Course Number: 1249
Course Title: Rotational Dynamics, Thermal Physics, and Vibrational Motion

Instructor: Dr. Geraldine L. Cochran
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Office Hours: TBD

Course Description: PHYSICS 1249 is the second 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, but is about ½ of the PHYSICS 1250 content.

Note: The first course in this sequence is PHYSICS 1248. The combination of PHYSICS 1248 + PHYSICS 1249 is equivalent to PHYSICS 1250.

Pre-req / Co-req: Math 1121, 1140, 1141, 1149, 1150, or above

Pre-req: Physics 1248 is required

Course Format (3 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)
- **Monday (Homework 2):** Focuses on problem solving, longer (~90 minutes)

Note: Exams are given on Wednesday during lab times. Exam duration is 120 minutes.
Note: For this 3 credit hour course, out-of-class work is approximately 5 hours each week.

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.***

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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: 20% This is a 120-minute, closed book exam on **February 5**.

Unit 2 Exam: 20% This is a 120-minute, closed book exam on **March 5**.

Unit 3 Exam: 20% This is a 120-minute, closed book exam on **April 10.**

***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.**

Online Homework: 20% Online homework is due Fridays and Mondays* 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. On **Sunday January 19**, homework will be due on Sunday at 11:59 pm. This will be a shorter (~30 minutes) homework assignment.

Labs: 20% 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. The surveys are counted as extra credit toward your overall grade. Pre-course surveys are held on **January 8.** Post-course surveys are held on **April 16.**

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.

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Table of Course Weights

Unit 1 Exam	20%
Unit 2 Exam	20%
Unit 3 Exam	20%
Mastering Physics Homework	20%
Labs	20%
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 $\leq$ **score** $<$**92**	**A-**
84 $\leq$ **score** $<$**88**	**B+**
80 $\leq$ **score** $<$**84**	**B**
76 $\leq$ **score** $<$**80**	**B-**
72 $\leq$ **score** $<$**76**	**C+**
67 $\leq$ **score** $<$**72**	**C**
62 $\leq$ **score** $<$**67**	**C-**
56 $\leq$ **score** $<$**62**	**D+**
50 $\leq$ **score** $<$**56**	**D**
$<$**50**	**E**

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.

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Week	Day (Date)	Activity	Relevant Textbook Sections
1	Sun (1/5)		
	Mon (1/6)		
	Tues (1/7)	**Lecture 1:** Introduction and Review	
	Wed (1/8)	**Lab:** 1248a Review & Pre-surveys	
	Thurs (1/9)	**Lecture 2:** Torque	8.1 - 8.2 Extended Bodies at Rest and Torque
	Fri (1/10)	**Homework 1 Due at 11:59 pm**	8.1 - 8.2 Extended Bodies at Rest and Torque
2	Sun (1/12)		
	Mon (1/13)	**Homework 2a Due at 11:59 pm**	8.1 - 8.2 Extended Bodies at Rest and Torque
	Tues (1/14)	**Lecture 1:** Static Equilibrium & Center of Mass	8.3 - 8.4 Conditions of Equilibrium; Center of Mass
	Wed (1/15)	**Lab:** Calculating Center of Mass and Understanding Static Equilibrium	8.3 - 8.4 Conditions of Equilibrium; Center of Mass
	Thurs (1/16)	**Lecture 2:** Equilibrium continued	8.3 - 8.4 Conditions of Equilibrium; Center of Mass
	Fri (1/17)	**Homework 2b Due at 11:59 pm**	Chapter 8
3	Sun (1/19)	**Homework 3a Due at 11:59 pm**	Chapter 8
	Mon (1/20)	**No Classes**	
	Tues (1/21)	**Lecture 1:** Rotational Kinematics	9.1 Rotational Kinematics
	Wed (1/22)	**Lab:** Rotational Kinematics & Dynamics	9.1 - 9.2 Physical Quantities Affecting Rotational Acceleration
	Thurs (1/23)	**Lecture 2:** Newton's Laws for Rotational Motion	9.3 Newton's Second Law for Rotational Motion
	Fri (1/24)	**Homework 3b Due at 11:59 pm**	9.1 - 9.3

