University of Alberta, Faculty of Science
Department of Physics
Fall 2017

ASTRO 120: Astronomy of the Solar System

Fall 2017
Mondays / Wednesdays / Fridays 15:00–15:50
CCIS L2-200 (lower level 2, towards Quad)

Instructor: Gregory R. Sivakoff
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Office Hours: Wednesdays & Thursdays 10:30 – 11:30 or by appointment
Occasional cancellations, if any, will be announced on eClass

Website: https://eclass.srv.ualberta.ca/my/

Look for "ASTRO 120 Fall 2017 - Astronomy of the Solar System" under "My Courses." The site will contain course announcements, links to "Mastering Astronomy" for assignments, lecture notes (after the lecture has been given), discussion forums, representative evaluative material for exams, etc.

Calendar Course Description:

★3.0 (*fi* 6) (either term, 3-0-0). The development of astronomy and astronomical techniques, including results obtained from the latest orbiting observatories. The origin, evolution and nature of the Earth, the other planets and non-planetary bodies will be discussed. Viewing experience will be available using the campus observatory. Prerequisites: Mathematics 30-1 and Physics 30.

Real Course Description:

This course focuses on exploring our knowledge of astronomy and astrophysics of the Solar System, as well as open questions in the field. We will discuss the origin, evolution and nature of the Earth, the other planets, and non-planetary bodies in our Solar System. Through this lens, we will develop understanding of astronomy and astronomical techniques, while considering both what is currently known and recent results obtained from the latest observatories and exploratory missions. Specific objectives include:

- Understand what astronomy and astronomical techniques reveal about the key components of our solar system.
- Increase appreciation of the sky through observing activities at the campus observatory.
- Develop familiarity with the physical forces that dominate in our solar system.
- Illuminate your place in the Solar System and the special qualities of Earth that make it amenable to human life.
- Enhance problem-solving skills through relatively simple problems.
- Explore how science works through the astronomy of the Solar System.
- Place our Solar System within the larger context of our Galaxy and the Universe.

Course Prerequisites:

Pure Mathematics 30 or Mathematics 30-1 and Physics 30. Specifically, this course will require mathematics at the intermediate algebra level, specifically the ability to isolate variables in equations. Students will also be expected to: (a) be able to model physical systems with basic physics equations; (b) have previous exposure to the concepts of light and gravity; (c) substitute the values of variables into physics equations; and (d) manipulate units using dimensional analysis. Students who do not have the required prerequisites at the time of taking this course should not expect supplementary professorial tutoring from the instructor. Prerequisites may be waived with instructor approval: to do so, please obtain a "Waiver of Prerequisite" form and ask the instructor to sign it. Students must have either all prerequisites or a signed waiver to get credit for the course.

Required Course Textbook and Equipment:

1. Textbook: Here you have four basic choices.

   - "The Cosmic Perspective, Eighth Edition," by Bennett, Donahue, Schneider, & Voit. This bound version of the textbook covers all the material that we will study in this course AND in ASTRO 122, which is taught in the Winter. If you plan on taking ASTRO 122 and either you want a bound book or you plan to sell your used book to a bookstore, this (most expensive) option is likely the best option for you.
   - "The Cosmic Perspective, Books a la Carte Edition, Eighth Edition," by Bennett, Donahue, Schneider, & Voit. This looseleaf version of the textbook covers all the material that we will study in this course AND in ASTRO 122, which is taught in the Winter. While this is the most inexpensive (and most transportable physical) option, be forewarned that most bookstores are unlikely to buy back this edition once it has been opened or used.
   - "The Cosmic Perspective, The Solar System, Eighth Edition," by Bennett, Donahue, Schneider, & Voit. This bound version of the textbook is a "split" and contains only the material that we will cover in this course. If you are not intending to take ASTRO 122 and plan to sell your used book, this (intermediately expensive) option is likely the best option for you.
   - "The Cosmic Perspective, Eighth Edition, eBook" — The bookstore and the Mastering Astronomy website offer an eBook if you do not care for paper copies of textbooks, and are ok with losing access to the book in a year. These are also bundled with new copies of the textbook from the book store. This option is about as expensive as the looseleaf version of the whole course.

