

The Solar System
ASTR 1000-001 — Fall 2018
T/R 11:00AM-12:15PM — Duane G1B20

INSTRUCTOR: Dr. John Keller

E-mail: john.m.keller@colorado.edu (please include ASTR1000 in subject line with no spaces)

Office: Duane D335 (3rd floor, three floors up and two wings west from lecture hall)

Office Phone: 303-735-7998

Office Hours: TR 12:30-1:30PM, W 11AM-12PM, and by appt (email, zoom, in person)

Preferred Gender Pronouns: he/him/his

TEACHING ASSISTANT: Abhishek Kumar

E-mail: Abhishek.Kumar@colorado.edu

Office Hours/Astronomy Help Room (D142): TR 4-5PM and by appt (email, in person)

Preferred Gender Pronouns: he/him/his

COURSE DESCRIPTION:

This course will examine principles of modern astronomy for non-science majors, summarizing our present knowledge about the Earth, Moon, planets, other solar system objects, and even other solar systems. We will study the solar system to understand planetary processes and come to appreciate Earth's place – and ours – in the universe. We will study planetary formation and evolution, and also explore issues of habitability and life on and beyond Earth. The course will also highlight the latest discoveries from space. 3 credits.

PREREQUISITES:

No formal prerequisites, just a natural curiosity about what's out there. ASTR 1000 satisfies the two-semester (without lab) core curriculum natural science sequence if ASTR 1020 is later taken. If you are interested in lab+sequence credit, you must enroll in ASTR 1010 instead of ASTR 1000. Students who are planning to major in the sciences, or are considering the Astronomy/Astrophysics major/minor, are strongly encouraged to take ASTR 1030 (offered this semester) instead of ASTR 1000. Students may receive credit for only one of ASTR 1000, 1010, or 1030.

The math required will include basic algebra, geometry, and scientific notation. To review basic math, go to <http://lasp.colorado.edu/~bagenal/MATH/main.html>.

COURSE MATERIALS:

You will need the following course materials for this class:

- Lecture Tutorials for Introductory Astronomy by Prather et al., 3rd Edition (new, not used!)
- iClicker or iClicker+ (see below)
- Voting Card (provided by instructor)
- The Cosmic Perspective textbook (Solar System or Full Version)
- Mastering Astronomy Online Homework Account

You are required to bring your Lecture Tutorial book, clicker, and voting card to class every day. You should also bring a scantron form on examination dates (type will be discussed in class). You can purchase Mastering Astronomy online (www.pearson.com/mastering/astronomy) or as part of a textbook bundle. **For details see Powerpoint presentation or word document on Canvas. Our Course ID is CUF18ASTR1000KELLER.** You should also bring a scantron form on examination dates (type will be discussed in class).

INSTRUCTIONAL PHILOSOPHY OF COURSE:

The overarching goals of this course are for you to understand the nature of science through the eyes of astronomy, to understand the big ideas in planetary science, and to develop and/or nurture a lifelong interest in astronomy and current events surrounding astronomy. Throughout this quarter, we will focus on what we currently know about solar systems, how we know what we know, and what we do not yet know. Resources for success include lecture slides (provided on Canvas), Lecture Tutorials for Introductory Astronomy, and The Cosmic Perspective textbook (copies available on reserve in the library). I strongly encourage you to come talk with me during my office hours and collaborate with classmates and other peers both during and outside of class.

Active engagement with group activities occurs daily. Educational research has shown that students learn only a limited amount of information from lecture alone, no matter how clear or entertaining. Therefore, this course is composed of a series of mini-lectures augmented by collaborative in-class activities through the Lecture Tutorials (LT) intended to help you more actively engage with course content. The activities target specific ideas presented in lecture and are designed to be completed in pairs during class by talking through the questions and writing detailed, consensus responses. You will not submit the activities that are done in class for grading. However, the questions are quite similar to the questions you will find on the course exams, and you are therefore strongly encouraged to consider these activities as a critical component to your success in the course. The LT text must be brought to class each day. We will also make use of Voting Cards and clickers as an opportunity for you to test your understanding of course material during class.

Class attendance and participation is required. Since this course is built around daily activities, your attendance and full participation at each class period is an essential component of your success in the course. If you miss a class, you are responsible for finding out any content of the class and any announcements that were made. Clicker questions and in-class writing activities will be collected to monitor class participation.

