Physics 215N: Fundamentals of Physics with Calculus I Fall, 2019

Course Information

- Instructor: Dr. David A. Macaluso
- Office: C.H. Clapp Building, room 119
- Contact: david.macaluso@umontana.edu, 243-6641 (office)
- Lectures: MTWTr, 1:00 PM – 1:50 PM, CHCB 131
- Office Hours: MTW 2-3. I am happy to help students and answer questions outside my normally scheduled office hours and I strongly encourage students to seek my assistance whenever necessary.

Course Description

This course will introduce students to the fundamental concepts of Classical Physics. We will explore Kinematics in 1-D/2-D and circular motion, Gravity, Work & Energy, Momentum, Fluids, and Oscillations & Waves. We will also concentrate on developing **problem solving skills** and **scientific critical thinking skills**.

Textbook & Materials

- **Required** text: *University Physics Volume I* available in pdf form on the Moodle site and at https://openstax.org/details/books/university-physics-volume-1
- **Suggested** supplemental text: *Fundamentals of Physics, 10th Edition* – Halliday & Resnick
- Access to TopHat for online homework
- iClicker Remote - 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.

Through the 15th instructional day, ALL classes are dropped in CyberBear. 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)

Online homework: tophat.com
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. Improved critical thinking and problem solving skills.
3. An appreciation for the rigorous nature of scientific methodology in evidence-based inquiry.
4. An improved ability to take previously learned concepts and techniques and apply them in new and unfamiliar situations.
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.

Specific Learning Outcomes

It is expected that the student will:

Kinematics

Apply knowledge of the relationships between time, displacement, distance, velocity, speed and acceleration to situations involving objects in one and two dimensions

Vectors

Perform vector analysis in one and two dimensions

Forces

Solve problems involving the force of gravity

Analyze situations involving the force due to friction

Solve problems that involve application of Newton's laws of motion in one and two dimensions

Energy

Perform calculations involving work, force, and displacement

Analyze the relationship between work, kinetic and potential energy, with reference to the law of conservation of energy

Solve problems involving power and efficiency

Linear Momentum

Apply the concept of momentum, impulse, and conservation of linear momentum in one and two dimensions

Rotation

Understand the relation between angular acceleration, rotational inertia and torque

Apply the concept of kinetic energy and work to rotation

Angular Momentum

Apply the concept of angular momentum to problems involving rotation and torque, with reference to the law of conservation of angular momentum

Equilibrium

Use knowledge of force, torque, and equilibrium to analyze various situations

Gravitation

Analyze the gravitational attraction between masses

Apply Kepler's laws and Newton's Law of Universal Gravitation to the motion of planets and satellites

Fluids

Understand the nature of compressible and incompressible fluids through a study of their density and pressure

Apply and Archimedes' Principle and Pascal's Principle to understand the forces and pressures exerted by fluids

Understand fluid flow by using the equation of continuity and Bernoulli's Principle

Oscillations and Waves

Apply the principle of Simple Harmonic Motion to the periodic motion of springs, pendulums and other oscillatory systems

Become familiarized with the nature of standing and traveling waves, and the Principle of Superposition

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 or be concurrently enrolled in the prerequisite/corequisite courses M171 or equivalent and PHSX 216N.

Reading Assignments

Students are expected to read the lecture 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 make up a large portion of your grade and 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. **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, trig and basic calculus.

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

Grading Policy

Exams (four @ 12.5% each)	**50%**
Cumulative Final Exam	**20%**
Homework	**15%**
iClicker Questions	**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

- You are **NOT** allowed to use a smartphone or any notes during the exams. You are only allowed a calculator* and something to write with (*programmable calculator lids must be stored in your bag/pack).
- The final exam will be held in the classroom, CHCB 131 (see schedule).
- **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.**
- This is a large lecture hall with approximately 75 students, so please:
  - Arrive on time as lectures begin promptly (with a "free" iClicker point).
  - Do not start packing your things early - I will (usually) not keep you late.
- Keep phones and tablets/laptops stored 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 Codes available at https://www.umt.edu/safety/policies/default.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 https://www.umt.edu/dss/.

Tentative Course Schedule (dates and topics subject to change)

Week	Chapters	Topics & Reading	Notes	PHSX 216 Lab	Exams
Week 1 8/26 – 8/30	1 2	Intro, Units, Sig Figs Vectors		Error Analysis	
Week 2 9/2 – 9/6	3	1D Kinematics	**Labor Day** *No Class Monday*	Measuring *g* & Intro to Python	
Week 3 9/9 – 9/13	4	2D & 3D Kinematics		Projectile Motion	**Exam 1 (Ch. 1-4)** **Thursday Sept 12**
Week 4 9/16 – 9/20	5	Newton's Laws		Force Tables	
Week 5 9/23 – 9/27	6	Newton's Laws		Circular Motion	
Week 6 9/30 – 10/4	7	Work & Kinetic Energy		***No Lab***	
Week 7 10/7 – 10/11	8 9	Potential Energy Linear Momentum		Collisions	**Exam 2 (Ch. 5-8)** **Thursday Oct 10**
Week 8 10/14 – 10/18	9 10	Linear Momentum Rotation		Ballistic Pendulum	
Week 9 10/21 – 10/25	10	Rotation		***No Lab***	
Week 10 10/28 – 11/1	11	Angular Momentum		Moment of Inertia	
Week 11 11/4 – 11/8	12 13	Equilibrium Gravitation		***No Lab***	**Exam 3 (Ch. 9-12)** **Thursday, 11/7**
Week 12 11/11 – 11/15	13 14	Gravitation Fluids	**Veteran's Day** *No Class Monday*	Archimedes' Principle	
Week 13 11/18 – 11/22	14 15	Fluids Oscillations		Hooke's Law	
Week 14 11/25 – 11/29	15 16	Oscillations Waves	***Thanksgiving*** *No Class W, Tr*	***No Lab***	
Week 15 12/2 – 12/6	16 17	Waves Sound	Last Day of Class: *Thursday*	Waves on a String	**Exam 4 (Ch. 13-17)** **Tuesday, 12/3**
Week 16 12/9 – 12/13	All of 'em!	Finals Week	Final Exam in CHCB 131	***No Lab***	**FINAL EXAM 12/11** **1:10 – 3:10 pm**