

## Syllabus for AST2002 - Section 0001, Spring 2018

**Lecture Time:** Mon, Wed, & Fri 9:30-10:20 am.

**Location:** Psychology (PSY) 108

**Instructor:** Dr. Chris Bennett.

**E-mail:** [Christopher.Bennett@ucf.edu](mailto:Christopher.Bennett@ucf.edu)

**Office:** Physical Science Building (PSB) 308 **Office Hours:** Monday 3-4 pm, Tuesday 3-4 pm

### Course Description:

This is a broad survey of astronomy including motions in the sky, the solar system, stars, galaxies, and the origin and evolution of the universe. With such a broad array of topics it is not possible to cover each one in great depth. Instead we will emphasize the scientific techniques used to elucidate the physical evolution of the universe. We will use astrophysics as a case-study to illustrate scientific inquiry and quantitative reasoning.



On January the 15<sup>th</sup>, the results from an image taken with the orbiting Hubble Space Telescope (Left) were released, after it spent over 100 hours acquiring light from a region of the sky covering approximately that which a grain of sand held at arms-length would occupy. The original resulting image known as the Hubble Deep Field image is shown, revealing over 3000 galaxies (Image credit: NASA)

Course Goals: (1) Learn the key concepts of modern astronomy, from planetary science to cosmology. (2) Learn how scientists use basic principles of physics to understand the larger cosmos. (3) Develop skills in quantitative reasoning, critical thinking, and scientific inquiry, using astronomy as a test case.

Course Philosophy: Our goal in this course will be to gain an appreciation of the basic concepts in modern astronomy and to use astronomy as a case study in scientific study and quantitative reasoning. To accomplish this, we will use the powerful techniques of scientific inquiry, and we will learn how these techniques have been used to teach us what we now know about the universe. We will learn about the solar system, the night sky, stars, and galaxies. However, we will not treat these topics as a source of facts to be memorized. Rather, we will employ elegant and simple physical concepts such as the nature of gravity, energy, and light to understand the processes that shaped our solar system and the universe. This will require some quantitative work, but nothing beyond simple algebra. This course is designed for non-science majors, so the goal will be science literacy rather than science proficiency. By using scientific techniques to study

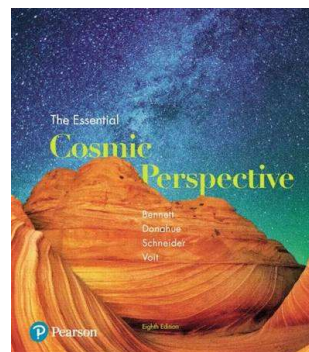
the physics of the planets, stars, and galaxies, you will (hopefully) gain an increased appreciation of how science works, not only in astronomy but in other fields as well.

General Advice for Students: We will follow the same order as in the recommended textbook, but note that we will not necessarily cover precisely the same material – some parts will be in more depth while others may be glossed over. ***Some material for the exams may be based solely on topics covered within the lectures.*** It is highly recommended that read the material being covered ahead of time, take notes during each class, and should anticipate spending ~2 hours reading/homework for each class-hour. This class can be challenging to many students – if you have difficulty with a problem, or concept please come and see me during office hours (posted at the top of page 1), or e-mail me about it (preferably sooner rather than later). If you are unable to make these times, please e-mail me to set-up an alternative time. Remember that I am here to help you and am happy to do! When e-mailing me regarding this class please put “AST2002” as part of the subject title. It is also encouraged get to know your fellow students, share notes and work on problems together. Be forewarned that I favor an interactive teaching environment so be prepared to answer questions and occasionally participate in demonstrations. I will attempt to allow for a short period of time after class to answer questions, but please be warned I will not always be able to do so (I often have appointments off-campus at 11am Mon/Wed). This will be a big class so please come to my office hours for questions and help (also, I cannot write recommendation letters for people I have not met in person).

