

Physics 3041 (Spring 2021) **Mathematical Methods for Physicists**

Lectures: M W F 1:25–2:15 pm

Quizzes: F (**2/12, 3/19, 4/23**) 1:25–2:15 pm

Final exam: TBA

In order to take the makeup final exam, you must report conflict with the regular final exam by the time to be announced.

Instructor: Yong-Zhong Qian (qianx007@umn.edu) **Office hour:** Tu 1–2 pm

TA Office hours:

Kivanc Bugan (bugan004@umn.edu) M 11 am – 12 noon, Tu 3:30–4:30 pm

Dan Cronin-Hennessy (croni028@umn.edu) F 11 am – 1 pm

Outline of lectures & tentative schedule

1/20, 22, 25 Taylor series (Chapters 1, 4)

1/27, 29; 2/1 Gaussian and exponential integrals (Chapter 2)

2/3, 5, 8 Complex numbers & functions (Chapter 5)

2/12 Quiz 1: Chapters 1, 2, 4, 5

2/10, 15, 17 Matrices & determinants (Chapter 8)

2/19, 22, 24, 26; 3/1, 3, 5, 8, 10 Linear vector spaces (Chapter 9)

3/19 Quiz 2: Chapters 8, 9

3/12, 15, 17, 22, 24, 26 Ordinary differential equations (Chapter 10.1–10.4)

3/29, 31; 4/2, 12, 14, 16 Multivariable & vector calculus (Chapters 3, 7)

4/23 Quiz 3: Chapters 3, 7, 10.1–10.4

4/19, 21, 26, 28, 30; 5/3 Partial differential equations (Chapter 10.5)

TBA: Final Exam

Materials: The required textbook is *Basic Training in Mathematics: A Fitness Program for Science Students* by R. Shankar. This book is rather concise and should be read before the relevant materials are covered in lectures.

If you would like another book for more detailed exposition of the materials, *Mathematical Methods in the Physical Sciences* by Mary L. Boas or *Mathematical Methods for Physics and Engineering* by K. F. Riley, M. P. Hobson, and S. J. Bence is recommended.

Other materials, such as lecture notes, homework, and solutions to homework and quizzes, will be posted on Canvas.

Online classroom courtesy: All lectures are given through Zoom. Please follow these rules of etiquette: (1) When joining class, choose as quiet an environment as possible. (2) Mute yourself. Remember to unmute when asking a question, or when participating in other ways. (3) Make sure to maintain and project a professional environment if you use the camera. (4) When you show up you are joining a community intent on learning. Participate and engage. No distracting activities. As with in-person classes: no eating, drinking, newspaper reading, or other non-learning-related activities.

The course: The goal of this course is to review and present the mathematical tools for upper-division undergraduate physics courses. Particular emphasis will be given to physics applications through examples. Topics include single and multivariable calculus, complex numbers and functions, linear algebra, vector calculus, and ordinary and partial differential equations.

This course **requires** that you have completed Math 1271 (Calculus I), 1272 (Calculus II), and 2373 (CSE Linear Algebra & Differential Equations). It is **highly recommended** that you take Math 2374 (CSE Multivariable Calculus & Vector Analysis) concurrently. Therefore, we will **NOT** repeat what you should have learned from those or equivalent courses.

To get the most out of this course, you should **read the relevant part of the textbook before it is covered in lectures (see the tentative schedule on the preceding page)**. If you find that the textbook is insufficient for you to understand a topic or that you need brush up on the materials, please consult your textbooks for Math 1271, 1272, 2373, and 2374 or read one of the other textbooks recommended on the preceding page.

In addition, you must actively work at problem solving to know whether you fully understand the concepts involved. **Don't fall behind!** It is extremely difficult to catch up and the longer you leave it the harder it gets. What you get out of the course will depend on the productive effort and quality time you put into it. **If you are experiencing difficulties, contact me or a TA as soon as possible.**

Lectures: Reading assignments will be announced on Canvas before lectures. You are expected to read the relevant material before coming to class so that the lectures reinforce the concepts, rather than presenting them for the first time. You are always encouraged to think critically about the material presented and ask questions.

Announcements: It is occasionally necessary to change schedules, including the dates of quizzes. **Students are responsible for receiving ALL announcements made during the lecture, by email, or on Canvas.** I will try to post the most important announcements on Canvas. **It is crucial to have the correct Canvas settings so that you will receive appropriate notifications (e.g., by email) for announcements.** Missing an announcement is not an acceptable excuse for missing a quiz or a course-related deadline. It is the sole responsibility of any student missing a lecture to determine what course material and announcements are missed.

