Term Information

Effective Term	Autumn 2024

General Information

Course Bulletin Listing/Subject Area	Physics
Fiscal Unit/Academic Org	Physics - D0684
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	1248
Course Title	Mechanics, Work, and Energy
Transcript Abbreviation	Mech Work & Energy
Course Description	PHYSICS 1248 is the first course in a two-course series, for students in physical sciences, mathematics, and engineering. This course covers rotational dynamics, fluids, thermal dynamics, and vibrational motion. The physics content in relation to these topics is covered in the same depth and rigor as in PHYSICS 1250. The combination of PHYSICS 1248 + PHYSICS 1249 is equivalent to PHYSICS 1250.
Semester Credit Hours/Units	Fixed: 4

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Laboratory, Lecture, Recitation
Grade Roster Component	Recitation
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites	Math 1120, 1121, 1140, 1150 or higher OR Math Placement M
Exclusions	Not open to students with credit for 1250.
Electronically Enforced	Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	40.0801
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore

Requirement/Elective Designation

Natural Sciences

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Students shall demonstrate conceptual understanding of Newton’s Laws of motion and conservation laws.
- Students shall apply their physics understanding using their developed problem solving skills to solve practical problems involving a variety of contexts involving matter and its interactions.
- Students will also be able to create, interpret, and evaluate various representations of physical quantities including (position, velocity, acceleration, time, force, momentum, impulse, energy, work, and power).

Content Topic List

- Uniform Motion, Circular Motion, Projectile Motion, Gravitation, Newton's Laws, Work and Energy

Sought Concurrence

Yes

Attachments

- GE Foundations 1248.pdf: GE Statement

  (GEC Model Curriculum Compliance Stmt. Owner: Gramila,Thomas J)
- Course_Request_Letter_PHYSICS_1248_9.pdf: Course motivation

  (Cover Letter. Owner: Gramila,Thomas J)
- NMS Feedback Response.docx.pdf: Improvements Response

  (Academic Program Revision Stmt. Owner: Gramila,Thomas J)
- Concurrance_request_November.pdf: Concurrence email listing

  (Concurrence. Owner: Gramila,Thomas J)
- 1248 Syllabus_rev_3.pdf: Syllabus

  (Syllabus. Owner: Gramila,Thomas J)
- Revisions_Apr.pdf: Revisions description

  (Academic Program Revision Stmt. Owner: Gramila,Thomas J)

Comments

- Please see Subcommittee feedback email sent 4/15/24. *(by Neff,Jennifer on 04/15/2024 09:33 AM)*
- Changes to syllabus made as requested. Changes and additional info in "NMS Feedback Response" -- Thanks!

  PS - Concurrence request made by email and then in person last November *(by Gramila,Thomas J on 03/01/2024 08:09 PM)*
- Revisions still need to be made. *(by Humanic,Thomas John on 02/29/2024 10:31 AM)*
- Let's discuss this proposed series in January. There are some things that are confusing. *(by Vankeerbergen,Bernadette Chantal on 12/22/2023 12:05 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Gramila,Thomas J	12/09/2023 07:16 PM	Submitted for Approval
Approved	Humanic,Thomas John	12/10/2023 08:14 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	12/22/2023 11:38 AM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	12/22/2023 12:05 PM	ASCCAO Approval
Submitted	Gramila,Thomas J	01/24/2024 12:39 PM	Submitted for Approval
Approved	Humanic,Thomas John	01/24/2024 03:08 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	01/24/2024 03:46 PM	College Approval
Revision Requested	Neff,Jennifer	02/13/2024 10:24 AM	ASCCAO Approval
Submitted	Humanic,Thomas John	02/13/2024 02:57 PM	Submitted for Approval
Revision Requested	Humanic,Thomas John	02/29/2024 10:31 AM	Unit Approval
Submitted	Gramila,Thomas J	03/01/2024 08:09 PM	Submitted for Approval
Approved	Humanic,Thomas John	03/13/2024 11:59 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	03/28/2024 01:21 PM	College Approval
Revision Requested	Neff,Jennifer	04/15/2024 09:33 AM	ASCCAO Approval
Submitted	Gramila,Thomas J	04/17/2024 05:56 PM	Submitted for Approval
Approved	Humanic,Thomas John	04/17/2024 06:30 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	04/18/2024 08:14 AM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	04/18/2024 08:14 AM	ASCCAO Approval

Dear Committee Members,

We include in this resubmissions changes to address the one contingency and three recommendations cited in the most recent communication. All of these are addressed in the updated syllabus. This includes the inclusion of the required text on religious accommodation, a correction regarding the math prerequisites, (really appreciate that careful consideration and guidance!!), the outside of class work expectations, and finally, we note that the technology required in the course is mentioned in the syllabus, which is just access to Carmen and a scientific calculator.

