CHATTANOOGA STATE COMMUNITY COLLEGE
Chattanooga, Tennessee
Mathematics and Science Division

Course Syllabus

ASTR 1030 - ASTRONOMY COURSE SYLLABUS

Instructor: CREDIT HOURS: 4
Phone CLASS HOURS: 3
E-Mail: LABORATORY HOURS: 3

Catalog Course Description:
Introduction to astronomy, history and methods of astronomy, methods of astronomy, formation of the solar system, and the physical characteristics of the sun, planets, moons, and minor members of the solar system (asteroids, meteoroids, and comets).

Pre-requisites: College level skills in English, Reading, and Mathematics
There are no other college-level courses that must be taken before this one, but the student should have entry-level college reading and math skills. Some concepts of astronomy and some laboratory exercises require the ability to understand and perform some basic algebraic manipulations. The Physics 1030 may be taken before or after this course for those students needing a two-semester science elective. The most logical sequence would be Physics and then Astronomy because some of the laws studied in Physics apply to Astronomy.

Co-requisites: none

Entry Level Standards:
The student should have the mathematical competence level necessary to perform basic algebraic manipulations required to solve for an unknown variable in an algebraic equation: operations involving decimal fractions, ratios, percentages and scientific notations.

Textbooks/ Materials:

Chattanooga State, ASTR 1030 Laboratory Manual, August 2009

WebAssign access code, to be provided with a new book or purchased online.
**Supplementary Materials:**
The student should have a three ring binder or notebook and a calculator. The PowerPoint Notes are available for purchase for some classes.

**Hardware Requirements:**
Specific hardware requirements for this course include a CDROM drive, Pentium level computer, and as fast and reliable an internet connection as the student can provide. A printer for printing out sky charts is also needed.

This is considered a **supplemental course**, which means it has required elements of the course online. These elements may include, but are not limited too, syllabi, calendars, announcement, notes, and homework. Homework will be completed online.

CSTCC provides computer access to all students, in computer labs throughout the campus. The homework may be printed off in the computer labs, completed at home, and entered into the computers at school. If you have any questions, please contact the instructor.

I. **Program Student Learning Outcome 5:** Issues in today’s world require scientific information and a scientific approach to informed decision making. Therefore, the goal of the Natural Science requirement is to guide students toward becoming scientifically literate. This scientific understanding gained in these courses enhances students’ ability to define and solve problems, reason with an open mind, think critically and creatively, suspend judgment, and make decisions that may have local or global significance.

**CSLO Student Learning Outcomes**
CSLO 1. Students will demonstrate the ability to conduct an experiment, collect and analyze data, and interpret results in a laboratory setting.
CSLO2. Students will demonstrate the ability to analyze, evaluate and test a scientific hypothesis.
CSOL3. Students will demonstrate the ability to use basic scientific language and processes, and be able to distinguish between scientific and non-scientific explanations.
CSOL4. Students will demonstrate the ability to identify unifying principles and repeatable patterns in nature, the values of natural diversity, and apply them to problems or issues of a scientific nature.
CSLO5. Students will demonstrate the ability to analyze and discuss the impact of scientific discovery on human thought and behavior.

PSLO 4: To expand students’ understanding of mathematics beyond the entry level requirements for college and to extend their knowledge of mathematics through relevant mathematical modeling with applications, problem solving, critical thinking skills, and the use of appropriate technologies.

CSLO6. Students will use mathematics to model real world behaviors and apply mathematical concepts to the solution of real-life problems.

Required assessments
1. Tests: the students will be tested upon their ability to use basic physics language and processes, identify unifying principles, demonstrate the ability to analyze and discuss the impact of scientific discovery, and use mathematic to solve problems and model the real world.
2. Lab Reports: Students will demonstrate the ability to conduct an experiment, collect and analyze data, and interpret results in a laboratory setting.
3. Quizzes: will assess the student’s ability to use basic physics language, and solve real world mathematics problems. Quizzes may be traditional but are may be in class formative assessments that may be done traditionally or by PRS “clickers”.
4. Homework: the students will be assessed upon their ability to use basic physics language and processes, identify unifying principles, demonstrate the ability to analyze and discuss the impact of scientific discovery, and use mathematic to solve problems and model the real world.

