Advanced Mathematics for Engineers I

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Class schedule: TuTh 8:30-10:30 am in 2166 DOW  
Office Hours: TuWeTh 11:00 am-12:00 pm

Course Description: This course is an introduction to some of the main mathematical techniques in engineering and physics. It is intended to provide some background for courses in those disciplines with a mathematical requirement that goes beyond calculus. Model problems in mathematical physics are studied in detail and applications emphasized throughout. Topics include Fourier series and integrals, the classical partial differential equations (heat, wave and Laplace equation) solved by separation of variables and an introduction to complex analysis with applications to potential theory.


Prerequisites: Single- and multi-variable calculus (Math 115, 116, 215 or Honors version), ordinary differential equations (Math 216 or Honors version). Basic familiarity with MATLAB, Mathematica or MAPLE can be useful but is not mandatory.

Electronic Devices: It is a coursewide policy that laptops, smartphones, cell phones, iPods, iPads, tablets, smartwatches and other electronic devices may NOT be used by students during class.

Course Website: This section will have a Canvas page at http://canvas.umich.edu.

Email: You are responsible for information contained in course email messages sent to your official “umich.edu” email address. Please check your email regularly.

Homework: The only way to really LEARN mathematics is to DO mathematics. Along with the math you will do during class, weekly homework will be assigned from each section that we cover. These assignments are to be completed individually and handed in every Thursday morning before 10:30am (unless otherwise announced). In order to do well in this class, you must keep up with these assignments. All deadlines are firm and homework is worth 50% of the Grade component.

Exams:
Midterm Exam (20% of Grade Component): Th, Oct. 18th
Final Exam (30% of Grade Component): Tu, Dec. 18th
The dates for the exams are absolutely firm. Make plans NOW to be certain these dates are in your calendar. Generally, only students with a regularly scheduled class are accommodated at an alternate time. Anyone with a regularly scheduled class during these times should let me know immediately. Note that travel is not a sufficient excuse to have an exam scheduled on a different day. Missing an exam with an unapproved or undocumented excuse will result in a grade penalty in the course.

**Grading Policy:** Homework assignments will be graded by a grader.

**Academic Integrity:** According to the *LSA Community Standards of Academic Integrity*, the College “prohibits all forms of academic dishonesty and misconduct. Academic dishonesty may be understood as any action or attempted action that may result in creating an unfair academic advantage for oneself or an unfair academic advantage or disadvantage for any other member or members of the academic community.” Do NOT cheat. If you cheat in this class, you risk failing the course. If you have any questions about what is, or is not, allowed in this course, please ask.

**In Class:** You are required to come to class. Students who do not attend class rarely succeed in this course. If you must miss class for any reason, it is your responsibility to get notes from a classmate and catch up on the material. You are also responsible for the information given in any announcements made during class. A few points to remember:

- Come to class on time and do not leave early. If for some reason you absolutely have to arrive late or leave early, please let me know in advance and do so discretely.
- Treat your peers and instructor with respect and abide by all course policies.
- Talk to your classmates, collaborate with your classmates, get to know your classmates.
- Remember that no cell phones, tablets, computers, or other “gadgets” may be used in class. Texting is strictly prohibited. If you break this rule, I will hold onto your device for that class.

**Accommodations for Students with Disabilities:** If you think you need an accommodation for a disability, please let me know as soon as possible. In particular, a Verified Individualized Services and Accommodations (VISA) form must be provided to me at least two weeks prior to the need for a test/quiz accommodation. The Services for Students with Disabilities (SSD) Office (G664 Haven Hall; http://ssd.umich.edu/) issues VISA forms.

**Final Note:** I look forward to working with and getting to know you all. It will be an interesting, fun, and rewarding semester. Please do keep in mind the following:

> In this class expect to work on many assignments; work hard; read the textbook; complete all assigned work; and ask questions when things don’t make sense. In exchange you may expect me to do all I can to help you learn.

If you have any questions or concerns during the term, please do not hesitate to contact me.
MATH 450-001 tentative course schedule:

09/04-10/18
Chap. 3.4, 3.7, 4.1-4.2: Review of ODEs, series, power series
Chap. 17.1-4: Fourier Series, half- and quarter-range expansions
Chap. 17.5: Differentiation and integration of Fourier Series
Chap. 17.6-7: Sturm-Liouville theory
Chap. 18.1-3: Intro to PDEs, diffusion (heat) equation, Separation of variables
Chap. 19.1-3: 1-D and 2-D Wave equation
Chap. 19.4: D’Alembert’s solution
Chap. 20.1-3: Laplace equation, separation of variables

10/18 Midterm Exam
10/23-12/11
Chap. 17.9-10, 18.4: Fourier transform, Applications of Fourier transforms
Chap. 21.1-3: Complex numbers and complex functions
Chap. 21.4: Complex functions in polar coordinates
Chap. 21.5: Analyticity
Chap. 22.1-2: Conformal Mapping
Chap. 22.3-6: Bilinear transformation
Chap. 23.1-2: Complex integration
Chap. 23.3-4: Cauchy’s theorem and fundamental theorem of complex integration
Chap. 23.5: Cauchy integral formula

Course review

12/18 Final Exam