Thanks for the help!

Tom Gramila and Geraldine Cochran
Physics Department

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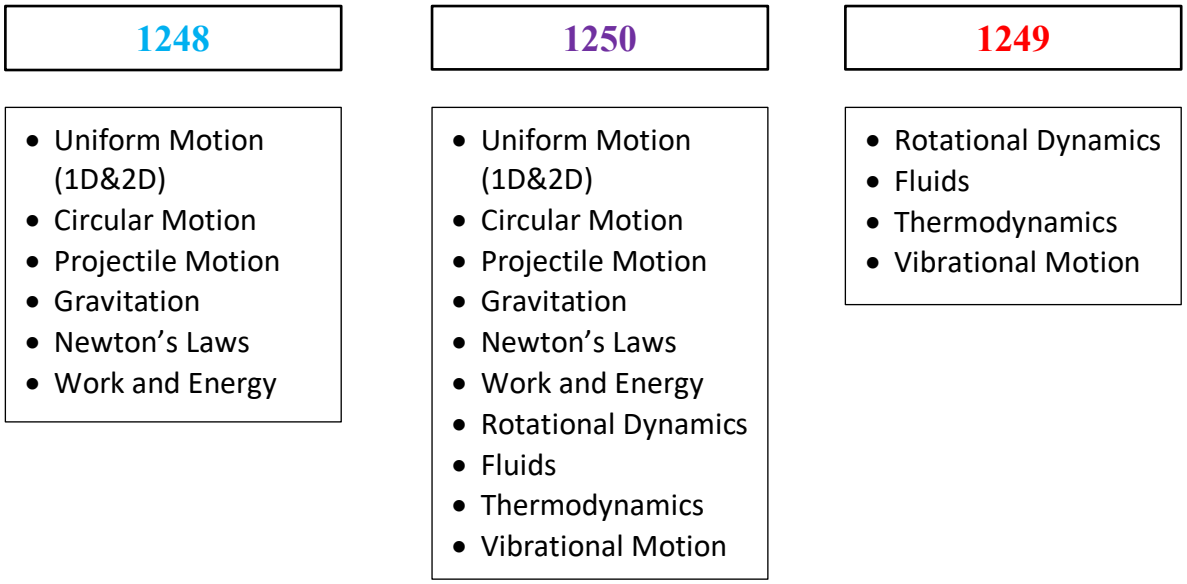
November 14, 2023

Dear Arts & Sciences Curriculum Committees,

I propose two new introductory physics courses, PHYSICS 1248 (Mechanics, Work, and Energy) and PHYSICS 1249 (Rotational Dynamics, Thermal Physics, and Vibrational Motion), as a new pathway for students who cannot immediately enroll into PHYSICS 1250 (Mechanics, Work and Energy, Thermal Physics) due to math placement and would potentially benefit from a reduced pace. The 1248 and 1249 courses combined would be equivalent in content to PHYSICS 1250 but would not require mastery or readiness for calculus. Students successful in this two-semester sequence (and 1251 math prerequisites) would subsequently be ready to take PHYSICS 1251 (E&M, Waves, Optics, Modern Physics). **Figure 1** lists the topics of the existing PHYSICS 1250 course and the proposed PHYSICS 1248 and 1249 courses.



The model for this course is based on a successful model (two-semester mechanics course) at Rutgers University (Extended Analytical Physics 1a and 1b, EAP). This course was transformed and taught by Suzanne White Brahmia who found it to be successful in supporting women and Black and Latinx students (referred to as Underrepresented Minorities) in terms of course completion and persistence. **Table 1** below (from White Brahmia, 2008) shows the passing rate for first-year physics students before and after the implementation of the EAP sequence.

