

Mathematical Methods of Physics

Physics 355

Welcome to Mathematical Methods of Physics at Old Dominion University. This course is intended to give a solid practical foundation to mathematics commonly used in physics that is essential for undergraduate study of physics beyond the introductory level courses. The key objectives of the course include developing both solid understanding of underlying concepts and skills for practical applications. The course contains a mandatory recitation section

Prerequisites and corequisites	<p><u>Prerequisites</u>: <i>Introductory Physics I & II, Calculus I and II.</i></p> <p><u>Pre- or corequisite</u>: <i>Calculus III.</i> Math proficiency in introductory calculus is essential. If you are uncertain about your preparation, consult the instructor.</p>
Classes	Tuesdays and Thursdays: 16:20 – 17:35, in Oceanography & Physics room 204, then the recitation session on Tuesdays 17:40-18:30 in room 303.
Instructor	<p>Dr. Alexander Godunov</p> <p>Office: OCNPS 219 (Oceanography and Physics)</p> <p>Phone: 683-5805</p> <p>agodunov@odu.edu</p>
Materials	<p>Textbook (<u>required</u>): “Mathematical methods in the Physical Sciences” by Mary Boas (currently in third edition, older editions are just as good as the last one.)</p> <p>Textbook (<u>recommended</u>): “Mathematical Methods for Physics and Engineering” by Riley, Hobson and Bence (you can use 3rd or 2nd editions).</p>
Support resources	<p><i>Office hours</i>: Tuesday 11:30-12:30 (office), Thursday 15:00-16:00 (office), and by appointment.</p> <p><i>Blackboard</i>: Some useful information is posted on the class Blackboard page.</p> <p><i>E-mail</i>: agodunov@odu.edu (have “Physics 355” in the subject line).</p> <p><i>Phone</i>: 683-5805 (feel free to contact the instructor for any urgent questions).</p>
Time commitment	Physics 355 is a demanding course and students should allocate sufficient time during the semester to do well in the course (6 to 9 hours per week). If you are spending more than 12 hours per week, you should contact the instructor to develop a different studying strategy.
Course Grades	<p>The final grade is calculated on an absolute scale. There are 100 points possible for this course of which</p> <p>30 points – Three Midterm Exams</p> <p>40 points – Final Exam</p> <p>30 points – Homework assignments</p> <p>The grading policy is non-competitive and lenient, but there will be no curve. If everyone in the class does well, everyone can get an A.</p> <p>A letter grade is determined only at the end of the term. Grade Requirements</p> <p>92 ≤ A < 100 88 ≤ A- < 92 83 ≤ B+ < 88</p> <p>77 ≤ B < 83 72 ≤ B- < 77 66 ≤ C+ < 72</p> <p>60 ≤ C < 66 55 ≤ C- < 60 50 ≤ D < 55 F < 50</p>

Class time	Attendance is highly advisable for students with grades B+ and above, and attendance is required for students with B and below. If you have to miss a class, it is your responsibility to find out what you missed.
Homework	<p>Homework assignments will be set as we progress through the course. One assignment will be due approximately each week.</p> <p>Each student is required to keep an Assignment Journal in which all assignment problems are to be solved. Doing the homework problems is one of the best ways to learn the material.</p> <p>You should start homework early and get help if needed before the due date.</p> <p><u>No individual extensions of assignment submission dates will be given.</u></p>
Reading Assignments	Because there will be limited time for presenting information in class so it is vitally important that you read the appropriate sections of the textbook BEFORE coming to class. Reading ahead requires time management and discipline, but the payoff is considerable - the material will be much easier to understand.
Mid-term exams	<p>There will be three midterm exams. The midterm examinations will be given during the regularly scheduled class periods. The examinations will emphasize the material in lectures and homework assignments. Your work should be neat and orderly to earn full credit on a problem.</p> <p>No make-up examinations will be given. In case you have a legitimate reason for missing an exam, consult with me before, or at least within 24 hours after the exam.</p> <p>The exam dates will be set as we progress through the course (a subject of weather conditions since almost every fall we have classes cancelled due to severe weather conditions).</p> <p>Requests for correction of grading mistakes on exams can be made when the work is returned to you. The requests must be made within two days after getting your grade. Requests should be written. In their request, students must explain why they believe there is a mistake in grading and why they deserve more credit. However, clerical errors (e.g., addition errors) will be corrected immediately.</p>
Final Exam	<p>December 10th (Tuesday) 15:45 – 18:45</p> <p>Place: Oceanography & Physics, Room 204</p>
Keys to success	In Physics 355 it is vital to both understand the underlying concepts and apply them to problem solving. Advanced reading, consistent participation, and timely completion of assignments are the keys to success. If you work regularly and allocate enough time each day to complete the assignments on time and keep up with the course, you will get the most out of the course both intellectually and grade-wise. Two things that generally do not work are memorization and cramming to catch up just before the examinations (it will be impossible to assimilate all the material). Use the support resources to clarify the material as soon as you feel unsure about something — the instructor is there to help you.