   Note that the previous edition of the book (7th) should be usable for most of the course but it is not "supported." This means that you will be responsible for any updated or corrected content from these editions. Weekly reading assignments will be given as chapters, which means that there will be no effort to cross-reference page numbers or figure numbers between editions. Historically, about 5% of the content does not overlap between the editions.

2. An i>clicker remote: Versions "1," "+," and "2" of the remote will all work as you will only need to answer multiple choice questions. The former two options are cheaper, while the latter is more flexible for future courses that would require i>clickers that can answer alpha/numerical answers. At least one of these options should be available in the University Bookstore.

3. Access to the online homework system through MasteringAstronomy: There are two options:

   - "Mastering Astronomy Student Access Kit." The "Mastering Astronomy Student Access Kit" was a no-cost addition to all of the textbook packages for this course in the University Bookstore. If you purchased a textbook elsewhere that did not come with a "Mastering Astronomy Student Access Kit," consider purchasing a kit (available at either www.masteringastronomy.com or the University Bookstore). This Student Access Kit gives you full access to not only the assignments via any internet connection, but also an electronic version of the textbook, and a range of tools to aid your understanding of course material. Students who took Astro 122 last year and purchased "The Cosmic Perspective, Eigth Edition" by Bennett, Donahue, Schneider, & Voit and a "Mastering Astronomy Student Access Kit," should e-mail the professor.
   - Students who wish to opt out of the use of the fee-for-service online homework system "MasteringAstronomy" (where students pay the fee directly to the third party provider and have unlimited access), have the option to access the assignments (only) for no charge on computers housed in Cameron Library. ***You must e-mail your instructor if you wish to adopt this option.***

Online Assignment Disclaimer:

Online assignments are a component of this course and are provided by a third-party company that runs "MasteringAstronomy." Please be aware that this company will be storing assessment information that may be associated with you. To protect your personal information, you have been assigned an Anonymous ID in BearTracks. You must use this Anonymous ID as part of your username to identify yourself on these systems (if your Anonymous ID is "XXXXXXXXXX", you must use "XXXXXXXXXX@ualberta.ca" as your username). You are not required to provide any additional personal information to these companies. To protect your privacy, you should also consider using "Anonymous" or your Anonymous ID for your Last Name; you should also consider creating a more anonymized (i.e., external to the University) e-mail address to use. This ensures that only the Anonymous ID, performance on the on-line homework, and the affiliation to the University of Alberta for this Anonymous ID is conveyed to the company. If you have any concerns about this, please contact the instructor of the course.

Optional Textbooks and Equipment:

1. A calculator.

   Rules for Calculators in Tests & Exams:

   This class follows the Faculty of Science / Faculty of Engineering's Calculator policy for non-programmable calculators. **Only calculators with a Faculty of Science gold sticker or Faculty of Engineering gold sticker are allowed in the either the midterm test or the final exam.** Students can purchase calculators at the University Book Store with Faculty of Engineering' stickers already affixed to them. Alternatively, students can bring calculators purchased elsewhere to Faculty of Science Student Services (CCIS 1-001) where the appropriate sticker will be affixed to the calculator. Using an illegal device on the Midterm Test or Final Exam will result in your case being forwarded to the associate dean with a minimum recommendation of 25% penalty of your earned grade on the test/exam. In addition, your illegal device or exam may be seized. ***Ignorance of these rules will not be an acceptable excuse.***

Topics Covered:

The below schedule in this course is approximate and subject to change.