Table 1. Passing rate of first-year physics, API and EAP I combined.

	All	Women	Underrepresented Minorities
Before ('85 & '85)	$64\% \pm 1\%$	$55\% \pm 2\%$	$28\% \pm 1\%$
After ('92 & '93)	$76\% \pm 2\%$	$76\% \pm 3\%$	$59\% \pm 1\%$
Current ('07 & '08)	$73\% \pm 1\%$	$71\% \pm 1\%$	$64\% \pm 1\%$

Table 2 (from White Brahmia, 2008) shows the completion of STEM degrees at Rutgers University within six years. Note the change in the percentage of students from minoritized ethnic/racial groups who completed their STEM degrees within six years after the implementation of this course.

Table 2. Completion of STEM degree at Rutgers University within six years.

	All	Women	Underrepresented Minorities
Before ('85 & '85)	$45\% \pm 3\%$	$32\% \pm 4\%$	$8\% \pm 4\%$
After ('92 & '93)	$57\% \pm 3\%$	$59\% \pm 4\%$	$53\% \pm 4\%$
Current ('07 & '08)	$68\% \pm 2\%$	$70\% \pm 3\%$	$58\% \pm 3\%$

I taught this two-semester sequence at Rutgers University Fall 2017 - Spring 2023. **Table 3** below provides the performance for students in Analytical Physics 2a (Electricity and Magnetism) who took EAP with me and students who took AP (the traditional calculus-based sequence) in 2017 and 2018.

Table 3. Performance in Physics 2a	**EAP students' grades of C or better**	**EAP students' grades of D, F, or Withdrew**	**AP students' grades of C or better**	**AP student grades of D, F, or Withdrew**
Fall 2017	79% $(n = 27)$	21% $(n = 7)$	89% $(n = 505)$	11% $(n = 64)$
Fall 2018	85% $(n = 40)$	15% $(n = 7)$	94% $(n = 580)$	6% $(n = 35)$

Despite taking the EAP course prior to taking or passing calculus, students in EAP performed on par with students who took calculus with the majority of these students passing Physics 2a. While I did not publish findings on the effectiveness of this course, a t-test revealed that one cohort of students who took the extended two-semester sequence with me performed no differently in the Electricity and Magnetism course than their calculus-ready peers who took the traditional sequence.

The purpose of the proposed two-semester course is to provide an alternative pathway to accepted OSU students interested in physics and engineering that allows them to take physics their first year, likely shortening their time to degree.

A similar letter was sent to Dr. David Tomasko, Associate Dean for Undergraduate Education and Students Services in the College of Engineering.

Sincerely and respectfully,

Geraldine L. Cochran, PhD.
Associate Professor

Department of Physics
The Ohio State University
Cochran.604@osu.edu

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, 1121, 1140, 1150 or higher OR Math Placement 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**	

GE Rationale: Foundations: Natural Science (4 credits)

Requesting a GE category for a course implies that the course fulfills all expected learning outcomes (ELOs) of that GE category. To help the reviewing panel evaluate the appropriateness of your course for the Foundations: Natural Sciences, please answer the following questions for each ELO.

A. Foundations

Please explain in 50-500 words why or how this course is introductory or foundational in the study of Natural Science.

This course is an introduction to ways of understanding, explaining, and describing physical phenomenon with a focus on motion and laws of conservation. Students will get an introduction to the laws that govern motion, various ways of representing motion (verbal descriptions, mathematical equations, data tables, and kinematics graphs). Students will be introduced to conservations laws such as conservation of mass, conservation of energy, and conservation of momentum. Students will learn to represent transfers of conserved physics quanities through verbal descriptions, mathematical equations, and bar charts. (85 words)

B. Specific Goals for Natural Sciences

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

Expected Learning Outcome 1.1: Successful students are able to explain basic facts, principles, theories and methods of modern natural sciences; describe and analyze the process of scientific inquiry.

This course will utilize two research-supported, inquiry-based approaches to learning science concepts: the Investigative Science Learning Environment (ISLE) and Modeling Instruction in Physics (MI-P). Materials developed for these two approaches will be utilized in recitations and labs. The lectures follow an ISLE approach. Students will thus describe and analyze the process of scientific inquiry. Students will be able to explain basic facts, principles, and laws governing physical phenomena in relation to motion, work and energy, and impulse and momentum.

