Physics Adelphi University

0156-301-001
Mathematical Methods in Physics II
Section 1
Spring Semester 2021
Professor Matthew Wright
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Office hours: M 10-12, W 9-11, F 11-12
Note: Feel free to come by at other times or make an appointment if necessary. Officially, questions via email will be answered within 24 hours. I will do my best to answer them ASAP.

SYLLABUS

TEXTS:

Mathematical Methods in the Physical Sciences, 3rd ed., Boas (ISBN: 9780471198260) [Download for free on web]

Access to Matlab, or other scientific programming language.
Training will be provided in and after class when necessary. This software can be found in the computer lab in the physics main office.

COURSE DESCRIPTION AND PURPOSE:

An applied mathematics course covering topics relevant to the study of physics and engineering, including calculus of variations; coordinate transformations and tensor analysis; special functions; series solutions of differential equations; complex analysis; and probability and statistics. Students will use mathematical computer packages such as Mathcad for some assignments [Note: the description here is from the university catalog, but is not fully accurate and needs to be updated—we will use Matlab instead of Mathcad.].

GEN ED LEARNING GOALS/DISTRIBUTION REQUIREMENTS:

N/A

COURSE PREREQUISITES:

0156-113 (or equivalent) and 0156-211 (or equivalent)

COURSE OR MATERIALS FEES:

N/A

COVID STATEMENT:

Until Covid appears to be under control, we will meet online during class times. If for some reason, we can begin meeting in person as the semester goes along, there will always be an online version of the class.

SCHEDULE (* subject to change):

There are four sections for this course:

- Probability and Statistics Exam – 2/19/2021
- Calculus of Variations Exam – 3/5/2021
- Series Solution for Differential Equations – 4/9/2021
- Complex Analysis – Final Exam Period

The following days there will be no class: March 10, April 16, May 3

COURSE LEARNING GOALS:

- **Organized knowledge:** Students should be able to articulate in their own words the big ideas from each chapter, section, and/or lecture, thus indicating that they have organized their content knowledge. They should be able to filter this knowledge to access the information that they need to apply to a particular physical problem, and make connections/links between different concepts.

- **Visualize the problem:** Students should be able to sketch the physical parameters of a problem, as appropriate for a particular problem.

- **Problem-solving techniques:** When faced with a math problem, choose and apply appropriate problem solving techniques. Transfer the techniques learned in class and through homework to novel contexts (i.e., to solve problems which do not map directly to those in the book). Justify selected approach (see "Communication" above).

- **Problem-solving strategy:** Draw upon knowledge and skills to attack a problem even when a process leading to a correct solution is not yet clear. Continue to develop the ability to monitor progress towards a solution by learning how to:

    1. Backtrack and try a new approach when necessary
    2. Recognize when a solution has been reached and be able to articulate why this solution is valid (see "Expecting and Checking Solution" below)
    3. Persist through to the solution of problems requiring many steps

- **Communication.** Students should be able to justify and explain their thinking and/or approach to a problem or physical situation, in either written or oral form.

- **Intellectual maturity:** Students should accept full responsibility for their own learning. They should be aware of what they do and do not understand about physical phenomena and classes of problem. They should learn to ask sophisticated, specific questions. Students should learn to identify and articulate where in a problem they experienced difficulty and to take appropriate action to move beyond that difficulty. Finally, they should regularly check their understanding against these learning goals and seek out appropriate help to fill in any gaps.

- **Build on Earlier Material:** students should recognize and make use of connections to prior work, especially concerning mathematically tools developed in Math Methods I, Calculus I & II, and Physics I & II.

STUDENTS WITH DISABILITIES:

If you have a disability that may significantly impact your ability to carry out assigned coursework, please contact the Office of Disability Support Services (DSS), located in Room 310 of the University Center, 516-877-3145, dss@adelphi.edu. The staff will review your concerns and determine, with you, appropriate and necessary accommodations. When possible, please allow for a reasonable time frame for requesting ASL Interpreters or Transcription Services; a minimum of four (4) weeks prior to the start of the semester is required.

