# Astr 111-DL1: The Solar System (3 credits)

# Spring 2023



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**Office hours:** Tuesday from 3 to 4 or by appointment on Zoom.

## Course Description

This science course fulfills 3 credit hours of general education science. If taken with a section of the Solar System lab (Astronomy 112), it satisfies the natural science core requirement for a lab science at GMU. It is designed to provide a stimulating environment for learning about the solar system and how astronomers come to understand things like the scale of the solar system and its likely origins as well as details about the various planets and other components of the solar system.

In addition to learning the basic facts necessary to have a good mental picture of the solar system and objects in it, students will have a chance to consider how scientists construct, test and evaluate theories, a powerful way of thinking that can be applied outside of purely scientific fields.

## Required Textbooks

Fraknoi, Morrison, Wolff, Astronomy, Openstax. Chapters 1→14:
https://openstax.org/details/books/astronomy-2e

This course has been designed as an "Open Educational Resource" course. This means that we have found a free on-line textbook, courtesy of OpenStax at Rice University. It is printable, or you can simply download and read the PDF copy which is also attached in the Blackboard course.

## Natural science goals and learning outcomes

The general education natural sciences courses engage students in scientific exploration; foster their curiosity; enhance their enthusiasm for science; and enable them to apply scientific knowledge and reasoning to personal, professional and public decision-making.

To achieve these goals, students will:

1. Understand how scientific inquiry is based on investigation of evidence from the natural world, and that scientific knowledge and understanding:
    A: evolves based on new evidence
    B: differs from personal and cultural beliefs

2. Recognize the scope and limits of science.
3. Recognize and articulate the relationship between the natural sciences and society and the application of science to societal challenges (e.g., health, conservation, sustainability, energy, natural disasters, etc.).
4. Evaluate scientific information (e.g., distinguish primary and secondary sources, assess credibility and validity of information).
5. Participate in scientific inquiry and communicate the elements of the process, including:
    A: Making careful and systematic observations
    B: Developing and testing a hypothesis
    C: Analyzing evidence
    D: Interpreting results

**Expected Skills**
Some assignments require basic algebra and geometry skills. You will need to be able to enter formulas and work with a spreadsheet as well. Because homework and lecture material will be on-line and in the Blackboard course, reliable internet access is vital, and you will need to check email and Blackboard daily for updates and information.

**Course Structure**
Readings, supplemental videos, and weekly quizzes are on Blackboard. This allows you to work in a somewhat self-paced and relaxed environment as you learn traditional lecture material.

In order to really understand, you need to do something with the material. This includes participating in short on-line discussions, taking weekly quizzes over the readings, writing short reflective journal entries, and completing a final project or comprehensive exam.

To succeed it is important for you to commit to doing your best working and thinking as you study the on-line materials and prepare discussion postings. The level of engagement and commitment required for this class is greater than for a typical face-to-face lecture. As with all things worth doing, it will require effort, attendance, and preparation.

This course will have succeeded if long after you have forgotten the composition of the atmosphere of Jupiter you remember how to ask the kinds of questions a scientist might ask and continue to develop curiosity and interest about how the world works.

**Blackboard Login Instructions**
Access to MyMason and GMU email are required to participate successfully in this course. Please make sure to update your computer and prepare yourself to begin using the online format on the first day of class. Check the IT Support Center website. Make sure you run a system check a few days before class. Become familiar with the attributes of Blackboard and online learning. Some browers are more compatible with Blackboard than others, please check the support center if you have any kind of trouble accessing or submitting materials.

**Technology Requirements**
**Hardware:** You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and access to a fast and reliable broadband internet connection (e.g., cable, DSL). A larger screen is recommended for better visibility of course material. You will need speakers or headphones to hear recorded content and a headset with a microphone is recommended for the best experience.

**Software** : This course uses Blackboard as the learning management system. You will need a browser and operating system that are listed compatible or certified with the Blackboard version available on the myMason Portal. See supported browsers and operating systems. Log in to myMason to access your registered courses. Your computer should be capable of running current versions of those applications. Microsoft Excel and Word are standard for working with spreadsheets and documents. Make sure your computer is protected from viruses.

**Course-specific Hardware/Software**

**Respondus Lockdown Browser:** You must install Respondus Lockdown Browser on your computer before you start an exam.

**Assignments Description**

Assignments consist of quizzes which are open book, discussion posts, at- home-investigations and journal reflections, and either a project or a comprehensive final exam based on the weekly quiz materials.

**Exams:** The tests and exams in this course will be mostly conceptual questions with a few problems requiring you to do some calculations. Questions will tend to focus on understanding of the concepts and principles of Astronomy under study; Questions could have any format including multiple-choice, essay questions, fill in the blank etc..

| ASSIGNMENT | SCORING | POINTS | TOTAL POSSIBLE POINTS |
|---|---|---|---|
| **MIDTERM EXAM** | **Covers material from the first** | 100 | 100 |
| **DISCUSSIONS, INVESTIGATIONS, or JOURNAL ENTRIES** | Discussions, or at-home investigations, usually one a week. These are scored on completeness and scientific accuracy. | Points varydepending on difficulty | 150 |
| **REFLECTIVE JOURNAL** | Weekly journal writing detailing what you learned during the module | Not individually scored, journal should show evidence of your growing understanding | 50 |
| **QUIZZES** | 13 Weekly quizzes | 10 | 130 |
| **FINAL PROJECT or FINAL EXAM** | Create a project based on guidelines provided by midterm, or take a final exam based on quiz material. Due date for the projects is before the end of the semester while the final will be offered during final exam week | 100 | 100 |
| **TOTAL POSSIBLE** ***(note that there are 40 extra points. You must the midterm exam, the final exam or project, and enough discussions, at-home investigations, and journal entries to get the grade you want to achieve.).*** | | | 530 |

