Course Number: 1248
Course Title: Mechanics, Work, and Energy

Instructor: Dr. Geraldine L. Cochran
Office: Physics Research Building Room 1006
Email: cochran.604@osu.edu
Office Hours: TBD

Course Description: PHYSICS 1248 is the first course in a two-course series, for students in physical sciences, mathematics, and engineering. This course covers Newton's Laws, work and energy. The physics content in relation to these topics is covered in the same depth and rigor as in PHYSICS 1250, but is about ½ of the PHYSICS 1250 content.

Note: There is a second course, PHYSICS 1249. The PHYSICS 1249 course will be the rest of the PHYSICS 1250 content. The combination of PHYSICS 1248 + PHYSICS 1249 is equivalent to PHYSICS 1250.

Pre-req / Co-req: Math 1120, 1140, 1148, 1149, 1150, or higher; or Math Placement Level M

Course Format (4 credits): This course follows a weekly cycle of in-person components and electronic homework that should be submitted anytime before the due date.

- **Tuesday (Lecture 1, 55 min):** Interactive lectures will introduce course topics and offer an opportunity test your understanding of lecture topics without penalty.
- **Wednesday (Lab, 125 min):** During labs students work together in the same assigned discussion groups as in recitation.
- **Thursday (Lecture 2, 55 min):** Interactive lecture
- **Friday (Homework 1):** Focuses on conceptual understanding, shorter (~30 minutes)
- **Sunday (Homework 2):** Focuses on problem solving, longer (~90 minutes)
- **Monday (Recitation, 55 min):** All recitations require group work (GW). Students are required to attend for credit and must submit GW assignments on Carmen.

Note: For this 4 credit hour course, out-of-class work is approximately 7 hours each week.

Note: Exams are given on Wednesday during lab times. Exam duration is 120 minutes.

Carmen Canvas carmen.osu.edu: Carmen is the Learning Management System (LMS) used at Ohio State. It is the central hub from which your course will be conducted. Course **announcements** will be made on Canvas. Course resources (e.g. practice exams) will be uploaded to Canvas. Please check Canvas **several times a week** to stay up-to-date.

Required Textbook, Homework System, and Lab Manual:

- ✔ *College Physics: Explore and Apply, 2e by Etkina, Planinsic, and Van Heuvelen.* ***You do not need to buy the entire textbook. You should purchase a modified version of the textbook that only covers mechanics. You can purchase the e-text combined with Mastering Physics access*** *from Pearson or the bookstore.* ***Mastering Physics is required for homework.***
- ✔ ***A lab manual is required.*** Please contact the Barnes & Noble bookstore on High Street. ***Students must bring the lab manual to labs that involve experiments.***
- ✔ ***A scientific calculator is required.***

Course Number: 1248

Course Title: Mechanics, Work, and Energy

To ensure you purchase access to the correct Mastering Physics textbook version and homework system, please, use Carmen Canvas to access Pearson and use the course key: MPCochranXXXXXX.

Your course grade is determined by the following:

Unit 1 Exam: 14% This is a 120-minute, closed book exam on **September 18**.

Unit 2 Exam: 14% This is a 120-minute, closed book exam on **October 30**.

Unit 3 Exam: 14% This is a 120-minute, closed book exam on **December 4.**

***Makeup exams are offered one week after the regularly scheduled exam. Exams that are not made up within two weeks will receive a grade of 0.**

Design Practicals (2): 14%. There are two experimental design practicals during the semester. This assignment is completed as a group, but each student can submit their assignment to Canvas individually or as a group. Your grade is based on the accuracy of your predictions. Your predictions are based on your conceptual knowledge of physics and your ability to problem solve. Extra credit on your Design Practical is added to your Unit Exam Grade! So, try your best!

Recitation Grade (Workshop): 14%. Your recitation grade is determined by activities you complete during the workshops. This may include participation in workshop activities, completion of worksheets, quizzes, and group practice exams.

