Syllabus Astronomy 115

Spring 2020

This four credit natural science course satisfies 3 credits of lecture and one credit of laboratory for the Mason Core requirement. It is a hybrid, active learning course with four in-person hours and two hours of on-line learning materials.

Instructor: **Dr. Rebecca J. Ericson**

Contact Information:

Office: 201B Planetary Hall
Tel: 703-993-4588
Email: rericso1@gmu.edu
Office Hours: Thursday 4 - 5 or by appointment

LA: **Catherine Tounzen**
Email:
Office Hours:
Office Location:

Purpose:

Astronomy 115 is part of the core (general education) program at GMU. According to the GMU catalogue the purpose of general education courses is: "to educate, liberate, and broaden the mind, and to instill a lifelong love of learning."

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 evolves based on new evidence and 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 (for lab courses only) by: a) Making careful and systematic observations, b) Developing and testing a hypothesis, c) Analyzing evidence, d) Interpreting results

Course Objectives for Astronomy 115:

Astronomy 115 is a Mason Core natural science course that explores the edges of current understanding of exoplanets, planets orbiting other stars. As you come to understand how astronomers develop and test ideas you will develop a deeper understanding of the scientific process and will develop your scientific reasoning skills in the context of astronomy. The main emphasis of the course is investigating how astronomers have come to know what they know about exoplanets and how solar systems seem to form and develop based on study of our own solar system and comparison of ours to systems of planets orbiting nearby stars.

Deadlines:

On-line mini-lectures and videos in addition to readings are required to prepare for the week's work. New on-line lecture materials will be available each Tuesday and a quiz over these materials is due the following Monday at midnight. The assumption is that by viewing the videos and on-line materials, reading and taking quizzes, you will learn what you will need to do well in the class activities for that week.

Text Books (Required):

Fraknoi, A, Morrison, D. and Wolff, S.C. (2016) **Astronomy**, OpenStax, Rice University. Availablefor free online at (https://openstax.org/details/books/astronomy)

Tasker, E. (2017). **The Planet Factory: Exoplanets and the search for a second earth**. Bloomsbury Signa.

Prather, E. E., Slater, T. F., Adams, J. P., and Brissenden, G. (2013), **Lecture-Tutorials for Introductory Astronomy, 3rd ed**. Pearson.

The first text, **Astronomy**, is free, available in a variety of formats from OpenStax at the address above. We will use it for background astronomy readings.

The **Tasker** book is a mass market paperback, that should be available from the bookstore and is the main focus for the exoplanet information. Much of the quiz material will come from this book.

The **Lecture Tutorial** book is a workbook to use in class. While it is preferable for each student to have one, I am also fine with having you share books and write answers on paper rather than in the workbook. You will find this to be a very useful book for learning the underlying astronomy concepts that are the foundation for understanding exoplanets.

Technology requirements:

You will need reliable computer access to participate in this course. You must be able to both upload and download documents, and watch videos. Some materials will require you to

use Flash, you may need to install this and other programs or upgrades to use some features of Blackboard and instructional materials.

A smartphone or tablet may not be sufficient for the course, be sure you also have access to a fully featured computer.

You will need to ***check emails (use the GMU account only) and Blackboard regularly*** and will be required to submit quizzes before the due date and time each week. At times we may do on-line discussion postings as well, these will be assigned during in-person class time.

For more detailed requirements about some of the necessary technology for different applications see the information below on *Blackboard* and *Collaborate*.

Blackboard:

The course is delivered through Blackboard. Please be sure you have adequate technology to access the site and do the required work. Go to My Mason, sign in and select the Courses tab, then look for the Astronomy 115. If you need help there is a section of the courses page of My Mason called *Courses 9.1 Resources for Faculty and Students* with helpful links. Other sources of help with Blackboard:

- Contact courses@gmu.edu and include your Mason email and G#
- Walk in and Phone support at the Collaborative Learning Hub, Johnson Center 311, (703) 993-3141
- Contact the ITU Support Center at (703) 993-8870 for general help, including login or network issues

Getting started:

1. Before the first week of the semester be sure you can access the Blackboard site for Astronomy 115 and can navigate the tabs and course elements.

2. Go to the Blackboard "Journals" and post a message and picture for the class as instructed.

3. Visit the Week 1 page on Blackboard and work on week 1 materials, readings, short videos the first graded journal assignment and the quiz. Note deadlines for each of the elements and complete work on time.

Policies:

Active learning courses require more organization and input by students than do traditional large lecture format courses. You will need to participate fully each week by:

1. Reading the materials and watching the on-line lectures and other materials
2. Completing the quiz based on the week's materials by Monday night of the following week.
3. Completing the journal by Monday night of the week following the week it is assigned.

4. Coming to class with questions about the material you have read and watched
5. Contributing to class and small group discussions
6. Carrying out laboratory experiments

Students with disabilities:
Students with documented disabilities or special needs should contact the instructor during the first week of class so that we can accommodate your needs throughout the course. Students who suspect they have disabilities that need accommodation should contact the Office of Disability Services at George Mason as soon as possible in order to get proper documentation.

