

AEP 4200/5200: Intermediate Mathematical Physics

Fall 2023

Instructor: Professor Bruce Kusse
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Teaching Assistant: Justin Tahmassebpur.

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Office Hours: Justin M 4-5pm Clark 218
B Kusse T 1-2 pm Clark 206

Course Description

This course is the second in the mathematical methods sequence for Applied & Engineering Physics and related disciplines. Topics include Fourier and Laplace transforms, ordinary and partial differential equations, separation of variables, method of Frobenius, Green's functions, wave and diffusion equations, solutions to Laplace's equation, Hermitian operators, Sturm-Liouville operators, Bessel functions, Legendre polynomials, and spherical harmonics. Students are responsible for all content covered in lecture, textbook, and homework problems.

Prerequisites: AEP 3200 (Introductory Mathematical Physics), PHYS 2213 or permission of instructor

Student Outcomes:

- Provide students with the mathematical tools to handle the material taught in upper-level undergraduate physics and engineering courses.
- Present the topics with a minimum of formal mathematical proofs but with at least informal proofs of all material.

Course Structure

Lectures: Mon, Wed, Fri 12:20–1:10, PSB 120

Discussion Section: Tues 2:55–4:10pm, PSB 120

Homework

Homework comes in the form of weekly problem sets that will be due (after PS 1) Wednesday by 6pm in the AEP homework box outside of 244 Clark Hall. Late homework will not be graded. However, at the end of the semester your lowest homework grade will be dropped. Extenuating circumstances, like illness or family issues, causing late homework will be considered on an individual basis.

A note on group work: you may collaborate and work together on the problem sets, but you must turn in your own solutions. You may not copy, by hand or otherwise, someone else's work and turn it in as your own.

Exams

There will be two prelims and one final exam:

Prelim 1: Thursday, September 21, 7:30-9:30pm. PHS 120

Prelim 2: Thursday, November 02, 7:30-9:30pm. PHS 120

Final Exam: TBD

Grading Policy

The final course grade will be calculated from the assessments as follows:

30% Problem Sets

30% Prelims

40% Final Exam

Course Materials

Mathematical Physics: Applied Mathematics for Scientists and Engineers, 2nd Edition by B. R. Kusse and E. A. Westwig

Lecture notes will be posted on CANVAS after each lecture.

Supplemental Reading

These books are all available electronically or in hard copy from the Cornell Math Library:

Mathematical Methods of Physics by J. Mathews and R. L. Walker

Introduction to Complex Variables by R. V. Churchill

Mathematical Methods for Physicists by G. B. Arfken

Mathematical Physics by E. Butkov

Course Policies

Classroom Etiquette

I understand that some of you may use your computers or tablets during class to electronically record your notes. Please refrain from using computers for anything else and keep your phones off.

Communication

The preferred channel of communication for the class is the Canvas site. Class-wide announcements will be made on Canvas and general questions can be asked to the instructor and TAs using the Canvas Discussion board. E-mails to the instructional team should be kept to a minimum. Please include "AEP 4200" in the subject line of any e-mails. In all cases, please allow

24 hours for a reply. Note: as a rule, you are more likely to get a quicker reply on Canvas. Still, it is important to avoid urgent questions that must be answered right away... the night before a problem set is due, for example...

Academic Integrity

Each student is expected to abide by the Cornell University Code of Integrity. You may collaborate on homework but everything you turn in must be your own work. Copying from solution manuals or each other is strictly forbidden. To be ready for the exams you'll need to be able to do all the problems on your own. Course materials posted on Canvas are intellectual property belonging to the author. Students are not permitted to buy, sell, trade or share any course materials without the express permission of the instructor.

Illnesses and Absences

Lecture notes will be posted on Canvas after each class. If you are absent due to illness, you are expected to keep up with course material on your own or by working with a peer. If you need help finding a peer work partner, please send me an e-mail and I will help facilitate.

Access and Accommodations

Your access in this course is important. Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students should register with Student Disability Services (SDS). Please provide me your SDS accommodation letter early in the semester so that we have adequate time to arrange your approved academic accommodations..

Inclusion

Students in this course come from a variety of backgrounds, abilities, and identities. To promote learning for all, each member of this course is expected to contribute at all times to an inclusive and respectful environment in and out of class. If you feel that this is not happening, please contact me.