT IDENTIFICATION VERIFICATION

Students enrolled in online courses will be required to participate in a minimum of one (1) proctored assignment and/or one (1) virtual event to support student identification verification. Please refer to your Instructor Information Sheet for information regarding this requirement.

CLASSROOM ETIQUETTE:

As a matter of courtesy to other students and your professor, please turn off cell phones and other communication/entertainment devices before class begins. If you are monitoring for an emergency, please notify your professor prior to class and switch cell phone ringers to vibrate.

NETIQUETTE: is the term commonly used to refer to conventions adopted by Internet users on the web, mailing lists, public forums, and in live chat focused on online communications etiquette. For more information regarding Netiquette expectations for distance learning courses, please visit Online Netiquette.

ACADEMIC DISHONESTY:

All forms of academic dishonesty, as outlined in the Student Code in the HGTC catalog, will NOT be tolerated and will result in disciplinary action. Anyone caught cheating or committing plagiarism (Defined in the code as: "The appropriation of any other person's work and the unacknowledged incorporation of that work in one's own work offered for credit") will be given a grade of a zero for that assignment and reported to the Senior VP of Academic Affairs, in accordance with the student handbook. A second offense will result in the student being withdrawn from the course with a "WF" and charges being filed with the Chief Student Services Officer.

Part II: Student Learning Outcomes

COURSE LEARNING OUTCOMES and ASSESSMENTS*:

Chapter 1: Science and the Universe
Describe the size and age of the universe and Earth's place in it.
Explain how astronomers use the scientific method to study the universe.
Show how astronomers use mathematics, including graphs, to find patterns in nature.
Describe our astronomical origins.

Chapter 2: Observing the Sky
Define the main features of the celestial sphere.
Explain the system astronomers use to describe the sky.
Describe how motions of the stars appear to us on Earth.
Describe how motions of the Sun, Moon, and planets appear to us on Earth.
Understand the modern meaning of the term constellation.
Describe early examples of astronomy around the world.
Explain how Greek astronomers were able to deduce that Earth is spherical.
Explain how Greek astronomers were able to calculate Earth's size.
Describe the motion of Earth called precession.
Describe Ptolemy's geocentric system of planetary motion.
Explain the origins of astrology.
Explain what a horoscope is.
Summarize the arguments that invalidate astrology as a scientific practice.
Explain how Copernicus developed the heliocentric model of the solar system.
Explain the Copernican model of planetary motion and describe evidence or arguments in favor of it.
Describe Galileo's discoveries concerning the study of motion and forces.
Explain how Galileo's discoveries tilted the balance of evidence in favor of the Copernican model.

Chapter 3: Orbits and Gravity
Describe how Tycho Brahe and Johannes Kepler contributed to our understanding of how planets move around the Sun.
Explain Kepler's three laws of planetary motion.
Describe Newton's three laws of motion.
Explain how Newton's three laws of motion relate to momentum.
Define mass, volume, and density and how they differ.
Define angular momentum.
Explain what determines the strength of gravity.
Describe how Newton's universal law of gravitation extends our understanding of Kepler's laws.
Compare the orbital characteristics of the planets in the solar system.
Compare the orbital characteristics of asteroids and comets in the solar system.
Explain how an object (such as a satellite) can be put into orbit around Earth.
Explain how an object (such as a planetary probe) can escape from orbit.
Explain how the gravitational interactions of many bodies can causes perturbations in their motions.
Explain how the planet Neptune was discovered.

Chapter 4: Earth, Moon, and Sky

Describe how latitude and longitude are used to map Earth.
Explain how right ascension and declination are used to map the sky.
Describe how the tilt of Earth's axis causes the seasons.
Explain how seasonal differences on Earth vary with latitude.
Explain the difference between the solar day and the sidereal day.
Explain mean solar time and the reason for time zones.
Understand how calendars varied among different cultures.
Explain the origins of our modern calendar.
Explain the cause of the lunar phases.
Understand how the Moon rotates and revolves around Earth.
Describe what causes tides on Earth.
Explain why the amplitude of tides changes during the course of a month.
Describe what causes lunar and solar eclipses.
Differentiate between a total and partial solar eclipse.
Explain why lunar eclipses are much more common than solar eclipses.