Online Homework: 14% Online homework is due Fridays and Sundays by 11:59 pm and through Mastering Physics. LATE HOMEWORK IS PENALIZED AUTOMATICALLY THROUGH MASTERING PHYSICS. You lose 1% for each day it is late. So, you can still submit homework late and earn partial credit.

Labs: 14% Each numbered Experiment has a numbered Prelab. Prelabs are due the Sunday prior to the lab at 11:59pm. Labs should be completed in-person during lab time. Credit will not be given to labs that are not completed in-person.

Course Surveys: 2% Course presurveys are graded based on completion and not accuracy. Course surveys are administered during Lab. Pre-course surveys are held on **August 21.** Post-course surveys are held on **November 6.**

Lecture Participation – Participation in lecture as evidenced by responses to Learning Catalytics questions will be extra credit (up to 2%). The points will be tracked via Mastering Physics and Canvas throughout the semester. However, the extra credit will be finalized and added at the end of the semester. Learning Catalytics points will be administered as 0.7 for participation and 0.3 for the correct answer. So, an incorrect answer is 0.7 point. The correct answer is 1 point.

Course Number: 1248
Course Title: Mechanics, Work, and Energy

Table of Course Weights

Unit 1 Exam	14%
Unit 2 Exam	14%
Unit 3 Exam	14%
Design Practicals	14%
Workshop (Recitation)	14%
Mastering Physics Homework	14%
Labs	14%
Course Surveys	2%
Total	**100%**

Course Letter Grade Assignment: Once your overall point total (final score) has been calculated using the weighting scheme shown above, your letter grade will be assigned based on the following scale:

Total Score (%)	Letter Grade
>92	**A**
88 ≤ score <92	**A-**
84 ≤ score <88	**B+**
80 ≤ score <84	**B**
76 ≤ score <80	**B-**
72 ≤ score <76	**C+**
67 ≤ score <72	**C**
62 ≤ score <67	**C-**
56 ≤ score <62	**D+**

50 $\leq$ score $<$56	**D**
$<$50	**E**

General Education Foundations: Natural Sciences

Goals

1. Successful students will engage in theoretical and empirical study within the natural sciences while gaining an appreciation of the modern principles, theories, methods, and modes of inquiry used generally across the natural sciences.

2. Successful students will discern the relationship between the theoretical and applied sciences while appreciating the implications of scientific discoveries and the potential impacts of science and technology.

Expected Learning Outcomes:

1.1. Explain basic facts, principles, theories, and methods of modern natural sciences, and describe and analyze the process of scientific inquiry.

This course accomplishes 1.1. Students will know facts, principles, laws, and methods of modern natural sciences that govern motion and conservation laws. After completion of the associated lab for this course students will be able to describe and analyze the process of scientific inquiry.

1.2 Successful students are able to identify how key events in the development of science contribute to the ongoing and changing nature of scientific knowledge and methods.

This course accomplishes 1.2 Students will use foundational concepts and models to understand and evaluate physical concepts. They will then identify when and why these models break down for more complex situations. New scientific knowledge will then be used to refine the models to something that better suits the more complex situations.

1.3. Employ the processes of science through exploration, discovery, and collaboration to interact directly with the natural world when feasible, using appropriate tools, models, and analysis of data.

The 1- credit hour lab included in this course allows students to learn through exploration, discovery, and collaboration. Students complete a pre-lab activity that sometimes consists of conceptual questions and other times simple calculations. During the lab students work in groups of 3 or 4 to make predictions, setup experiments, collect data, analyze data, and interpret findings. The lab component is a mixture of traditional lab (follow instructions), directed observations, and design practicals (apply your knowledge to a physical, real-world situation). As an example, during the projectile motion lab students will use their conceptual understanding and problem solving skills to determine where a projectile will land when launched from a projectile launcher at a given height and angle.

2.1 Successful students are able to analyze the inter-dependence and potential impacts of scientific and technological developments.