Week	Primary Reading	Lecture Topics
1	Chapter 1	Course Introduction; Tour of the Universe
2	Chapter 2	Sky Motions; Seasons, Lunar Phases
3	Chapter 3	Early Astronomy; Renaissance Astronomy; Kepler's Laws
4	Chapter 4	Newton's Laws; Conservation Laws; Gravitation
5	Chapter 5	Tides; Light; Matter and Spectra
6	Chapter 6	Doppler Effect; Telescopes
7	Chapter 14 & 7	The Sun; Solar Activity and Solar System Intro; Midterm
8	Chapter 8	Solar System Formation; and Evolution; Planetary Interiors,
9	Chapter 9 & 10	Planetary Magnetism & Surfaces; Atmospheres; Weather & Climate
10	Chapter 11	Climate Change; Jovian Planets; Jovian Moons, & Rings
11	Chapter 12	Asteroids & Comets; Dwarf Planets & Impacts; Exoplanets
12	Chapter 13 & 24	Confronting Nebular Theory, Life on Earth, Life Out There

Grading:

Class Participation:	8%	Over entire term
Reading Assignments:	8%	Approximately every week
Standard Assignments:	20%	Approximately every week
Long-term Assignments:	8%	Four assignments spread over entire term
Midterm Test:	20%	October 20 (CCIS L2-200)
Final Exam:	32%**	December 13, 14:00*** (Location TBD)

* All students are responsible for all class participation and assignments starting Sep 6.

** There is no possibility of a reexamination in this course as the Final Exam weight is $< 40\%$.

*** Students must verify this date/time on BearTracks when the Final Exam Schedule is posted.

Grade Assignment:

Grades are assigned by taking the score for each course component and calculating a total course percentage score using the component weights given above. When this is done all components of the course are individually capped at 100%. The overall percentage is then used to assign course grades. **Grade boundaries will be decided based on a combination of historical student performances and the instructor's expectations and judgment.** Where possible natural grade boundaries will be used. The absolute percentage scores to secure a particular grade will vary from year to year because it is not possible to write exams with consistently identical difficulty levels. Historically, the median letter grade / mean GPA for this course is a B−/2.62. All students are responsible for all class participation and assignments from the first day of the course. *Note:* Grades are unofficial until approved by the Department and Faculty offering the course.

Ace Clause:

If your Final Exam score is greater than any of the following class components (Class Participation, Reading Assignments, Standard Assignments, and the Midterm Test), then the Final Exam score will be used in your average instead of that component. This replacement will not be applied to any category where disciplinary actions have been taken. Example: if you miss the Midterm Test and (technically) receive a 0 on it, your Final Exam score will be used in place of the missed midterm when calculating your final average. However, if you cheat on the Midterm Test and are given a reduced disciplinary grade, that disciplinary grade will not be replaced by your Final Exam. *Important Warnings:* My Midterm Test and Final Exam scores are typically 20% lower than course averages in other components, so do not rely on this clause.

Class Participation:

Participation on i>clicker questions during class forms the participation grade. Before students answer most questions, they will have a short amount of time to discuss the question with their neighbour. If there is significant disagreement on the correct response students may get a second chance to discuss and respond. These questions provide the instructor with instant feedback on whether students understand the concepts, allowing them to adapt their lecture. In addition, the best person to explain a concept is often someone who has just grasped the concept and thus understands the parts of the concept that were hardest to grasp. Although the four individual class participation grades with the lowest percentage marks will be dropped when calculating the contribution to the final grade, students are highly encouraged to attend every lecture.

Reading Assignments:

Students will be regularly assigned to read sections or chapters of the book that will be followed up by an online reading assignment that should be relatively quick and easy to do if the material is read carefully. It is important to do the reading because some topics may only be covered in the book and not in lectures. The online reading assignments (on "MasteringAstronomy") help provide the instructor with feedback on what students understand. Topics emphasized in lecture are more likely to be emphasized on exams, but students are responsible for all assigned reading material.

Standard Assignments:

Online standard assignments (on "MasteringAstronomy") have been designed to provide students with feedback on the areas of the course that they are having trouble understanding. They will require more time than the reading assignments to complete. The questions are intended to give students some feedback if they fall into common misconceptions and may be tried multiple times, with a small penalty, until they get it correct. Students are very strongly encouraged to keep trying until they correctly answer the questions, seeking help if required (by meeting the instructor either during office hours, just after the lecture, or by appointment). Do not be afraid to ask for help.

