

GSCI 162 – Science of the Planets
Course Syllabus – Summer 2012 (May 19 – May 30, 2014)

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Office Hours:

- In person, on campus, by appointment
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- Or by appointment on Skype (videoconferencing) – most times of day/night!

NATURE OF COURSE CONTENT

Science of the Planets, GSCI 162, explores the origin and evolution of the Solar System by comparing and contrasting the different classes of objects present (planets, asteroids, comets, stars). We will use evidence obtained through the exploration of the Solar System using telescopes, manned and unmanned missions, and other forms of remote sensing to inform our own explorations. We will examine the dynamics of our Solar System, including gravity, tides, the seasons, eclipses, and the phases of the moon (both Earth's and other planets). This course is designed to address specific earth and space science objectives based on the Virginia Science SOLs.

This is a two credit, TWO WEEK online block class that satisfies part of your General Education and IDLS science sequence. It will be conducted asynchronously, meaning you can work on assignments whenever you want! **However, this doesn't mean the class will be easy. You should plan on spending about 2 hours a day on this class over its two week span.** I will interact with you primarily through the Facebook group, where I plan to be very active, but please feel free to call or text me as well. I am happy to talk to you about what you're learning, and explain things in more depth if and when you have questions.

There are 8 modules, so we will do 5 modules the first week, 3 modules the second week, and finish by expanding your portfolio from GSCI 161. Each module will include watching videos, working with interactive applets, maybe doing a reading or two, taking notes, and participating in the Facebook group. The purpose of each module is to introduce you to material you can include in your portfolio.

GOALS OF THE COURSE

Course Objectives

1. Students will be able to identify key issues related to the relationship between science, government and society.
2. Students will be able to formulate an argument to support their own opinions on whether the government should continue to provide billions of dollars of research money for space exploration, backing up their positions with facts and a statement of personal values.
3. Students will be able to describe the various objects in the Solar System, including their similarities and differences, their composition, their origin, and their dynamics.

4. Students will be able to diagram and describe the dynamics of the Earth-Moon system and explain observable phases of the Moon, and eclipses.
5. Students will be able to compare and contrast the different planets and their ring/moon systems. They will be able to differentiate between the behavior and taxonomy of terrestrial and gas giant planets and their surroundings.
6. Students will be able to describe the Earth-Sun system, including the cause of seasons, the effect of solar disturbances, and the significance of the Sun to life on Earth (and planetary spacing).
7. Students will be able to describe the findings from investigating the Solar System by human exploration and remote sensing, and discuss the relevance of those observations to the Earth-Moon system.
8. Students will be able to differentiate between comets, asteroids, and meteors and be able to describe the origin and evolution of each, as well as the importance of comets and meteors to the evolution of life on Earth.
9. Students will be able to understand retrograde motion.
10. Students will understand the classification systems that are used to determine whether objects in the Solar System are planets, and will become familiar with plutoids and dwarf planets, Trans-Neptunian objects and the Kuiper belt, exoplanets and the search for extraterrestrial life.
11. Students should be able to discuss the origin and evolution of the Solar System.
12. Students will be able to describe current efforts to search for objects within our Solar System and planets in this and other solar systems.

General Education, Cluster Three learning objectives pertinent to the course are:

Objective 1: Describe the methods of inquiry that lead to mathematical truth and scientific knowledge and be able to distinguish science from pseudoscience.

Objective 2: Use theories and models as unifying principles that help us understand natural phenomena and make predictions.

Objective 5: Use graphical, symbolic, and numerical methods to analyze, organize, and interpret natural phenomena.

Objective 6: Discriminate between association and causation, and identify the types of evidence used to establish causation.

Objective 7: Formulate hypotheses, identify relevant variables, design experiments to test hypotheses.

Objective 8: Evaluate the credibility, use, and misuse of scientific and mathematical information in scientific developments and public-policy issues.

RECOMMENDED SCHEDULE

Module	Day	Focus on:
1	Monday, May 19th	<p>THE SUN</p> <p>Video: History Channel – SUN (45 min) https://www.youtube.com/watch?v=_RVECe7V9Tc</p> <p>Interactive Activities:</p> <p>Post your answer to the following question: What do you think are the 5 <i>most notable features</i> about the Sun, based on the History Channel video and why?</p>