2.2 Successful students are able to evaluate social and ethical implications of natural scientific discoveries.

2.3 Successful students are able to critically evaluate and responsibly use information from the natural sciences.

This course accomplishes 2.1 by allowing for discussion fo the application of physical laws and conceptual understanding of the way the world works to technology used today.

This course accomplishes 2.2 by allowing students the opportunity to evaluate social and ethical implications of natural scientific discoveries as introduced in lecture and via questions on lab worksheets.

This course accomplishes 2.3 by providing multiple opportunities for students to determine if multiple representations of motion are consistent and physically possible.

Additional Important Information:

ACADEMIC MISCONDUCT

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

DISABILITY SERVICES

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

RELIGIOUS ACCOMMODATIONS

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity.

Policy: Religious Holidays, Holy Days and Observances:
https://oaa.osu.edu/religious-holidays-holy-days-and-observances

MENTAL HEALTH

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can

learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Course Number: 1248
Course Title: Mechanics, Work, and Energy

Week	Day (Date)	Activity	Relevant Textbook Sections
1	Sun (8/18)		
	Mon (8/19)	**No Classes**	
	Tues (8/20)	**Lecture 1:** Introduction, Review of Syllabus, Models	
	Wed (8/21)	**Lab:** Presurveys	
	Thurs (8/22)	**Lecture 2:** Physical Quantities & Dimensional Analysis	1.1 - 1.3 (Modeling, Physical Quantities)
	Fri (8/23)	**Homework 1 Due at 11:59 pm**	1.1 - 1.3 (Modeling, Physical Quantities)
2	Sun (8/25)	**Homework 2a** Due at 11:59 pm	1.1 - 1.3 (Modeling, Physical Quantities)
	Mon (8/26)	**Recitation:** Symbols Representing Physical Quantities	1.1 - 1.3 (Modeling, Physical Quantities)
	Tues (8/27)	**Lecture 1:** Making Estimates	1.4 (Making Rough Estimates)
	Wed (8/28)	**Lab:** Exponents & Dimensional Analysis, Prefixes & Estimates	1.4 (Making Rough Estimates)
	Thurs (8/29)	**Lecture 2:** Uniform Motion	2.1 - 2.2, 2.4 (Descriptions of Motion)
	Fri (8/30)	**Homework 2b Due at 11:59 pm**	1.1 - 1.4 (Making Rough Estimates)
3	Sun (9/1)	**Homework 3a Due at 11:59 pm**	Chapter 1
	Mon (9/2)	**No Classes**	
	Tues (9/3)	**Lecture 1:** Graphical Representations of Uniform Motion	2.5 - 2.6 (Representing Motion, Constant Velocity Motion)
	Wed (9/4)	**Lab:** Fastness Index & Constant Velocity Motion Problems	2.5 - 2.6 (Representing Motion, Constant Velocity Motion)
	Thurs (9/5)	**Lecture 2:** Constant Acceleration Motion	2.7 - 2.9 (Motion at Constant Acceleration)
	Fri (9/6)	**Homework 3b Due at 11:59 pm**	2.5 - 2.9

