# ASTR 101/L
## Conceptual Astronomy

### Course Syllabus

<table>
<thead>
<tr>
<th>Instructor(s)</th>
<th>Instructor (843) 349-XXXX</th>
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<td>Office Location Email</td>
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<tr>
<th>Time</th>
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| Webpage       | [https://moodle.coastal.edu](https://moodle.coastal.edu) |

<table>
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<tr>
<th>Required Texts</th>
<th>Lecture-Tutorials for Introductory Astronomy by Prather et al., 3rd edition</th>
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<td>Bad Astronomy by Philip Plait</td>
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| Lecture Description  | ASTR 101 Conceptual Astronomy. (3) (Coreq: ASTR 101L) An introduction to contemporary astronomy that explores our current understanding of the Cosmos and the unique methods employed to study astronomical objects. Topics include history of astronomy, observed motions of celestial objects, the solar system, stellar evolution, galaxies, and cosmology. The course material is designed primarily, but not exclusively, for non-science majors. F, S, Su. |

| Laboratory Description  | ASTR 101L Conceptual Astronomy Laboratory. (1) (Coreq: ASTR 101) Using laboratory equipment and exercises, students investigate subtopics in astronomy. While there is not a formal mathematical prerequisite, competency in high school algebra and geometry is expected. F, S, Su. |

| Student Learning Outcomes | Student learning outcomes are measurable statements that specify what students should know and be able to do at the completion of the course. Due to their length, a complete list of the learning outcomes for this course are listed at the end of this document. |
Course Objectives

The course goal is for students to gain a broad understanding of the nature, scope, and evolution of the Universe and where Earth fits within this framework. By the end of the semester a student should be able to: locate, identify, and describe major members of the celestial sky and how their locations and appearances change with time; describe the basic theories of light and matter and apply these principles in simple contextual problems to demonstrate how astronomers learn about distant objects using only the detected radiation they emit; and demonstrate a clear understanding of the current theories governing the origins and evolution of the Universe and its constitutes.

Overarching a student's comprehension of the foundational concepts in astronomy, the general theme for the course is to develop an understanding of the scientific method. Astronomy has a rich and well documented history, in addition to addressing some of life's deeper questions. By using astronomy as a case study, students should become comfortable using the scientific method including the ability to recognize the differences between hypotheses, theories, ad hoc approaches, and pseudoscience.

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Course Structure

In most university courses, the role of the instructor is to expel facts through lecturing while the students take notes on the material for later memorization. In this course things are different. Here the instructor’s responsibility is to assist the student in learning astronomy and the scientific method. Conversely, the student's responsibility is to become actively engaged in learning the material.

Lecture — The lecture time is devoted to discussions on the underlying theories and principles used to describe the Cosmos. The “lectures” consist of short (10-15 minutes) traditional lectures, separated by learner-centered activities. A learner-centered classroom is a novel approach to teaching where the focus is taken off the instructor and transferred to the student. This is achieved through activities such as think-pair-share questions, collaborative learning groups, and lecture tutorials.

Laboratory — Unlike a traditional science course, in this class the labs are integrated into the lecture. Each lab activity is self paced and done in groups of no more than three students. The purpose of the labs is for students to actively investigate the fundamental principles found in astronomy and to reinforce essential and sometimes difficult topics. The purpose of the labs is not to introduce new material; only to reinforce what's discussed in the lectures.
Activities — Sprinkled throughout the lectures are learner-centered activities. These activities are meant for students to become actively involved in the learning process. The majority of the activities are done out of the Lecture-Tutorials for Introductory Astronomy workbook. These particular activities are not collected, but instead are meant to play the role of class notes. Besides the Lecture-Tutorials, there are other collaborative learning group activities which are again meant to enhance the student learning experience. These activities are collected and included in the course grade.

Readings — Throughout the semester students are expected to read selected chapters from Philip Plait’s Bad Astronomy book prior to the start of class. These readings are brief, taking roughly fifteen to twenty minutes to complete. The pre-class reading assignments are announced at the end of the preceding lecture meetings and posted on-line.

Homework — Homework is assigned after each lecture and is due by the start of the next lecture. Homework is an important aspect of the class. Through reflecting on the previous lecture during the homework assignments, students should be able to clarify for themselves what area(s) may require more personal attention. The homework is assigned and completed through the Moodle classroom management system.