Expected Learning Outcome 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.

In the course we explain how foundational concepts and the models we utilize are refined to account for more complex situations. This follows the way that scientific understanding and knowledge is continually refined to account for new observations of physical phenomenon. As one example, students start with a model of uniform motion in a straight line. We then illustrate through activities that this model breaks down when an object is no longer moving as a straight line or when the motion is not uniform. We build on this

initial model to created models for accelerated (non uniform) motion, uniform circular motion, and projectile motion.

Expected Learning Outcome 1.3: Successful students are able to 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.

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

In this course we discuss the application of physical laws and conceptual understanding of the way the world works in connection to technology used today. As a part of these discussions, we also consider the implications of that technology on people and the planet. As an example, when we cover impulsive forces and collisions we discuss the invention of seatbelts and airbags. We also talk about the future of car safety equipment given the recent use of self-driving vehicles.

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

Building on what was written for GE 2.1, students are given the opportunity to evaluate social and ethical implications of natural scientific discoveries through lecture discussions and recitation activities. In lecture, these specific opportunities for evaluation are connected to lecture problems with contexts that connect to technology and scientific discoveries. Students are required to solve the problem, but also answer qualitative questions connected to the topic. In recitation this is built into the qualitative discussion questions, which replace the traditional conceptual questions or quantitative problem solving.

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

After completion of the associated labs and coursework students will be able to critically evaluate scientific information pertaining to physical laws and understand the limitations of those laws. Students will also be able to responsibly use the knowledge gained in the course to explain physical phenomena. For example, students will be able to evaluate information related to motion from various forms of

representation. They will be able to determine if multiple representations of motion are consistent and/or possible.

Students will also be able to evaluate the possibility of phenomena occurring using the laws of conservation. They will be able to differentiate between a physical quantity being constant within a system and conserved within nature. They will also learn how to track physical quantities to determine if there is a violation of a conservation law using both mathematical representation and visual representation via bar charts.

Fw: Introductions

Cochran, Geraldine <cochran.604@osu.edu>
Wed 2/28/2024 5:28 PM
To:Gramila, Thomas <gramila.1@osu.edu>

3 attachments (834 KB)
1250a Syllabus (1).pdf; 1250b Syllabus.pdf; Course_Request_Letter.pdf;

FYI

gC

Geraldine L. Cochran, Ph.D.
(she/her/hers)

Associate Professor
Department of Physics
The Ohio State University

PEARL - The Cochran Research Group

From: Cochran, Geraldine <cochran.604@osu.edu>
Sent: Thursday, November 16, 2023 1:50 PM
To: Grzybowski, Deborah <grzybowski.3@osu.edu>; Tomasko, David <tomasko.1@osu.edu>; Sampson, Winnie <sampson.38@osu.edu>; Barclay, Lisa <barclay.4@osu.edu>
Subject: Re: Introductions

Hi Deb,

I have attached a draft of both syllabi and an updated course requester letter. I listed on the syllabus for the1250a course the math requirement would be Math Placement Level, M (pre-calc), N (college algebra), or R (intermediate algebra). This is similar to the requirement for the course that I am basing the proposed 1250a on. For that course, students were required to place into pre-calculus and could also enroll if placed into college algebra with special permission.

Best,

gC

Geraldine L. Cochran, Ph.D.
(she/her/hers)

Associate Professor
Department of Physics
The Ohio State University

PEARL - The Cochran Research Group

From: Grzybowski, Deborah <grzybowski.3@osu.edu>
Sent: Thursday, November 16, 2023 11:47 AM
To: Cochran, Geraldine <cochran.604@osu.edu>; Tomasko, David <tomasko.1@osu.edu>; Sampson, Winnie <sampson.38@osu.edu>; Barclay, Lisa <barclay.4@osu.edu>
Subject: RE: Introductions

Geraldine,

Thank you so much for sending over the information. My big question is exactly what level of math prep do students need to be able to enter your 1250a sequence? I am cc'ing Asst Dean Lisa Barclay on this because she data on the learning opportunity that our current and future engineering students have regarding math placement.