Course Number: 1248
Course Title: Mechanics, Work, and Energy

4	Sun (9/8)	**Homework 4a & Prelab Due at 11:59 pm**	2.5 - 2.9
	Mon (9/9)	**Recitation:** Speeding up Index & Constant Acceleration Motion	2.7 - 2.9 (Motion at Constant Acceleration)
	Tues (9/10)	**Lecture 1:** Accelerated Motion & Review of Vectors	2.9 & 2.3 (Constant Acceleration & Operations with Vectors)
	Wed (9/11)	**Lab:** Experiment 1 - 1D Kinematics	Chapter 2
	Thurs (9/12)	**Lecture 2:** Review of Vectors continued	2.3 (Operations with Vectors continued)
	Fri (9/13)	**Homework 4b Due at 11:59 pm**	Chapter 2
5	Sun (9/15)	**Homework 5a Due at 11:59 pm**	Chapter 2
	Mon (9/16)	**Recitation:** Practice Exam	Chapters 1 & 2
	Tues (9/17)	**Lecture 1:** Unit 1 Review	Chapters 1 & 2
	Wed (9/18)	**Lab: Exam 1**	Chapters 1 & 2
	Thurs (9/19)	**Lecture 2:** Prep for Design Practical	Chapters 1 & 2
	Fri (9/20)	**No Homework Due: Prepare for Design Practical**	Chapters 1 & 2
6	Sun (9/22)	**No Homework Due: Prepare for Design Practical**	Chapters 1 & 2
	Mon (9/23)	**Design Practical 1: Uniform Motion**	Chapters 1 & 2
	Tues (9/24)	**Lecture 1: Exam 1 Discussion**	Chapters 1 & 2
	Wed (9/25)	**No Lab Today**	
	Thurs (9/26)	**Lecture 2: Intro to Forces (in 2D)**	3.1 - 3.4 (representing interactions, adding forces, inertial references frames)
	Fri (9/27)	**Homework 6 Due at 11:59 pm**	3.1 - 3.4 (representing interactions, adding forces, inertial references frames)

Course Number: 1248
Course Title: Mechanics, Work, and Energy

7	Sun (9/29)	**Homework 7a & Prelab Due at 11:59 pm**	3.1 - 3.4 (representing interactions, adding forces, inertial references frames)
	Mon (9/30)	**Recitation:** Tug o' War Index	3.1 - 3.4 (representing interactions, adding forces, inertial references frames)
	Tues (10/1)	**Lecture 1:** Creating Force Diagrams	3.1 (Describing, representing interactions)
	Wed (10/2)	**Lab:** Experiment II - Vectors	3.1 - 3.4 (representing interactions, adding forces, inertial references frames)
	Thurs (10/3)	**Lecture 2:** Hooke's Law & Friction	4.3 (Friction)
	Fri (10/4)	**Homework 7b Due at 11:59 pm**	Chapter 3
8	Sun (10/6)	**Homework 8a & Prelab Due at 11:59 pm**	Chapter 3
	Mon (10/7)	**Recitation:** Force Diagrams & Problem Solving w Forces	3.1 - 3.4 (representing interactions, adding forces, inertial references frames)
	Tues (10/8)	**Lecture 1:** Applying Newton's Laws Part 1	3.4 - 3.7 (Newton's 1st & 2nd Laws, Gravitational Force)
	Wed (10/9)	**Lab:** Experiment V - Static Friction	4.3 (Friction)
	Thurs (10/10)	**No Classes**	
	Fri (10/11)	**No Classes**	
9	Sun (10/13)	**No Homework Due**	
	Mon (10/14)	**PRELab Due at 11:59 pm** **Recitation:** Stickiness Index and solving problems with friction	4.3 (Friction)
	Tues (10/15)	**Lecture 1:** Applying Newton's Laws Part 2	4.1 - 4.4 (Force components and skills for analyzing forces in 2D)
	Wed (10/16)	**Lab: Experiment III - Dynamic Forces**	Chapter 4
	Thurs (10/17)	**Lecture 2:** Projectile Motion	4.5 (Projectile Motion)
	Fri (10/18)	**Homework 9 Due at 11:59 pm**	Chapter 4
10	Sun (10/20)	**Homework 10a & Prelab Due at 11:59 pm**	Chapter 4
	Mon (10/21)	**Recitation:** Projectile Motion	4.5 (Projectile Motion)
	Tues (10/22)	**Lecture 1:** Uniform Circular Motion	5.1 - 5.4 (Circular Motion)
	Wed (10/23)	**Lab:** Experiment IV - 2D Kinematics	4.5 (Projectile Motion)
	Thurs (10/24)	**Lecture 2:** Gravitation	5.5 (The Law of Universal Gravitation)
	Fri (10/25)	**Homework 10b Due at 11:59 pm**	Chapters 3 - 5

