Course Description: This course discusses the chemical processes important for the formation of our solar system and that subsequently acted on the objects within the solar system. It also discusses nuclear processes responsible for synthesis of the elements and alteration of isotopic abundances.

Instructor: Dr. Jessica Barnes, jjbarnes@lpl.arizona.edu, 520-621-2012, Kuiper Space Sciences, Room 540. Office Hours, TW 2:00 to 3:00 PM or by appointment.

Course Website: Course materials will be uploaded to the PTYS 510A course page on D2L (https://d2l.arizona.edu/, student login is required) as the semester progresses.

Couse Objectives: The objective of this course is to provide students with an understanding of the origins and evolution of our solar system from a chemical perspective.

Expected learning outcomes: At the end of the course, students should be able to:
• Demonstrate an understanding of the basic principles of and current research hot-topics in the field of cosmochemistry.
• Use chemical datasets and calculations to understand and/or identify chemical and physical processes relevant to the formation and evolution of the solar system.

Schedule: We will meet Monday and Wednesday from 12:30 to 1:45 PM in Kuiper Space Sciences, Rm. 312. Course materials will be made available online as the semester progresses.

Textbook: There is no formal textbook assigned for the course. It is intended that all material will be self-contained within the lectures. However, several textbooks serve as excellent references and are worthwhile investments for students planning a career in cosmochemistry. The following will be available on D2L as e-books, and I will indicate relevant chapters for each lecture:

Cosmochemistry (H. Y. McSween Jr. and Gary R. Huss), 2010. Cambridge University Press, 549 p. A fairly up-to-date account of the state of the field presented in classical textbook format. Probably the best and most accessible presentation of material for newcomers to the field.

Treatise on Geochemistry second edition Volume 1: Meteorites and cosmochemical processes (Heinrich D. Holland editor. and Karl K. Turekian editor), 2014. Elsevier Science, 454 p. A more up-to-date account of the state of the field in a more encyclopedic format.

In addition, the following are useful resources that will be placed on reserve in the LPL library:

Meteorites and the Early Solar System 2 (D.S. Lauretta and H. Y. McSween Jr., eds.), 2006. The University of Arizona Press, 943 p. An encyclopedic compendium of the chemical and physical processes that led to the formation of the solar system as revealed through the meteoritic record. Assumes a large degree of prior knowledge of the field.

Meteorites, Comets, and Planets (A. M. Davis, ed.), 2014. Elsevier. 737p. A good introduction to the variety of planetary materials available in terrestrial collections and what such materials tell us about the evolution of the solar system.
Planetary Materials (J. J. Papike, ed.) 1998. Mineralogical Society of America. Although out of date, it is a nearly complete overview of the variety of planetary materials at that time. The book contains limited discussion of the significance of such materials for origins of the solar system and instead emphasizes the properties, e.g., chemistry, structure, of the constituent minerals of meteorites, interplanetary dust particles, etc.

Performance Metrics:

Mid-term Exam:	35%
Final Exam:	35%
Homework:	20%
Class participation:	10%

Grading Scale (%):

A	≥ 90
B	80 to 89
C	70 to 79
D	60 to 69
E	< 60

Credit is not given for assignments that are turned in late.

- See for http://registrar.arizona.edu/courses/final-examination-regulations-and-information?audience=students&cat1=10&cat2=31 final-exam regulations.
- See http://www.registrar.arizona.edu/students/courses/final-exams for the final exam schedule.
- The final exam for our class is scheduled for **May 13th, 2020 from 10:30 to 12:30 pm.**

Absence and Class Participation Policies: Absences for any sincerely held religious belief, observance, or practice will be accommodated where reasonable. See http://policy.arizona.edu/human-resources/religious-accommodation-policy. Absences pre-approved by the UA Dean of Students (or dean's designee) will be honored.

Accommodations for Students with Disabilities: For students with disabilities, reasonable accommodations will be provided by the Disability Resources Center: drc.arizona.edu/instructors/syllabus-statement

Classroom Behavior: No mobile phone use during class unless it is somehow involved in the lecture/discussion. Computers are allowed to take notes or otherwise for lecture-relevant content. No Facebook or other social media activities are permitted or anything else that might be construed as behavior that distracts from the lecture.

Academic Integrity Policy: The Student Code of Academic Integrity prohibits plagiarism: deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity.

Nondiscrimination and Anti-Harassment Policy: Please see University Policy 200E on prohibited behaviors: http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Threatening Behavior Policy: The UA policy on threatening behavior prohibits threats of physical harm to any member of the University community: policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Disclaimer: The information contained in this course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

Schedule	**Lecture Topics**
Week 1	Introduction to Cosmochemistry
Week 2:	**Classes cancelled**
Week 3-4	Periodic Table, Bonding, Crystallography, and Planetary Materials Types (H1)
Week 4-5	Meteorites: Components and classification
Week 5-6	Nuclear Chemistry (H2)
Week 6-7	Nucleosynthesis
Week 7-8	Solar Abundances (H3)
Week 8-12	Presolar Grains
Week 9:	**Spring Break March 5 to March 9**
Week 10:	**Lunar & Planetary Science Conference March 16-20 (classes cancelled)**
Week 11:	**Mid-term Exam – Monday, March 23, 2020**
Week 12-13:	Chemical Fractionation I: Thermodynamics, Condensation, Igneous/Volatile/Physical Fractionation (H4)
Week 13-14:	Chemical Fractionation II. Stable Isotopes, Mass-dependent and mass–independent fractionation
Week 14-15:	Radiogenic Isotopes – Basic principles; Long-lived nuclides (H5)
Week 15-16:	Radiogenic Isotopes – Short-lived nuclides
Week 16-17:	Solar system chronology
Week 17:	A cosmochemical model of solar system formation (H6)

Final Exam –May 13, 2020 from 10:30 to 12:30 pm.

*H = homework