Description & Course Objectives
This course is an introduction to the "minor planets" — the asteroids, comets, Kuiper Belt objects, and dwarf planets. These small celestial bodies constitute the debris left over from the processes of planet formation and, as such, hold physical and chemical clues to almost the entire history of the solar system. During this course, we will review the current state of knowledge about their spatial distribution, their physical characteristics and chemical compositions, their origin and evolution, as well as techniques of study. Students will acquire a broad overview of the natural processes that govern our solar system and of the techniques that planetary scientists use to extend our knowledge.

Expected Learning Outcomes
• You will be able to identify and summarize the important features of and differences between small solar system bodies: Asteroids, Comets, and Kuiper Belt Objects.
• You will be able to describe the different techniques used to observe and study small solar system bodies.
• You will gain hands on experience collecting and analyzing both real and analog observations collected of small solar system bodies.
• You will be able to interpret the scientific value of
• Graduate Students Only: You will be able to prepare and present effective, informative, and accurate synthesis of results from previous NASA mission.

Absence and Class Participation Policy
The UA’s policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.
Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Absences may affect a student’s final course grade. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class online activities, please contact me as soon as possible. To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or drc-info@email.arizona.edu. If you are experiencing unexpected barriers to your
success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

**Required Texts or Readings**

There is no required textbook. The following books provide review articles and background on the topics that we will cover, but we will also use papers from the current planetary science literature.

- Asteroids III, pub: University of Arizona Press, yr: 2002
- Comets II, pub: University of Arizona Press, yr: 2004

**Required Extracurricular Activities**

There is one planned field activity that will take place outside the classroom. Students will spend an evening at the telescope of one of the largest asteroid search programs in the world, the Catalina Sky Survey, which is conducted at the UofA’s facilities at Mount Lemmon; the estimated time commitment is six hours, including travel time.

Other activities held hours include working, which will include assignments that require time spent in the departmental laboratory.

**Scheduled Topics/Activities and Assignments Due Dates**

See attached (pg. 6). The instructor reserves the right to adjust this schedule per classroom pace and performance.

**Final Examination or Project**

The due date of your final term paper is 12/15/2022.

**Grading Scale and Policies**

Regular grades are awarded for this course: A B C D E. Grading scale: A > 90% ; B = 80.1 - 90%; C = 70.1 - 80%; D = 60.1 - 70%; E < 60%. The instructor reserves the right to adjust these grade boundaries to her expectation of class performance.

**400 level expectations**: Students will be expected to actively participate in class and will be required to complete a number of homework assignments, and a term paper (in lieu of a final exam).

**400 level Grading**: Class participation: 20%; Homework assignments: 60%; Term paper: 20%.

**500 level expectations**: All of the above for 400-level, plus students will be expected to (i) to research the literature on one of the primary topics and to lecture/lead the class discussion on it, and (ii) include some original work in their term paper.

**500 level Grading**: Class participation: 20%; Homework assignments: 50%; Term paper: 15%. Leading Class Lecture: 15%.

**Incomplete (I) or Withdrawal (W)**:

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at [http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete](http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete) and [http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal](http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal) respectively.
Dispute of Grade Policy
Provide the acceptable time period for disputing a grade on a paper, project, or exam.

Honors Credit
All Tier One and Tier Two courses must be available for Honors credit. If the course does not have a stand-alone Honors section, the requirements to fulfill an Honors contract should be listed. Honors contract information is available at https://www.honors.arizona.edu/honors-contracts.

Classroom Behavior Policy
Recommended language:
To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Additional recommendations depending on instructor preferences:
Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Alternate language for those who want to restrict computers and laptops to an area of the classroom:
Some learning styles are best served by using personal electronics, such as laptops and iPads. These devices can be distracting to other learners. Therefore, students who prefer to use electronic devices for note-taking during lecture should use one side of the classroom.

Alternate recommended language for those who do not wish to permit laptops in the classroom:
The use of personal electronics such as laptops, iPads, and other such mobile devices is distracting to the other students and the instructor. Their use can degrade the learning environment. Therefore, students are not permitted to use these devices during the class period.

Threatening Behavior Policy
The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations
Recommended language is provided on the Disability Resource Center website: http://drc.arizona.edu/instructors/syllabus-statement.

