

# ASTR 114 203

## Spring 2020 - **REVISED**

**Section: 203**  
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**EDUCATIONAL GOALS:** The general education natural sciences courses are designed to 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. Astronomy 114 contributes to this goal within the content of stellar and galactic astronomy. During the lab class students should:

- Understand how scientific inquiry is based on investigation of evidence from the natural world
- Appreciate the nature of scientific knowledge and understanding:
  - Scientific knowledge evolves based on new evidence
  - Objective understanding is distinct from personal and cultural beliefs
- Recognize the scope and limits of science
- Recognize and articulate the relationship between the natural sciences and society and how science can help solve societal challenges (e.g., public health, conservation, sustainability, energy, natural disasters, etc.)
- Evaluate scientific information (e.g., distinguish primary and secondary sources, assess credibility and validity of information)
- Participate in scientific inquiry and communicate the elements of the process, including:
  - Making careful and systematic observations
  - Developing and testing a hypothesis
  - Analyzing evidence
  - Interpreting results

**OBJECTIVES:** This laboratory is the companion to Astronomy 113: Stars and Galaxies. It is designed to reinforce the concepts presented in the lecture course through hands-on experimentation and realistic computer simulations. These tools and techniques should help students better understand what astronomers know about the universe and how they come to know it. A series of labs will prepare students for a final project in which they analyze and identify an unknown sky object and present their findings in a summary paper. Other labs will help students develop skills in graphing, scientific reasoning, and critical thinking that may transfer to other areas of study and interest.

**SUPPLIES:** You will need the following supplies:

- Access to Blackboard outside of class
- Notebook for keeping track of class activities and completed labs for reference during the practical exam

- Hardcopies of lab background and instructional materials
- Loose leaf paper
- Graph paper
- Writing implements
- Scientific calculator

Lab exercises, pre-lab materials, answer sheets and supplementary materials, including links to helpful websites, will be delivered via Blackboard. You should read the pre-lab materials before each week's class. **You are required to complete each pre-lab quiz before the beginning of that week's lab activity.** Be sure to check Blackboard for updates and announcements each week before coming to class.

**LAB PROCEDURES:** Much of the time you spend in lab will be working in 3-person groups. Be sure that you have contact information for your lab partners and that you come to class each week prepared to carry out the complete lab. Lab reports are due at the end of each class period and will usually be graded the following week. Pre-labs quizzes, conclusion questions, and the final practical exam are individual assignments and must be completed without consulting other students. **Lab reports submitted each week by the groups must list all student members so that all students get credit for the lab.**

**NOTE: In order to receive credit for a lab, each student must be registered in the appropriate Blackboard group at the time of submission.**

It is advisable to keep a lab notebook with copies of completed labs. This may be on paper or electronic. Either way, your lab notebook will be a valuable resource at the end of the semester when you work to identify an unknown object using the tools and techniques learned earlier in the semester. It is important therefore that you attend every lab session and keep accurate records of your work.

## GRADING

**Laboratory Exercises:** The laboratory exercises will help you understand how astronomers gather information about celestial objects and will augment the material from your lecture about concepts in stellar astronomy. You will use simulated optical and radio telescopes along with simulated photometers and spectrometers to help you understand and analyze what you see. **You must complete 9 labs, plus the Observatory Visit and the Practical Exam. You must also complete 9 pre-lab quizzes (one for each lab plus one for the Observatory Visit).**

**Practical Exam:** The practical exam, Identifying Object X, is mandatory and will serve as a test of your understanding of how astronomers use various techniques to understand objects we observe in the sky. **This is a mandatory, individual effort, and you will be assigned an individual time to come to lab to research the object.** You will then write up a report describing your research and the results and submit it within a week of taking the practical exam.

**Pre-Lab Quizzes:** Pre-lab background preparation material is provided for each lab. Read this material and then take the pre-lab quiz, which is due before your lab meeting.

