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:** After taking this course, 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 – Send an email to set up a ZOOM session.

**Lecture Schedule:** MWF 8am – 11:59pm

**Room:** ONLINE.

**Required Item:** Top Hat Pro (1 year $41 online after VCU discount)

**Required Textbook:** Elementary Astronomy by Robert H. Gowdy ($60 in Top Hat Marketplace)

**Required Item:** Packback Questions Subscription ($25 for the semester)

**Last Day to Drop with a W:** November 24, 2020.
Overview of How the Course Works

The course will be taught from materials that are available through your Top Hat account. It is important to read each chapter of the textbook before we cover it in lecture. In order to encourage you to do that, each chapter contains questions, which are assigned as homework with a due date. To get homework credit, you must answer the questions before the due date for each chapter. Each multiple-choice response gets half credit for the response and half credit for correctness. Each discussion question gets full credit for participation. The percentage of possible credit becomes your “homework score.”

Lectures will be assigned on Top Hat on the days that the course “meets.” A new lecture will be assigned at 8am each Monday, Wednesday, and Friday. After each main point in the lecture, there will be a multiple-choice question about it. Each response that is made on the day of the lecture gets half credit for participation and half credit for correctness. The percentage of possible credit becomes your “Top Hat response score” for that lecture. Lectures will remain available for review after the day they are first assigned.

The Packback Questions site uses an AI-powered computer algorithm to assign “curiosity scores” to your posts on that site. These scores encourage you to ask complex questions that do not have simple answers and to give thoughtful and well-documented answers. In addition to responding to lectures, you are required to post questions and answers on Packback Questions. Post at least one substantial question (more than 30 curiosity points) about the course material and at least two substantial responses (more than 30 curiosity points) each week to obtain a 100% posting score for the week.

Each week I add up your Top Hat response scores and your Packback curiosity scores to produce your engagement total for the week. Because I just add these scores together, you can use Packback scores to make up for missing Top Hat responses or quizzes. The Engagement section of the Syllabus give the detailed procedure for calculating your engagement score from the total.

The lectures cover a great deal of detailed information that you are expected to understand. Online, open-book Multiple-choice exams will assess how much you understand and provide your assessment score. The Assessment section of the syllabus gives the detailed procedure for calculating your assessment score.

Your overall score determines your final grade:

\[
\text{Overall score} = 10\% \text{ Homework} + 10\% \text{ Posting} + 15\% \text{ Engagement} + 65\% \text{ Assessment} + \text{extra credit}
\]

\[
A=90.0-100.0, \ B=80.0-89.9, \ C=69.5-79.9, \ D=59.5-69.4
\]
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. The exam schedule and notices of upcoming due dates will be on the Announcements page of our Blackboard website.

Top Hat Pro: We will be using the Top Hat (www.tophat.com) platform to support our online course. You will be able to study, submit answers to lecture questions, and take exams using Apple or Android smartphones and tablets, as well as internet-connected computers of any type. We will be using the custom-built interactive Top Hat Textbook “Elementary Astronomy” for this class.

Visit the Top Hat Overview (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/809346
- Note: our Course Join Code is 809346.
- VCU will require you to use your VCU eID to register.
- Top Hat will require a paid subscriptions for Top Hat – one year for $41.
- Your “Elementary Astronomy” interactive textbook will be applied at checkout for $60. You will see “preview” versions of all the textbook chapters right away. The full versions, with interactive questions for homework, will be assigned later.
- If you need to be reimbursed from financial aid, purchase account codes at the bookstore and use those to register for Top Hat, Top Hat Test, and the textbook.

Should you require assistance with Top Hat at any time, 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.

Before you start posting, be sure to read the Community Guidelines found in the tutorial on Packback. If your post doesn’t follow the Packback Community Guidelines, there is a chance it will be removed and you won’t receive points for that post.