GRADING INFORMATION:

Grading will be based upon an absolute scale approximated by the table to the right. The class is not curved and it is in your best interest to help each other learn astronomy. No extra credit will be provided. The list below describes how the components of the course will be weighted.

- Participation: 5%
- Observation Projects (2): 8%
- Observation Report (1): 2%
- Homework: 10%
- Midterm Exams (best 2 of 3): 50%
- Final Exam (cumulative): 25%

90% ~ 100%	A
80% ~ 89.9%	B
70% ~ 79.9%	C
60% ~ 69.9%	D
< 59.9%	F

ASTRONOMY HELP ROOM: The APS department has an astronomy help room staffed by graduate students from 2:00 – 6:00pm on Tues/Wed/Thurs in Duane D142. You may attend the help room to receive help on homework, exam questions, or any aspect of the course. While not all volunteers are intimately familiar with the exact details of this class, they will all be able to help you get started. The lecture TA for this class will be staffing the help room for at least two hours a week so you may choose to go at that time for guaranteed help related to this class.

PLANETARIUM: The class will meet in the Fiske Planetarium theater on several occasions. Our currently scheduled planetarium sessions are 8/30, 9/6, 9/20, 9/27, 10/23, 11/6, 11/15, 12/11. On these days, please report directly to the Planetarium. Please do not arrive late, as that will interfere with other people adapting to the dark and you will not be admitted. Doors will be closed and locked 10 minutes after the scheduled class start time. You should bring your clicker, voting card, and Lecture Tutorial book to the planetarium.

REQUIRED TEXTBOOK:

The Cosmic Perspective: The Solar System, 8th Ed. by Bennett et al. (required). I will assign regular readings from this book. Recent editions (6th and 7th) as well as the full Cosmic Perspective are acceptable, but it is your responsibility to make sure the material is the same as the assigned reading (some chapters have been re-arranged as well as information on recent discoveries). E-text versions of the book are also acceptable.

EXAMS:

There are no makeup exams for any reason (including excused absences). Many students will have to miss an exam during the semester, and I accommodate that by dropping your lowest score. If you know ahead of time that you will miss more than one exam for a legitimate reason, contact Dr. Keller as soon as possible (at least two weeks before the exam).

Exam content will be based upon Lecture Tutorials, homework questions, lecture notes, and reading assignments. Each midterm will contain multiple choice questions and short answer questions. The final exam will have the same format, but is longer. During these closed-book, closed-note exams, you are not allowed to wear headphones or communicate with anyone in the classroom except for the course instructor or exam proctor. Cell phones must remain off at all times during exams. The midterm exams are scheduled as shown in the planned class schedule below. Any changes in the midterm schedule will be announced at least one week prior to the midterm exams.

The cumulative final exam will take place on **Saturday, December 15 from 1:30pm – 4:00pm**. Do not make travel arrangements that conflict with the final exam, as there will be no late or make-up exams given. If you have been certified to take an exam under special circumstances, please notify me to make necessary arrangements in advance of the exam date.

HOMEWORK/MASTERING ASTRONOMY:

Written homework is due electronically on Canvas on the day it is scheduled due. Written homework turned in during or after class (but before the solutions are posted) will be considered late and will receive 50% credit. Once the solutions are posted late homework will not be accepted. Online Mastering Astronomy homework is typically due by 11:59pm on the day it is scheduled due but you should check the online website to be sure. Partial credit (up to 50%) will be given to online homework submitted after this time. Online homework can be completed up until the start time of the final. Do not abandon online homework just because it is late. Some credit is better than none and you will be in a much better position for the exams.

INDEPENDENT PROJECTS:

There are two long term independent projects that you will conduct throughout the semester. Each will involve going outside to observe changing patterns of the Sun and Moon in the sky. There are no make-ups for these projects.

Sunset Observation Project: This project involves making short observations of the sunset throughout the quarter. Over an eight-week period, you will make four sunset observations on the same observation sheet, which you will turn in along with a written report. Details will be posted on Canvas and discussed the first week of class.

