
Instructor:	Olga Goulko	Lectures:	M&W 4:45-6:45pm, W04-0141
Office:	ISC-1-1180	Office hours:	M&W 3:30-4:30pm, or by appointment
Email:	olga.goulko@umb.edu	Homework due:	Fri 11:59pm

Mathematics is the language of physics. The goal of this course is to make you fluent in the most important aspects of this language. This course is taught by a physicist and the emphasis is on the application of mathematical methods to physics problems. We will focus on problem solving rather than on rigorous proofs and derivations. This course is not meant to replace mathematics courses on the topics covered, but to supplement them by providing an opportunity to practice these methods.

Expected learning outcomes

- Acquiring an overview over the most essential mathematical methods for physicists
- Being able to identify the mathematical tools needed to solve a particular physics problem
- Becoming fluent in the correct application of these methods
- Being aware of the main mathematical subtleties and exceptional cases

These skills are essential for all areas of physics and will be heavily drawn upon in other graduate courses.

Course topics

The topics and their schedule may change as the semester develops.

- Vector analysis (Weeks 1 and 2)
- Infinite series (Week 3)
- Complex analysis (Weeks 4–6)
- Special functions (Week 7)
- Differential equations (Weeks 8–11)
- Fourier series (Week 12)
- Integral transforms (Week 13)
- Probability and Statistics (Weeks 14 and 15)

The first exam is tentatively planned for Wednesday, March 22nd (Week 8). The second exam will take place during the assigned finals slot.

Book suggestions

There is no required textbook. The following textbook covers most of the course topics:

G. B. Arfken, H. J. Weber, and F. E. Harris, *Mathematical Methods for Physicists*, 7th edition

Another helpful textbook is:

A. Altland, J. von Delft, *Mathematics for Physicists: Introductory Concepts and Methods*

Lecture notes

Lecture notes will be provided via Blackboard ahead of the corresponding lectures. I encourage you to look through them beforehand. The notes are concise and are not meant to replace the lectures and background reading. Rather they are meant to give an overview of the most important topics covered in class and provide a guidance for more in depth study.

Homework

There will be weekly homework assignments, which need to be submitted by the deadline via Gradescope (with link on Blackboard). Detailed instructions will be provided with the first assignment. Since this course is a methods course, the homework is particularly important to understand the concepts taught in class and to become skilled in applying them. In addition, there will be short weekly pre-class warm-up exercises, to be submitted (on Blackboard) at least two hours before each Monday lecture. These will be graded based on (serious and honest) participation only and will help you get prepared for the week's lectures.

Weekly updates and additional course announcements will be posted on Blackboard and sent via email. Please make sure to check your email regularly.

Grading

- warm-up exercises: 5%
- homework: 45%
- 2 exams: 50% (25% each)

Course grade percentages (may be adjusted):

A: 90% A-: 85% B+: 80% B: 75% B-: 70% C+: 65% C: 60% C-: 55%

Accommodations

UMass Boston is committed to providing reasonable academic accommodations for all students with disabilities. Please contact the Ross Center for Disability Services (ross.center@umb.edu, 617-287-7430) for recommendations for specific accommodations if needed. If you already have a recommendation, please contact me as soon as possible, preferably within the first two weeks of classes, so that we can work out the best way to support you.

Student mental health

Graduate school can be a significant undertaking. If you or someone you know experiences academic stress, difficult life events, or feelings of anxiety or depression, we encourage you to seek support. Helpful, effective resources are available via the University Health Services. The UHS Counseling Center can be reached at 617-287-5690 (including after-hours and on weekends). Whether or not you are a current patient at the center, you will be able to access telehealth crisis support. Please know that the Counseling Center and university are working to provide remote support for students during this difficult time. More information is available online at https://www.umb.edu/healthservices/counseling_center

Student conduct

Students are required to adhere to the University Policy on Academic Standards and Cheating, to the University Statement on Plagiarism and the Documentation of Written Work, and to the Student Code of Conduct. The Student Code of Conduct and Instructional Setting Conduct Policy are available online.

In particular, you may not post or circulate outside the class any course materials without the written permission of the instructor.

I generally have a zero-tolerance policy for cheating, and all violations will be reported and result in substantial penalties. If you have any doubts or questions about what constitutes academic misconduct, please do not hesitate to contact me.