ASTRONOMY 113-001	STARS, GALAXIES AND UNIVERSE	SPRING 2023

Professor: Dr. Hakeem M. Oluseyi
E-mail: holuseyi@gmu.edu
Class Hours: TR 3:00-4:15PM; Innovation Hall #222
Office Hours: TR 1:30–2:45PM; East Building, Room #207E
Required Text: ASTRONOMY – https://openstax.org/details/books/astronomy

Introduction: This general astronomy course is intended to familiarize students (with or without scientific background) with the structure, origin, and evolution of our universe and its constituents. It describes our growing knowledge of the objects which make up the universe: galaxies, stars, nebulae, planets, etc., and includes discussion of some enigmas of modern astronomy, such as the dark energy and dark matter (which together account for as much as 95% of the mass/energy of the universe), quasars, x-ray sources, black holes, and pulsars. The course will accomplish these objectives by emphasizing the study of four major subjects that are the focus of active research by contemporary astronomers.

i. How are stars and planetary systems formed, how do they evolve, and what are their fates? How does the evolution of stars affect the dynamics and evolution of our galaxy? What can dense stellar remnants tell us about the fundamental nature of matter, space, and time?

ii. How did the present organization of luminous matter evolve? What is the nature of active galaxies and quasars, and what are their remnants in the contemporary universe? How did galaxies originate?

iii. How was our universe created, and what will be its ultimate fate? What is the nature, quantity, and distribution of non-luminous (*i. e*. "dark") matter in the universe? What is the nature of the dark energy that accelerates the universe's expansion?

iv Is there life elsewhere in the universe?

Purpose: The purpose of Astronomy 113 is to present scientific research and discovery as a creative human *activity*, which has both important similarities and significant differences with other creative human *activities* such as the fine arts, politics, and literature. Because of its intrinsic appeal to the imagination, its close links to technology and its universality, astronomy and its related sub-disciplines of astrophysics and cosmology are especially well suited to provide a vehicle to introduce the creative nature of the scientific enterprise to students of the humanities, the social sciences, and technology. It has been argued that the study of history demonstrates that problems that arise within civilizations or when different civilizations interact are seldom solved; rather, they are transformed into new, sometimes positive, sometimes negative, challenges. Although it is possible to more objectively identify "progress" in science than in human history, change and the identification of new problems which present new challenges and new opportunities are a feature of both activities. The challenge which this course attempts to address, then, is to use the process of presenting our current knowledge of the universe, the techniques which have permitted the acquisition of that knowledge, and the current questions that knowledge has allowed us to formulate, to explain and illustrate how the process of acquiring that knowledge is undertaken. Developing in the student an understanding of the evolution of the basic astronomical models that have been refined and transformed into the models currently adapted to explain the universe and of the techniques and motivations used by major innovators, both past and present, is a major goal of the course.

Approach: The approach taken by Astronomy 113 is fundamental in that it does not assume previous study of physics or advanced mathematics, but it is also intended to be intellectually stimulating. It is based on the assumption that the ideal of contemporary astronomy, astrophysics, and cosmology are logically based on simple models that can be explained without resorting to complex mathematical concepts. The course is also based on the assumption that an in-depth approach to the study of a set of carefully selected fundamental questions, which is supported by a description of the basic concepts, discoveries, and theories which led to the identification of the fundamental questions under study, is likely to be more interesting and of more lasting value to the student whose main interests lie outside of the fields of basic science. The approach will also clearly emphasize that astronomical research is a process embedded in our society, which affects and is, in turn, affected by society. A clear exposition of the historical roots and development of current concepts, and the role of innovative individuals (including women and scholars from a variety of ethnic and cultural backgrounds) and of technological innovation in the process, will be an important theme of the course.

Course Structure: Astronomy 113 will be primarily a lecture course; however, there are Astronomy Laboratory courses available for those students who may wish to experience astronomical observing and data analysis firsthand.

Grading Philosophy, Assignments, and Examinations: Grades will be based on three components: (1) class participation for [10%], (2) four in-class quizzes [15% each], and (3) the final examination [30%]. The final will cover the entire course.

STUDENTS WITH DISABILITIES: If you are a student with a disability and you need academic accommodation, please see me and contact the Disability Resource Center at 703-993-2474.

COMMUNICATION: All students should check university e-mail accounts for class updates. I will send e-mails through Blackboard. Office

ENROLLMENT: Students are responsible for verifying their enrollment in the class. The last day to drop classes without penalty **is Monday, February 6**. Unrestricted Withdrawal Periods is Tuesday, February 14 to Monday February 27.

HONOR CODE:
No help may be given or received by students when taking quizzes, tests or examinations, whatever the type or wherever taken, unless the instructor specifically permits deviation from this standard.

All work submitted to fulfill course requirements is to be solely the product of the individual(s) whose name(s) appear on it. Except with the permission of the instructor, there should be no reliance on work previously prepared by another student, and except with permission of the instructor, no paper or work of any type submitted in partial fulfillment of the requirements of another course may be used a second time to satisfy a requirement of any course. No assistance is to be obtained from commercial organizations that sell or lease research help or written papers. With respect to all written work, proper footnotes and attribution are required.

Final Exam: Thursday, May 11

Astronomy 113 Lecture Series- Spring 2023
*Note that the schedule is subject to change as required

Week	Lecture	Date	Topic	Chapter
1		24-Jan-23	Introduction and Light	5
	1	26-Jan-23	Light and Matter	5
2	2	31-Jan-23	Tools of the Astronomer	6
	3	02-Feb-23	Ancient Astronomy	2
3	4	07-Feb-23	Pre-Modern Astronomy	2,3
	5	09-Feb-23	Earth, Moon, and Sky	4
4	6	**14-Feb-23**	**Quiz 1**	**2 – 6**
	7	16-Feb-23	The Sun I	15
5		21-Feb-23	The Sun II	16
	8	23-Feb-23	Analyzing Starlight	17
6	9	28-Feb-23	The Stars: A Celestial Census	18
	10	02-Mar-23	Celestial Distances	19
7	11	07-Mar-23	Interstellar Medium	20
	12	**09-Mar-23**	**Quiz 2**	**15 – 20**
8	13	*14-Mar-23*	*Spring Break*	
	14	*16-Mar-23*	*Spring Break*	
9	13	21-Mar-23	Star Birth and Planet Formation	21
	14	23-Mar-23	Stellar Evolution	22
10		28-Mar-23	Star Death	23
	15	30-Mar-23	Black Holes and General Relativity	24
11	16	**04-Apr-23**	**Quiz 3**	**21 – 24**
	17	06-Apr-23	Milky Way Galaxy	25
12	18	11-Apr-23	Galaxies	26
	19	13-Apr-23	Active Galaxies	27
13	21	18-Apr-23	Galaxy Evolution and Dark Matter	28
		20-Apr-23	**Quiz 4**	**25 – 28**
14	22	25-Apr-23	Origin of the Universe	29
	23	27-Apr-23	Evolution of the Universe	29
15	24	02-May-23	Life in the Universe I	30
	25	04-May-23	Life i the Universe 2	30
		11-May-23	**Final Exam**	