Long-term Assignments:

Students will be given six long-term assignments early in the semester. One of these assignments will be mandatory, and students will be required to complete three out of the five other assignments. There will be individual deadlines over the course of the semester when either a given assignment is due, or it is required that students have completed a given number of the assignments. Students will be able to complete the mandatory assignment and two additional assignments independent of

visiting the campus observatory; however, students will be able to complete three of the assignments only at the campus observatory. Assignments at the campus observatory can be completed during the observatory's public observing hours, Thursday 12:01 pm — 1:00 pm and at varying times during the semester after 7 pm on Thursdays (see the observatory's regular schedule at http://uab.ca/observatory). There will also be extra sessions just for ASTRO 120 students every Wednesday at either 11:30 am — 12:30 pm or at varying times during the semester after 7 pm on Wednesdays; details for these will be announced weekly on eClass. **It is highly suggested that students complete the observatory assignments as soon as their schedule and clear observing conditions allow.** If a student can not make these public hours due to another regularly scheduled class, they need to contact the instructor early in the semester to enable the instructor to schedule an additional session for all such students. ***The Ace Clause does not apply to this component.***

Midterm Test:

There will be an in-class test on October 20, 2017 that will be on all the course work covered in Chapters 1–7 and 14. Students should bring an allowed (see above) electronic calculator, writing implements, and their student photo I.D. to the test. Students may bring a single letter-sized paper with content on only one side of the paper.

Final Exam:

The final exam will cover the entire course material. While it will be about twice the length of the midterm test, students will have three hours to complete it. Every student is responsible for confirming the final exam time and location with the University exam schedule: it may change and is not under the control of the instructor. Students should bring an allowed (see above) electronic calculator, writing implements, and their student photo I.D. to the test. Students may bring a single letter-sized paper with content on both sides of the paper.

Class Policies:

Cell Phone Policy:

Cell phones are to be silenced during lectures, and labs. Cell phones may not be brought to exams.

Assignment Deadline Policy:

Reading and Standard Assignments will be graded online with immediate feedback. Their deadlines are strictly enforced by the site, with late assignments earning a zero. Individual extensions will not be made. To mitigate this strong enforcement in the case of incapacitating illness, severe domestic affliction, or religious convictions, both the reading assignments with the two lowest percentage marks, and the standard assignments with the two lowest percentage marks will be dropped when calculating the contribution to the final grade. In the case of longer-term issues due to incapacitating illness, severe domestic affliction, or religious convictions, contact the instructor as soon as is possible. The long-term assignments must be turned in by their deadlines to the ASTRO 120 dropbox in CCIS or on-line, as indicated for each assignment. ***Because of the long lead-time in long-term assignments, no late long-term assignments are accepted.***

Collaboration Policies:

Astronomy courses will often require you to make observations of celestial phenomena (specifically in the observatory labs in this course). Obtaining observational data from another student or by accessing an electronic resource and then representing those data as your own observations are a violation of academic integrity.

You are expected to collaborate for multiple aspects of this class. Research shows that working together to solve astrophysics problems leads to significant learning and benefit for everyone. However, graded work should represent your understanding of the material. A good rule is "work together, write separately." For more clarity, consult the Appropriate Collaboration link on the Office of the Dean of Students website (https://www.deanofstudents.ualberta.ca/en/AcademicIntegrity/AppropriateCollaboration.aspx. For the various components of the course, here are some detailed rules.

- *Class Participation:* You are supposed to collaborate in answering the questions. To supply answers for credit, you need to be in class with your own i>clicker. If you are caught with multiple i>clickers in class, they will be confiscated and an academic dishonesty report for every student involved will be submitted.
- *Reading Assignments:* These must be completed entirely on your own.
- *Standard Assignments:* You may work together to complete these assignments. You must enter your own answers into MasteringAstronomy.
- *Long-term Assignments* Unless otherwise instructed, you must complete these assignments on your own. You must always submit your own written work.
- *Midterm Test and Final Exam:* You must work entirely by yourself with no access to course materials. Note there are multiple different versions of any test or exam so copying tends to produce wrong answers.

