ASTR181: Principles of Astronomy II
Spring 2015: January 12–May 15
MWF 10:00 AM–10:50 AM, Room: STB 225

Version 1: January 8, 2015 (subject to change)

Professor:	Kathy Cooksey, Ph.D., STB 219; kcooksey@hawaii.edu; 808-932-7195
Office Hours:	MT 1–2 PM, W 9–10 AM, and by appointment
Website:	Laulima ASTR-181-001 (HIL.12534.SP15)
Textbook:	*The Cosmic Perspective, 7th Ed.* by Bennett, Donahue, Schneider, & Voit (no `MasteringAstronomy` required)

Course Description:

A survey of modern stellar, galactic, and extragalactic astronomy, with emphasis on the underlying physical principles. Topics covered include stellar structure, interstellar environments and the formation of stars, stellar evolution and death, the structures of galaxies, and cosmology. Intended for science majors and prospective science teachers. The student should have a good operational familiarity with high school algebra. (CRN: 12534, Section: 001)
Pre-requisite: ASTR180

Learning Objectives:

- Broad course goals:
  1. Understand how astronomers know what they know about the universe by identifying the observations on which fundamental principles of astronomy are based.
  2. Form a conceptual framework of the content, structure, and evolution of the universe as evidenced by the ability to connect topics in astronomy in multiple, meaningful ways.
  3. Practice and improve problem-solving skills, especially in how how an approach is motivated, how a solution is formatted, and how the answer is verified to be reasonable.
  4. Learn/practice "reading" equations and figures for information so that even unfamiliar equations or figures can be assessed for their meaning.
- Specific content goals:
  1. Physical quantities have units that are used units to understand the physical quantities, solve problems, and support intuition about the relative scales of physical quantities.
  2. Dimensional analysis is a way of solving problems and "reverse engineering" equations.
  3. All astronomers have is light to study so the properties of light (e.g., blackbody radiation, flux-luminosity relation, magnitude system) are exceedingly important to understand
  4. Gravitational force is the mover and shaker of the universe, so it and related concepts (e.g., orbital motions, etc.) are also exceedingly important to understand.
  5. To understand how astronomers know what they know, students should understand modern astronomical observing (e.g., types of telescopes, importance of wavelengths, etc.)
  6. There is an interplay between the motion of an object and its signature in astronomical observations (i.e., Doppler shifts).

Email, Textbook, and Website:

- UHH considers email and Laulima an official form of communication; students are responsible for receiving and returning information in a timely manner.
- The student must ensure that the professor has her/his correct email address.
- The required textbook is *The Cosmic Perspective, 7th Ed.* by Bennett, Donahue, Schneider, and Voit.
- The Laulima course website is listed under ASTR-181-001 (HIL.12534.SP15). This site will be the hub for all course information.

Class Rules:

1. Students are responsible for their own learning, which includes preparing for class, submitting work, asking questions, and seeking additional help.
2. Students should be respectful and supportive of their peers' learning, which means helping each other with difficult concepts but not just giving the answer.
3. Students should convey (either in person, by email, through an intermediary, or somehow) to the professor questions, comments, and concerns about the course.
4. The professor should be receptive to and respectful of the students' needs and interests and should generally follow the class rules as detailed for the students.
5. Sign in each class on the attendance sheet.
6. The professor will randomly call on students to articulate their understanding. This is motivated by the need to assess what students are thinking so that learning can progress.
7. A non-smart-phone calculator is required for every class. Students should practice with the calculator they will use for quizzes and the final exam.
8. Solutions to problems must show sufficient supporting work to receive full points.

General Course Outline[1]

Reading assignments are assigned before the class in which they will be reviewed. Students are expected to come to class with questions about the assigned reading, which include Mathematical Insights.

Group problem solving is in-class, every non-quiz Wednesday. The groups are assigned and change after each quiz. Groups should make a habit of sitting together each class for other, irregular activities.

Homeworks (HW) are due every two weeks, on Wednesdays, at class time. The homeworks are all quantitative (e.g., problems, figures, etc.) and posted to Laulima:Resources. The homeworks include one or more of the in-class (IC) problem set. One problem is graded in detail, the rest checked for completeness (including proper setup and assessment). The problem graded in detail is worth 25 of the 50 total homework-points.

Quizzes are every third week starting 18 February and cover all preceding content, but only problem types from the noted homework(s) and in-class problem set(s) will be tested. All quizzes have a group component of one problem, worth 25% of the quiz grade. Groups decide whether a member who missed the previous non-quiz in-class group problem-solving session will be allowed to participate in the group quiz problem and, hence, have a chance for the 25% of the quiz grade.

For "Current Events in Astronomy," students summarize a recent astronomy-related news story or scientific publication in less than five minutes. The topic must relate to the course content (basically, not Solar system planets/asteroids/comets/etc). The article will be projected for the student's use. Current Events are claimed on a first-come, first-serve basis on the course's Laulima

[1]Subject to change.

