Astronomy answers the basic question "What is our place in the Universe?" As the oldest of the sciences, it offers many examples of how science works. As a science that takes the entire universe as its subject matter, it incorporates and applies all of the other sciences. You will learn how the combination of measurements and well-tested models makes it possible to know things that we could never experience directly. We know the distance to the center of the Earth even though no one has ever gone there. Similarly, we know the temperature and chemical composition of the center of the Sun and many other seemingly impossible things. You will learn how very special life on Earth is when we discuss the conditions that might be required for life elsewhere. You will learn ways to think rationally about unlikely but terrifying events such as asteroid impacts. You will learn the power of the basic laws of motion that come from physics when we discuss the motion of planets and the prediction of asteroid impacts. You will learn the origin of the Sun's energy and you will learn how life on Earth uses that energy.

**Course Objectives:** You will

1. Be able to think critically about the processes and results of science.
2. Know the science behind events such as climate change, earthquakes, and asteroid impacts, that can affect the entire Earth and be able to apply this knowledge to matters of public discussion.
3. Know how life on Earth reproduces and be able to apply this knowledge to discussions about the search for life elsewhere.
4. Be able to use formulas to calculate such things as the distances to stars and the risk implied by an asteroid impact prediction.
5. Be able to use a graphical representation of data to understand the life histories of stars.
6. Be able to ask questions about science and judge the accuracy of information about science.

**Instructor:** Robert H. Gowdy,  
701 W. Grace St., Room 2411, Telephone 828-1821, email rgowdy@vcu.edu  
Office hours by appointment

**Class Schedule:** MWF 11am – 11:50am

**Room:** MCALC 1107.

**Required Item:** Top Hat Subscription (4 months $26; 1 year $38; Lifetime $75)

**Required Item:** Packback Questions Subscription ($18 for the semester)

**Recommended Textbooks:** *Astronomy: A beginners Guide (any recent edition)* by Chaisson/McMillan

* Astronomy Study Guide: Notes to Accompany the Online Textbook by Robert H. Gowdy

**Last Day to Drop with a W:** Friday, March 23, 2018.
Overview of How the Course Works

After each main point in lecture, I will ask a question about it and you will respond using the Top Hat system. Most (but not all) of the questions are linked to the online lecture notes and you are encouraged to check them out ahead of time. For the linked questions, all responses are marked correct. However, there will often be questions that are not linked to the notes and, for those questions, only the correct answer gets credit. The percentage of correct answers becomes your “Top Hat Question Score.”

In addition to attending lecture, you are required to post questions and answers on Packback Questions. Post at least one question about the course material and two answers each week. The Packback Questions site uses an AI-powered computer algorithm to assign “Curiosity Scores” to these questions and answers. These scores encourage you to ask complex questions that do not have simple answers and to give thoughtful and well-documented answers.

The Top Hat question scores and the Packback Curiosity scores are combined to produce your Engagement Score. The Engagement section of the Syllabus give the details of how that works.

The lectures cover a great deal of detailed information that you are expected to retain. Multiple-choice exams will be used to assess how much you retain and provide your Assessment Score.

Your final grade is based on your overall score:

75% Assessment + 25% Engagement

Websites

Blackboard Website: Our course has a website on Blackboard. There you will find a summary of your grades, links to important course elements and access to some optional assignments.

Lecture Website: All of the course materials are on this website. While you may wish to use a textbook for reference, no textbook is required. Here are several ways to get to the lecture website:
- From the Blackboard website, select the button marked “Lecture Website.”
- From the VCU home page, type “Gowdy” in the search box. Then select
  - Go → Robert H. Gowdy Homepage → P103
- To go directly to the lecture website, use the URL: http://www.courses.vcu.edu/PHY-rhg/astron/

Lon-Capa Website: All of the possible quiz and test questions are available for practice at this site. To go there use the URL http://loncapa.vcu.edu, log in with your VCU eID (your VCU email login). Select PHYS 103 from your course list. Then select “Course Contents” from the main menu at the top of the display.
Top Hat

**Top Hat:** We will be using the Top Hat (www.tophat.com) classroom response system in class. You will be able to submit answers to in-class discussion questions using Apple or Android smartphones and tablets, laptops, or through text message.

**Visit the Top Hat Overview** ([https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide](https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide)) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.

An invitation will be sent to you by email, but if you don't receive this email, you can register by simply visiting our **Top Hat course website:** Unique Course URL: [https://app.tophat.com/e/012380](https://app.tophat.com/e/012380).

Note: our Course Join Code is 012380

When you register, you will be asked for your email address.
Be sure to use your preferred school email in the form ...@vcu.edu.

Top Hat will require a paid subscription, and a full breakdown of all subscription options available can be found at [https://tophat.com/educational-technology/pricing/](https://tophat.com/educational-technology/pricing/).

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-549

Packback Questions

We will be using the Packback Questions platform for online discussions about class topics.

Navigate to [https://Packback.co/questions](https://Packback.co/questions) and click "Register as a new student". Note: If you already have an account on Packback you can login with your credentials.

Be sure to register with your school email address in the preferred form ...@vcu.edu and your real first name and last name

Enter our class community's access code into the "Join a new Community" module on your dashboard.