Chapter 5: Radiation and Spectra

Explain the evidence for Maxwell's electromagnetic model of light.
Describe the relationship between wavelength, frequency, and speed of light.
Discuss the particle model of light and the definition of photon.
Explain how and why the amount of light we see from an object depends upon its distance.
Understand the bands of the electromagnetic spectrum and how they differ from one another.
Understand how each part of the spectrum interacts with Earth's atmosphere.
Explain how and why the light emitted by an object depends on its temperature.
Describe the properties of light.
Explain how astronomers learn the composition of a gas by examining its spectral lines.
Discuss the various types of spectra.
Describe the structure of atoms and the components of nuclei.
Explain the behavior of electrons within atoms and how electrons interact with light to move among energy levels.
Explain how emission line spectra and absorption line spectra are formed.
Describe what ions are and how they are formed.
Explain how spectral lines and ionization levels in a gas can help us determine its temperature.
Explain why the spectral lines of photons we observe from an object will change as a result of the object's motion toward or away from us.
Describe how we can use the Doppler effect to deduce how fast astronomical objects are moving through space.

Chapter 6: Astronomical Instruments

Describe the three basic components of a modern system for measuring astronomical sources.
Describe the main functions of a telescope.
Describe the two basic types of visible-light telescopes and how they form images.
Recognize the largest visible-light and infrared telescopes in operation today.
Discuss the factors relevant to choosing an appropriate telescope site.

Define the technique of adaptive optics and describe the effects of the atmosphere on astronomical observations.
Describe the difference between photographic plates and charge-coupled devices.
Describe the unique difficulties associated with infrared observations and their solutions.
Describe how a spectrometer works.
Describe how radio waves from space are detected.
Identify the world's largest radio telescopes.
Define the technique of interferometry and discuss the benefits of interferometers over single-dish telescopes.
List the advantages of making astronomical observations from space.
Explain the importance of the Hubble Space Telescope.
Describe some of the major space-based observatories astronomers use.
Describe the next generation of ground- and space-based observatories.
Explain some of the challenges involved in building these observatories.

Chapter 7: Introduction to the Solar System
Describe how the objects in our solar system are identified, explored, and characterized.
Describe the types of small bodies in our solar system, their locations, and how they formed.
Model the solar system with distances from everyday life to better comprehend distances in space.
Describe the characteristics of the giant planets, terrestrial planets, and small bodies in the solar system.
Explain what influences the temperature of a planet's surface.
Explain why there is geological activity on some planets and not on others.
Explain how astronomers can tell whether a planetary surface is geologically young or old.
Describe different methods for dating planets.
Describe the characteristics of planets that are used to create formation models of the solar system.
Describe how the characteristics of extrasolar systems help us to model our own solar system.
Explain the importance of collisions in the formation of the solar system.

Chapter 8: Earth as a Planet
Describe the components of Earth's interior and explain how scientists determined its structure.
Specify the origin, size, and extent of Earth's magnetic field.
Denote the primary types of rock that constitute Earth's crust.
Explain the theory of plate tectonics.
Describe the difference between rift and subduction zones.
Describe the relationship between fault zones and mountain building.
Explain the various types of volcanic activity occurring on Earth.
Differentiate between Earth's various atmospheric layers.
Describe the chemical composition and possible origins of our atmosphere.
Explain the difference between weather and climate.
Outline the origins and subsequent diversity of life on Earth.
Explain the ways that life and geological activity have influenced the evolution of the atmosphere.
Describe the causes and effects of the atmospheric greenhouse effect and global warming.
Describe the impact of human activity on our planet's atmosphere and ecology.
Explain the scarcity of impact craters on Earth compared with other planets and moons.
Describe the evidence for recent impacts on Earth.

Detail how a massive impact changed the conditions for life on Earth, leading to the extinction of the dinosaurs.
Describe how impacts have influenced the evolution of life on Earth.
Discuss the search for objects that could potentially collide with our planet.

Chapter 9: The Moon and Mercury
Discuss what has been learned from both manned and robotic lunar exploration.
Describe the composition and structure of the Moon.
Differentiate between the major surface features of the Moon.
Describe the history of the lunar surface.
Describe the properties of the lunar "soil".
Compare and contrast ideas about how lunar craters form.
Explain the process of impact crater formation.
Discuss the use of crater counts to determine relative ages of lunar landforms.
Describe the top three early hypotheses of the formation of the Moon.
Summarize the current "giant impact" concept of how the Moon formed.
Characterize the orbit of Mercury around the Sun.
Describe Mercury's structure and composition.
Explain the relationship between Mercury's orbit and rotation.
Describe the topography and features of Mercury's surface.
Summarize our ideas about the origin and evolution of Mercury.