Course Number: 1248

Course Title: Mechanics, Work, and Energy

11	Sun (10/27)	**Homework 11a Due at 11:59 pm**	Chapters 3 - 5
	Mon (10/28)	**Recitation:** Uniform Circular Motion and Gravitation	5.1 - 5.5 (Uniform Circular Motion & Gravitation)
	Tues (10/29)	**Lecture 1:** Unit 2 Exam Review	Chapters 3 - 5
	Wed (10/30)	**Lab:** Unit 2 Exam	Chapters 3 - 5
	Thurs (10/31)	**Lecture 2:** Design Practical Discussion	Chapters 3 - 5
	Fri (11/1)	**No Homework Due:** Prepare for Design Practical	Chapters 3 - 5
12	Sun (11/3)	**No Homework Due:** Prepare for DP	Chapters 3 - 5
	Mon (11/4)	**Design Practical 2:** Projectile Motion	Chapters 3 - 5
	Tues (11/5)	**Lecture 1:** Exam 2 Discussion	Chapters 3 - 5
	Wed (11/6)	**Lab: Posttests (Full credit for completion)**	Chapters 1 - 5
	Thurs (11/7)	**Lecture 2:** Impulse & Momentum Part A	6.1 - 6.3 (Mass accounting, linear momentum, impulse)
	Fri (11/8)	**Homework 12 Due at 11:59 pm**	
13	Sun (11/10)	**Homework 13a & Prelab Due at 11:59 pm**	6.1 - 6.3 (Mass accounting, linear momentum, impulse)
	Mon (11/11)	**No Classes**	
	Tues (11/12)	**Lecture 1:** Impulse & Momentum Part B	6.4 - 6.5 (The generalized impulse-momentum principle)
	Wed (11/13)	**Lab:** Experiment VII - Conservation of Momentum	6.1 - 6.3 (Mass accounting, linear momentum, impulse)
	Thurs (11/14)	**Lecture 2:** Impulse & Momentum Part C	6.6 - 6.7 (Jet propulsion and collisions in 2D)
	Fri (11/15)	**Homework 13b Due at 11:59 pm**	Chapter 6
14	Sun (11/17)	**Homework 14a & Prelab Due at 11:59 pm**	Chapter 6
	Mon (11/18)	**Recitation:** Mojo Index, Rocket Boost Index, and Weightlifting Index	Chapter 6 & Intro to Chapter 7 (Work and Energy)
	Tues (11/19)	**Lecture 1:** Work & Energy Part A	7.1 - 7.2 (Work and Energy, Conservation of Energy)
	Wed (11/20)	**Lab:** Experiment VI - Conservation of Energy	Chapter 7
	Thurs (11/21)	**Lecture 2:** Work & Energy Part B	7.3 - 7.6 (Classifying Energy & Tracking Transformation)
	Fri (11/22)	**Homework 14b Due at 11:59 pm**	Chapters 6 & 7

Course Number: 1248

Course Title: Mechanics, Work, and Energy

15	Sun (11/24)	**Homework 15a Due at 11:59 pm**	Chapters 6 & 7
	Mon (11/25)	**Recitation:** Understanding Impulse, Momentum, & Collisions	Chapters 6 & 7
	Tues (11/26)	**Lecture 1:** Collisions	7.7 - 7.8 (Collisions & Power)
	Wed (11/27)	**No Classes**	
	Thurs (11/28)	**No Classes**	
	Fri (11/29)	**No Classes**	
16	Sun (12/1)	**No Homework Due**	
	Mon (12/2)	**Recitation:** Practice Exam	Chapters 6 & 7
	Tues (12/3)	**Lecture 1:** Unit 3 Exam Review	Chapters 6 & 7
	Wed (12/4)	**Lab: Unit 3 Exam (Last Day of Classes)**	Chapters 6 & 7
	Thurs (12/5)		
	Fri (12/6)	**First Day of Final Exams**	