App for making pdf files: Homework, all the quizzes, and the final exam require submission of clearly readable pdf files. **Submission that is hard to read will receive NO credit!** Please make sure that you are able to make clearly readable pdf files by using a free app such as **Adobe Scan (<https://acrobat.adobe.com/us/en/mobile/scanner-app.html>)** or **CamScanner (<https://www.camscanner.com>)**.

Phone holder: For communications during a Zoom meeting, it is very helpful to show through the camera how you are solving a problem with pencil and paper. You may wish to do a Google search for a goose-neck phone mount, which is a phone holder that can be mounted to a desk, table, or bookshelf and be bent or twisted into different shapes to position the phone. By twisting it to look down at a sheet of paper and connecting to Zoom on your phone, it's straightforward to show your writing and drawing.

In-class discussion: To encourage interaction during the Zoom lectures, breakout rooms will be used for groups to discuss some problems, usually in the form of multiple-choice (MC) questions. Each student should submit the answers individually following the discussion. **Credits will be recorded mostly based on participation.** Group members are encouraged to interact outside the lectures as well.

Homework: Homework will be posted on Canvas each Wednesday and due the following Wednesday before the start of the lecture. **Late homework will not be accepted.** The graded homework will be returned to you within a week. Solutions will be posted on Canvas.

You can discuss with other students in the class about the homework problems, but should then solve them on your own. Infraction of this rule will be considered, and dealt with, as academic dishonesty, i.e., cheating.

Quizzes & final exam: Three quizzes and a final exam will be given on the dates specified at the beginning of this syllabus.

Grades will be determined based on the better of the two options:

Option 1: MC (4%), homework (16%), three quizzes (16% each), final exam (32%)

Option 2: MC (4%), homework (16%), best two quizzes (16% each), final exam (48%)

Division between grades is approximately: A (85–100), B (70–84), C (55–69), D (40–54), F (< 40). Dividing lines will not be adjusted upwards, but may be adjusted a few points downwards. Subdivision within each grade level will be specified at the end of the course.

Regrading: If you have a dispute about your homework or quiz score, please first discuss this with the TA who graded the problem. If you are still not satisfied, please contact me. **Regrading should be resolved within one week of receiving the graded work.**

Makeup quizzes: There will be no early quizzes for any reason. As soon as you know that you have an acceptable excuse for not taking a scheduled quiz with the class, please contact me to discuss options and consequences.

Makeup final: There will be no early finals for any reason. **To get a makeup final you must have two finals scheduled at the same time, 3 finals scheduled on the same day, or a University sanctioned excuse, and must submit a request form by the date to be announced.**

Students with disabilities that affect their ability to participate fully in class or to meet all course requirements are encouraged to discuss these matters with the Disability Resource Center so that appropriate accommodations can be arranged. **Please provide a copy of your accommodation letter for the current semester to the instructor and the physics front office (physics@umn.edu).**

Policy & resource information can be found on the next page.

Responsibilities: The U of M assumes that all students enroll in its programs with a serious learning purpose and expects them to be responsible individuals who demand of themselves high standards of honesty and personal conduct. All students are expected to behave at all times with respect and courtesy toward their fellow students and instructors and to have the highest standards of honesty and integrity in their academic performance. Any behavior which disrupts the classroom learning environment or any attempt to present work that the student has not actually prepared on his/her own, or to pass an examination by improper means, is regarded as a serious offense which may result in the expulsion of the student from the University. The minimum penalty for such an offense is a failing grade for this course. Aiding and abetting the above behavior is also considered a serious offense resulting in equally severe penalties.

- Student Conduct Code

http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf

- Scholastic Dishonesty

See Student Conduct Code

- Use of Personal Electronic Devices in the Classroom

<http://policy.umn.edu/education/studentresp>

- Makeup Work for Legitimate Absences

<http://policy.umn.edu/education/makeupwork>

- Appropriate Student Use of Class Notes and Course Materials

<http://policy.umn.edu/education/studentresp>

- Grading and Transcripts

<http://policy.umn.edu/education/gradingtranscripts>

- Sexual Harassment

<https://policy.umn.edu/hr/sexharassassault>

- Equity, Diversity, Equal Opportunity, and Affirmative Action

http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity_EO_AA.pdf

- Disability Accommodations

<https://diversity.umn.edu/disability>

- Mental Health and Stress Management

<http://www.mentalhealth.umn.edu>