**Observatory Visit:** A visit to the GMU observatory is an out-of-class lab and is mandatory. Your instructor will give you instructions about how to sign up for your visit, which will last about 30-45 minutes. You will need to come to the observatory (located in the Research I building), and gather at the elevators where a guide will meet you and take you to the telescope on the top floor. **You must write a report detailing your visit, as outlined in instructions on Blackboard, and submit it in the associated Dropbox. The report is due the week following your visit.** For more information about the telescope and procedures for visiting, see the GMU observatory website, <https://cos.gmu.edu/observatory/>

**Final Grade:** Grades from the above assignments will determine your final grade as follows:

Graded Elements	Possible points
<b>Observatory Visit</b> – out-of-class lab – report on your tour of the GMU observatory and your observations.	100
<b>Lab Reports</b> – 9 regular in-class labs. A missed lab counts 0 points. You must attend class in order to receive credit for lab participation.	900
<b>Lab Practical Exam</b> – Extrasolar Planets – Collect data in lab and submit your write-up explain how you approached the problem and the results of your investigation.	100
<b>Pre-Lab Quizzes</b> – 10 quizzes are required, and each one is worth 10 points (one quiz for each of the 9 labs plus one for the observatory visit).	100
<b>Total</b>	<b>1200</b>
<b>10<sup>th</sup> Lab</b> – A makeup lab that students can use to replace a lab missed due to exceptional circumstances, or for those who wish to replace the lowest-scoring lab of the 9 regular labs.	100 Replaces a missed lab or low scoring lab (NOT the Practical Exam)

Letter Grade	Percent Score
A+	97-100
A	93-96.9
A-	90-92.9
B+	87-89.9
B	83-86.9
B-	80-82.9
C+	75-79.9
C	70-74.9
C-	67-69.9
D	60-66.9
F	below 60

Each lab missed will lower your grade by approximately one letter grade. Missing 4 labs or more will result in automatic failure. Labs cannot be made up except under exceptional circumstances. No work will be accepted after the last regular class meeting. The score of A+ is not automatic, instructors may award it for students who have shown exceptional effort and achieved a final score of 97% or above. There are no extra credit assignments, so the final course grade depends solely on work done during the regular semester.

## LABORATORY CONDUCT

**Cell Phones:** Inappropriate (not class related) use of personal or lab electronic devices may result in being sent out of lab.

**Computer Use:** The computers in the lab room are to be used for class work only. Students using web or email services that are not class related may have access to the web blocked. Computers may not be used to work on assignments for other classes. ***Please DO NOT turn off the computer when you finish.***

**Personal computers:** Personal computers may be used only with instructor's permission and only for lab work. You may not disconnect lab equipment to plug in a personal electronic device.

**Classroom courtesy:** Use the lab time to work on astronomy. Students who disrupt the classroom with loud, inappropriate, or off-topic conversations may be asked to leave the lab after a warning. Show courtesy to your fellow students and to your instructor by giving whole-hearted attention to the topic at hand. *Before leaving the lab, clear your workstation and push the computer keyboard and chair back in place, but please DO NOT turn off the computer!*

**Food and drink:** Food and drink are NOT permitted in the Astronomy lab during regularly scheduled lab sessions.

**Visitors:** You may not bring visitors to the astronomy lab with you, even if they are students enrolled in other sections of the course. You may not complete your work or make up missed labs in sections in which you are not enrolled. You must attend the section in which you are enrolled in order to get credit for the class.

## GENERAL POLICIES

**Withdrawal:** If you need to withdraw from this course you must do it within the University established time frame. Check Patriot web for important dates.

**Students with Disabilities:** Please contact the Office of Disability Services (SUB I, Room 222, Phone 703-993-2474, <http://ods.gmu.edu/>), if you have a learning or physical disability that will need accommodation in the astronomy laboratory. Give the appropriate paperwork to as soon as possible so the proper accommodations can be provided for you.

**Honor Code:** Student members of the George Mason University community pledge not to **cheat, plagiarize, steal,** and/or **lie** in matters related to academic work. For more information and definitions of the terms above go to <http://oai.gmu.edu/honor-code>. Group work is important in the lab, and part of

doing this work honestly is doing your part and giving teammates credit for their contributions. **Lab reports should always list all of the members so that all team members get credit for the lab.**

**Safety and security:** The provost’s office has set up a system for notifying students and staff of emergencies. You can sign up for emergency messages to your cell phone by going to <https://alert.gmu.edu>. Call 911 in case of life-threatening emergencies in the classroom.