Moon Log Project: Through this project, you will develop a model of the lunar cycle and moon phases. The project will involve initial observations of the moon's position and phase in the sky over a series of days/nights. You will then make a prediction of the moon's position and phase at a point in the future and later test this prediction through additional observation. Due dates to be announced within the first three weeks of semester.

INDEPENDENT REPORTS: You must complete one of the following two short-term projects project the semester (which will be counted as a written homework and cannot count as your lowest homework dropped). If you do both independent projects, it can replace your lowest written

homework. Your short-term project can be either an observing project or a public lecture report.

Observing Report: Several observing sessions at the Sommers-Bausch observatory will be announced during the course. Students must attend an observing session and turn in a written report of what they have observed no later than two weeks after the observing night. Written reports must include at least one paragraph on each object and should include a description of the objects observed (what they are, age, distance, other important facts, etc...) and their astronomical importance. You should attempt to understand and explain the facts you are reporting (especially if they are outside the topics we've talked about in class). Additionally, choose ONE object that you observed and describe how your chosen object is represented in some aspect of our culture (book, song, TV, movie, art, etc...) Reports that simply repeat material from the web or other sources will be penalized. Written reports must be submitted via Canvas and will be analyzed using CU's plagiarism detection software. Be sure to cite any sources you use. You should also turn in your observing sheet (with TA signature) to Dr. Keller or your TA by the two-week deadline. Of course, telescopes can't see through clouds, so if the conditions are bad, the observing may be cancelled (check your email before coming to the observatory). Sommers-Bausch observatory is located behind Fiske Planetarium, close to the corner of Regent Drive and Kittredge Loop Road. Dates: 8/29, 9/18, 10/9, 10/17, 11/6, 12/5. Signup is required and can be found on Canvas.

Public Lecture Report: Attend a local public lecture on an astronomical topic (approved upcoming lectures will be announced in class and posted on Desire2Learn). Write a two-page report (double-spaced) summarizing the talk in your own words (and using concepts you understand). Be sure your summary includes the major ideas of the talk and how it relates to our course (if applicable). One bonus point will be given if you ask the speaker a relevant question (either at the end of the talk during the question/answer period or privately after the conclusion of the talk) and give the speaker's response. If you hear of a lecture that might count but are unsure, please check with Dr. Keller first. Talk summaries are due no later than two weeks after the talk. Talk summaries must be submitted via Canvas and will be analyzed using CU's plagiarism detection software. Talk summaries will be graded based on scientific accuracy as well as adherence to standard English grammar rules. A list of approved lectures will be posted on the course website.

LECTURE TUTORIALS:

Throughout the semester you will complete and turn in worksheets from Lecture Tutorials for Introductory Astronomy, by Prather et al. Although these worksheets will NOT be graded, you are required to understand this material and questions very similar to some worksheet questions will appear on the exams. You will not be given an answer key for these worksheets but can come discuss the solutions in office hours.

CLICKERS:

Each of you will need to purchase a wireless student response system (iClicker or iClicker+). Several times during each class I will ask questions to get you to think carefully about some of the concepts we have covered. Often I will have you talk to your neighbors after you answer on your own, so you can help each other figure out the correct answer.

Class will usually start with a straightforward, clicker question from the assigned reading. Students generally report that the reading clicker questions are easy if they've done the reading but hard if they haven't. Do your reading before class!!

Your worst 4 days of clicker scores will be dropped. This will cover you if you are sick, have a family emergency, or need to miss class for any other reason (approved or unapproved). This will also cover technical problems with your clicker (if you are using a clicker from a previous semester, replace your batteries now!) Clickers will be graded as:

0 pts	No answer
1 pt	Wrong answer
2 pts	Right/valid answer

Not all clicker questions will be graded for right/wrong. In some cases, I want to know what you truly think without you worrying about being penalized for getting the question wrong. These questions will simply be given credit as 0 pts for no answer, 1 pt for any answer. I will do my best to make clear if a question is being graded as right/wrong or no/any answer.

You must register your clicker at iclicker (<http://iclicker.com>). Using someone else's clicker for them is a violation of the Honor Code and both you and the person whose clicker you are operating will receive a zero for the entire clicker portion of your grade (and be reported to the Honor Code Office.) Each day is worth less than 0.2% of your total grade. Is it really worth losing 5% of your grade for a measly 0.2%?