		Observe the moon! See instructions above and log your observation on FB
2	Tuesday, May 20th	<p>THE MOON</p> <p>Videos: History Channel – MOON (45 min in 4 parts) https://www.youtube.com/watch?v=aUT5Lsq9sP0&list=PL4E4396B9A84B4FE2</p> <p>If other planets were at the same location as our Moon: https://www.youtube.com/watch?v=usYC_Z36rHw (1 min)</p> <p>Moon Phases http://www.youtube.com/watch?v=nXseTWTZlks (3 min)</p> <p>You may also wish to explore the “Eclipse Interactive” and “Lunar Phases Interactive” at http://highered.mcgraw-hill.com/sites/0072482621/student_view0/interactives.html#</p> <p>Interactive Activities: Post your answers to the following questions:</p> <ul style="list-style-type: none"> • How would you explain why the phases of the moon occur to a 6th grader? How much is the moon illuminated by the sun at each phase? • What is a solar eclipse? What is a lunar eclipse? • What is the configuration of the Earth, Moon and Sun during a solar eclipse? During a lunar eclipse? • At what phase of the moon do solar and lunar eclipses happen? How soon after a solar eclipse will the next lunar eclipse occur? <p>Observe the moon! See instructions above and log your observation on FB</p>
3	Wednesday, May 21st	<p>THE EARTH</p> <p>Video: Eclipses: https://www.youtube.com/watch?v=zTVhNGGFEOs (22 min) Seasons: https://www.youtube.com/watch?v=XuJoh8gi05g (23 min)</p> <p>You may also wish to explore the “Seasons Interactive” at http://highered.mcgraw-hill.com/sites/0072482621/student_view0/interactives.html#</p> <p>Interactive Activities: Post your answers to the following questions:</p> <ul style="list-style-type: none"> • How would you explain why the seasons occur to a 6th grader? What are the most common <i>misconceptions</i> about what causes the seasons on Earth? • Why does the length of day change from summer to winter? • What causes the tides? How many tides occur per day, and why? <p>Observe the moon! See instructions above and log your observation on FB</p>
4	Thursday, May 22nd	<p>MERCURY & VENUS</p> <p>Reading: http://www.universetoday.com/22153/venus-and-mercury/</p>

		<p>You may also wish to explore the “Retrograde Motion Interactive” at http://highered.mcgraw-hill.com/sites/0072482621/student_view0/interactives.html#</p> <p>Interactive Activities:</p> <p>Post your answers to the following questions:</p> <ul style="list-style-type: none"> • What do you think are the 5 most notable features about Mercury and Venus, and why? • What is unique about the rotation of Mercury? What is unique about the rotation of Venus? (Hint: they are two different things) • Why are scientists interested in sending exploration missions to Venus? What can we learn about the Earth by studying Venus? • What is RETROGRADE MOTION? How is it different than retrograde rotation? If you were observing a planet from night to night, and it was retrograde, would it be moving from east to west or west to east? (* very important concept) <p>Observe the moon! See instructions above and log your observation on FB</p>
5	Friday, May 23rd	<p>MARS & the ASTEROID BELT</p> <p>Video: History Channel – MARS (45 min) https://www.youtube.com/watch?v=n1uI7qTa62w</p> <p>Asteroids & Impact Hazards http://www.youtube.com/watch?v=gcGjtwpncx4 (9 min)</p> <p>The Deadly Asteroid Apophis (great video!!!) http://www.youtube.com/watch?v=xaW4OI3_M1o (7 min)</p> <p>Interactive Activities:</p> <p>Post your answers to the following questions:</p> <ul style="list-style-type: none"> • What do you think are the 5 most notable features about Mars, based on the History Channel video, and why? • What geologic feature on Mars stands out, and why? • Why are scientists interested in sending exploration missions to Mars? • What are asteroids, and where are most of them located? How many asteroids are within our solar system? • What is Apophis and why is it significant? <p>Observe the moon! See instructions above and log your observation on FB</p>
6	Monday, May 26th	<p>JUPITER & SATURN</p> <p>Video: Discovery Channel – JUPITER (48 min) https://www.youtube.com/watch?v=Z1tIS-S-Mqw</p> <p>History Channel – SATURN (45 min) https://www.youtube.com/watch?v=pLoXUfeZGt0</p> <p>Reading – status of Saturn’s Hexagon http://news.discovery.com/space/saturns-north-pole-hexagon-mystery-solved.html</p>

