

Faculty of Science
Physics Department

Course Outline of Astrophysics

1. Instructor's Information

Instructor's / Coordinator's Name:	Prof. Hatem Widyan
Office Hours:	10-11, 12-1: Sunday, Tuesday, Thursday
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Research and Teaching Assistant / Supervisor / Technical (if any):	NA

2. Course Information

Course No.: 402352	Astrophysics	Level: 3 rd yr
Course Type: Theoretical	Prerequisite: General Physics I	Class Time: 11:00-12:00
Academic Year: 2019-2020	Semester: Fall	Study hours:

3. Course Description

Astrophysics, is a three credit hour course on the fundamental physical concepts applied to observational and theoretical astronomy. We begin by reviewing the concept of basic principles of descriptive astronomy. After that we introduce the concept of celestial sphere and the coordinates used to locate an astronomical object on the sphere. Covered material will include the physical processes occurring in and around stars, details of the stellar life cycle, spectral classes; stellar interior; stellar structure; binary systems, variable stars, star formation; stellar evolution and stellar remnants.

4. Course Objectives:

a-	Review of terminologies related to astrophysics.
b-	Introduce celestial sphere and different coordinates defined on the sphere.
c-	Discuss physical properties of stars.
d-	Introduce H-R diagram.

e-	Classify binary stars systems and have a knowledge about variable stars.
f-	Understand the life cycle of stars and star remnants.

5. Course Learning Outcomes (CLO)

(Knowledge, Skills, and Competencies) (K,S,C)

Upon successful completion of the course, the students will be able to:

- CLO 1:** Define various quantities related to the course. (K)
CLO 2: Recognize the basic characteristics celestial sphere. (K)
CLO 3: Calculate the physical properties of stars. (S)
CLO 4: Draw the H-R diagram and classify the stars. (S,C)
CLO 5: Define binary and variable stars. (S,C)
CLO 6: Understand the life cycle of stars and stellar remnants. (S)

6. Course Content

Week	Topic	Comments	Course Outcome
1	CHAPTER : OVERTURE	We review the concept of stars	CLO1
2-4	Chapter 1: 0 <ul style="list-style-type: none"> ➤ Terminologies ➤ Celestial sphere ➤ Coordinate systems ➤ Solving problems 	We introduce the terminologies related to celestial sphere and define different coordinates used in specifying the position of the star on the sphere.	CLO1+CLO2
5-8	Chapter 1: Physical Properties of Stars <ul style="list-style-type: none"> ➤ Stellar distances ➤ Stellar Magnitudes ➤ Stellar Luminosity and Brightness ➤ Stellar Motions and Masses ➤ Stellar spectra 	The various properties of stars are defined and estimated by assuming that the star is an ideal black body.	CLO1+CLO3
9-10	Chapter 2: H-R Diagram <ul style="list-style-type: none"> ➤ Main-sequence ➤ Lines of constant radii ➤ Luminosity classes ➤ Analyzing H-R diagram 	The stars are classified into different groups. This is done through H-R diagram.	CLO1+CLO4

FIRST EXAM ON OCTOBER 27 2019 (Sunday) 25%			
11	Chapter 3: Binary Stars ➤ Classification ➤ Masses of binary stars	Since 50% of the stars in our galaxy are binary systems, then it is worth explore these systems. Binary systems enable us to determine the masses of stars.	CLO1+CLO5
12	Chapter 4: Variable Stars ➤ Intrinsic variables ➤ Pulsating variables ➤ Extrinsic variables ➤ Eclipsing variables	Variables stars pulsate in a periodic manner. Some of them are considered standard candles to locate the position of stars relative to these variable stars.	CLO1+CLO5
13-14	Chapter 5: Life Cycle of Stars ➤ Life cycles of stars and planets ➤ Brown dwarfs ➤ Low mass stars ➤ Mid mass stars ➤ Massive stars	An age can be assigned and calculated for the stars. They start a young star and as time goes on, they become older and older and finally they die. The cycle of their life depends on their masses.	CLO1+CLO6
~SECOND EXAM ON DECEMBER 8 2019 (Sunday) 25%			
15	Chapter 6: Stellar Remnants ➤ White dwarfs ➤ Neutron stars ➤ Black holes	At the end of the life cycle of the star it dies and it will convert to a white dwarf or a neutron star or a black hole depending on the mass of the star.	CLO1+CLO6
16	Review	Review	Final Exam

7. Teaching and Learning Strategies and Evaluation Methods

No.	Learning Outcomes	Teaching Strategies	Learning Activities	Evaluation Method (Exam/ presentations/ discussion/ assignments)	/Measurement
1	(CLO1)	trad. lect.	Discussion & Problem Solving	HW & First Exam & Final Exam	
2	(CLO2)	trad. lect.	Discussion & Problem Solving	HW & First Exam & Final Exam	
3	(CLO3)	trad. lect.	Discussion & Problem Solving	HW & Second Exam & Final Exam	
4	(CLO4)	trad. lect.	Discussion & Problem Solving	HW & Second Exam & Final Exam	
5	(CLO5)	trad. lect.	Discussion & Problem Solving	HW & Final Exam	
6	(CLO6)	trad. lect.	Discussion & Problem Solving	HW & Final Exam	

8. Assessment

Methods Used	Assessment Time	Distribution of grades
1- Semester work (report,	During semester	00%

assignments, attendance)		
3- First Exam	Sixth week	25%
3- Second Exam	Tenth	25%
4- Final Exam	Week of the final exams	50%

9. Textbook

Main Reference	Astrophysics
Author	Mashhour A. Al-Wardat
Publisher	-
Year	2017
Edition	1 st (or any Edition)
Textbook Website	-

10. Extra References (books and research published in periodicals or websites)

1-	Foundations of Astrophysics by Ryden & Peterson Addison-Wesley; 1 edition (2010)
2-	Advanced Astrophysics, Neb. Duric Cambridge University Press (2004)