Expectations	<p>For the most efficient use of time in class – you are expected to be prepared for class by reading the material ahead. Once again, it requires discipline, but the pay-offs are considerable.</p> <p>You are expected to read the sections in the textbook that are covered in class. You should spend at least 1 hour each class day working with your textbook.</p> <p>Exams and assignments – you are expected to do your work in a neat way (clear diagrams, equations, explanations and numbers). You must show your work and explain your reasoning to earn full credit on a problem.</p> <p>Finally, you are expected to ask for help when you feel you do not understand something. Do not wait until the final exam to address any problems with the material, most of the time it will be too late.</p>
Professional Integrity	<p>In Physics 355, high professional and ethical standards are promoted. Plagiarism and cheating are serious offenses and may be punished by failure on the exam and failure in the course. The academic integrity code is to be maintained at all times.</p>
Policy on class disruption	<p>Class disruption will not be tolerated. Students attending class have the right to a professional, quiet and amiable learning environment free of disruption. Disruptive behavior may include but is not limited to: persistent late arrivals or leaving early in a manner that disrupts the regular flow of the class, talking while the instructor is talking, speaking in class without first obtaining recognition and permission to speak, use of electronic equipment such as cell phones, computers, MP3 players, etc. in a manner that disrupts the class</p>
Collaboration	<p>Collaboration in and out of class is strongly encouraged. Because the course is graded on an absolute scale, you will never reduce your grade by helping others — on the contrary, by doing so you will reinforce your own knowledge and improve your performance. Although, before working together or consulting others on any assignments, it is helpful to first tackle the work alone. Activities for which collaboration is not permitted are: examinations, quizzes, and submission of homework assignments.</p>
Accommodation	<p>Students are encouraged to self-disclose disabilities that have been verified by the Office of Educational Accessibility by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations will not be made until the Accommodation Letters are provided to instructors each semester.</p>

Course Outline

Subjects

1. Brief review of differential and integral calculus for $f(x)$
2. Infinite series
3. Complex numbers
4. Functions of two and more variables
5. Multiple integrals and line integrals
6. Linear algebra (matrices, eigenvalues and eigenvectors)
7. Vector analysis and differential vector operators
8. Ordinary differential equations in physics
9. Fourier series and Fourier integral transforms
10. Calculus of variations
11. Functions of a complex variable* (basics)
12. Partial differential equations* (brief introduction)

* *Indicates optional sections (If we get that far)*

Name: _____

Past, present and future classes

* Please mark with "+" yes, "-" no, "?" not sure

Math: past now future

Math 307 Differential equations _____

Math 312 Calculus III _____

Math 316: Linear Algebra _____

Math 401: PDE _____

Math 421: Applied mathematics II _____

Math 422: Complex variables _____

Physics: past now future

Phys 319: Analytical Mechanics _____

Phys 323: Modern Physics. _____

Phys 420: Introductory Computational Physics _____

Phys 425: Electromagnetism I _____

Phys 452: Introduction to Quantum Mechanics _____

Phys 454: Thermal and Statistical Physics _____