<table>
<thead>
<tr>
<th>CSLO/ Assessment Alignment:</th>
<th>CSLO #1</th>
<th>CSLO #2</th>
<th>CSLO #3</th>
<th>CSLO #4</th>
<th>CSLO #5</th>
<th>CSLO #6</th>
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<tbody>
<tr>
<td><strong>Assessments:</strong></td>
<td>Labs</td>
<td>Lab Centripetal Force</td>
<td>Tests HW Labs Final exam</td>
<td>Test 1 HW 2</td>
<td>HW 1-2 Test 1</td>
<td>Test 2 HW 6 Lab Fc Exam</td>
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</table>
II. **Topics:**

A. A Brief Tour of the Astronomy
   1. The nature of science in general and as it applies to astronomy.
   2. Use of large numbers and scales used in astronomy
   3. The applications of velocity, time and distance, including the speed of light to astronomy.
   4. List and describe the accomplishments of important historical astronomers
      5. Aristotle, Eratosthenes, Hipparchus, Ptolemy, Tycho Brahe, Kepler, Copernicus, Galileo,
   6. Contrast and compare astrology to astronomy.

B. Science of Astronomy
   1. Laws of Motion, the Laws of Planetary Motion, and the Law of Gravity
   2. Define orbit and satellite.
   3. The student will be able to describe orbital motion and use formulas for centripetal force and gravity in a laboratory situation.

C. The Earth, Moon and the Sky
   1. Terms including, sky atmosphere, stars, constellations, galaxies.
   2. Definition, cause and description of seasons.
   3. The bases of various calendars.
   4. The phases and motion of the moon.
   5. Properties, diagrams, and causes of tides and eclipses.

D. Electromagnetic Spectrum and Telescope
   1. The electromagnetic spectrum and its uses in astronomy.
   2. List the properties and design of the reflector, refractor and radio telescopes, lists advantages and disadvantages of each.

E. The Solar System
   1. The principle components of a solar system.
   2. Terrestrial planets, gas giants, and dwarf planets.
   3. The history of the solar system and how we know it.

F. The Earth
   1. Why we study the earth as part of astronomy.
   2. The parts of the earth; core, mantle, crust, hydrosphere, and atmosphere.
   3. Describe chemical and radiation processes that affect planets and life.
G. The Moon and Mercury
   1. Contrast and compare the Moon and Mercury
   2. Surface features; craters, rilles, mountains, maria, scarfs, tectonic plates
   3. Scientific probes to the planets.
   4. Compare the Moon and Mercury to the Earth

H. Venus and Mars
   1. The atmosphere, surface features, geology, water and evolution of Venus and Mars.
   2. Compare Venus and Mars to the Earth.
   3. List scientific probes to the planets.
   4. The surface features of Venus and Mars
   5. The atmospheres of Venus and Mars
   6. The moons of Venus

I. The Gas Giants
   1. The size, atmosphere, surface features, geology, water, moons evolution of the Gas Giants or Jovian Planets.
   2. The major identifying characteristics of each Gas Giant, including historical discovery.
   3. Students will be able to list scientific probes to the planets.
   4. Rings: List which planets have rings, describe the rings and the development of the rings
   5. Gas Giants moons: Match the major moons to their planets.
   6. List and describe the most important of the moons, including the ones with outstanding characteristics, i.e. size, water, volcanoes, atmosphere

J. Pluto and Beyond
   1. Pluto and Charon, and why Pluto is no longer an official planet.
   2. KBO objects.
   3. Dwarf Planets

K. Comets, Asteroids and Meteorites
   1. The origin, path, and parts of a comet.
   2. Meteors and meteorites and their effects.
   3. Location of, description of, and name of prominent asteroids.
   4. The effects of asteroid impact with earth.

L. The Sun
   1. The origin, relative size, and function of the sun.
   2. The parts of the sun’s core and atmosphere.
   3. The student will be able to compare the sun to other stars.
4. The fuel and power source of the sun

M. Exobiology
   1. The search for extra terrestrial life.

III. **Instructional Activities**

Instructions activities used in this course include, but are not limited to the following:

I1. Lecture
I2. Power Point presentations
I3. Videos
I4. Student class participation; clicker questions, online research, group study and response, and web searches
I5. Outside class participation; online and traditional homework, web searches, research
I6. Laboratory experiences, traditional activity labs, online labs, computer simulations, and outdoor viewing labs at night
I7. Assessments, tests, lab reports, homework

IV. **Indicators:**

1) Explain what is meant by the “scientific method” and how the theories and laws of science are developed. Relate the effects the use of this method has on mankind's thinking with specific application to the comparison of astronomy and astrology.