Chapter 10: Earthlike Planets: Venus and Mars
Explain why it's difficult to learn about Venus from Earth-based observation alone.
Describe the history of our interest in Mars before the Space Age.
Compare the basic physical properties of Earth, Mars, and Venus, including their orbits.
Describe the general features of the surface of Venus.
Explain what the study of craters on Venus tells us about the age of its surface.
Compare tectonic activity and volcanoes on Venus with those of Earth.
Explain why the surface of Venus is inhospitable to human life.
Describe the general composition and structure of the atmosphere on Venus.
Explain how the greenhouse effect has led to high temperatures on Venus.
Discuss the main missions that have explored Mars.
Explain what we have learned from examination of meteorites from Mars.
Describe the various features found on the surface of Mars.
Compare the volcanoes and canyons on Mars with those of Earth.
Describe the general conditions on the surface of Mars.
Describe the general composition of the atmosphere on Mars.
Explain what we know about the polar ice caps on Mars and how we know it.
Describe the evidence for the presence of water in the history of Mars.
Summarize the evidence for and against the possibility of life on Mars.
Compare the planetary evolution of Venus, Earth, and Mars

Chapter 11: The Giant Planets
Provide an overview of the composition of the giant planets.
Chronicle the robotic exploration of the outer solar system.

Summarize the missions sent to orbit the gas giants.
Describe the basic physical characteristics, general appearance, and rotation of the giant planets.
Describe the composition and structure of Jupiter, Saturn, Uranus, and Neptune.
Compare and contrast the internal heat sources of the giant planets.
Describe the discovery and characteristics of the giant planets' magnetic fields.
Discuss the atmospheric composition of the giant planets.
Describe the cloud formation and atmospheric structure of the gas giants.
Characterize the giant planets' wind and weather patterns.
Understand the scale and longevity of storms on the giant planets.

Chapter 12: Rings, Moons, and Pluto
Name the major moons of each of the Jovian planets.
Describe the basic composition of each Jovian planet's ring system.
Describe the major features we can observe about Callisto and what we can deduct from them.
Explain the evidence for tectonic and volcanic activity on Ganymede.
Explain what may be responsible for the unusual features on the icy surface of Europa.
Describe the major distinguishing characteristic of Io.
Explain how tidal forces generate the geological activity we see on Europa and Io.
Explain how the thick atmosphere of Titan makes bodies of liquid on its surface possible.
Describe what we learned from the landing on Titan with the Huygens probe.
Discuss the features we observed on the surface of Triton when Voyager 2 flew by.
Compare the orbital characteristics of Pluto with those of the planets.
Describe information about Pluto's surface deduced from the New Horizons images.
Note some distinguishing characteristics of Pluto's large moon Charon.
Describe the two theories of planetary ring formation.
Compare the major rings of Saturn and explain the role of the moon Enceladus in the formation of the E ring.
Explain how the rings of Uranus and Neptune differ in composition and appearance from the rings of Saturn.
Describe how ring structure is affected by the presence of moons.

Chapter 13: Comets and Asteroids
Outline the story of the discovery of asteroids and describe their typical orbits.
Describe the composition and classification of the various types of asteroids.
Discuss what was learned from spacecraft missions to several asteroids.
Recognize the threat that near-Earth objects represent for Earth.
Discuss possible defensive strategies to protect our planet.
Characterize the general physical appearance of comets.
Explain the range of cometary orbits.
Describe the size and composition of a typical comet's nucleus.
Discuss the atmospheres of comets.
Summarize the discoveries of the Rosetta mission.
Describe the traits of the centaur objects.
Chronicle the discovery and describe the composition of the Oort cloud.
Describe trans-Neptunian and Kuiper-belt objects.
Explain the proposed fate of comets that enter the inner solar system.