Topics

The course is divided into four sections:

1. The Celestial Sphere
   - Celestial Sphere
   - Diurnal and Annual Changes in the Sky
   - Solar and Lunar Motions

2. Solar System
   - Planetary Motion
   - Physical Laws
   - Planetology

3. Stars and Galaxies
   - Stellar Properties
   - Galaxies
   - Dark Matter

4. The Big Questions
   - Cosmology
   - Extraterrestrial Life
Grading  

During the semester it’s possible to earn up to 1,000 points. A final letter grade is assigned based on the total number of points earned throughout the semester according to the scale,

- A  > 851 points
- B+  826 → 850 points
- B   751 → 825 points
- C+  726 → 750 points
- C   651 → 725 points
- D+  626 → 650 points
- D   551 → 625 points
- F   < 550 points

The point distribution is divided into four categories,

- **Exams**  400 points  40% of the overall course grade
- **Homework**  400 points  40% of the overall course grade
- **Short Essays**  100 points  10% of the overall course grade
- **Activities**  100 points  10% of the overall course grade

Although ASTR 101 and 101L are listed as separate courses, one single grade is calculated and reported for both courses.

**Exams** — There are three exams during the semester plus a final. The exams are completed during the scheduled class time and are identified on the course calendar posted on Moodle. The instructor reserves the right to change the exam times should it be necessary, but ample notice will be given. Unless prior arrangements are made, there are no makeup exams. If a student fails to take the exam at the scheduled time, then a zero is recorded for that exam grade.

Each exam is worth one hundred points (10% of the course grade). No exams are dropped nor are they curved. All exams are closed-notes and closed-book with the exception of the student’s personal copy of the *Lecture-Tutorials for Introductory Astronomy* workbook. No electronic devices of any kind are allowed during the exams. The exams only cover the material since the previous exam. The final is comprehensive and is structured in the same way as each intermediate exam.

**Homework** — A brief homework assignment is assigned at the end of each lecture and is due by the start of the next lecture. The homework consists of ten multiple choice questions. Each question is worth one point, making each homework worth ten points overall.

The multiple choice homework assignments are completed online using Moodle. It’s the student’s responsibility to ensure that Moodle has recorded a grade after the completion of each assignment. If there appears to be a problem with Moodle, the student needs to contact the instructor prior to the due date for the homework assignment.
In addition to the multiple choice homework assignments there are four specialized assignments that are unique to the current lecture discussions. Each of these assignments are also worth ten points and are explained on the Moodle course page.

_Laboratory Exercises_ — Although the course implements a number of laboratory style exercises, there are no specific assignments associated with the lab activities. Instead the associated lecture homework for that day incorporates questions related to the lab-style activities and their outcomes.

_Short Essays_ — Prior to each exam an essay of 500 words or less must be completed on a topic related to the material also covered on the exam. The essays allow students to explore a particular topic touched on in class, but not afforded an in depth investigation during lecture. The essays are completed through Moodle in the weeks leading up to the exams.

_Activities_ — Distributed throughout the lectures are ten small group activities which are collected at the end of class. Each activity is graded simply on participation, including effort, and is worth ten points. The purpose of the collaborative group activities is for the students to become active in the learning process and for the professor to have feedback on the student’s understanding of the material.

Since attendance is not mandatory, these activities can be made up outside of class. This is accomplished by reviewing the lectures posted on the Moodle course page and completing the assigned tasks labeled on one of the slides. All makeup activities are due by the start of the next class and must be completed on the appropriate activity sheet. No scratch paper activities are accepted. If the work is subpar, the instructor reserves the right to not accept the makeup activity or to give only partial credit.

_Extra Credit_ — There are no extra credit assignments available during the semester. Extra credit is unfair to students that work diligently during the semester and rewards those that wait until the last moment to earn extra points.

**Deadlines**

Due to the sequential nature of the material, and the continual pace of the class, it's imperative that students complete the assignments on time. As such, all reported deadlines are hard deadlines. If a student fails to submit an assignment by the specified time, then a zero is recorded for that assignment.

