

Solar System Formation and Dynamics

ASTR 3710 - Prof. Schneider - Fall 2018

Tuesday/Thursday 11:00-12:15 in DUANE G130

WEB SITE: <http://learn.colorado.edu>

Instructor: Nick Schneider	TA: Kyle Connour
Office: Duane D-337: west from the classroom... two floors up... a bit south in a back hallway.	Office: Kyle meets in the two different rooms as listed below, and can also meet by appointment.
Help Sessions: Tuesday: 12:30-2:15* in Duane D-220 Wednesday 10:15-11:30 in D-220 *late arrivals please arrange in advance	Help Sessions: Tuesday: 3-4pm in Duane D-142 Wednesday: 3:30-5:30 in Duane D-220
Also Astronomy Help Room , Tues/Weds/Thurs 3-6 in D-142	
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General Information. Covers the origin of planetary systems and their dynamical evolution. Topics include the physics and chemistry of planetary formation, orbital mechanics, and extrasolar planets. The goals of the course are to (1) develop a solid conceptual understanding of how where planetary systems come from and how they work; (2) to foster good problem-solving abilities; (3) to gain a deep appreciation of the revolution now occurring in planetary science through the phenomenal discoveries of extrasolar planets.

Prerequisites & Major/Minor Credit: Prerequisites: One year of calculus-based physics plus Calculus 1 & 2, or instructor consent. There is no astronomy-related prerequisite. 3710 is an elective for APS major and minor, *but does not count towards the "planetary sequence" ASTR3720/3750*. Note that ASTR 3710, 3720 and 3750 may be taken in any order.

Course Materials:

- Required text: *Fundamental Planetary Science* by Lissauer and DePater. Additional relevant required readings will be posted on D2L.
- An iClicker, registered through myCUinfo (see complete instructions posted at <https://oit.colorado.edu/tutorial/cuclickers-iclicker-remote-registration>) using your CU identikey, not your numerical ID. Clickers for credit starts Tuesday, 4 Sept.
- A scientific calculator that can perform at least scientific notation, exponentials, logarithms and trigonometric functions. **Bring it to class every day.** There will be some computer work; access will be provided if necessary.
- Class notes will be posted online at D2L

Course Assessment. Course grade = 20% for each midterm, 30% for the final, 20% for homework and 10% for class participation (half from clicker scores, half from discussion). Daily attendance is expected; notify the instructor of absences (beforehand if possible or afterwards if not) in order to catch up on what you missed.

Class 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](#). While everyone understands what the honor code means on exams, there's sometimes confusion on what it means for written assignments. Students are encouraged to work together on homeworks, but your write-ups must be independent. Copying, whether by hand or cut-and-paste on your computer, constitutes cheating. The best way to ensure you understand the assigned material is to split off from the group when writing up your answers. Of course, using another person's clicker is also cheating.

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 in the first two weeks of the semester 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](#).

Religious Observances. 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. If you have religious obligations, resulting in conflicts with scheduled exams, assignments or required attendance, you must contact me in the first two weeks of class to make alternate arrangements. See full details at [See the campus policy regarding religious observances](#) for full details.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation. The University of Colorado 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.

Email & Digital Devices Policies. CU requires you to regularly read email sent to your CU-provided address. When you send mail, please (1) make good use of the “Subject:” line to alert me to your problem or question and level of urgency, and (2) always send a copy to yourself on important messages. Homework should not be emailed except under extenuating circumstances.

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. In ASTR 3710, permission is granted for laptops and tablets to be used in the first two rows, only for taking lecture notes, and only by prior arrangement with the instructor.

Classroom Lecture Video Capture. Each lecture will be recorded through CU’s course capture cameras in the back of the classroom. Individual lectures will be made available on request, preferably via email, to students who missed class. Students who do not wish to appear in the videos should sit near the rear of the classroom. (Student voices are generally not loud enough to be heard in the recordings.)

ASTR 3710 – Formation & Dynamics of Planetary Systems – Semester Outline

I. Formation of the Solar Nebula & Protosun

- Nucleosynthesis: The Origin of the Elements
- Nebular collapse
- Observations of Protoplanetary Disks
- Structure of the Solar Nebula
- Condensation & Chemistry
- Accretion & gas capture; jovian vs. terrestrial planets
- The Evidence from Meteorites; Radiometric dating

II. Elementary Celestial Mechanics

- Orbits & Kepler's laws
- Interplanetary spacecraft
- Gravitational encounters & impacts

III. Orbital Interactions & Evolution

- Orbital Resonances
- Tides & Tidal Heating; Spin-Orbit Coupling
- Orbital Evolution

IV. Case Studies

- Planetary satellites
- Planetary rings
- Formation & Evolution of Asteroid & Kuiper Belts & Oort Cloud
- The Impact Threat

V. Extrasolar Planets

- Detection & Nature of extrasolar planets
- Formation of Other Planetary Systems; Migration
- Orbits & Habitability

Exams:

- Exam 1: Thursday 27 September, covering Topic I & part of Topic II
- Exam 2: Thursday, 1 November covering Topics II, III and IV. (Backup date: 8 Nov)
- Final Exam (cumulative): Saturday 15 December 1:30-4:00pm in the regular classroom.

***Note:** The syllabus may be updated with additional information or corrections. The current version will always be available at D2L>Content>Handouts.*