

# University Physics II

## Physics 232N/227N

Welcome to University Physics II at Old Dominion University. This course is intended to give a solid introduction to basic principles of electricity, magnetism and light. These topics form a substantial part of foundation of modern science and technology.

The key objectives of the course include developing problem-solving skills, as well as preparing university students for professional careers in science and engineering. The course is calculus based.

**Pre- and Co-requisites** Prerequisites: Phys 231N or Phys 226N with a grade of C or better, and Math 211. Pre- or co-requisite: Math 212 or permission of instructor.  
If you are uncertain about your preparation in math, consult the instructor.

**Classes** Time: Monday and Wednesday 11:00 – 12:50  
Place: Oceanography & Physics, Room 142 – 144

**Format** The course-working environment is SCALE UP (Student-Centered Active Learning Environment for Undergraduate Programs). This environment facilitates active and collaborative learning in a studio-like setting. Mini-lectures are interspersed with group problem solving and discussions.

**Instructor** Dr. Alexander L. Godunov  
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**Course TA** Christopher Hopper: chopper@odu.edu

**Materials** Textbook: “University Physics” by Young and Freedman (13<sup>th</sup> edition). There are several versions of this text including with and without Modern Physics. Any version will work fine. Due to the high cost of textbooks, you can use “University Physics” by Young and Freedman (12<sup>th</sup> edition), which is much cheaper.  
Mastering Physics: <http://www.masteringphysics.com/>  
Clickers are recommended.

**Support resources** *Blackboard*: Majority of information including lecture notes, exam and quiz solutions will be posted on the class Blackboard page.  
*Office hours*: Monday 13:00 – 14:00 (OCNPS 219),  
Wednesday 13:00 – 14:00 (Physics Learning Center), and by appointment.  
*E-mail*: agodunov@odu.edu (with “physics 232” in the subject line).  
*Phone*: 683-5805 (feel free to contact the instructor for any urgent questions).  
*Physics learning center*: A place where students in any physics course can receive help. The center is staffed by physics faculty and TAs (2<sup>nd</sup> Floor Atrium, Physical Sciences Building), <http://www.odu.edu/physics/resources/learning-center>

**Time commitment** Physics 232 is a demanding course and students should allocate sufficient time during the semester to do well in the course (6 to 12 hours per week). If you are spending more than 15 hours per week, you should contact the instructor to develop a different studying strategy.

<b>Course Grades</b>	<p>The final grade is calculated on an absolute scale. There are 100 points possible for this course of which</p> <p>25 points – Final Exam  40 points – Four Midterm Exams  10 points – Quizzes  10 points – Homework assignments (Mastering Physics)  5 points – Homework journal  10 points – laboratory</p> <p>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.</p> <p>Grade Requirements (breakpoints)</p> <p><math>92 \leq A &lt; 100</math>   <math>88 \leq A- &lt; 92</math>   <math>83 \leq B+ &lt; 88</math>  <math>77 \leq B &lt; 83</math>   <math>72 \leq B- &lt; 77</math>   <math>66 \leq C+ &lt; 72</math>  <math>60 \leq C &lt; 66</math>   <math>55 \leq C- &lt; 60</math>   <math>50 \leq D &lt; 55</math>   <math>F &lt; 50</math></p>
<b>Class time</b>	<p>Each class period will consist of lectures, interactive discussions, and problem solving.</p> <p><u>Attendance is mandatory.</u> If you have to legitimately miss a class, it is your responsibility to find out what you missed.</p> <p><u>Policy on class disruption:</u> 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, etc. in a manner that disrupts the class.</p>
<b>Homework</b>	<p>The homework is to be submitted via the web using Mastering Physics. The class ID is <b>ODU2015PHY232</b>.</p> <p>Homework assignments will be set as we progress through the course. At least one assignment will be due approximately each week.</p> <p><b>Each student is required to keep an Assignment Journal</b> in which all assignment problems are to be completed before posting solutions on Mastering Physics. Solutions in the assignment journal have to follow the structure of "Sample homework solutions". At the end of every assignment you should write what was the least clear point in the chapter</p> <p>The journal will be periodically collected, reviewed, and graded by the class TA. Doing the homework problems is one of the best ways to learn the material. Credit for homework is given to encourage practicing and thinking about physics on a regular basis. This credit will influence the final grade for this course. 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>
<b>Reading Assignments</b>	<p>Because there will be limited time for presenting information in class so it is <b>VITALLY IMPORTANT</b> that you read the appropriate sections of the textbook</p>

BEFORE coming to class. Reading ahead requires time management and discipline, but the payoff is considerable - the material will be much easier to understand. The reading assignment questions may be given as pop-up quizzes or as Mastering Physics reading assignments.

