

## **FUNDAMENTALS OF ASTRONOMY AND ASTROPHYSICS (PHYS 304) SYLLABUS, FALL 2023**

**Course Overview.** This curriculum is designed to introduce students to the basic concepts and principles of astronomy and astrophysics. Students will be introduced to the topics of celestial mechanics, radiative processes, observational techniques used in astronomy, stellar evolution, galaxies and cosmology. The detailed syllabus is as follows:

### 1. Introduction to Astronomy

- Historical overview of astronomy
- Astronomical units and measurements
- Solar system

### 2. Physical concepts used in Astrophysics

- Celestial co-ordinates
- Kepler's law of motion, Central forces, Gravitation
- Radiative processes in astrophysical sources: thermal emission, synchrotron emission, formation of spectral lines

### 3. Observational techniques

- Electromagnetic spectrum
- Different types of telescopes

### 4. Stellar Astrophysics

- Properties and Classification of stars, Hertzsprung Russell Diagram, Equations of stellar structure
- Nuclear processes in stars, Stellar atmospheres
- Stellar evolution, Sun

### 5. Galaxies and Cosmology

- Classification and properties of Galaxies
- Big Bang Theory and expansion of the Universe
- Dark Matter and Dark Energy

### 6. High Energy Astrophysics

- Supernova explosion
- White dwarfs, neutron stars and black holes
- Accretion onto compact objects and supermassive black holes.

**Required textbook:** An Introduction to Modern Astrophysics, Second Edition by Bradley W Carroll and Dale A Ostlie

**Optional textbooks:** Radiative Processes in Astrophysics by George B. Rybicki, Alan P. Lightman

An Introduction to the Theory of Stellar Structure and Evolution by Dina Prialnik

High Energy Astrophysics by Malcolm Longair

**Instructor:** Nazma Islam. E-mail: nislam@umbc.edu

**Lectures times:** Monday and Wednesday, 2.00-3.15 pm, Performing Arts and Humanities building, Room 124

**Office Hours:** Monday and Wednesday, 12 noon to 1 pm and 4 pm to 5 pm, face to face or online. Physics Building Room 325. Students can visit me during the office hours or set up an appointment for an online discussion.

## **Grading**

**Homework and Quizzes (40%):** A homework will be assigned almost every other week. The homework will be assigned on the material discussed in class and will be distributed via UMBC Blackboard and print copies if requested. Students are expected to solve all the problems and are required to submit them latest by the deadline (no late homeworks are allowed) either on Blackboard or handwritten copies. Quizzes will be announced in the class and students are required to solve it during the class and submit them.

### **Mid Term (30%):**

It will cover the material from the beginning of the class up to the lecture before the mid term.

### **Final Exam (30%):**

An exam at the end of the course on all the course material, but with more emphasis on the material discussed after the first mid-term.

**Grading Scale:** A: 90-100, B: 80-89, C: 70-79, D: 50-69, F: Below 50

Clear handwriting, proper English grammar and syntax, as well as logical flow of your arguments and no missing steps are required in all exams and homework.

**Academic Integrity:**

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, and the UMBC Policies section of the UMBC Directory.

**Accessibility and Disability Accommodations, Guidance and Resources**

Accommodations for students with disabilities are provided for all students with a qualified disability under the Americans with Disabilities Act (ADA & ADAAA) and Section 504 of the Rehabilitation Act who request and are eligible for accommodations. The Office of Student Disability Services (SDS) is the UMBC department designated to coordinate accommodations that creates equal access for students when barriers to participation exist in University courses, programs, or activities.

If you have a documented disability and need to request academic accommodations in your courses, please refer to the SDS website at [sds.umbc.edu](https://sds.umbc.edu) for registration information and office procedures.

SDS email: [disAbility@umbc.edu](mailto:disAbility@umbc.edu)

SDS phone: [410-455-2459](tel:410-455-2459)

**Sexual Assault, Sexual Harassment, and Gender Based Violence and Discrimination**

[UMBC Policy](#) in addition to federal and state law (to include Title IX) prohibits discrimination and harassment on the basis of sex, sexual orientation, and gender identity in University programs and activities. Any student who is impacted by sexual harassment, sexual assault, domestic violence, dating violence, stalking, sexual exploitation, gender discrimination, pregnancy discrimination, gender-based harassment, or related retaliation should contact the University's Title IX

Coordinator to make a report and/or access support and resources. The Title IX Coordinator can be reached at [titleixcoordinator@umbc.edu](mailto:titleixcoordinator@umbc.edu) or 410-455-1717.

You can access support and resources even if you do not want to take any further action. You will not be forced to file a formal complaint or police report. Please be aware that the University may take action on its own if essential to protect the safety of the community.

If you are interested in making a report, please use the [Online Reporting/Referral Form](#). Please note that, if you report anonymously, the University's ability to respond will be limited.

### **Hate, Bias, Discrimination and Harassment**

UMBC values safety, cultural and ethnic diversity, social responsibility, lifelong learning, equity, and civic engagement.

Consistent with these principles, [UMBC Policy](#) prohibits discrimination and harassment in its educational programs and activities or with respect to employment terms and conditions based on race, creed, color, religion, sex, gender, pregnancy, ancestry, age, gender identity or expression, national origin, veterans status, marital status, sexual orientation, physical or mental disability, or genetic information.

Students (and faculty and staff) who experience discrimination, harassment, hate, or bias based upon a protected status or who have such matters reported to them should use the [online reporting/referral form](#) to report discrimination, hate, or bias incidents. You may report incidents that happen to you anonymously. Please note that, if you report anonymously, the University's ability to respond may be limited.