**Grading Scale:**

| Letter Grade | Points needed |
|---|---|
| A | 465 - 500 |
| A- | 450 - 464 |
| B+ | 435 - 449 |
| B | 415 - 434 |
| B- | 400 - 414 |
| C+ | 375 - 399 |
| C | 350 - 374 |
| C- | 335 – 349 |
| D | 300 - 334 |
| F | Below 300 |

**Course Policies**

**Release of modules and due dates:** The due dates for each module are on Tuesdays. I will release each module about 10 days before the due date to give you a week-end plus a full week to work. Grades for the assignment should start showing up not long after the due date and you can keep track on the total to compare to how you hope to progress in the course.

**Late Assignments:** I accept late assignments within reason, however, the work will quickly become overwhelming if you miss multiple assignments. But I prefer that you learn in the course so would rather take an occasional assignment late than to have you miss the experience altogether.

**Instructor-Student Communication:** I will respond to your emails as quickly as possible. Answers to most administrative questions should be on the syllabus, on Ask Your Professor if others have asked the same question, or on the Blackboard site itself for more technical questions.

It often happens that I forget to click every button to open a module, assignment or quiz, if you let me know there is a problem opening something I absolutely will welcome the information, so don't be shy! I love early responders!

**University Policies and Resources**

a. Academic Honesty: You are expected to be familiar with and abide by the University's Honor Code. The Code can be found here. It is your responsibility to see me if you have questions about these policies. George Mason University has an honor code that states the following:

*To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this: Student Members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.*

b. Students must follow the university policy for "Responsible Use of Computing" which you can access through the course website.
c. Student services: The University provides range of services to help you succeed academically and you should make use of these if you think they could benefit you.
d. Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
e. The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance. Counseling Center: Student Union I, Room 3129, 703-993-2380.
f. Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester. All academic accommodations must be arranged through that office. Please note that accommodations MUST BE MADE BEFORE assignments or exams are due. I cannot adjust your grade after the fact.
g. The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing. University Writing Center: Robinson Hall B Room 213, 703- 993-1200. The writing center includes assistance for students for whom English is a second language.
h. Diversity: George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

## Course Schedule

| Week | Due date | Reading assignment | Main ideas covered this week |
|---|---|---|---|
| 01/25 – 02/01 | 02/01 | Ch 1: Science and the Universe<br>Ch 7: An introduction to the Solar system | -Introduction – Overview of the universe<br>-Measurements in astronomy<br>-Overview of planets in the solar system<br>-Composition and structure of planets |
| 02/02 – 02/08 | 02/08 | Ch 2: Observing the Sky | -Motion and apparent motion in the sky<br>-Sorting out what makes science different |
| 02/09– 02/14 | 02/14 | Ch 3: Orbits and Gravity | -Kepler's Laws<br>-Newton's laws of motion<br>-Newton's law of gravitation |
| 02/15– 02/21 | 02/21 | Ch 4: Earth, Moon, and Sky | -Learning the night sky<br>-Seasons and apparent motion of objects in the sky |
| 02/22 – 02/28 | 02/28 | Ch 5: Radiation and Spectra | -The behavior of light<br>-The electromagnetic spectrum |
| 03/01 – 03/07 | 03/07 | Ch 6: Astronomical Instruments | -Telescopes, Radio telescopes, Space based telescopes |
| Available 03/10 and 03/11 | 03/11 | Midterm Exam on Respondus Lockdown browser | Covers Chapters 1 – 5 and 7 readings and associated videos in modules one through five. |
| 03/08- 03/21 | 03/21 | Ch 8: Earth as a planet<br>Ch 10: Earthlike Planets | -Earth geology<br>-Earth's atmosphere<br>-Venus and Mars |
| 03/13 – 03/19 | **Spring Break** | | |
| 03/22 – 03/28 | 03/28 | Ch 9: Cratered Worlds | -Moon and Mercury |
| 03/29- 04/04 | 04/04 | Ch 11: The Giant Planets | -Giant planet overview<br>-Atmospheres of giant planets |
| 04/05 – 04/11 | 04/11 | Ch 12: Rings, Moons and Pluto | -Rings and moons<br>-New Horizon mission to Pluto |
| 04/12 – 04/18 | 04/18 | Ch 13: Solar System Debris | -Collisions!<br>-Comets and meteorites |
| 04/19 - 04/25 | 04/25 | Ch 14: The Origin of the Solar System | -Formation of the solar system |
| 04/19 | 04/19 | Project due if selected - otherwise you must take the comprehensive final exam | -see possibilities on the Blackboard site |
| 04/26 - 05/03 | 05/03 | Exoplanets | What we are learning about planets orbiting stars other than our Sun |
| 05/12 through 05/13 | | Final Exam if selected. Will be given over lockdown browser | All missing work due by the end of the day on May 6th |