**Laboratory**

Attendance & participation is required in the laboratory portion of this course. Any student with more than one absence will fail the laboratory and hence the entire course. You must hand in a lab report to get credit for each session. If you cannot avoid missing a lab session, contact the lab instructor in advance.

**Quizzes**

There will be periodic quizzes through the semester (except on exam weeks). There will be no make-up quizzes. However, the lowest quiz score will be dropped at the end of the semester.

**Mid-term exams**

There will be four midterm exams. The midterm examinations will be given during the regularly scheduled class periods. All the exams will be closed book. The examinations will emphasize the material in lectures and homework assignments. Some material covered in class may be omitted. Your work should be neat and orderly; with large, neat, and clearly labeled diagrams. Formulas and numbers alone won't do; you must show your work and explain your reasoning 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. If you miss a midterm examination for an officially excused reason (documented illness or family emergency, major religious holidays, or official university business) your missed examination score will be replaced with the appropriately scaled score on the portion of the final exam that covers same material as the missed midterm examination.

Tentative exam dates: February 9<sup>th</sup>, March 4<sup>th</sup>, April 1<sup>st</sup> (or 6<sup>th</sup>), April 20<sup>th</sup>. (These dates are subject of weather conditions and a function of our progress through the course.)

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**

May 6<sup>th</sup> 2015, 8:30 – 11:30

Place: Oceanography & Physics, Room 142

**Mid-semester evaluation**

Old Dominion University requires faculty of 100 and 200 level courses to submit a Progress Report Grade (by LeoOnline during the fifth week of classes). This grade will be compiled from work completed by February 15, 2015 and weighted according to the course grade table listed above. You will be able to access your progress grade from the student menu in LeoOnline; simply click "Progress Report."

- Keys to success** In University Physics it is vital to understand the underlying concepts. 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 pay-offs are considerable.
- 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 reading your textbook.
- 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** 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.
- Collaboration** Collaboration in class and on homework assignments 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.

## Course Outline

### Topics

#### **Electromagnetism**

21. Electric Charge and Electric Field
22. Gauss's Law
23. Electric Potential
24. Electrostatic Energy and Capacitors
25. Current, Resistance, and Electromotive Force
26. Direct-Current Circuits
27. Magnetic Field and Magnetic Forces
28. Sources of EM fields
29. Electromagnetic Induction
30. Inductance
31. Alternating Current
32. Electromagnetic Waves

#### **Optics**

33. The Nature and Propagation of Light
34. Geometric Optics and Optical Instruments
35. Interference
36. Diffraction

#### **Modern Physics**

37. Relativity

Some sub-topics may be added and some topics omitted at the instructor's discretion, and depending on student's interest and time constraints.

#### **More modern physics\***

Atomic Physics, Molecules, Condensed Matter, Nuclear Physics, Particle Physics and Cosmology.

\* While many students will later take a course "Modern Physics" we are going to have a short review of the most important ideas, experiments, facts and applications.