Code of Academic Integrity
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

The University Libraries have some excellent tips for avoiding plagiarism, available at http://new.library.arizona.edu/research/citing/plagiarism.
Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor’s express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

Nondiscrimination and Anti-harassment Policy
The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students
UA Academic policies and procedures are available at http://catalog.arizona.edu/policies

Campus Health
http://www.health.arizona.edu/
Campus Health provides quality medical and mental health care services through virtual and in-person care.
Phone: 520-621-9202

Counseling and Psych Services (CAPS)
https://health.arizona.edu/counseling-psych-services
CAPS provides mental health care, including short-term counseling services.
Phone: 520-621-3334

The Dean of Students Office’s Student Assistance Program
http://deanofstudents.arizona.edu/student-assistance/students/student-assistance
Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services.
Email: DOS-deanofstudents@email.arizona.edu
Phone: 520-621-7057

Survivor Advocacy Program
https://survivoradvocacy.arizona.edu/
The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.
Email: survivoradvocacy@email.arizona.edu
Phone: 520-621-5767
Campus Pantry

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries at no cost. Please see their website at: campuspantry.arizona.edu for open times.

Furthermore, please notify me if you are comfortable in doing so. This will enable me to provide any resources that I may possess.

Preferred Gender Pronoun

This course affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is on the class roster, please let me know. Feel free to correct instructors on your preferred gender pronoun. If you have any questions or concerns, please do not hesitate to contact me directly in class or via email (instructor email). If you wish to change your preferred name or pronoun in the UAccess system, please use the following guidelines:

Preferred name: University of Arizona students may choose to identify themselves within the University community using a preferred first name that differs from their official/legal name. A student’s preferred name will appear instead of the person’s official/legal first name in select University-related systems and documents, provided that the name is not being used for the purpose of misrepresentation. Students are able to update their preferred names in UAccess.

Pronouns: Students may designate pronouns they use to identify themselves. Instructors and staff are encouraged to use pronouns for people that they use for themselves as a sign of respect and inclusion. Students are able to update and edit their pronouns in UAccess.

More information on updating your preferred name and pronouns is available on the Office of the Registrar site at https://www.registrar.arizona.edu/.

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instruct
Week 1 (8/23, 8/25)
Class Introduction, Syllabus, Ungraded Assessment Quiz
Introduction and Guest Lecture on Radar Observation

Week 2 (8/30, 9/01)
Historical Observations, Nomenclature
Telescopic Observation and Surveys
Assignment #1, Decadal Survey

Week 3 (9/6, 9/8)
Intro to Asteroids
Intro to Meteorites

Week 4 (9/13, 9/15)
Assignment #2, Meteorite Lab
Intro to Meteorites cont...
First observations of an asteroid up close

Week 5 (9/20, 9/22)
NEAR Shoemaker Mission to Eros
Hayabusa Sample Return to Itokawa

Week 6 (9/27, 9/29)
Dawn at Vesta
Dawn at Ceres
Assignment #3, Crater Scaling Laws on Small Bodies

Week 7 (10/04, 10/06)
Hayabusa 2 Sample Return from Ryugu
OSIRIS-REx from Bennu

Week 8 (10/11, 10/13)
OSIRIS-REx from Bennu cont...
Sample Analysis after asteroid Sample Return Missions
Assignment # 4, Spectroscopy

Week 9 (10/18, 10/20)
Double Asteroid Redirect Test (DART)
Planetary Defense

Week 10 (10/25, 10/27)
Intro to Comets
Assignment # 5, Catalina Sky Survey Field Trip

Week 11 (11/01, 11/03)
Giotto and the "Halley Armada"
The Deep Impact and Stardust Missions

Week 12 (11/8-Election Day, 11/10)
The Rosetta Mission to comet 67P/Churyumov–Gerasimenko.
Intro to KBOs
Term paper outline due

Week 13 (11/15, 11/17)
New Horizons at Pluto
New Horizons at Arrokoth

Week 14 (11/22, 11/25-Thanksgiving)
Small Bodies and the Origin of Life
Thanksgiving - No class

Week 15 (11/29, 12/01)
Future Missions
Special Topics

Week 16 (12/06)
Special Topics