Student resources:

Academic advising center – 703-993-2470
Campus counseling center – 703-993-2380
Office of Disability Services – 703-993-2474
Writing center – 703-993-1200
Math tutoring center – 703-993-1460
Office of Diversity, Inclusion, and Multicultural Education
Religious Holiday Calendar

Classroom conduct:

Astronomy 115 is designed as a collaborative learning experience. It is important that students participate in all activities in the online environment and that they contribute actively to groups and class discussions both in-person and on-line. Discussions should be conducted with respect for each other and at a high level of discourse. Disruptive behavior will not be tolerated and may result in a student being temporarily barred from participating in activities and incurring a grade penalty. Please do not share student contributions outside of this course.

Work Ethic:

Astronomy 115 involves both individual and collaborative work. You are expected to contribute actively to group activities and to respect and value opinions and work of other group members.

Honor Code:

George Mason's Honor code states that "Student members of the George Mason University pledge not to cheat, plagiarize, steal, or lie in matters related to academic work." If you have questions about the meaning of these terms, please ask. I expect you to hold to this standard by carefully citing sources used in your work and by doing your own work on tests and individual assignments.

In an environment where group work is highly valued it can be difficult to sort out what policies apply. At a minimum follow these guidelines:

- Work identified as individual should be strictly your own.
- Cheating on exams or presenting another's work as your own (plagiarism) will result in a zero grade for the assignment.
- Students are expected to actively collaborate on assignments identified as group, but it is important that only students who actively participate are given credit. The group is responsible for ensuring that all members take part and assume responsibility for group assignments.
- Material that is drawn from written or electronic sources must be appropriately cited. For on-line discussion, it is usually enough to simply reference a text page or web site. In a more formal paper a bibliography and appropriate in-text citations are mandatory. If in doubt about how to do this contact an instructor.

Important dates for Spring 2020

MLK Day: University Closed	Mon. Jan 20
First Day of Spring Classes: Payment Due Date	Tue. Jan 21
Last Day to Submit Domicile Reclassification Application	Tue. Jan 21
Last Day to Add: All Individual Sections Forms Due	Tue. Jan 28
Last Day to Drop with 100% Refund	Wed. Feb 5
Last Day to Drop (Last Day for 50% Refund)	Tue. Feb 11
Unrestricted Withdrawal Period	Wed. Feb 12 – Mon. Feb 24
Mid-term Evaluation Period: 100-200 level classes - Grades Available via PatriotWeb	Mon. Feb 17 – Fri. Mar 20
Selective Withdrawal Period - Undergraduate Students Only **(100% tuition liability)**	Tue. Feb 25 – Mon. Mar 30

Spring Recess: No Classes	Mon. Mar 9- Sun. Mar 15
Incomplete Work from Fall 2019 Due to Instructor	TBD
Incomplete Grade Changes from Fall 2019 Due to Registrar	TBD
Dissertation/Thesis Deadline	Fri. May 1
Reading Day(s): Reading days provide students with additional study time for final examinations. Faculty may schedule optional study sessions, but regular classes or exams may not be held.	Tue. May 5
Last Day of Class	Mon. May 4
Examination Period	Wed. May 6 – Wed. May 13
University Commencement	Fri. May 15

Grading System:

You grade will be based on both lecture and lab work.

Activity	Percent of course grade
Weekly blackboard quizzes	10% of grade
Lab reports (group grades)	25% of grade
Journals	10% of grade
Project 1	10% of grade
Project 2	25% of grade
Portfolio	10% of grade
Participation	10% of grade
Total	***100%***

Grading-Percentage based on calculations in table above:

A = 93-100	C+ = 77-79.9
A- = 90-92.9	C = 73-76.9
B+ = 87-89.9	C- = 70-72.9
B = 83-86.9	D = 60-69.9
B- = 80-82.9	F = 0-59.9

Quizzes

Quizzes help you know whether you are grasping the material or not, and where to focus your effort to understand. You may take the quiz twice, but your grade will be based on the average of the attempts, so try to do well the first time. An activity in class may occasionally be a "pop" quiz to ensure you really do understand the material. Quizzes are to be your individual work. They will usually be provided through Blackboard.

Lab reports

The heart of a laboratory science course is the laboratory experience. Astronomy is somewhat different from many of the sciences in that it is more historical than experimental. Astronomers base their hypotheses and theories on data and on experimental results from fields such as physics and chemistry but cannot recreate such things as planet formation in the laboratory. Computer simulations, spectral analysis, and studying astronomical objects in multiple wavelengths are just some of the techniques that help us understand the universe.

We will have lab activities during in person sessions. Occasionally they will involve some out of class preparation. Labs will generally be done in groups of three and will receive a group grade. Each group members is responsible for all parts of the lab, though each will have a different role, leader, recorder, or checker with additional responsibilities. Lab reports are due at the end of the Thursday face to face session.