However during this semester, I recommend speaking to me directly first. It is possible we can figure it out.

HONOR CODE STATEMENT:

Students enrolled in this course are expected to abide by the Adelphi University Honor Code. The purpose of the Honor Code is to protect the academic integrity of the University by encouraging consistent ethical behavior in assigned coursework by students. Following is excerpted from the Student Honor Code:

The Code of Academic Honesty
The code of academic honesty prohibits behavior, which can broadly be described as lying, cheating, or stealing. Violations of the code of academic honesty will include, but are not limited to, the following:

1. Fabricating data or citations
2. Collaborating in areas prohibited by the professor
3. Unauthorized multiple submission of work
4. Sabotage of others' work, including library vandalism or manipulation
5. Plagiarism: presenting any work as one's own that is not one's own
6. The creation of unfair advantage
7. The facilitation of dishonesty
8. Tampering with or falsifying records
9. Cheating on examinations through the use of written materials or giving or receiving help in any form during the exam, including talking, signals, electronic devices, etc.

TURNITIN:

Adelphi University has a license agreement with Turnitin.com, a service that helps prevent plagiarism from Internet resources. I reserve the right to request an electronic copy of any written assignment submitted in this course for review through Turnitin.com. Please see Adelphi's tips for students on preventing plagiarism and student instructions for Turnitin.com for more information." *****

STUDENT COURSE EVALUATIONS:

During the last two weeks of the class, you will receive notification, via email and eCampus, that the course evaluation is available for your input electronically.

Availability will end at the start of the final examination period. Your feedback is valuable and I encourage you to respond. Please be assured that your responses are anonymous and the results will not be available to the instructor until after the end of the semester and therefore after course grades have been submitted. *****

Additionally, feel free to provide feedback to the instructor on the one minute paper that will be handed out during most classes. Please do not include your name on this feedback.

MOODLE:

While Moodle will be used to display sensitive material, most of the course work can be found here: https://wrightresearchlab.wordpress.com/math-methods-2/

ASSIGNMENTS/COURSEWORK:

Homework:

There is going to be plenty of homework. Homework sets and due dates will be provided on the class website. Less is more when it comes to homework. I am only going to assign a few problems; however, I expect that students will do the following with each problem:

- Try it independently
- Work in Groups
- Look up the Answer

Your solutions should include at least the first two attempts. You should make an attempt to annotate your work on places where things didn't work out. Yes I am expecting that you will get things. I want you to get things wrong. I want to help correct your thought process.

Homework is important part of you developing into a problem solver and physicist. These will require extreme work. Here is what my peer (Steven Pollock) wrote about collaboration on assignments:

> **I strongly encourage collaboration**, an essential skill in science and engineering (and highly valued by employers!) Social interactions are critical to scientists' success - most good ideas grow out of discussions with colleagues, and essentially all physicists work as part of a group. Find partners and work on homework together. However, it is also important that you OWN the material. I strongly suggest you start homework by yourself (and that means really making an extended effort on every problem) Then work with a group, and finally, finish up on your own - write up your own work, in your own way. There will also be time for peer discussion during classes - as you work together, try to help your partners get over confusions, listen to them, ask each other questions, critique, teach each other. You will learn a lot this way!

Exams:

No calculators, books, or notes will be allowed on the exams (in-class and final). For some material, tables will be provided. There will be a group component to each test.

Classwork:

Each class will have

- Readings
- Pre-class video
- Pre-class assignment (This is will be counted.)
- Document/worksheet to drive discussions
- Numerical assignments will be sprinkled in through the semester and will be fair game for exams.

GRADING/EVALUATION:

Grades:	Exam I	17%
	Exam II	17%
	Exam III	17%
	Exam IV	17%
	Homework	16%
	In class work	16%

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Percentage	95	90	87	84	79	75	71	65	60	55	50	

ATTENDANCE POLICY:

You are strongly encouraged to come to each class. There numerous reasons you may miss class (e.g., illness, conferences), therefore you can miss up to two without it counting negatively toward your grade. If you expect to miss a large number of classes, please contact the instructor as soon as possible.