

Physics 324: “Modern Physics” Syllabus – Spring 2025

General Information

Instructor: Dr. Mark Henriksen
Office: Physics 414
Class Location: Sherman Hall 014
Time: MWF 10 - 10:50 AM

email: henrikse@umbc.edu
office hours: after class or by appointment

Course Communications

Course notices will be posted on blackboard or sent via email to the address on your class registration. You will need to regularly check for communications from me. Grades for exams and homework are posted on blackboard.

Goals for this course

This course will give you a broad introduction most of the primary research areas in physics. If you go on to graduate school at a major research university, there will be substantial research opportunities in the areas covered in this course. Because of the breadth of modern physics, you will need to do a lot of reading since approximately 10 pages of the book are covered in each lecture. The lectures will emphasize the most important concepts so there will be some topics in a chapter that are not covered in class and you are not responsible for these. *One of the desired outcomes for this course is that you find a topic or two that you would like to know more about* and take an elective course at UMBC in that area. The UMBC physics department offers a range of undergraduate elective courses including astrophysics, relativity, atmospheric science, and materials so you can pursue your interests through electives. Some of the other topics in this course serve as an introduction to future physics courses: quantum mechanics and statistical physics, which are required of a physics major. In the past, UMBC students have also gone on to get PhDs in particle physics, with no introduction to the field other than that in modern physics. Also, keep in mind that this may be the only class you have in special relativity, so it is emphasized.

Grading procedures

Grades will be calculated using the following template: (1) two midterm exams worth 25% each, (2) homework worth 25%, and (3) a final exam worth 25%. Please note that exams will be based on lecture material (which includes sample exam questions) so that good attendance and attention in class will help you do well. Equal weight is given to each component of your grade to reduce stress.

Policy on Late Homework

Completing all assignments on time is best for doing well in this course! If you have a problem getting a homework assignment in on time, then we should talk about it.

Scope of this Course

The following topics will be covered, in order, during lectures. The lecture material is taken from the textbook, "Modern Physics", by Tipler. You are encouraged to ask questions to further your understanding. You are also encouraged to read related material in the book and anything that interests you. The homework problem numbers are from the 6th edition. You can use an earlier edition but *must turn in the correct homework problems*. Used copies of the 6th edition are available as well as PDF copies on the internet.

Reading Schedule for Lectures and Class Preparation

1. P.4 – 55, Special Relativity
2. P. 65 – 112, Special Relativity Continued and Introduction to General Relativity
3. P. 119 – 144, Quantization of Charge, Light and Energy
4. P. 153 - 184, The Nuclear Atom
5. P. 193 – 313, An Introduction to Quantum Mechanics (chapters 5,6,7)
6. P. 326 - 365, Introduction to Statistical Physics
7. P. 494 - 568, Introduction to Nuclear Physics
8. P. 579 - 631, Introduction Particle Physics
9. P. 639 - 696, Concepts in Astrophysics and Cosmology

Schedule of Exams

Midterm I: March 12

Midterm 2: April 30

Final Exam: Monday 5/19 10:30 AM – 12:30 PM

Homework assignments and Exam reviews

Below is the schedule of homework with **due dates in parentheses**

1. Ch. 1: 3,13,50,58 (2/3)
2. Ch. 2: 13,17,19,25 (2/10)
3. Ch. 3: 5,21,32,51 (2/17)
4. Ch. 4: 9,13,47,55 (2/24)
5. Ch. 5: 9,13,17,25,33 (3/3)
6. Ch. 6: 9,30,55,47 (3/10)

Midterm I: Review on 3/10 (Chapters 1 – 5), Exam on 3/12

Week of 3/17 is spring break)

7. Ch. 7: 26,30,47,63 (3/31)
8. Ch. 8: 13,17,21,41 (4/7)
9. Ch. 11: 17,37,53,99 (4/14)
10. Ch. 12: 1,13,46,51 (4/21)

Midterm II: Review on 4/28 (chapters 6,7,8,11,12), Exam on 4/30

11. Ch. 13:1,2,5,10,14,28,36,41 (5/9) **Note that this is a Friday (and 5 lectures on Chapter 13)**
12. Final Exam Review on 5/12, **Final exam on Monday 5/19 10:30 AM – 12:30 PM**

Achieving Course Goals and Meeting Academic Expectations

Attending class, completing all homework assignments, and reviewing sample problems in the lectures will ensure that you do very well in the course. Please keep in mind that **I'm here to help you do well in modern physics.**

Policy on Academic Integrity

“Academic integrity is an important value at UMBC. 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.”

Student Support /Disability Services

“UMBC is committed to eliminating discriminatory obstacles that may disadvantage students based on disability. Services for students with disabilities are provided for all students qualified under the Americans with Disabilities Act (ADA) of 1990, the ADAAA of 2009, 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 would allow for students to have equal access and inclusion in all courses, programs, and activities at the University.”