Academic dishonesty will be taken seriously (please read the student responsibilities at the end of this Course Outline). Please don't put yourself or your instructor in the position where this section of the Course Outline is invoked.

Midterm Test Deferral Policy:

If you are absent for the Midterm Test for any reason, your grade will be replaced with your Final Exam score; there is no make up Midterm Test. (See the Ace Clause above.)

Final Examination Deferral Policy:

A student who cannot write the final examination because of an incapacitating illness or is suffering from severe domestic affliction or other compelling reasons may apply for a deferred final examination. Deferral applications must be made to the student's Faculty office within 48 hours of the missed examination and must be supported by a completed University of Alberta Medical Statement Form or other appropriate documentation (§Academic Regulations — Attendance 2.d of the University Calendar). Deferred examinations are a privilege and not a right; there is no guarantee that a deferred examination will be granted. Misrepresenting facts to gain a deferred examination is a serious breach of the Code of Student Behaviour.

The deferred Final Exam will be held on **Saturday, January 20th from 09:00 a.m. to 12:00 noon in CCIS L1-029**.

Electronic Communication:

This course outline will be archived at http://www.ualberta.ca/∼sivakoff/teaching.html. Primary online content (e.g., deadlines, class notes, and important class notifications) will be organized through an eClass Moodle course (available at https://eclass.srv.ualberta.ca/my/). The eClass will have a few discussion forums students may participate in; respectful communications at all times is required. Please note that "individual blogs (under the My Profile section) are viewable by the entire UAlberta Moodle community."

E-mail should be the only electronic communication used if a response on the instructor's part is required. As University classes occur in a professional setting, all e-mails for this class should include a formal salutation and signature and should not include internet slang. E-mail not following this convention will be ignored. The instructor will try to respond to all e-mails within 1 "business" day. ***Please include "ASTRO 120:" and the subject of the e-mail as part of the subject line to help the instructor quickly identify the message (e.g., "ASTRO 120: Request for appointment").***

Disclaimer:

Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this syllabus.

Student Responsibilities:

Academic Integrity:

"The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize them selves with the provisions of the Code of Student Behaviour (online at www.governance.ualberta.ca) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University."

All forms of dishonesty are unacceptable at the University. Any offence will be reported to the Associate Dean of Science who will determine the disciplinary action to be taken. Cheating, plagiarism and misrepresentation of facts are serious offences. Anyone who engages in these practices will receive *at minimum* a grade of zero for the assignment, paper or exam in question and no opportunity will be given to replace the grade or redistribute the weights. As well, in the Faculty of Science the sanction for **cheating** on any examination will include a **disciplinary failing grade** (NO EXCEPTIONS) and senior students should expect a period of suspension or expulsion from the University of Alberta.

Students are encouraged to discuss assignments with their classmates, friends, family, etc. If students choose to work together on standard assignments, they must submit their own work for grading whether it be submitted online or offline. Direct copying of another's work is plagiarism.

Specialized Support & Students with Disabilities:
(students registered with Student Accessibility Services - SAS)

Eligible students have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with SAS deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for U of A to provide accommodations. Contact SAS (www.ssds.ualberta.ca) for further information.
Please note: Students registered with SAS who will be using accommodations in the classroom or the lab, or who will be writing exams through SAS, are required to provide a "Letter of Accommodation" to the instructor as soon as possible. Students are encouraged to make an appointment with the instructor to discuss any required accommodations, ideally within the first two weeks of class.

Academic Support:

As adults, students are expected to take more responsibility for their own education. If a student needs additional assistance in developing strategies for better time management, study skills or examination skills, keeping up with the material, or adjusting to university learning, then they need to seek help themselves. Sources of help include: the instructor, Isaac Isaac (the Physics Undergraduate Advisor, CCIS 4-185), and the Student Success Centre (2-300 Students' Union Building).

"Policy about course outlines can be found in Course Requirements, Evaluation Procedures and Grading of the University Calendar".