

PHYSICS 416: Cosmology
SPRING 2025 Syllabus
Revised: 20 Jan 2025

COURSE OVERVIEW

Cosmology, the study of the Universe, its birth and evolution, is currently experiencing a tremendous renaissance, mostly due to a plethora of new observations such as those of the Cosmic Microwave Background (CMB) by recent missions such as WMAP (NASA) and *Planck* (a joint NASA and ESA mission). This introduction to modern cosmology discusses the Big Bang, the expanding Universe and the basic cosmological parameters describing it, the dynamics of our Universe, dominated by some unspecified dark matter and dark energy, arguments for an early inflationary period, the formation of light elements in the early universe, and the wealth of information we extract from measurements of the CMB.

By the time the semester is over, you will have an up-to-date knowledge of the evolving state of affairs in cosmology, of the things we are pretty sure we understand, as well as of the open issues that arguably make cosmology the most exciting area of physics and astronomy. We will focus our efforts on understanding the concepts of cosmology, their observational foundation, their range of applicability and their limitations. Beyond the required textbook (see below), we will make use of articles from journals such as "Scientific American", and "Science", and specialized astrophysics journals, as well as of web pages from various institutes and universities. The goal of the semester will be to cover the entire Ryden textbook, in addition to any outside material.

Instructor: Dr. Eileen Meyer, E-mail: meyer@umbc.edu office: physics 312

Lectures, time and place

Mondays 10-11:30 AM

Wednesdays 10-11 AM

Room: Meyerhoff Chemistry Bldg, 256

Office Hours: *usually* to be held **Monday 2:30-4:00 PM and Thursday 3-4 PM** in my office, PHYS 312, or by appointment. **Please bookmark this calendar:** [PHYS 416 Office Hrs](#) and check the posted office hours sessions before attending (or email me!) as my research schedule does sometimes require moving the office hours to different times of the week (this has already been done in some cases which you can see in the google calendar.)

Class web page: We will use Blackboard

Prerequisite: Physics 324 or Instructor Permission

Required Text: "Introduction to Cosmology" by Barbara Ryden. Cambridge University Press; 2nd edition (November 24, 2016) ISBN: 1107154839 (**Note: Second Edition is required! Unlike some texts, it was updated substantially from the 1st edition.**)

Grading:

Final Exam (25%): An exam at the end of the course on all the course material.

Mid Term (25%): There will be only one mid-term for the course, on the Wednesday before Spring Break (March 12). (The final exam will put more weight on the second-half material.)

Homework (50%): A homework will be assigned approximately weekly, to be due 7 days following at the beginning of class (a total of approximately 10 homeworks). Solutions will not be posted until all homeworks have been turned in. See late policy below.

NOTE: 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. *If you cannot write neatly and legibly, you will be asked to type your homework.*

Late Homework Policy/Missed exam policy:

10% penalty per calendar day, up to five days, after which the grade will be zero. Homework will be marked late starting at 10:05 am on class days. Exception to this rule: NO LATE HOMEWORK will be accepted for the last homework due before the midterm or final. This is to ensure adequate time to grade the homework and return it before the test.

Except in exceptional circumstances, a missed exam will result in a failing grade.

Grading Scale:

A standard grading scale (with no curve) will be used: 89.5-100 is an A, 79.5-89.4 is a B, etc.

Important dates:

Jan 27 (Mon)	First lecture
Feb 5 (Wed)	No class -- Dr. Meyer at JWST review (make-up date Fri March 7)
February 7	Last day to drop a class without a "W" grade
February 12 (Wed)	Dr. Meyer away, Dr. Shuvo will substitute
March 7 (Friday**)	Make-up class for Feb 5, from 10-11 AM in Meyerhoff Chem 256.
March 12*	Mid-term Exam (10:00 AM - 12:00 noon, location TBD)
March 17-21 (M-F)	Spring Break
April 9 (Wed)	Dr. Meyer out of town, Dr. Shuvo will substitute.
May 12 (Mon)	Last lecture (review)
Monday, May 19	Final Exam (Meyhf Chem 256, 10:30am-12:30pm)

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 for registration information and office procedures.

SDS email: disAbility@umbc.edu

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

If you will be using SDS approved accommodations in this class, please contact the instructor to discuss implementation of the accommodations. During remote instruction requirements due to COVID, communication and flexibility will be essential for success.

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 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.

Notice that Faculty and Teaching Assistants are Responsible Employees with Mandatory Reporting Obligations

All faculty members and teaching assistants are considered Responsible Employees, per UMBC's Policy on Sexual Misconduct, Sexual Harassment, and Gender Discrimination. Faculty and teaching assistants therefore required to report all known information regarding alleged

conduct that may be a violation of the Policy to the Title IX Coordinator, even if a student discloses an experience that occurred before attending UMBC and/or an incident that only involves people not affiliated with UMBC. Reports are required regardless of the amount of detail provided and even in instances where support has already been offered or received.

While faculty members want to encourage you to share information related to your life experiences through discussion and written work, students should understand that faculty are required to report past and present sexual harassment, sexual assault, domestic and dating violence, stalking, and gender discrimination that is shared with them to the Title IX Coordinator so that the University can inform students of their rights, resources, and support. While you are encouraged to do so, you are not obligated to respond to outreach conducted as a result of a report to the Title IX Coordinator.

If you need to speak with someone in confidence, who does not have an obligation to report to the Title IX Coordinator, UMBC has a number of Confidential Resources available to support you:

Retriever Integrated Health (Main Campus): 410-455-2472; Monday – Friday 8:30 a.m. – 5 p.m.; For After-Hours Support, Call 988.

Center for Counseling and Well-Being (Shady Grove Campus): 301-738-6273; Monday-Thursday 10:00a.m. – 7:00 p.m. and Friday 10:00 a.m. – 2:00 p.m. (virtual) Online Appointment Request Form

Pastoral Counseling via The Gathering Space for Spiritual Well-Being: 410-455-6795; i3b@umbc.edu; Monday – Friday 8:00 a.m. – 10:00 p.m.

Other Resources

Women’s Center (open to students of all genders): 410-455-2714; womenscenter@umbc.edu; Monday – Thursday 9:30 a.m. – 5:00 p.m. and Friday 10:00 a.m. – 4 p.m.

Shady Grove Student Resources, Maryland Resources, National Resources.

Child Abuse and Neglect

Please note that Maryland law and UMBC policy require that faculty report all disclosures or suspicions of child abuse or neglect to the Department of Social Services and/or the police even if the person who experienced the abuse or neglect is now over 18.

Pregnant and Parenting Students

UMBC’s Policy on Sexual Misconduct, Sexual Harassment and Gender Discrimination expressly prohibits all forms of discrimination and harassment on the basis of sex, including pregnancy. Resources for pregnant, parenting and breastfeeding students are available through the University’s Office of Equity and Civil Rights. Pregnant and parenting students are

encouraged to contact the Title IX Coordinator to discuss plans and ensure ongoing access to their academic program with respect to a leave of absence – returning following leave, or any other accommodation that may be needed related to pregnancy, childbirth, adoption, breastfeeding, and/or the early months of parenting.

In addition, students who are pregnant and have an impairment related to their pregnancy that qualifies as disability under the ADA may be entitled to accommodations through the Office of Student Disability Services.

Religious Observances & Accommodations

UMBC Policy provides that students should not be penalized because of observances of their religious beliefs, and that students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the responsibility of the student to inform the instructor of any intended absences or requested modifications for religious observances in advance, and as early as possible. For questions or guidance regarding religious observances and accommodations, please contact the Office of Equity and Civil Rights at ecr@umbc.edu.

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.