

SYLLABUS *

MATHEMATICAL METHODS FOR THE PHYSICAL SCIENCES

FALL 2020

https://www.phys.uconn.edu/~rozman/Courses/P2400_20F/



Last modified: September 2, 2020

Course description: Physics 2400 *Mathematical Methods for the Physical Sciences* covers the basic mathematical tools used in sciences and engineering: complex analysis, ordinary and partial differential equations, integral transforms, asymptotic expansions, and special functions. The course introduces Computer Algebra Systems (as analytic calculators) and encourages the use computerized typesetting (as used by physicists and mathematicians for professional publications).

The goal of this course is to give an introduction to mathematical methods for solving hard mathematics problems that arise in the sciences. The approach requires a combination of “real” mathematics, skill in making legitimate approximations, and intelligent use of computers to get some motivation and verify the approximations. We will start with assorted tools of the trade and simple problems (simple integrals, simple differential equations, etc.) and progress toward more challenging topics.

Course format: Hybrid/Blended. The class has both in-person and online components. The class will not meet in-person for all meetings, but in-person instruction will be available.

Course website: http://www.phys.uconn.edu/~rozman/Courses/P2400_20F/

*Syllabus information may be subject to change. The most up-to-date syllabus is located on the course website linked above.

Lectures: MoWe 5:00PM – 6:15PM, ~~BPB-131~~ GS-119

Instructor: Michael Rozman

email: michael.rozman@uconn.edu

office hours: Mo 6:15 PM – 7:15 PM in GS-119,
We 6:15 PM – 7:15 PM in GS-119, and by appointment

Textbook: not required but highly recommended – Hung Cheng, *Advanced Analytic Methods in Applied Mathematics, Science, and Engineering*, Luban Press, 2006

Handouts for the lectures will be provided.

Exams: Three midterm exams, no final. Parts of the exams may be substituted by take-home projects.

Grading scheme:

The course grade will be calculated using the following scheme.

Homework assignments	40%
3 Midterms	60%

Course grade = $0.4 \cdot \text{HW} + 0.2 \cdot (\text{M1} + \text{M2} + \text{M3})$, correctly rounded to integers and capped at 100%.

The percent grades are converted to the letter grades as following.

Percent grade	Letter grade
94+	A
90-93	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-

Class schedule: this is a *preliminary* schedule.

Week(s)	Subject
1-2	Simple tools: Gaussian integrals; Euler's formula; Gamma function, $\Gamma(x)$, Beta function $B(x, y)$; differentiation with respect to a parameter for evaluation of integrals and sums; Leibniz's formula.
3-6	Complex analysis for physicists.
5	Midterm I - Wed, Sep 30
7-8	Asymptotic expansion of integrals and sums
9	Integral transforms
10	Midterm II - Mon, Nov 2
10-11	Perturbation methods
12-15	Solution of differential equations
14	Thanksgiving recess
15	Midterm III - Mon, Dec 7

For an up-to-date schedule consult the *Academic Calendar* at https://www.phys.uconn.edu/~rozman/Courses/P2400_20F/downloads/calendar.pdf

Honors conversion:

Students interested in honors conversion should contact the instructor during the *second* week of classes.

Homework: Homework assignments submitted on time may be returned (at the discretion of the instructor) for corrections.

Homework assignments are not accepted after the solutions had been discussed in class, and/or had been posted online, and/or graded assignments returned. Individual emergencies can be accommodated by extra credit assignments.

You are welcome to discuss the homework's problems with others in order to better understand them but the work you turn in must be your own. In particular, you must run your own calculations (where applicable) and communicate and explain the results in your own words.

Members of collaborating groups must consistently list all collaborators names.

Assignments that are hard to understand are also hard to grade correctly, therefore: (a) use words and pictures to supplement your equations; (b) work must progress linearly down the page – recopy solutions that are too nonlinear.

Requirements for written assignments:

- Use letter-size paper.
- Box your final answer(s) and important intermediate results.
- When submitting an assignment on paper, use only one side of each sheet, **staple** your notes together, with the assignment cover page (if applicable).

Highly recommended: make copies of homework assignments for your own files.

- When submitting an assignment online, scan your submission, and convert the scan(s) into a single pdf document.

Communications: talking in person (including videoconferencing) is the preferred method to communicate with the instructor with regards to the course matters; email is a good option to ask/answer a short question or to schedule a video appointment.

- use your UConn email address for class communications.
- please include the tag ``[phys2400]`` (without quotes) in the subject of your email, e.g. “[phys2400] midterm II review session”.
- the subject line of your email should communicate exactly what the email is about so that the recipient can prioritize the email’s importance without opening it. E.g. “[phys2400] Tacoma bridge collapsed - cannot come to the exam” would be a good email subject (assuming email existed in 1940 ...); “urgent”, “important”, “a question” are bad ones. Do not use your name as subject – the sender name is already visible as a part of email header. (For the same reason do not repeat your name at the beginning of your email.)
- please no emails with attachments or embedded graphics unless requested by the instructor.

Student responsibilities and academic policies: Students at the University of Connecticut are held to certain standards and academic policies. Review these important standards and policies — the links are provided on the course website.