Mathematical Methods for the Physical Sciences

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 equations, integral transforms, asymptotic expansions, and special functions. The course introduces Computer Algebra Systems (as analytic calculators) - mathematica, maple, maxima, matlab, and sympy, 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 try to discuss these methods in the context of mathematics problems that arise in a variety of fields, ranging from optics (e.g. the colors of the rainbow), to quantum mechanics (e.g the semi-classical limit), to fluid mechanics. We will start with tools of the trade and simple problems (simple integrals, simple differential equations, etc.) and progress toward more challenging topics.

Lectures: TuTh 5:00 PM — 6:15 PM in P121, Physics Building

Course Webpage: `http://www.phys.uconn.edu/phys2400/`

Instructor: Michael Rozman

email:	rozman@phys.uconn.edu
phone:	860 486 5827
office:	P327, Physics Building
office hours:	TuTh 4:00 PM – 5:00 PM in P122, and/or by appointment

Course Assistant: Anees Ahmed

email:	anees.ahmed@uconn.edu
office:	P209, Physics Building
office hours:	TBA

Textbook(s):

- Lorella M. Jones, *Introduction to Mathematical Methods of Physics*, Benjamin/Cummings, 1979 (reprint available from Co-op, $33.50)
- Sanjoy Mahajan, *Street-Fighting Mathematics: The Art of Educated Guessing and Opportunistic Problem Solving*, MIT Press, 2010 (available online from the publisher, free)

Communications: talking in person is the preferred method to contact the instructor; email is the next best option.

- please include the tag *"[phys2400]"* (without quotes, no spaces) in the subject of your email, e.g. "[phys2400] midterm II retake"
- please no emails larger than 10K without instructor's explicit permission or request. Use *UConn File DropBox* `https://dropbox.uconn.edu/dropbox` or *UConn FileLocker* `http://web2.uconn.edu/filelocker/` for submitting large files

Homework: Weekly homework assignments

Assignments that are hard to understand are also hard to grade properly, 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 acceptable written assignments:

- Use letter-size paper. Use only one side of each sheet.
- $\boxed{\text{Box}}$ your final answer(s).
- Staple your sheets together. (i.e. no paper clips, torn or folded corners)

Highly recommended: make copies of homework assignments for your own files. (A copy machine is in the main physics office. It is available for you for free.)

Honors conversion: Students interested in honors conversion should contact the instructor during *the first week of classes*.

Exams: Two midterm exams and a *cumulative* final exam

Course project(s): may be assigned as a partial or full replacement of the exams

Use of LaTeX is strongly encouraged. Extra points will be assigned for homework prepared in LaTeX

Grading scheme: The course grade will be calculated using the following scheme.

Homework	40%
Midterms	35%
Final exam	20%
Class participation	5%