2) Beginning with our solar system, name the types of major structures in the universe and list them in their order of relative size and distance from the Earth.

3) Understand and relate how the discoveries of astronomy have affected human understanding of the cosmos, for example, the effects of Galileo's discoveries on the acceptance of the geocentric theory.

4) Describe the celestial sphere and related terminology. Describe the history of astronomy including the discoveries of the early Greek astronomers and discoveries of later astronomers Copernicus and Galileo.

5) Be able to locate and identify four of the naked-eye planets and determine their coordinates using simple tools.

7) Describe events leading to the discovery of Uranus and Neptune.

8) Explain phenomena resulting from the motions of the Earth and Moon (eclipses, solstices, equinoxes, seasons, retrograde motion and precession) including terminology used to define celestial motions and positions. Describe the orbital motion of the Moon and how it produces the observed phases, ocean tides, and eclipses.

9) List some of the major contributions to society due as a direct consequence of the space program (spinoffs)

10) Name and describe the structure, features and characteristics of the collective groupings of planets and their moons and other smaller objects in the solar system.

11) Describe the scale of the solar system including the relative sizes of objects and their orbits and explain why the patterns occur.

12) Describe the processes important to the formation and evolution of the internal structure, surface, and atmosphere of the Earth, Moon and Mercury.

13) Describe the orbital and rotational characteristics of the Moon and Mercury.

14) From basic data verify Kepler's hypothesis of elliptical orbits by determining the geometrical form of the orbit for one planet.

15) Describe the processes important to the formation and evolution of the internal structure, surface, and atmosphere of the Venus and Mars.

16) Describe the orbital and rotational characteristics of the Venus and Mars.

17) Describe and compare the composition, internal structure, and atmospheres of the Jovian planets and explain why they are different.

18) Describe and compare the ring systems of the Jovian planets, how they were discovered, and explore why they are different. Describe and compare the orbital characteristics of the moon systems of the Jovian planets and explore why they are different.

19) Describe the characteristics of Pluto and its moon.

20) Describe the structure, features and characteristics of the minor members (comets, asteroids, meteoroids, etc.) of the solar system.

21) Describe the basic structure, features, and characteristics of the Sun.
22) Describe the Sun’s magnetic cycle and the structure of its atmosphere.

23) Describe current debate on 9 planets versus dwarf planets.

24) Be able to use proper laboratory techniques, including measurement, telescopes, star finders, and teamwork. Perform research involving the acquisition of astronomical data through direct personal measurement through Internet sources.

25) Be able to analyze sources that support or criticize historical data related to the space program (i.e. Moon Landing Hoax). 11,12,13, C2, C4,C5

26) Be able to solve mathematic formulas for one unknown given two other knowns in formulas including $v = d/t$, $c = d/t$, $k = T^2/R^3$, $F = mv^2/r$, $1/f = 1/i + 1/o$. $M = F_0/F_e = h/h_o$

V. Assessment

Student evaluation and mastery of course materials will be based on performance on unit tests, laboratory exercises, and a comprehensive final exam. The final grade will be determined as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Unit Tests</td>
<td>40%</td>
</tr>
<tr>
<td>Lab</td>
<td>25%</td>
</tr>
<tr>
<td>Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>5%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
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</tbody>
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TESTS

No special makeup tests will be given. However, if you miss a test and circumstances warrant it, you may be able to make arrangements with the instructor and take the test prior to the next scheduled class. You may also be able to take the test early if you know in advance that you will miss a test. If you take all tests during the semester, your score on the final exam will be substituted for a low unit test score. If you missed any tests, your score on the final exam can be substituted for one missed test.

The final exam will include material from the entire semester. Your unit tests should be thoroughly reviewed prior to taking the final exam. The correct answers to exam questions and problems usually will be posted after the graded tests are returned. You should check your answers against the posted answers and make corrections as appropriate. Prior tests will not be re-posted at the end of the semester.

LABS
Read laboratory procedures prior to each lab class. You need to be familiar with the experiment procedures prior to the lab class. At the discretion of the lab instructor, a quiz may be given at the start of any lab class covering the material in that day’s lab.

Labs will be performed as a team effort with the other students at your table. Each group will complete the lab experiment and turn in one lab report at the end of the lab period. Since concept questions from lab frequently appear on lecture tests, all members of the group should record all the data, perform all the calculations, and discuss and record the answers to any lab questions. This will also prevent one person’s miscalculation from lowering everyone’s lab grade!