The deadline for posting to your community each week is Saturday at 11:59 pm.
Note: it takes 24 hours for the Packback team to moderate a post and send a coaching email. If for any reason your post is moderated because it does NOT meet the Community Guidelines, you will need to edit and re-publish your post to receive credit for the week. This is why it is important that you complete your Packback questions and responses long before the deadline in case your post is moderated.

Register by following the instructions below:

1. Navigate to https://questions.packback.co/sign-up/create-account.
   Note: If you already have an account on Packback you can login with your credentials.
2. Make sure to register with the ...@vcu.edu form of your email address and the same form of your name that you used to register for the class.
3. Enter our class community’s access code into the “Join a new Community” module on your dashboard. Our Community access code 8727b4a9-ce53-486d-b5f0-d5de9fe82eb4
4. Follow the instructions on your screen to finish your registration.

If you have ANY questions or concerns regarding Packback throughout the semester, please contact the customer support team at holla@packback.co!

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

Homework

Reading assignments and due dates will be given on the Announcements page of our Blackboard Website. Answer all of the questions in each assigned chapter at our Top Hat website. You will have two tries at each question. Important: Never waste a wrong answer! If your first answer to a question is wrong, look for the answer in the reading before you try again.

Reading assignments are due every Thursday night. Try to finish assignments early because:

- It is best to read each chapter before it is covered in lecture so that you can look for things in the lecture that you had trouble understanding in the chapter.
- Sometimes two chapters will be due at once and the night before they are due might not be enough time to read them both and answer all of the questions.
- Technology like your computer and its internet connection can be counted on to go bad at the worst possible time --- like all day Thursday.

Your homework score for the semester will be the average of all your reading homework scores with the lowest score dropped.

Packback Posting

Each week you get a “posting score” from the Packback Discussion Forum. The posting score is 100% if you asked at least one question with a curiosity score of over 30 and gave at least two responses with scores of over 30%. The curiosity scoring is done by a program that looks for complex, open-ended questions and well-referenced answers.

Packback posts are due every Saturday night at 11:59pm. Posts made after that time go toward the following week. Try to get your posts done early in the week so that you can respond if Packback rejects one. Also, if your internet connection does not go down on Thursday, you can bet that it will be down on Saturday night.

Your posting score for the semester will be the average of your weekly posting scores with the lowest score dropped.

Engagement

Weekly Engagement Points: Each week, your Blackboard gradebook will provide a list of scores:

- The total of all your Packback curiosity scores for the week.
- The lecture response score for each of the lectures (/100)

Add up these scores to get your Engagement Total for the week.

Target Total: Your goal is to get all of the responses correct and get a total Packback Curiosity Score of 150 points each week. For a normal week with three lectures and one quiz, that adds up to a target of 350 engagement points. If some lectures are missed due to holidays, exams, weather, etc., the target will be lower.
**Weekly Engagement Score:** This score is the percentage of the target total that you achieved. If you post extra questions and responses with decent curiosity scores, you can easily get this score to go over 100%. Scores above 150% are set back to 150%, so you can get some extra credit from posting, but you have to spread it out over the semester.

**Overall Engagement Score:** Your overall 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 August 31, 2020.) and dropping the lowest score.

**Assessment**

There will be Four progress exams using Top Hat Test. Each exam consists of 50 multiple choice questions. Consult the “Announcements” page of the Blackboard 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 section of the lecture notes. Use Top Hat to take the final exam online from 8am December 1, 2020 to 11:59pm December 2, 2020.

You must take the final exam.

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

\[
\begin{align*}
\text{Add up all five scores (4 hour exams and the final).} \\
\text{Subtract the lowest of the five scores.} \\
\text{Add twice the final exam score.} \\
\text{Divide by 6.}
\end{align*}
\]

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.

Notice that the grading procedure does not change or replace any of the exam grades given in the Blackboard Student Gradebook.