**Attendance**

Students that regularly attend class typically earn better grades and learn more than students who miss class. The learner-centered class structure is specifically designed around collaborative learning activities that help students understand the material better and ultimately score higher on exams. Although all assignments can be done at home without the help of others, talking through ideas with a peer, and with the support of the instructor, enhances the learning experience.
In short, class attendance is vital to a student’s mastery of the subject, however, attendance is not mandatory—but it is expected! Out of respect for other students and the professor, if a student feels that they will be or are a distraction, then they’re encouraged not to attend class. If there’s a distraction during class the professor will ask the offender to leave.

Office Hours

In general, there’s an open-door policy with regard to office hours. If the instructor’s door is open, feel free to step in and ask questions. Additionally, there are normal office hours which are posted on Moodle. If a student has a brief question or if there’s a scheduling conflict with office hours, then the student is encouraged to contact the professor by email.

Student Expectations

A consistent theme for this class is personal responsibility. A student’s grade in this class depends on the effort put into it. While a learner-centered environment goes a long way to mastering the material, it’s still expected that a student spends time outside the classroom reviewing the lectures and the day’s activities. If a student is having difficulties, they’re welcome to speak with the professor for additional help.

If there are special circumstances that the professor should be aware of, such as a learning disability or a planned unavoidable absence, it’s the student’s responsibility to bring this to the attention of the professor within the first week of the course. The professor will make any reasonable accommodations that are needed.

In Class Distractions

The use of cell phones, including text messaging, is not permitted during class. In fact, no cell phones are allowed to be visible during class. If there’s an emergency situation please let the professor know ahead of time and proper arrangements can be made. If a cell phone rings during class the professor reserves the rights to answer it for the student in a polite manner. If classroom distractions are a consistent problem lost time will be made up with an increase in homework assignments. If a single person is the root of many problems then that person will be asked to leave the classroom.

Academic Honesty

Coastal Carolina University is an academic community that expects the highest standards of honesty, integrity, and personal responsibility. Members of this community are accountable for their actions and reporting the inappropriate action of others and are committed to creating an atmosphere of mutual respect and trust.

Cheating and plagiarism are serious offenses at any academic institution. They’re defined for Coastal Carolina University in the Student Handbook. For this course, some assignments are meant to be collaborative (group activities), some are meant to be largely done individually with outside help allowed (homework assignments), and some are meant to be complete as an individual (exams). For this course, a first cheating or plagiarism violation will result in a zero grade for that assignment. A second offense will result in an automatic failing grade (FX) for the course.
Tell me and I’ll forget; show me and I may remember, involve me and I’ll understand.

— Chinese Proverb
Student Learning Outcomes for ASTR 101/101L

This course introduces numerous definitions and concepts. Compiled together it appears that this course covers a tremendous amount of topics and techniques. Moreover, as each lecture focuses on one particular topic and/or technique it’s possible to lose sight of the bigger picture and the context with which the material is being presented. Listed below are the expected student learning outcomes for the course. Student learning outcomes are statements that specify what students should know, be able to do, or be able to demonstrate when they’ve completed a course.

1. Students should develop a foundational understanding of the central concepts that are essential in astronomy. Students should be able to:
   a. summarize the hierarchal structure to the Universe
   b. explain how apparent changes in the sky arise predominately from Earth’s three motions
   c. summarize the origin of lunar phases and be able to predict when each phase is observable
   d. summarize how the evolving historical cosmologies demonstrate the scientific method
   e. explain and apply Kepler’s Three Laws of Planetary Motion
   f. describe how, through the study of light, astronomers can measure the composition, temperature, distance, and motion of astronomical bodies
   g. describe the multitude of ways astronomers measure distances to astronomical bodies
   h. outline the nuclear fusion process that occurs in the cores of stars and describe how fusion leads to the production of heavier elements and detectable electromagnetic radiation
   i. outline the lifecycle of a star
   j. explain the morphology of galaxies
   k. explain the Hubble flow and why it implies the Big Bang

2. Students should develop an understanding of the scientific method. Students should be able to:
   a. formulate reasonable hypotheses that address causal questions
   b. identify scientific evidence, and explain what is and what is not scientific evidence
   c. formulate a logical argument for testing proposed scientific hypotheses
   d. evaluate scientific evidence, testing them against relevant criteria and standards
   e. express conclusions that deductively follow from the expectations and observations