

# Mathematical Methods in Physics I

## Physics 601

Mathematical Methods in Physics I (Phys. 601) is intended to introduce mathematics and mathematical methods used by professional scientists. The key objectives of the course include developing both solid understanding of underlying concepts and skills for practical applications.

<b>University Catalog</b>	PHYS 601. Mathematical Methods of Physics I. 3 Credits.
<b>Classes</b>	Tuesdays and Thursdays: 11:00 – 12:15, in Oceanography & Physics room 303
<b>Instructor</b>	Dr. Alexander Godunov Office: OCNPS 219 (Oceanography and Physics) Phone: 683-5805 agodunov@odu.edu Web: www.odu.edu/~agodunov
<b>Textbooks</b>	There is not a single textbook covering equally well all the subjects in this course. However, these (optional) textbooks will work well for the class: “Mathematical methods in the Physical Sciences” by M. Boas (3 <sup>rd</sup> edition – older editions are just as good as the last one), “Mathematical Methods for Physics and Engineering” by Riley, Hobson and Bence (any edition), G. B. Arfken at all “Mathematical methods for physicists” (7 <sup>th</sup> edition, Elsevier, Academic Press, 2012, older editions will work too).
<b>Support resources</b>	<i>Office hours:</i> Tuesdays and Thursdays: 10:00 -11:00 and by appointment. <i>Canvas:</i> Some useful information is posted on the class Canvas page. <i>E-mail:</i> agodunov@odu.edu (have “Physics 601” in the subject line). <i>Phone:</i> 683-5805 (feel free to contact the instructor for any urgent questions).
<b>Class time and attendance</b>	Attendance is highly advisable. If you have to miss a class, it is your responsibility to find out what you missed.
<b>Course Grades</b>	The final grade is calculated on an absolute scale. There are 100 points possible for this course of which 35 points – Three midterm exams 15+15+5, where 5 points for the lowest exam 25 points – Final Exam 40 points – Homework assignments The grading policy is non-competitive and lenient, but there will be <b>no curve</b> . If everyone in the class does well, everyone can get an A. A letter grade is determined only at the end of the term. Grade Requirements $92 \leq A < 100$ $88 \leq A- < 92$ $83 \leq B+ < 88$ $75 \leq B < 83$ $70 \leq B- < 75$ $65 \leq C+ < 70$ $60 \leq C < 65$ $55 \leq C- < 60$ $50 \leq D < 55$ $F < 50$
<b>Homework</b>	Homework assignments will be set as we progress through the course. One assignment will be due approximately each week.

Doing the homework problems is one of the best ways to learn the material. You should start homework early and get help if needed before the due date. No individual extensions of assignment submission dates will be given.

**Mid-term exams**

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.

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.

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).

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.

**Final Exam**

December 13<sup>th</sup> (Thursday) 12:30 – 15:30

Place: Oceanography & Physics, Room 303

**Keys to success**

In Physics 601 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**

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 payoffs are considerable.

You are expected to read the sections in the textbook that are covered in class.

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.

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.

**Professional Integrity**

In Physics 601, 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. Using Google, Chegg, and similar resources for getting solutions to homework problems is considered as cheating.

**Policy on class disruption**

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

**Collaboration**

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, and submission of homework assignments.

**Accommodation**

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.

## Course Outline

### Subjects

1. Series and series of functions
2. Ordinary differential equations (applications to physics)
3. Green's functions
4. Calculus of variations
5. Complex numbers and functions of complex variables
6. Vector analysis, Hilbert spaces
7. Linear algebra (matrices, eigenvalues, and eigenvectors)
8. Fourier series and Fourier integral transforms
9. Path integrals
10. Some special methods in physics\*
11. Integral equations\*

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