Chapter 14: Meteors, Meteorites, and the Origin of the Solar System
Explain what a meteor is and why it is visible in the night sky.
Describe the origins of meteor showers.
Explain the origin of meteorites and the difference between a meteor and a meteorite.
Describe how most meteorites have been found.
Explain how primitive stone meteorites are significantly different from other types.
Explain how the study of meteorites informs our understanding of the age of the solar system.
Describe the motion, chemical, and age constraints that must be met by any theory of solar system formation.
Summarize the physical and chemical changes during the solar nebula stage of solar system formation.
Explain the formation process of the terrestrial and giant planets.
Describe the main events of the further evolution of the solar system.
Describe how the observations of protoplanetary disks provides evidence for the existence of other planetary systems.
Explain the two primary methods for detection of exoplanets.
Compare the main characteristics of other planetary systems with the features of the solar system.
Describe the geological activity during the evolution of the planets, particularly on the terrestrial planets.
Describe the factors that affect differences in elevation on the terrestrial planets.
Explain how the differences in atmosphere on Venus, Earth, and Mars evolved from similar starting points in the early history of the solar system.

Students – please refer to the Instructor's Course Information sheet for specific information on assessments and due dates.

Part III: Grading and Assessment

EVALUATION OF REQUIRED COURSE MEASURES/ARTIFACTS*

Students' performance will be assessed, and the weight associated with the various measures/artifacts are listed below.

EVALUATION*

Lecture	75%
Lab	25%
Total	100%

Students, for the specific number and type of evaluations, please refer to the Instructor's Course Information Sheet.

GRADING SYSTEM:

Please note the College adheres to a 10-point grading scale A = 100 – 90, B = 89- 80, C = 79 – 70, D = 69 – 60, F = 59 and below.

Grades earned in courses impact academic progression and financial aid status. Before withdrawing from a course, be sure to talk with your instructor and financial aid counselor about the implications of that course of action. Ds, Fs, Ws, WFs and Is also negatively impact academic progression and financial aid status.

The Add/Drop Period is the first 5 days of the semester for **full term** classes. Add/Drop periods are shorter for accelerated format courses. Please refer to the academic calendar for deadlines for add/drop. You must attend at least one meeting of all of your classes during that period. If you do not, you will be dropped from the course(s) and your Financial Aid will be reduced accordingly.

Part IV: Attendance

Horry-Georgetown Technical College maintains a general attendance policy requiring students to be present for a minimum of 80 percent (80%) of their classes in order to receive credit for any course. Due to the varied nature of courses taught at the college, some faculty may require up to 90 percent (90%) attendance. Pursuant to 34 Code of Federal Regulations 228.22 - Return to Title IV Funds, once a student has missed over 20% of the course or has missed two (2) consecutive weeks, the faculty is obligated to withdraw the student and a student may not be permitted to reenroll. **Instructors define absentee limits for their class at the beginning of each term; please refer to the Instructor Course Information Sheet.**

For online and hybrid courses, check your Instructor's Course Information Sheet for any required on-site meeting times. Please note, instructors may require tests to be taken at approved testing sites, and if you use a testing center other than those provided by HGTC, the center may charge a fee for its services.

Science Department Attendance Policies

For a 15-week course (fall and spring) or a 10-week course (summer), the allowed number of absences for a MW or TR class is as follows: 4 absences are allowed for lecture and 2 are allowed for lab, regardless of reason. For a lecture class that meets once a week, the allowed number of absences is 2.

For a 7-week fast-paced course (fall and spring) or a 5-week fast-paced course (summer), the allowed number of absences is as follows: 1 absence is allowed for lecture and 1 for lab, regardless of reason.

When a student surpasses the allowed number of absences, the student will be dropped automatically from the course with a W or a WF. Remember, an absence is an absence, no matter if it is excused or not!

Online/Hybrid Attendance:

Students enrolled in distance learning courses (hybrid and online) are required to maintain contact with the instructor on a regular basis to be counted as "in attendance" for the course. All distance learning students must participate weekly in an Attendance activity in order to demonstrate course participation. Students showing no activity in the course for two weeks (these weeks do not need to be consecutive) will be withdrawn due to lack of attendance.

Lab Attendance for Hybrid Courses:

Students in hybrid classes in which labs meet weekly, are allowed two (2) lab absences. Students in hybrid labs that only meet 5 or 6 times during the semester, must attend all lab sessions for its entirety. When a student surpasses the allowed number of absences, the student will be dropped automatically from the course with a W or a WF.

Part V: Student Resources

THE STUDENT SUCCESS AND TUTORING CENTER (SSTC):

The SSTC offers to all students the following **free** resources:

1. **Academic tutors** for most subject areas, **Writing Center support**, and **college success skills**.
2. Online **tutoring** and academic support resources.
3. Professional and interpersonal communication **coaching** in the EPIC Labs.