Our Community Access Code: 82B77DBF-D176-5F74-7F0B-8BF2B6919EFF

Follow the instructions on your screen to finish your registration and then click into our class Curiosity Community. You can make your first post by clicking the gold “Ask a Question” button.

For a brief introduction to why we are using Packback Questions in class, watch this video: vimeo.com/packback/Welcome-to-Packback-Questions
Assessment

Four hour exams will be given in class. Each exam consists of 50 multiple choice questions. Consult the “Exams” page of the lecture website for the dates and the material that each exam covers.

A comprehensive final exam will consist of 120 multiple-choice questions, with at least one question from each module of the lecture notes. The exam will be given in MCALC1107 at 8:00am on Monday, May 7, 2018

You must take the final exam.

Total Assessment Score: Each exam has a maximum score of 100. Compute your Total Assessment Score as follow:

Add up all five scores (4 hour exams and the final).
Subtract the lowest of the five scores.
Add twice the final exam score.
Divide by 6.

The first two steps cause the final exam to replace your lowest hour exam score when the final exam score is not the lowest. The third step means that the final exam is at least 1/3 of your assessment score whether it replaces anything or not. Notice that the final exam score itself is never replaced.

Engagement

Vigilance: Check your Top Hat gradebook and the Blackboard gradebook to make sure everything is working. If your scores are not making it into the gradebooks, it is your responsibility to fix the problem. You are also required to maintain your Packback Questions account and check regularly that your number of questions, number of answers, and total Curiosity Score for each week appear in the Blackboard gradebook.

Weekly Engagement Points: Each week, your Blackboard gradebook will provide

- The percent of correct Top Hat answers for each of the lectures
- The number of questions you asked in the Packback Curiosity Community.
- The number of answers you gave in the Packback Curiosity Community.
- Your total Packback Curiosity score for the week.

Add up all the in-class quiz scores and the Curiosity score and then subtract 10 points for each question and 15 points for each answer to get your Engagement Points for the week. The subtractions are to discourage extremely simple questions and answers.

Target Engagement Points: Your goal is to get all of the Top Hat discussion questions in each of our weekly lectures correct and get a Packback Curiosity Score of 240 each week. For a normal week with three lectures, that adds up to a target of 500 engagement points.
**Weekly Engagement Score:** Each week you will get a score that indicates how close you came to your Engagement Target. This score is

- Zero if you did not post at least one question and at least two answers that week.
- Otherwise it is the percent of your target engagement points that you achieved.
- You can over-achieve and get more than 100%, but anything over 150% gets set back to 150%.

**Total Engagement Score:** Your Engagement score for the semester is the average of all your weekly engagement scores, starting with the second full week of class (Week No. 3 in the Tentative Schedule, starting January 28, 2018).

**Final Grade Calculation**

Your final score is

\[ 0.75 \times \text{Assessment Score} + 0.25 \times \text{Engagement Score} + \text{Extra Credit} \]

This score determines your grade:

- A=90.0-100.0, B=80.0-89.9, C=69.5-79.9, D=59.5-69.4

**Extra Credit**

1% extra credit may be earned by taking the online Science Literacy Assessment exam as a pre-test at the start of the semester and as a post-test at the end of the semester. These tests will be available at our Blackboard web site and are announced through your VCU email.

Up to 5% extra credit may be earned by completing the Moon Observation Project.

- Preview deadline: February 13, 2018;
- Project deadline: April 10, 2018.

See the project instructions for details.

**Makeup Policy**

**Exams:** *Makeup exams will not usually be given after the regular exam time.* If you know that you cannot make a scheduled exam, you may schedule a time to take the exam *early* at my office. Exams that are missed due to unexpected events such as illness, accidents, family crises and so forth are taken care of by the grading procedure, which automatically replaces a missed exam with the final exam score.

**In-class Top Hat Questions:** Sometimes you get sick and can’t come to class. Sometimes you arrive late or have to leave early and do not answer all of the questions. Sometimes your cell phone dies and you
cannot respond to any questions. Get the lost engagement points back by asking and answering more questions in the Packback Curiosity Community during that same week.

**Packback Problems:** Suppose your computer dies and takes a week to fix or you get too sick to use the computer. You can get those points back by over-achieving in later weeks, posting more really good questions and answers than are required. Remember that the over-achievement is capped at 150% so that you need two super weeks to make up for a one-week wipeout.

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**Tentative Schedule of Topics**

**Here is the plan.** We will probably stay close to it, but sometimes stuff happens, so you should not use this plan to determine the times and content of the exams. The exam schedule on the “Exams” page of our lecture website will be kept up to date and is the place to look for that information. Similarly, do not look here to determine what modules we are covering on any given day during the semester. Instead, look at the list of questions asked in class that is linked to the “Announcements” page of our lecture website.

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<tr>
<td>15</td>
<td>Apr. 30</td>
<td>29</td>
<td>The Milky Way Galaxy</td>
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</table>

Engagement scores begin to count for Week 3. However, engagement activities --- Top Hat in-class questions and the Packback Curiosity Community --- begin on the first day of class to allow time to resolve problems.

**General VCU Syllabus Information**

[http://go.vcu.edu/syllabus](http://go.vcu.edu/syllabus)