		<p>Interactive Activities: Post your answers to the following questions:</p> <ul style="list-style-type: none"> • What do you think are the 5 most notable features about Jupiter, based on the Discovery Channel video, and why? What do you think are the 5 most notable features about Saturn, based on the History Channel video, and why? • The largest object in our solar system is associated with Jupiter. What is it? • What causes the storms on Jupiter and Saturn? • What are the moons of Jupiter like? If you were exploring them, where would you expect to find volcanoes, or water? • Why does Saturn have such perfectly developed rings? Where did the rings come from? • What are the moons of Saturn like? Why are scientists so interested in studying Titan? <p>Observe the moon! See instructions above and log your observation on the Discussion Board.</p>
7	<p>Tuesday, May 27th</p>	<p>OUTER PLANETS, TNOs, KUIPER BELT</p> <p>Video: History Channel – OUTER PLANETS (45 mins) https://www.youtube.com/watch?v=keKx15oNZ2g</p> <p>TNOs http://www.youtube.com/watch?v=v3pfzPW082c (10 min) Pluto, Eris & Dwarfs: http://www.youtube.com/watch?v=ddC3AKJXolk (10 min) Is Pluto a Planet? http://www.youtube.com/watch?v=FqX2YdnwtRc (3 min)</p> <p>Interactive Activities: Post your answers to the following questions:</p> <ul style="list-style-type: none"> • What do you think are the 5 most notable features about Uranus, Neptune and Pluto, based on the History Channel video, and why? • What are the characteristics of a planet? Why did Pluto get demoted? Do you agree with this? • What is the Kuiper belt? What are Trans-Neptunian objects? • What are the names of some of the dwarf planets? • Who is Mike Brown and what did he do? <p>Observe the moon! See instructions above and log your observation on the Discussion Board.</p>
8	<p>Wednesday, May 28th</p>	<p>TELESCOPES & SPACE EXPLORATION</p> <p>Videos: Kinds of Light (audio only) http://www.youtube.com/watch?v=WXE0EBbYuQs&feature=relmfu (5:40) Multiwavelength telescopes (audio only) http://www.youtube.com/watch?v=XPvoM-oJqT8 (3:40)</p>

		<p>Read http://en.wikipedia.org/wiki/Telescope which provides a great introduction to all the different kinds of telescopes</p> <p>Interactive Activity: Use the videos and any other information you find online to answer the questions below.</p> <ul style="list-style-type: none"> • Can ground based telescopes observe at all wavelengths? Why or why not? • Can space based telescopes observe at all wavelengths? Why or why not? • Pick one ground-based telescope and one space-based telescope that are either operating now or in construction, and tell us about them... what wavelength(s) do they operate on? What aspects of our solar system or universe are they designed to study? (You will have to use Google to find resources for this question) • Why do you have to keep telescope instrumentation cold, and which wavelength is this MOST important for? • What's more expensive, building and operating a ground-based telescope or a space-based telescope? Why? • What criteria would YOU use to determine whether or not to fund a new telescope, based on the science you have learned about the planets and observing with telescopes? <p>Observe the moon! See instructions above and log your observation on the Discussion Board.</p>
9	Thursday, May 29th	<p>LINKING SCIENCE PROCESSES & SCIENCE OF THE PLANETS</p> <p>Answer and post the following questions based on your reading of Mike Brown's "How I Killed Pluto":</p> <ul style="list-style-type: none"> • What OBSERVATIONS were Mike Brown and the others making to attempt to discover new planets? • How did Brown and his team use PREDICTION to validate whether or not they had discovered a planet? Did they make their predictions forward in time, backwards in time, or both? • Why are CLASSIFICATION systems important, according to Brown? (Hint: this discussion is near the end of the book)
10	Friday, May 30th	PORTFOLIO!

REQUIREMENTS & POLICIES

Textbook: Brown, M. (2010). How I Killed Pluto and Why It Had It Coming.
http://www.amazon.com/gp/product/0385531087/ref=as_li_ss_tl?ie=UTF8&tag=qualandinnowe-20&linkCode=as2&camp=217153&creative=399349&creativeASIN=0385531087

Videos and readings can be accessed online (see schedule below).

Attendance Policy and Final Exam: NO LATE WORK WILL BE ACCEPTED. This course is only two weeks – consider it a quick sprint – buckle down and just do it!

Honor Code: You are expected to abide by the JMU Honor Code at all times.

Special Needs: If you are a student who is registered with the Office of Disabilities, I need to be given written documentation to support your situation in order to provide you with any accommodations (this is required by law). Plans for any accommodations MUST be made within the first 48 hours of this course since it is so short.

Contacting the Instructor: You can contact the instructor any time (24/7) via email or SMS to 703.835.6336.

METHODS OF EVALUATION

Your grade in this course is ultimately based on my opinion of your professionalism as you participate in this class, and your ability to explain some of the key concepts at the end of the two week class timeframe. **My opinion will be based on** 1) the quality and timeliness of your posts to the Facebook group each day and your responses to your classmates' posts, and 2) the quality of your portfolio.

You are not competing with each other - so please feel free to share useful and interesting resources that you are adding to your portfolio that you think would be helpful to other IDLS students. Also, your instructor WANTS you to send her multiple drafts of your portfolio as it is in progress so she can provide feedback that ensures you are producing a high quality product.

There are a total of 32 points that can be earned in this course:

- 1 point for posting your thought questions to the Facebook group each of the 9 days
- 1 point for engaging in discussion on the Facebook group each of the 9 days
- 10 points for completing your portfolio to the instructor's satisfaction
- 2 points for posting and sharing your final portfolio with the class
- 2 points for posting and sharing your final "lessons learned" and reflections
- **Your points are "vested"** when you complete the reflection exercise and a short exit interview

Grade scale: 24+ points is an A, 19-23 is a B, 14-18 is a C, 9-13 is a D, 8 or below is an F.