Spring 2-1-2022

PHSX 217N.01: Fundamentals of Physics with Calculus II

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Physics 217N: Fundamentals of Physics with Calculus II Spring, 2022

Course Information

- Instructor: Dr. David A. Macaluso
- Office: C.H. Clapp Building, room 119
- Contact: Telephone (406) 243-6641, Email david.macaluso@umontana.edu
- Lectures: MTWTr, 1:00 PM – 1:50 PM, CHCB 131 (recorded for distance learning)
- Midterm Exams: Thursday evenings from 5-7 PM (see schedule for specific dates)
- Office Hours: MTW 11:00 AM-noon. I'm happy to help students outside my scheduled office hours.

Course Description

This course will introduce students to three fundamental fields in Classical Physics: Thermodynamics, Electricity & Magnetism, and Optics. We also explore Modern Physics topics including Relativity and Quantum Mechanics. In addition, this course will *heavily* emphasize the development of **problem solving skills** and **critical thinking**.

Textbook & Materials

- Required Text: *Physics for Scientists & Engineers with Modern Physics, 4th Edition* by Giancoli (eText with all-inclusive Mastering Physics homework access)
- iClicker Remote if attending in-person: We will be using iClicker remotes extensively in this class. Because smartphone use is prohibited in class you will need an actual remote (smartphone apps will not be supported). Lecture iClicker content will start the first day of Week 2.

Add/Drop/Withdraw

Please refer to the University policy on adding, dropping, and withdrawing from the course at http://www.umt.edu/registrar/students/dropadd.php.

From the 16th through the 45th instructional day, all classes must be dropped using Drop forms (instructor signature required, advisor signature required for undergraduates). **$10 fee applies.**
From the 46th to the last instructional day prior to finals week, classes must be dropped using the Drop form (instructor and Dean signatures required, advisor signature required for undergraduates). **$10 fee applies.**

Website(s)

1. Online homework: MasteringPhysics.com **2.** Grades and other materials will be posted on Moodle

General Learning Outcomes

Upon completion of this course, students should have gained:

1. A solid conceptual understanding of the foundational concepts of Classical Physics.
2. Appreciation for the methodology and activities scientists use to gather, validate and interpret data related to natural processes
3. Improved critical thinking and problem solving skills, such as detecting patterns, drawing conclusions, developing conjectures and hypotheses, and testing them by appropriate means.
4. An appreciation for the rigorous nature of scientific methodology in evidence-based inquiry, including how scientific laws and theories are verified by quantitative measurement, scientific observation, and logical/critical reasoning.
5. Insight into the thought processes of physical *approximation* and *modeling* and practice in the appropriate application of mathematics to the description of physical reality. This includes an understanding of how analytic uncertainty is quantified and expressed in the natural sciences

Specific Learning Outcomes

It is expected that the student will:

1. Be able to perform Coulomb's Law calculations
2. Understand the differences between electric field and electric potential
3. Be able to apply Gauss' Law to determine electric fields
4. Perform simple electric circuit analysis
5. Be able to determine magnetic forces and fields in simple geometries
6. Be able to apply Lenz' Law and Faraday's Law
7. Be familiar with the EM spectrum
8. Grasp the basics of geometrical optics
9. Develop an understanding of interference
10. Understand optical diffraction and the limitations it places on optical instruments
11. A basic understanding of the following topics in Modern Physics: Special Relativity, Quantum Mechanics, Cosmology, Nuclear Physics, and Particle Physics.

Expectations

This is a university-level physics course. The expectations are therefore appropriate for students who should all be familiar with the concepts of personal responsibility, accountability, and academic honesty. Specifically:

Attendance

Exams will be based on lectures and in-class problems and discussions. In addition, quizzes and iClicker lecture questions (points which ***cannot*** be made up without having made prior arrangements with me) represent a significant percentage of the course grade. Thus regular attendance, while not mandatory, is vital to student success. **I strongly encourage regular attendance.**

Prerequisites/Corequisites

All students must have completed Calculus I (UM-M171 or equivalent), have completed or be concurrently enrolled in the corequisite Calculus II course (UM-M172 or equivalent) and have completed or be enrolled in the associated lab course, PHSX 218N.

Reading Assignments

Students are expected to read the assigned material **before** class. Quizzes will be given during class that will be based at least partially on the reading. These quizzes will not be demanding, so reading ahead will both prepare you for the upcoming lecture and help assure you earn the "low hanging fruit" of reading quizzes.