Participation

Attendance is key to learning in this class and is at the heart of the design of this course. In an active learning classroom, you learn from what you DO as well as what you read and hear. You learn from your individual effort, from interacting with your classmates and from your instructor and Learning Assistant. With that in mind, just coming to class is not enough for full participation credit. You need to contribute to the class and your group, ask thoughtful questions, and actively participate in group and individual activities. Participation is graded on the following scale:

100% - exceptional engagement and thoughtful work throughout the course
83% - satisfactory participation, some thoughtful contributions to class
70% - partial participation, some time spent off-task or disengaged

60% - significant lack of participation or engagement, frequent absence
0% - Lack of attendance, disruption of learning environment, persistent disengagement

Journals

Each week there will be a journal prompt designed to help you reflect on and understand the course material. You will share some of these with your classmates and will be expected to submit your 5 favorite entries as part of your end-of-semester portfolio.

Projects

There will be two projects this semester, the first an individual writing based on the relevance of astronomy to your life and the second a group project exploring the nature of a particular exoplanet through a creative or informative presentation. Details about these projects will be posted on Blackboard.

Portfolio

The portfolio is a collection of work that demonstrates your learning in this class. Keep track of your work, including lab reports, small in-class assignments and your projects. You will select examples based on a rubric that will be supplied on Blackboard. The portfolio should reflect mastery based on the learning goals for Mason's core natural science classes, as well as a deepening understanding of exoplanets and our current understanding of how planetary systems come to be.

Assignment Schedule

This schedule is subject to change. Videos will be available on Blackboard and there may be additional short readings as new information emerges in this very volatile field of study. I may vary the course direction somewhat based on interest as well! A quiz and journal writing are due each Monday at midnight.

Week	**Topic – the "big picture" idea for the week**	**Lab (usually on Thursday but some preparatory material often on Tuesday**	**Readings and foundational material – may vary somewhat as the semester goes on.**	**Assignments due on Monday at midnight. Quizzes mostly cover material from the two texts, though an occasional question may come from supplementary reading and videos.**
Jan 21 and 23	Introduction: what is an exoplanet?	**Lab 1: Scale of the Galaxy**	**Astronomy Ch. 1 and 7.1, 7.2, 7.4** **The Planet Factory Preface and Introduction**	
Jan 28	Planets – in solar system and beyond	**Lab 2: Star wheel**	**Astronomy Ch. 5** **The Planet Factory Ch. 12 – Goldilocks Criteria**	(Due Jan 27 midnight) Quiz 1 (Planet Factory and Astronomy ch. 1 readings)

and 30			**Trappist 1 What is it Graphic Short story** **http://www.trappist.one/#stories**	Class introduction
Feb 4 and 6	Learning with light and the temperate zone	**Lab 3 Atomic spectra**	**Astronomy Ch. 18** **The Planet Factory Ch. 1 and 2**	(Due Feb 3 at midnight)_ Quiz 2 Journal entry 1: Value of ignorance
Feb 11 and 13	Building a star and its planets – stars with dusty discs.	**Lab 4: Classifying stars**	**The Planet Factory Ch. 3 and 4** **The Terminator Short Story** **https://www.nature.com/articles/542512a**	(Due Feb 10 midnight) Quiz 3 Journal 3
Feb 18 and 20	Theories of solar system formation	**Lab 5: Radial velocity**	**Astronomy ch. 21- Birth of stars** **The Planet Factory Ch. 5 and 6**	(Due Feb 17 midnight) Quiz 4 Journal 4 4 Project 1 deadline – submit by Monday this week
Feb 25 and 27	Ways of finding exoplanets	**Lab 6: Transiting planet detection**	**Astronomy Ch. 22 – Stars from adolescence to old age** **The Planet Factory Ch. 7 and 8**	(Due Feb 24 midnight) Quiz 5 Journal entry 5
Mar 3	Weird Worlds		**The Planet Factory Ch. 9, 10, and 11**	(Due Mar 16 midnight) Quiz 6 Journal 6
Mar 5	NO CLASS Meeting – Dr. Ericson out of town.	**Reading scientific writing – Out of class**		Scientific writing lab report
Spring break Mar 10 and 12				
Mar 17 and 19	More weird worlds	**Lab 7: Find a planet: Using Citizen science in astronomy**	**The Planet Factory Ch. 13 and 14**	(Due Mar 23 midnight) Quiz 7 Journal 7

Mar 24 and 26	Farthest Voyage I	**Lab 8: Exoplanet database graphing lab**	**The Planet Factory Ch. 15 and 16**	(Due Mar 16 midnight) Quiz 8 Journal 8 Post topic and medium for project
Mar 31 and Apr 2	Farthest Voyage II	**Choose your exoplanet**	**Astronomy Ch. 30 Life in the Universe** **The Planet factory Ch. 17**	(Due Mar 30 midnight) Quiz 9 Journal 9
Apr 7 and 9	Life in the Universe	**Lab 9: Nebular theory exploration with exoplanet database**	TBA	(Due Apr 13 midnight) Quiz 10 Journal 10
Apr 14 and 16	Life in the Universe 2	**Lab 10: Life on your exoplanet**	TBA	(Due Apr 20 midnight) Quiz 11 Journal 11
Apr 21 and 23	Prepare Role play	**Role play: ET found?**		(Due Apr 27 midnight) Work on Projects Project II paper due
Apr 28 and 30			In-class presentations of projects	
No Final exam				