No makeup lab exercises will be conducted. You will receive a zero for any missing lab reports. Your lowest lab report grade will be dropped.

HOMEWORK

Exercises at the end of each chapter will be assigned on WebAssign and graded. This grade determines your homework grade. See the Appendix in this lab manual for information on how to use WebAssign.

Students should also answer all “Questions” at the end of each assigned chapter. Questions that students have difficulty with should be brought up in class for clarification. Completion of the homework is necessary to prepare for tests.

FINAL EXAM: Comprehensive on all materials covered during the semester

VI. Grading Scale

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\begin{align*}
A &= 90 - 100 \\
B &= 80 - 89 \\
C &= 70 - 79 \\
D &= 65 - 69 \\
F &= \text{less than 65}
\end{align*}
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VII. Course Delivery Format

Faculty may require on-line activities and assignments to include on-line tests and submission of all written and on-line communications. The extent of on-line activities/assignments may vary by course but will be specified on the syllabus.

Hybrid Format – This format requires significant online activity. Students in hybrid classes must access course content and assessments using the Internet in order to pass the class, whether it meets full-time or part-time in the
classroom. Faculty need not hand out a copy of the syllabus and any other required course material, including their contact information.

VIII. College Policies

This class is governed by the policies and procedures stated in the current Chattanooga State Student Handbook. Additional or more specific guidelines may apply.

ADA Statement

Students who have educational, psychological, and/or physical disabilities may be eligible for accommodations that provide equal access to educational programs and activities at Chattanooga State. These students should notify the instructor immediately, and should contact Disabilities Support Services within the first two weeks of the semester in order to discuss individual needs. The student must provide documentation of the disability so that reasonable accommodations can be requested in a timely manner. All students are expected to fulfill essential course requirements in order to receive a passing grade in a class, with or without reasonable accommodations.

Disruptive Students

The term “classroom disruption” means - student behavior that a reasonable person would view as substantially or repeatedly interfering with the activities of a class. A student who persists in disrupting a class will be directed by the faculty member to leave the classroom for the remainder of the class period. The student will be told the reason(s) for such action and given an opportunity to discuss the matter with the faculty member as soon as practical. The faculty member will promptly consult with the division dean and the college judicial officer. If a disruption is serious, and other reasonable measures have failed, the class may be adjourned, and the campus police summoned. Unauthorized use of any electronic device constitutes a disturbance. Also, if a student is concerned about the conduct of another student, he or she should please see the teacher, department head, or division dean.

Affirmative Action

Students who feel that he or she has not received equal access to educational programming should contact the college affirmative action officer.

Academic Integrity/ Academic Honesty

In their academic activities, students are expected to maintain high standards of honesty and integrity. Academic dishonesty is prohibited. Such conduct includes, but is not limited to, an attempt by one or more students to use
unauthorized information in the taking of an exam, to submit as one's own work, themes, reports, drawings, laboratory notes, computer programs, or other products prepared by another person, or to knowingly assist another student in obtaining or using unauthorized materials. Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students guilty of academic misconduct, either directly or indirectly through participation or assistance, are immediately responsible to the instructor of the class. In addition to other possible disciplinary sanctions, which may be imposed through the regular institutional procedures as a result of academic misconduct, the instructor has the authority to assign an "F" or zero for an activity or to assign an "F" for the course.

**Email Communication**

Please note all communication with instructors about your course work should be through the eLearn Email system. For assistance on how to use the eLearn Email tool go to this url: [http://river.chattanoogastate.edu/orientations/Student_PDFs/eLearn_eMail_aug_09.pdf](http://river.chattanoogastate.edu/orientations/Student_PDFs/eLearn_eMail_aug_09.pdf).

For all other communication the official email system used by the college is through Tiger Mail. This is accessible by clicking the blue paw icon from the top right hand side of your Tiger Web home page [https://tigerweb.chattanoogastate.edu/cp/home/displaylogin](https://tigerweb.chattanoogastate.edu/cp/home/displaylogin).

**IX. Instructor Policies**

**Class participation**

This course has a laboratory component. Students must be actively involved in the laboratory exercises. Student involvement in class is also highly encouraged.

**Student Concerns**

If you are concerned about any issue related to this course, please discuss the issue first with your instructor. Student concerns that cannot be resolved with the instructor may be brought to the attention of the Department Head for Physical Sciences, Dr. Mitchell Rhea, office OMN F-7, phone 697-2544.

*The instructor reserves the right to modify this syllabus in writing during the course of the semester.*