COMMON COURTESY:

For the benefit of your fellow students and your instructor, you are expected to practice common courtesy with regard to all course interactions. For example:

- Act as mature and responsible adults at all times.
- Show up to class on time, and be prepared to learn when class starts.
- Do not leave class early and do not start packing up before class is over.
- If you must arrive late or leave early, please sit near a rear exit.
- Do not sit in the balconies. Your participation is vital to your learning.
- Please do not use cell phones in class (this includes text messaging).
- Laptop computers may only be used in the front three rows of one side of the classroom (and may only be used for taking notes).

The policy of the Department of Astrophysical and Planetary Sciences is to ban any use of electronic devices (cellphones, tablets, laptops) in class except as an approved accommodation granted by Disability Services, or as explicitly authorized by the instructor.

If you follow these requests, I will practice common courtesy towards you: ending class on time and dealing with you as individuals and as adults.

CANVAS:

Assignments, solutions, grades, announcements, handouts, lecture slides, and other class materials will be posted on Canvas. Make use of these resources, early and often.

ACCOMMODATION FOR DISABILITIES:

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see [Temporary Medical Conditions](#) under the Students tab on the Disability Services website.

CLASSROOM BEHAVIOR:

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on [classroom behavior](#) and the [Student Code of Conduct](#).

HONOR CODE:

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu; 303-492-5550). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the [Honor Code Office website](#).

SEXUAL MISCONDUCT, DISCRIMINATION, HARRASSMENT AND/OR RELATED RETALIATION:

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, [anonymous reporting](#), and the campus resources can be found on the [OIEC website](#).

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

RELIGIOUS HOLIDAYS:

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please contact me at least a week before any relevant religious holiday that may conflict with elements of this course.

See the [campus policy regarding religious observances](#) for full details.

Preliminary Course Schedule (subject to modifications)

Topic	Reading	Projected Dates	Mastering Astronomy HW: TBA	Possible LT Activities
Motion and Position in the Sky and Seasons	Chapters 1-2 Chapter S1	8/28 8/30 (Fiske) 9/4 9/6 (Fiske) 9/11	MA0 Due MA1 Due	Position Motion Seasonal Stars Solar vs. Sidereal Day Ecliptic Path of the Sun Seasons
Moon Phases	Chapters 2-3	9/13 9/18 9/20 (Fiske)	MA2 Due / HW1 Due Sunset Obs #1 Due MA3 Due	Cause of Moon Phases Predicting Moon Phases Sun Size
MIDTERM EXAM 1	9/25	Week 5		
Planetary Motion	Chapters 2-3	9/27 (Fiske) 10/2		Observing Retrograde Motion Kepler's Second Law Kepler's Third Law
Nature of Light and Gravity	Chapters 4-6	10/4 10/9 10/11 10/16	MA4 Due / Moon Predictions Due MA5 Due	EM Spectrum Light and Atoms Telescopes and Atmosphere Doppler Shift Newton's Laws and Gravity
Characteristics and Formation of the Solar System	Chapters 7, 8, and 12	10/18 10/23 (Fiske) 10/25	MA6 Due / HW2 Due MA7 Due	Patterns in the Solar System Meteorites, Asteroids, and Comets Measuring TNOs Temperature and Formation of SS
MIDTERM EXAM 2	10/30	Week 10		
Planetary Geology	Chapter 9	11/1 11/6 (Fiske) 11/8	MA8 Due	Earth's Changing Surface Comparative Geology
Planetary Atmospheres	Chapters 10-11	11/13 11/15 (Fiske) 11/27 11/29	HW3 Due MA9 Due / Sunset Project Due MA10 Due / Moon Project Due	Terrestrial Atmospheres Giant Planet Atmospheres Greenhouse Effect
MIDTERM EXAM 3	12/4	Week 14		
Other Planetary Systems and Astrobiology	Chapter 13 and 24	12/6 12/11 (Fiske) 12/13	MA11 Due	Extrasolar Planets
ENDTERM EXAM	Saturday, 12/15 1:30-4PM	Week 16		Cumulative Final Exam

Note: November 19-23 (Fall Break and Thanksgiving) is an academic holiday.

**The instructor reserves the right to update this syllabus as needed.
Updates will be distributed via Canvas and announced in class.**