**GMU email account:** Students must activate their GMU email accounts to receive important University information, including messages related to this class. Course information will usually be conveyed through Blackboard. Please use the Blackboard email function as your primary means of communicating with the instructor in this class.

**Other useful campus resources:**

**Writing Center:** A114 Robinson Hall; (703) 993-1200; <http://writingcenter.gmu.edu>

**University Library:** “Ask a Librarian” <http://library.gmu.edu/mudge/IM/IMRef.html>

**Counseling and Psychological Services (CAPS):** (703) 993-2380; <http://caps.gmu.edu>

**University Policies:** The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty and staff conduct in university affairs.

## Important Dates for Spring 2020

Martin Luther King Day (no classes)	Mon Jan 20
First day of classes; last day to submit Domicile Reclassification Application; Payment Due Date; full semester waitlists removed	Tue Jan 21
Last day to add classes—all individualized section forms due. Last day to drop with no tuition penalty	Tue Jan 28
Last day to drop with 100% tuition refund	Weds Feb 5
Final Drop Deadline (with no tuition refund)	Tue Feb 11
Midterm progress reporting period (100-200 level classes)—grades available via <a href="#">Patriot Web</a>	Mon Feb 17 – Fri Mar 20
Selective Withdrawal Period (undergraduate students only)	Tue Feb 25 – Mon Mar 30
Spring Break	Mon Mar 9 – Sun Mar 15
Last day of classes	Mon May 4
Reading Day, which provides students with additional study time before final examinations. Regular classes or exams are not held.	Tue May 5
Final Exam Period	Wed May 6 – Wed May 13
Commencement	Fri May 15

## Schedule of Labs and Quizzes

This is the lab schedule for Section 203. Each section will cover the same material during the designated week. Pre-lab exercises and quizzes are always due on Blackboard before your scheduled lab meeting begins.

Date	Lab Exercises, Quizzes and Project Due Dates
<b>27 Jan</b>	<b>LAB 1: Solar Rotation Lab</b>
	<i>Solar Rotation pre-lab quiz due by 4:30PM</i>
<b>3 Feb</b>	<b>LAB 2: Atomic Spectra Lab</b>
	<i>Atomic spectra pre-lab quiz due by 4:30PM</i>
<b>10 Feb</b>	<b>LAB 3: Stellar Classification Lab</b>
	<i>Stellar classification pre-lab quiz due by 4:30PM</i>
<b>17 Feb</b>	<b>LAB 4: Hertzsprung-Russell Diagram Lab</b>
	<i>Hertzsprung-Russell pre-lab quiz due by 4:30PM</i>
<b>24 Feb</b>	<b>LAB 5: Photoelectric Photometry of the Pleiades Lab</b>
	<i>Photoelectric Photometry of the Pleiades pre-lab quiz due by 4:30PM</i>
<b>2 Mar</b>	<b>LAB 6: Variable Stars Lab</b>
	<i>Variable stars pre-lab quiz due by 4:30PM</i>
<b>9–22 Mar</b>	<b><i>Spring Break – No Classes!</i></b>
<b>23 Mar</b>	<b>LAB 7: Radio Astronomy of Pulsars Lab</b>
	<i>Radio Astronomy of Pulsars pre-lab quiz due by 4:30PM</i>
<b>30 Mar</b>	<b>LAB 8: Hubble Redshift Lab</b>
	<i>Hubble red-shift pre-lab quiz due by 4:30PM</i>
<b>6 Apr</b>	<b>LAB 9: Galaxy Analysis and Identification Lab</b>
	<i>Galaxy Analysis and Identification pre-lab quiz due by 4:30PM</i>
<b>13 Apr</b>	<b>Practical Exam: Extrasolar Planets</b>
	<i>Extrasolar Planets pre-lab quiz due by 4:30PM</i>
<b>20 Apr</b>	<b>LAB 10: Makeup Lab</b>
	<i>Makeup Lab pre-lab quiz due by 4:30PM</i>
	<b><i>No Final Exam in ASTR 114</i></b>