Homework Assignments

Weekly homework assignments are the primary tool by which you learn physics and develop your problem solving skills. These assignments usually take 2-5 hours to complete so don't procrastinate. **NOTE: one "unit" represents 3 hours of student work and this is a 4-unit course, so it should occupy 12 hours per week; three hours and twenty minutes in-class, and *over eight hours* outside of class per week.**

Mathematics

The language of physics is math. You must be comfortable with algebra, geometry, and trigonometry to succeed. You will also be expected to be familiar with several calculus techniques, such as differentiation and integration.

Do not use cell phones or computers/laptops/notebooks in class. The only electronics permitted in class are your iClicker remotes.

Grading Policy

Exams (three @ 15% each)	**45%**
Cumulative Final Exam	**20%**
Homework	**20%**
In-class Participation (iClickers)	**15%**

Grades will be based on the traditional letter grade percentage scale (90s = A/A–, 80s = B+/B/B–, etc.). This course can only be taken with **the traditional grading option** (i.e. credit/no-credit is *not* allowed).

Final course grades are assigned based on the final student distribution. Students will not be given a lower grade than what is traditionally assigned to a given final percentage, e.g. a grade of 80% will be *at least* a B–.

Policies and Procedures

- **Late homework will not be accepted and there are no make-up exams except where prior arrangements have been made with me. Otherwise, late homework and missed exams will be scored as a zero.**
- Keep phones and tablets/laptops put away during lecture. **THIS IS A DEPARTMENT POLICY FOR THIS COURSE. Smartphones/computers are not allowed at any time in class or during exams.**
- All email correspondences with me must be to/from an official UM email address.

Academic Honesty

I encourage students to work together and to seek assistance from me whenever necessary. However, work submitted in this class must be the original work of the student. In addition, the majority of your grade will be based on quizzes and exams that test your mastery of the homework problems, so doing the problems on your own will give you the best chance to succeed.

University policy statement on academic honesty: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code: (http://www.umt.edu/vpsa/policies/student_conduct.php).

Students with Disabilities:

Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. “Reasonable” means the University permits no fundamental alterations of academic standards or retroactive modifications. For more information, visit the Disability Services for Students website at http://life.umt.edu/dss/.

Tentative Course Schedule (dates, topics and readings subject to change)

Week	Chapters	Topics	Notes	Exams
Week 1 1/17 – 1/22	Ch. 21	Electric Charge & Electric Field	***No Class Monday***	
Week 2 1/24 – 1/27	Ch. 21/22	Electric Charge & Electric Field, Gauss' Law		
Week 3 1/31 – 2/3	Ch. 22/23	Gauss' Law, Electric Potential		
Week 4 2/7 – 2/10	Ch. 23/24	Electric Potential, Capacitance		
Week 5 2/14 – 2/17	Ch. 24/25	Capacitance, Current & Resistance		**Exam 1:** **Thursday, 2/17**
Week 6 2/21 – 2/24	Ch. 25-27	Current & Resistance, DC Circuits, Magnetism	***No Class Monday***	
Week 7 2/28 – 3/3	Ch. 27/28	Magnetism & Sources of Magnetic Fields		
Week 8 3/7 – 3/10	Ch. 29/30	Induction, Inductance		
Week 9 3/14 – 3/17	Ch. 30/31	Inductance Maxwell's Equations & EM Waves		**Exam 2:** **Thursday, 3/17**
Week 10 3/21 – 3/24		***Spring Break – No Classes***		
Week 11 3/28 – 3/31	Ch. 31	Maxwell's Equations & EM Waves		
Week 12 4/4 – 4/7	Ch. 32/33	Light: Reflection & Refraction, Lenses & Optical Instruments		
Week 13 4/11 – 4/14	Ch. 33/34	Lenses & Optical Instruments, Interference		
Week 14 4/18 – 4/21	Ch. 34/35	Interference, Diffraction & Polarization		
Week 15 4/25 – 4/28	Ch. 36-38	Special Relativity, Quantum Mechanics		**Exam 3:** **Thursday, 4/28**
Week 16 5/2 – 5/5	Ch. 41-44	Nuclear & Particle Physics, Astrophysics & Cosmology	**Last Class 5/5**	
Week 17 5/9 – 5/13		***Finals Week***		**Final 3:20-5:20 PM** **Thursday, 5/12**