Notice that this scheme is NOT the same as DROPPING the lowest progress exam. Missing a progress exam puts more weight on the comprehensive final exam, which is not something you should want.
Final Grade Calculation

Your final score is

10% Homework + 10% Posting + 15% Engagement + 65% Assessment + 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 7.5% extra credit may be earned by consistently posting extra questions and responses on Packback. The engagement score for each week is allowed to go over 100% but scores over 150% are set back to 150%. To take full advantage of this extra credit, you need to spread it out over the whole semester.

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

- Preview deadline: September 21, 2020 at 11:59pm
- Project deadline: November 9, 2020 at 11:59pm.

See the project instructions on Blackboard for details.

Makeup Policy

Exams: Makeup hour 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. If you miss an hour exam due to an unexpected event such as illness, accident, family crisis or other problem, the grading procedure will have the effect of replacing the missed exam with the final exam score. If you miss the final exam, you may make it up only if you submit a request for a grade of incomplete.

https://rar.vcu.edu/media/strategic-enrollment-management/rar/docs/IncompleteGrade1.pdf

In-class Top Hat Questions and quizzes: 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 or arrive after the quiz has started. 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.
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 “Announcements” page of our Blackboard 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 have covered on any given day during the semester. Instead, look at the list of questions asked in class that is given in the Top Hat Gradebook.

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Chapters</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 17-21</td>
<td>1-2</td>
<td>Syllabus, Observations, Models, Constellations</td>
</tr>
<tr>
<td>2</td>
<td>Aug 24-28</td>
<td>3-4</td>
<td>Planets, Science, Moon Phases</td>
</tr>
<tr>
<td>3</td>
<td>Aug 31/4</td>
<td>4-5</td>
<td>Model of Motion, Exam 1, Newton’s Laws of Motion</td>
</tr>
<tr>
<td>4</td>
<td>Sep 9-11</td>
<td>5-6</td>
<td>Physics, Gravity, Solar System Overview</td>
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<tr>
<td>5</td>
<td>Sep 14-18</td>
<td>6-7</td>
<td>Comets, Kuiper Belt, Terrestrial Planets</td>
</tr>
<tr>
<td>6</td>
<td>Sep 21-25</td>
<td>7-8</td>
<td>Terrestrial Planets, Earth’s Moon</td>
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<tr>
<td>7</td>
<td>Sep 28/2</td>
<td>9</td>
<td>Jovian Planets, Exam 2, Jovian Planets</td>
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<tr>
<td>8</td>
<td>Oct 5-9</td>
<td>9-10</td>
<td>Outer Solar System, Solar System Formation</td>
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<tr>
<td>9</td>
<td>Oct 12-16</td>
<td>11</td>
<td>Living Earth, Earth Impacts</td>
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<tr>
<td>10</td>
<td>Oct 19-23</td>
<td>12</td>
<td>Earth Impacts. The Search for Life</td>
</tr>
<tr>
<td>11</td>
<td>Oct 26-30</td>
<td>13</td>
<td>The Search for Life, Exam 3, Telescopes</td>
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<tr>
<td>12</td>
<td>Nov 2-6</td>
<td>13-14</td>
<td>Measuring Star Distances, Star Brightness and Color,</td>
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<tr>
<td>13</td>
<td>Nov 9-13</td>
<td>15-17</td>
<td>Hertzsprung Russell Diagram, The Births and Death of Stars</td>
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<tr>
<td>14</td>
<td>Nov 16-20</td>
<td>17-18</td>
<td>Dark Matter, Exam 4, Galaxies</td>
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<tr>
<td>15</td>
<td>Nov 23</td>
<td>18</td>
<td>The Expanding Universe</td>
</tr>
</tbody>
</table>

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

General VCU Syllabus Information

Students should visit http://go.vcu.edu/syllabus and review all syllabus statement information. The full university syllabus statement includes information on safety, registration, the VCU Honor Code, student conduct, withdrawal and more.