Additional Material/Resources: Will be posted during lectures, and the lecture notes will be posted on Webcourses and the AST2002 page on my website which will be updated as the semester progresses (<http://sciences.ucf.edu/physics/bennett-lab/teaching/ast-2002-introduction-to-astronomy/>).

### **Textbooks:**

**Highly recommended:** *The Essential Cosmic Perspective*, 8<sup>th</sup> Edition by Bennett et al. This book can be purchased in loose-leaf form at the UCF bookstore, from amazon, or online from Pearson.com. The version in the bookstore also includes an access code to the [masteringastronomy.com](http://masteringastronomy.com) website which has additional course material available. Note that there are also two different versions offered by Pearson by the same authors. *The Cosmic Perspective Fundamentals* does not cover all the material covered in this class, whereas *The Cosmic Perspective* contains additional material aimed at a two-semester course. It is not essential to obtain the latest edition, but beware that the material (including homework) may be different. Note that the cover is different for loose-leaf vs. paperback.



**Also Recommended:** *Astronomy* by Fraknoi et al. which is made **freely available** by OpenStax. It can be downloaded **free of charge** from <https://openstax.org/details/books/astronomy> (as pdf, iBook, kindle, etc.). This book covers much of the same material as *The Cosmic Perspective*, but at ~1200 pages is less concise.

**iClicker2:** The class will make use of the iClicker2 feedback system in each class and 10% of the grade will be based on participation and score. When you first receive the iClicker2, you might need to register it (in which case, go to [www.iclicker.com/registration](http://www.iclicker.com/registration) to register it, we use iClicker classic and Canvas), but it is preferable to register through Wecourses (Canvas) directly (see immediately below). If this is the case, you should be sure to your NID (including the first two leading letters) as your student ID, and you must use your knights email address. The first week will be spent making sure that this is working for everyone and will not consist of graded material. Note that the original iClicker might work (I cannot guarantee this) but only offers multiple choice options - numerical answers cannot be entered; *most* questions in class will be multiple choice. It is highly recommended to replace the batteries that come with the original iClicker2 to extend the working range. *Anyone caught using someone else's clicker will immediately receive an F for the course – as will the owner of that clicker.*



iClicker2 remote

**Webcourses:** Details about the course including grades and announcements will be posted on Webcourses under AST2002 section 0001 ([webcourses.ucf.edu](http://webcourses.ucf.edu)). It is also essential that the iClicker2 is registered with Webcourses too. To do this, click on the iClicker menu on the left, and you will be asked to enter the remote ID, your e-mail (which must be your knights e-mail address), and the country. In addition, it is UCF policy that all instructors/faculty are required to document students; academic activity within the first week of each course. Therefore, there will be a syllabus quiz that needs to be completed before the end of the week.

**Homework:** ~8 homework assignments or quizzes will be assigned throughout the semester on Webcourses. I will send out announcements as well as inform you in the lecture period further details about these tasks. They are intended to help reinforce your understanding of the course material and account for a total of 10% of the assigned grade.

**Exams:** There will be three in-class exams during the semester, each which focus on the most recent material learnt since the previous exam, and a cumulative final exam - based on all of the coursework covered in the course. The top two scores from the mid-term will be kept and the lowest score dropped. The mid-terms are each worth 20% and the final 40%.

**Extra Credit:** Up to an additional 2% extra credit may be earned by visiting UCF's Robinson Observatory during the semester. They regularly host nights open to the public to observe the night sky, they have forms available for the students to fill out which you can complete and return to me. I must receive these by the last scheduled class on Fri Apr 20<sup>th</sup> for them to count. Note that completion of the extra credit is often sufficient to move someone up a grade boundary. For more information on the website (<https://planets.ucf.edu/observatory/knights-under-the-stars-schedule/>). The current observing schedule, as of 7<sup>th</sup> Jan 2018 looks like this:

No.	Date	Event Time
1	Wed Jan 31	7:00-8:30 pm EST
2	Thu Feb 22	7:00-8:30 pm EST
3	Wed Feb 28	7:30-9:00 pm EST
4	Thu Mar 22	8:30-10:00 pm EST
5	Wed Mar 28	8:30-10:00 pm EST
6	Thu Apr 19	8:30-10:00 pm EST

### **Grading:**

<b>A</b>	At or above 92.5%	<b>B-</b>	80%	<b>D+</b>	67.5%
<b>A-</b>	90%	<b>C+</b>	77.5%	<b>D</b>	62.5%
<b>B+</b>	87.5%	<b>C</b>	72.5%	<b>D-</b>	60%
<b>B</b>	82.5%	<b>C-</b>	70%	<b>F</b>	below 60%

Note: I reserve the right to adjust the grade scale, and the grade scale for exams will be posted after each exam with adjustments (a “curve”) if any. These adjustments, if made, will only help your grade. All assignment and exam grades are final 72 hours after they have been returned. Contact me before this 72-hour period is over if you have a grading dispute.

### **Break-down of Grading Criteria:**

- **10% iClicker2:** 5% Participation, 5% score (lowest 3 days will be dropped to account for any class absence or if you forget your clicker)
- **10% Homeworks/Quizzes:** There will be ~8 homework assignments/quizzes assigned through webcourses.
- **40% Mid-terms:** The two highest scores from the three exams will be taken.
- **40% Final Exam:** Based on all (cumulative) lecture material.
- **Extra Credit:** Up to 2% for attending Robinson Observatory

**Missed Work Policy:** It is Physics Department policy that making up missed work will only be permitted for University-sanctioned activities and bona fide medical or family reasons. Authentic justifying documentation must be provided in every case (and in advance for University-sanctioned activities). At the discretion of the instructor, the make-up may take any reasonable and appropriate form including but not limited to the following: giving a replacement exam, replacing the missed work with the same score as a later exam, allowing a dropped exam, replacing the missed work with the homework or quiz average. Note that for this class, the dropped exam is the default policy for a missed exam for any reason. This is also the policy for homework and clicker absences.

### **Important Dates:**

- Last day to confirm academic activity: Fri 12<sup>th</sup> Jan
- Last day to drop: Thu Jan 11<sup>th</sup>
- Last day to add: Jan 12<sup>th</sup>
- Withdrawal deadline: Wed Mar 21<sup>st</sup>

### **Additional Information:**

- F2F exams require raspberry scantrons w/ 50 questions and students shall bubble-in
- PID, test number, test version (A, B, C, D) else exams result in 5% grade reduction.
- All general UCF policies apply, such as the Golden Rule (<http://goldenrule.sdes.ucf.edu>) and the UCF Creed (<http://creed.ucf.edu/>)
- The University is committed to providing reasonable accommodations for all persons with disabilities. Please inform the instructor at the beginning of the semester so these needs can be addressed (students must register first with Student Disability Services).