Warmly,
Deb

From: Cochran, Geraldine <cochran.604@osu.edu>
Sent: Tuesday, November 14, 2023 2:58 PM
To: Tomasko, David <tomasko.1@osu.edu>; Sampson, Winnie <sampson.38@osu.edu>; Grzybowski, Deborah <grzybowski.3@osu.edu>
Subject: Re: Introductions

Hi All,

I've been in back-to-back meetings and finally had one that ended 5 minutes early. Attached is my draft request letter and a draft syllabus for 1250a.

Best,

gC

Geraldine L. Cochran, Ph.D.
(she/her/hers)

Associate Professor
Department of Physics
The Ohio State University

PEARL - The Cochran Research Group

From: Cochran, Geraldine <cochran.604@osu.edu>
Sent: Tuesday, November 14, 2023 10:30 AM
To: Tomasko, David <tomasko.1@osu.edu>; Sampson, Winnie <sampson.38@osu.edu>; Grzybowski, Deborah <grzybowski.3@osu.edu>
Subject: Re: Introductions

Sure! That works for me.

gC

Geraldine L. Cochran, Ph.D.
(she/her/hers)

Associate Professor
Department of Physics
The Ohio State University

PEARL - The Cochran Research Group

From: Tomasko, David <tomasko.1@osu.edu>
Sent: Tuesday, November 14, 2023 10:29 AM
To: Cochran, Geraldine <cochran.604@osu.edu>; Sampson, Winnie <sampson.38@osu.edu>; Grzybowski, Deborah <grzybowski.3@osu.edu>
Subject: Re: Introductions

No problem, it was a late request. How about you send us the documentation and we can create a plan quickly at 4pm. I'll just bug out when we're done.

Thanks,
David

David L. Tomasko
Associate Dean for Academic Programs & Student Services
Professor of Chemical & Biomolecular Engineering
The Ohio State University
If you have a zoom meeting scheduled with me: https://osu.zoom.us/my/davidtomasko

Executive Assistant: Winnie Sampson
sampson.38@osu.edu
614-688-4602

If one accepts that without deeply understanding and being a part of society then one cannot develop meaningful solutions to the problems it presents, then current demographic trends in engineering are an actual threat to the profession.

From: Cochran, Geraldine <cochran.604@osu.edu>
Sent: Tuesday, November 14, 2023 10:22 AM
To: Tomasko, David <tomasko.1@osu.edu>; Sampson, Winnie <sampson.38@osu.edu>; Grzybowski, Deborah <grzybowski.3@osu.edu>
Subject: Re: Introductions

I have another meeting at 3:30pm.

I understand from Tom Gramila that I should send you a copy of the syllabi and the letter explaining the courses. If it would be more helpful to work on this asynchronously, via email I can do that as well. Please, let me know what you prefer.

Best,

gC

Geraldine L. Cochran, Ph.D.
(she/her/hers)

Associate Professor
Department of Physics

The Ohio State University

PEARL - The Cochran Research Group

From: Tomasko, David <tomasko.1@osu.edu>
Sent: Tuesday, November 14, 2023 10:19 AM
To: Sampson, Winnie <sampson.38@osu.edu>; Cochran, Geraldine <cochran.604@osu.edu>; Grzybowski, Deborah <grzybowski.3@osu.edu>
Subject: Re: Introductions

All,
Is there any chance we could do this mtg at 3:30 instead of 4pm? I've have something come up at 4 that I would like to attend if possible.
David

David L. Tomasko
Associate Dean for Academic Programs & Student Services
Professor of Chemical & Biomolecular Engineering
The Ohio State University
If you have a zoom meeting scheduled with me: https://osu.zoom.us/my/davidtomasko

Executive Assistant: Winnie Sampson
sampson.38@osu.edu
614-688-4602

If one accepts that without deeply understanding and being a part of society then one cannot develop meaningful solutions to the problems it presents, then current demographic trends in engineering are an actual threat to the profession.

From: Sampson, Winnie
Sent: Friday, October 6, 2023 1:01 PM
To: Sampson, Winnie <sampson.38@osu.edu>; Cochran, Geraldine <cochran.604@osu.edu>; Grzybowski, Deborah <grzybowski.3@osu.edu>; Tomasko, David <tomasko.1@osu.edu>
Subject: Introductions
When: Tuesday, November 14, 2023 4:00 PM-4:30 PM.
Where: Microsoft Teams Meeting

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