**Timetable**  
(Tentative – weather dependent)

		Reading assignment	Topic
1	Jan. 12 (M)	Chapter 21: 1 – 4	21 Electric charge and electric field
2	Jan. 14 (W)	Chapter 21: 5 – 7	21 (cont.)
3	Jan. 19 (M)		no classes
4	Jan. 21 (W)	Chapter 22: 1 – 3	22 Gauss's law
5	Jan. 26 (M)	Chapter 23: 1 – 2	23 Electric potential
6	Jan. 28 (W)	Chapter 24: 1 – 2	23 (cont.); 24 Capacitance
7	Feb. 2 (M)	Chapter 24: 3 - 4	24 (cont.)
8	Feb. 4 (W)	Chapter 25: 1 – 4	25 Current, resistance, electromotive force
9	Feb. 9 (M)		1 <sup>st</sup> mid-term (chapter 21-25)
10	Feb. 11 (W)	Chapter 26: 1 – 3	26 Direct-current circuits
11	Feb. 16 (M)	Chapter 26: 4 – 5	26 (cont.)
12	Feb. 18 (W)	Chapter 27: 1 – 4	27 Magnetic field and magnetic forces
13	Feb. 23 (M)	Chapter 27: 5 – 6	27 (cont.);28 Sources of magnetic fields
14	Feb. 25 (W)	Chapter 28: 1 – 4	28 (cont.)
15	Mar. 2 (M)	Chapter 29: 1 – 3	29 Electromagnetic induction
16	Mar. 4 (W)		2nd mid-term (chapters 26-30)
17	Mar. 9 (M)		no classes
18	Mar. 11 (W)		no classes
19	Mar 16 (M)	Chapter 30: 1 – 2	30 Inductance;
20	Mar. 18 (W)		31 Alternating current; 32: Electromagnetic waves
21	Mar. 23 (M)	Chapter 33: 1 – 3	33 The nature and propagation of light
22	Mar. 25 (W)	Chapter 34: 1 - 3	34 Geometric optics
23	Mar. 30 (M)	Chapter 34: 4 – 5	34 (cont.)
24	Apr. 1 (W)		3 <sup>rd</sup> mid-term (chapter 33-34)
25	Apr. 6 (M)	Chapter 35: 1 – 2	35 Interference
26	Apr. 8 (W)	Chapter 36: 1 – 2	36 Diffraction
27	Apr. 13 (M)	Chapter 37: 1 – 3	37 Relativity
28	Apr. 15 (W)	Chapter 37: 4 – 5	37 (cont.)
29	Apr. 20 (M)		4 <sup>th</sup> midterm (chapter 35-37)
30	Apr. 22 (W)		Modern physics (brief introduction)
31	Apr. 27 (M)		Review of the course before the final (if time available)
32	May 6 (W)		Final examination (8:30 – 11:30)

**Checklist 1: Things to have**

- ✓ A textbook
- ✓ Access to Mastering Physics
- ✓ An assignment (homework) journal
- ✓ A clicker
- ✓ Time

**Checklist 2: Things to do**

- ✓ Read the textbook (before and after) till you understand
- ✓ Attend the class and really work through the class time
- ✓ Do homework and start doing it well before the last hour
- ✓ Keep the assignment (homework) journal and follow the instructions
- ✓ Talk to your instructor when needed.

**Checklist 3: Things NOT to do**

- ✓ Don't cheat.  
You learn nothing by cheating on homework and homework is the primary way that you learn physics.
- ✓ Don't plug and chug.  
Physics is not about crunching numbers

**Journals will be a vital part of your education**

As a reminder, all of your work, including your homework, must be your own work. This means that it must not be copied from other students, copied from another website, or etc. Most importantly, many homework problems later make an appearance on tests in similar forms, so if you do not take the time to work through them now, you will only hurt your grades on quizzes and exams.

Each student is required to keep an Assignment Journal in which all assignment problems are to be completed before posting solutions on Mastering Physics. A notebook or a single folder will work fine. Journals are to be neatly handwritten.

Instructions for solving problems in homework assignment journals (as well as exams and quizzes)

1. Name the type of physics most likely related to the problem in hand. Draw a diagram if needed.
2. Write down the "basic" equations for the physics of the problem.
3. Simplify (when possible) the "basic" equations using given data and conditions.
4. Solve the "adjusted" equation for the unknown(s) using algebra, trigonometry and calculus.
5. Achieve a numerical answer using your symbolic solution and the proper units.
6. Step back, and evaluate your answer in terms of units, dimensions, and most importantly, common sense.

At the end of every assignment you should have answers to the questions:

1. What was the "muddiest" point in this chapter?
2. What was the most difficult problem in this assignment and why?



**A weekly flowchart for studying physics**