Visit the Student Success & Tutoring Center website for more information. To schedule tutoring, contact the SSTC at sstc@hgtc.edu or self-schedule in the Penji iOS/Android app or at www.penjiapp.com. Email sstc@hgtc.edu or call SSTC Conway, 349-7872; SSTC Grand Strand, 477-2113; and SSTC Georgetown, 520-1455, or go to the Online Resource Center to access on-demand resources.

STUDENT INFORMATION CENTER: TECH Central

TECH Central offers to all students the following free resources:

1. **Getting around HGTC**: General information and guidance for enrollment, financial aid, registration, and payment plan support!
2. Use the Online Resource Center (ORC) including Office 365 support, password resets, and username information.
3. **In-person workshops, online tutorials and more services** are available in Desire2Learn, Student Portal, Degree Works, and Office 365.
4. **Chat with our staff on TECH Talk**, our live chat service. TECH Talk can be accessed on the student portal and on TECH Central's website, or by texting questions to (843) 375-8552.

Visit the Tech Central website for more information. Live Chat and Center locations are posted on the website. Or please call (843) 349 – TECH (8324), Option #1.

HGTC LIBRARY:

Each campus location has a library where HGTC students, faculty, and staff may check out materials

with their HGTC ID. All three HGTC campus libraries are equipped with computers to support academic research and related schoolwork; printing is available as well. Visit the Library website for more information or call (843) 349-5268.

STUDENT TESTING:

Testing in an **online/hybrid** course and in **make-up exam** situations may be accomplished in a variety of ways:

- Test administered within D2L
- Test administered in writing on paper
- Test administered through Publisher Platforms (which may have a fee associated with the usage)

Furthermore, tests may have time limits and/or require a proctor.

Proctoring can be accomplished either face-to-face at an approved site or online through our online proctoring service. To find out more about proctoring services, please visit the Online Testing section of the HGTC's Testing Center webpage.

The **Instructor Information Sheet** will have more details on test requirements for your course.

DISABILITY SERVICES:

HGTC is committed to providing an accessible environment for students with disabilities. Inquiries may be directed to HGTC's Accessibility and Disability Service webpage. The Accessibility and Disability staff will review documentation of the student's disability and, in a confidential setting with the student, develop an educational accommodation plan.

Note: It is the student's responsibility to self-identify as needing accommodations and to provide acceptable documentation. After a student has self-identified and submitted documentation of a disability, accommodations may be determined, accepted, and provided.

STATEMENT OF EQUAL OPPORTUNITY/NON-DISCRIMINATION STATEMENT:

Horry-Georgetown Technical College prohibits discrimination and harassment, including sexual harassment and abuse, on the basis of race, color, sex, national or ethnic origin, age, religion, disability, marital or family status, veteran status, political ideas, sexual orientation, gender identity, or pregnancy, childbirth, or related medical conditions, including, but not limited to, lactation in educational programs and/or activities.

TITLE IX REQUIREMENTS:

All students (as well as other persons) at Horry-Georgetown Technical College are protected by Title IX—regardless of their sex, sexual orientation, gender identity, part- or full-time status, disability, race, or national origin—in all aspects of educational programs and activities. Any student, or other member of the college community, who believes that he/she is or has been a victim of sexual harassment or sexual violence may file a report with the college's Chief Student Services Officer, campus law enforcement, or with the college's Title IX Coordinator or designee.

*Faculty and Staff are required to report incidents to the Title IX Coordinators when involving students. The only HGTC employees exempt from mandatory reporting are licensed mental health professionals (only as part of their job description such as counseling services).

INQUIRIES REGARDING THE NON-DISCRIMINATION/TITLE IX POLICIES:

Student and prospective student inquiries concerning Section 504, Title II, Title VII, and Title IX and their application to the College or any student decision may be directed to the Vice President for Student Affairs.

Dr. Melissa Batten, VP Student Affairs
Title IX, Section 504, and Title II Coordinator
Building 1100, Room 107A, Conway Campus
PO Box 261966, Conway, SC 29528-6066
843-349-5228
Melissa.Batten@hgtc.edu

Employee and applicant inquiries concerning Section 504, Title II, and Title IX and their application to the College may be directed to the Vice President for Human Resources.

Jacquelyne Snyder, VP Human Resources
Affirmative Action/Equal Opportunity Officer and Title IX Coordinator
Building 200, Room 205B, Conway Campus
PO Box 261966, Conway, SC 29528-6066
843-349-5212
Jacquelyne.Snyder@hgtc.edu