**Tentative Schedule:** (May be Subject to Change)

#	Class Date	Chapter/Section(s)	Topics
1	Mon 8 <sup>th</sup> Jan	Syllabus & 1.1	Introduction to the course, & the scale of the Universe
2	Wed 10 <sup>th</sup> Jan	1.2-1.3	History of the Universe, Spaceship Earth
3	Fri 12 <sup>th</sup> Jan	2.1	Patterns in the Night Sky
4	Mon 15 <sup>th</sup> Jan	2.2	The Reason for Seasons
5	Wed 17 <sup>th</sup> Jan	2.3-2.4	The Moon and Planets
6	Fri 19 <sup>th</sup> Jan	3.1 -3.3	The Science of Astronomy I
7	Mon 22 <sup>nd</sup> Jan	3.3-3.4	The Science of Astronomy II
8	Wed 24 <sup>th</sup> Jan	4.1-4.2	Newton's Laws of Motion
9	Fri 26 <sup>th</sup> Jan	4.3	Conservation Laws in Astronomy
10	Mon 29 <sup>th</sup> Jan	4.4	Gravity
11	Wed 31 <sup>st</sup> Jan	5.1	Light and Matter
12	Fri 2 <sup>nd</sup> Feb	5.2	What we Learn from Light
13	Mon 5 <sup>th</sup> Feb	5.3	Telescopes
14	Wed 7 <sup>th</sup> Feb	Review 1	Review (Chapters 1-5)
<b>15</b>	<b>Fri 9<sup>th</sup> Feb</b>	<b>Exam 1</b>	<b>Exam (Chapters 1-5)</b>
16	Mon 12 <sup>th</sup> Feb	6.1-6.2	Formation of the Solar System I
17	Wed 14 <sup>th</sup> Feb	6.3-6.4	Formation of the Solar System II
18	Fri 16 <sup>th</sup> Feb	7.1 and 7.5	Planet Earth
19	Mon 19 <sup>th</sup> Feb	7.2-7.3	The Moon, Terrestrial Planets I
20	Wed 21 <sup>st</sup> Feb	7.3-7.4	Terrestrial Planets II
21	Fri 23 <sup>rd</sup> Feb	8.1	Jovian Planets
22	Mon 26 <sup>th</sup> Feb	8.2-8.3	Satellites and Icy Rings of Jovian Planets
23	Wed 28 <sup>th</sup> Feb	9.1-9.2	Small Bodies I: Asteroids and Meteorites
24	Fri 2 <sup>nd</sup> Mar	9.3-9.5	Small Bodies II: Comets and Kuiper Belt Objects
25	Mon 5 <sup>th</sup> Mar	Review 2	Review (Chapters 6-9)
<b>26</b>	<b>Wed 7<sup>th</sup> Mar</b>	<b>Exam 2</b>	<b>Exam (Focused on Chapters 6-9)</b>
27	Fri 9 <sup>th</sup> Mar	10.1	Exoplanets I
	Spring Break		
28	Mon 19 <sup>th</sup> Mar	10.2-10.3	Exoplanets II
29	Wed 21 <sup>st</sup> Mar	11.1-11.2	The Interior of the Sun
30	Fri 23 <sup>rd</sup> Mar	11.2-11.3	Solar Magnetic Fields and the Sun-Earth Connection
31	Mon 26 <sup>th</sup> Mar	12.1	Stellar Properties and How We Measure Them
32	Wed 28 <sup>th</sup> Mar	12.2-12.3	Hertzsprung-Russell Diagram and Star Clusters
33	Fri 30 <sup>th</sup> Mar	13.1	The Interstellar Medium and Star Birth
34	Mon 2 <sup>nd</sup> Apr	13.2	Low Mass Stars
35	Wed 4 <sup>th</sup> Apr	13.3	High Mass Stars
36	Fri 6 <sup>th</sup> Apr	Review 3	Review (Chapters 10-13)
<b>37</b>	<b>Mon 9<sup>th</sup> Apr</b>	<b>Exam 3</b>	<b>Exam (Focused on Chapters 10-13)</b>
38	Wed 11 <sup>th</sup> Apr	14	White Dwarfs, Neutron Stars and Black Holes
39	Fri 13 <sup>th</sup> Apr	15-16	Our Galaxy, A Universe of Galaxies
40	Mon 16 <sup>th</sup> Apr	17	The Birth of the Universe
41	Wed 18 <sup>th</sup> Apr	18	Dark Matter, Dark Energy & The Fate of the Universe
42	Fri 20 <sup>th</sup> Apr	19	Life in the Universe
43	Mon 23 <sup>rd</sup> Apr		
<b>44</b>	<b>Fri 27<sup>th</sup> Apr</b>	<b>FINAL EXAM</b>	<b>7:00 AM – 9:50 AM (on ALL CHAPTERS)</b>