Wiki; students are responsible for verifying someone else has not already claimed the Current Event. Everyone should sign-up for each Current Event; students must present at least twice during the semester (not at the same Current Event).

Detailed schedule:[1] acronyms: HW = homework; IC = in-class problem solving; LS = Laulima survey; RfC = read-for-(next) class.

Date	Topic	In-class	Assignment	Due
M 12 Jan	L1 ASTR181 Overview	Concept pre-quiz	Read "Secret to Raising Smart Kids" (Dweck, *Scientific American*, 28 Nov 2007) if you haven't or need to again.	
W 14 Jan	L2 Overview of Universe		RfC: Review Ch 5	
F 16 Jan	L3 Light and Matter		RfC: Review Ch 5 (cont'd)	
M 19 Jan	MLK Day (no class)			
W 21 Jan		IC A: Light	HW #1: Light (incl. IC B)	
			RfC: Ch S4.1–4.2	
F 23 Jan	L4 Fundamental Physics I		RfC: Ch 14	
M 26 Jan	L5 Sun I			
W 28 Jan		IC B: Fundamental Physics (part of HW #1)		
F 30 Jan		Current Events in Astronomy I	RfC: Ch 14 (cont'd)	
M 2 Feb	L6 Sun II			
W 4 Feb		IC C: Sun	HW #2 is IC C & D	HW #1 (incl. IC B)
			RfC: Ch 15	
F 6 Feb	L7 Stars I			
M 9 Feb	L8 Stars II			
W 11 Feb		IC D: Stars		
F 13 Feb	L9 Stars III		RfC: Ch 16	
M 16 Feb	President's Day (no class)			
W 18 Feb		Quiz #1 [HW #1, IC A–B]	HW #3: Stars (incl. IC E)	HW #2 (IC C & D)
			RfC: Ch 17	
F 20 Feb	L10 Stellar Evolution I			
M 23 Feb	L11 Stellar Evolution II			
W 25 Feb		IC E: Stellar Evolution I	RfC: Ch S4.3–4.4, Ch 18	
F 27 Feb	L12 Fundamental Physics II & Stellar Evolution III			
M 2 Mar	L13 Stellar Evolution IV			
W 4 Mar		IC F: Stellar Evolution II	HW #4: Stellar Evolution (incl. IC F)	HW #3 (incl. IC E)
F 6 Mar		Current Events in Astronomy II	RfC: Ch 19	
M 9 Mar	L14 Milky Way Galaxy I			
W 11 Mar		Quiz #2 [HW #2/IC C–D]	LS #1: Mid-term course evals.	
F 13 Mar	L15 Milky Way Galaxy II		RfC: Ch 20	
M 16 Mar	L16 Galaxies I			
W 18 Mar		IC G: Galaxies I	HW #5: Milky Way Galaxy (incl. IC G)	HW #4 (incl. IC F)
F 20 Mar	L17 Galaxies II		RfC: Ch 20 (cont'd)	LS #1
23–27 Mar	Spring recess (no class)			
M 30 Mar	L18 Galaxies III			
W 1 Apr		IC H: Galaxies II	HW #6: Galaxies (incl. IC H)	HW #5 (incl. IC G)
			RfC: Ch 21	
F 3 Apr	Good Friday (no class)			
M 6 Apr	L19 Galaxy Evolution I			
W 8 Apr		Quiz #3 [HW #3–4, IC E–F]		
F 10 Apr	L20 Galaxy Evolution II		RfC: S3.1–3.4	
M 13 Apr	L21 Galaxy Evolution III & General Relativity			
W 15 Apr		IC I: Galaxy Evolution	HW #7 is IC I & J	HW #6 (incl. IC H)
			Read "Misconceptions about the Big Bang" by Lineweaver & Davis, *Scientific American*, 2005, Vol. 292, pp 24–23 (ISSN: 0036-8733). Available at Mookini.	
F 17 Apr	L22 Cosmology I	Discuss "Misconceptions"	RfC: Ch 22	
M 20 Apr	L23 Cosmology II			
W 22 Apr		IC J: Cosmology	RfC: Ch 23	
F 24 Apr	L24 Cosmology III			
M 27 Apr	L25 Cosmology IV			
W 29 Apr		Quiz #4 [HW #5/IC G–H]		HW #7 (IC I & J)
F 1 May		Current Events in Astronomy III		
M 4 May	L26 Course Synthesis	Course evals.		
W 6 May	L27 Course Synthesis (cont'd)	Concept post-quiz		
W 13 May	Final Exam	9:40 AM–11:40 AM, STB225		

Grading:

- The grade depends on the following items: quizzes (40%); homework assignments (30%); final exam (20%), completing pre/post-quizzes (5%), and in-class Current Events presentations (5%). The lowest homework and quiz grades will be dropped. Each student must present Current Events at least twice.
- There will be no make-up work other than the final exam.
  - If a student were excused, the graded work will not be included in her/his final grade.
  - If a student must miss a class for a reasonable reason, s/he must email the professor before the start of class time.
  - If a student were unable to email in advance due to extreme circumstances, s/he should contact the professor as soon as possible. Such instances will be judged on a case-by-case basis.
  - If a student were excused from all points in a given category, the percentage of the other categories will be increased to fill the void.
- Homework assignments are never excused since their due dates are known in advance. It is the student's responsibility to turn in the homework somehow, either by giving it to another student to submit or by scanning and emailing it to the professor.
- Late homework is accepted within 24 hours of the deadline for 75% credit.
- Group work is encouraged in class and for homework assignments. However, all submitted work must be the original work of the student with reference to any homework partners.
- All references (e.g., websites, books other than the official course textbook, etc.) used to complete assignments must be cited, including numbers, techniques, facts, etc.
- Cheating is not tolerated. Any question of cheating will be tested with an oral exam, to see whether the student(s) involved understand the material.
- The letter grade will be given based on the chart below, with modifications suitable to the class statistics:

Grade	% Required
A	≥ 93
A−	$[90, 93)$
B+	$[87, 90)$
B	$[83, 87)$
B−	$[80, 83)$
C+	$[77, 80)$
C	$[73, 77)$
C−	$[70, 73)$
D	$[60, 70)$
F	< 60

where e.g., $[90, 93)$ means $\geq 90\%$ and $< 93\%$.

Disability Support: Any student with a documented disability who would like to request accommodation should contact the University Disability Services Office at 932-7623 (V) or 932-7002 (TTY), as early in the semester as possible.

Advising: Advising is a very important resource designed to help students complete the requirements of the University and their individual majors. Students should consult with their advisor at least once a semester to decide on courses, check progress towards graduation, and discuss career options and other educational opportunities provided by UH Hilo. Advising is a shared responsibility, but students have final responsibility for meeting degree requirements.

Kilohana Academic Success Center: The KASC provides academic support opportunities for all UH Hilo students that foster their development into independent, self-motivated learners. Students who visit Kilohana have access to subject-specific and academic skills tutoring from UHH students selected for their academic achievement and dedication to helping others succeed. Kilohana is located on the lower level of the Mookini Library and on the web at `http://hilo.hawaii.edu/kilohana/`.

Human Rights: The University of Hawai'i at Hilo prohibits discrimination in its education programs based on race, national origin, color, creed, religion, sex, age, disability, veteran status, sexual orientation, gender identity or associational preference. If at any time during class you feel uncomfortable about what is being talked about, or feel that your human rights have been violated, please feel free to leave the room. However, the professor asks that you confer with her as soon as possible about what happened so that appropriate action can be taken if necessary to avoid future problems. If you are uncomfortable speaking with the professor about your concern, please contact Kalei Rapoza (`kaleihii@hawaii.edu`), Interim EEO/AA Director, at 932-7641.

UH Hilo Sexual Assault Policy: UH Hilo provides confidential assistance for victims of sexual assault. Counseling Services on-campus and the YWCA Sexual Support Services off-campus offer guidance regarding medical assistance and emotional help and can discuss options for reporting sexual assaults to law enforcement. All conversations are private and confidential. The UH Hilo Sexual Assault Policy can be found at: `http://hilo.hawaii.edu/uhh/vcsa/documents/UHHSexualAssaultPolicy.pdf` For assistance during the day, contact UH Hilo Counseling Services at (808) 932-7465; or, after hours and on weekends, contact the YWCA Sexual Assault Support Services at (808) 935-0677.
Student Conduct: Students are expected to follow the University of Hawai'i at Hilo Student Code of Conduct available at the following URL:
`http://www.uhh.hawaii.edu/catalog/student-conduct-code.html`.

Student's Name
Group Members' Names

ASTR181 Question X: Problem-Solving Steps

1. **Recognize the problem:** What's going on? What do I want?
   Draw a picture of the situation.
   Define useful quantities: identify what you know and don't know.
   State the question in terms of something you can calculate.

2. **Describe the problem in terms of the field:** What does this have to do with...?
   State general principles that might be useful to approach this problem.
   Give any constraints imposed by the situation.
   State any approximations that might be useful.
   Draw any diagrams that might be useful.
   Translate the general principles into equations specific to the situation.

3. **Plan a solution:** How do I get what I want?
   Identify your target quantity.
   Construct a chain of equations linking your target to known quantities.
   Check to see if you have sufficient equations.

4. **Execute the plan:** Let's get an answer.
   Math goes here.
   Follow your plan to calculate an answer.
   Check your units.

5. **Evaluate the solution:** Can this be true?
   Did you answer the question?
   Justify that your answer is reasonable.