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4	Sun (1/26)	**Prelab Due at 11:59 pm**	9.1 - 9.3
	Mon (1/27)	**Homework 4a Due at 11:59 pm**	9.1 - 9.3
	Tues (1/28)	**Lecture 1:** Rotational Momentum and Energy	9.4 - 9.5 Rotational Momentum and Rotational Kinetic Energy
	Wed (1/29)	**Lab:** Experiment IX - Rotational Dynamics	Chapter 9
	Thurs (1/30)	**Lecture 2:** Unit 1 Exam Review Part A	Chapter 8 & 9
	Fri (1/31)	**Homework 4b Due at 11:59 pm**	Chapter 8 & 9
5	Sun (2/2)		
	Mon (2/3)	**Homework 5a Due at 11:59 pm**	Chapter 8 & 9
	Tues (2/4)	**Lecture 1:** Unit 1 Exam Review Part B	Chapter 8 & 9
	Wed (2/5)	**Lab: Exam 1**	Chapter 8 & 9
	Thurs (2/6)	**Lecture 2:** Gases	12.1 - 12.2 Structure of Matter
	Fri (2/7)	**No Homework Due:**	
6	Sun (2/9)		
	Mon (2/10)	**Homework 6a Due**	12.1 - 12.2 Structure of Matter
	Tues (2/11)	**Lecture 1: Exam 1 Discussion & Gases continued**	12.3 - 12.6 Quantitative Analysis of Ideal Gas
	Wed (2/12)	**Lab:** Experiment XII: A **-** Ideal Gas	Chapter 12
	Thurs (2/13)	**Lecture 2:** Static Fluids	13.1 - 13.2 Density, pressure in fluids
	Fri (2/14)	**Homework 6b Due at 11:59 pm**	
7	Sun (2/16)	**Prelab Due at 11:59 pm**	
	Mon (2/17)	**Homework 7a Due at 11:59 pm**	

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	Tues (2/18)	**Lecture 1:** Static Fluids Continued	13.3 - 13.5 Pressure Variation w Depth, Buoyancy
	Wed (2/19)	**Lab:** Experiment XI - Fluids	Chapter 13
	Thurs (2/20)	**Lecture 2:** Fluids in Motion	14.1 - 14.2 Flow rate and Fluid Speed
	Fri (2/21)	**Homework 7b Due at 11:59 pm**	14.1 - 14.2
8	Sun (2/23)		
	Mon (2/24)	**Homework 8a Due at 11:59 pm**	Chapter 13 & 14.1 - 14.2
	Tues (2/25)	**Lecture 1:** Fluids in Motion Continued	14.4 - 14.5 Bernoulli's Equation
	Wed (2/26)	**Lab:** Fluids in Motion	Chapter 14
	Thurs (2/27)	**Lecture 2: Unit 2 Exam Review Part 1**	Chapters 13 & 14
	Fri (2/28)	**Homework 8b Due at 11:59 pm**	Chapters 13 & 14
9	Sun (3/2)		
	Mon (3/3)	**Homework Due at 11:59 pm**	Chapters 13 & 14
	Tues (3/4)	**Lecture 1: Unit 2 Exam Review Part 2**	Chapters 13 & 14
	Wed (3/5)	**Unit 2 Exam**	Chapters 13 & 14
	Thurs (3/6)	**No Physics Lecture Today**	
	Fri (3/7)	**No Homework Due**	
10	Sun (3/9)	**No Homework Due**	
	Mon (3/10)	**No Classes - Spring Break**	
	Tues (3/11)	**No Classes - Spring Break**	
	Wed (3/12)	**No Classes - Spring Break**	
	Thurs (3/13)	**No Classes - Spring Break**	
	Fri (3/14)	**No Classes - Spring Break**	
11	Sun (3/16)		
	Mon (3/17)	**No Homework Due**	
	Tues (3/18)	**Lecture 1:** Exam 2 Discussion & Thermodynamic Processes	15.1 - 15.2 Internal Energy & Energy Changes
	Wed (3/19)	**Lab:** Thermodynamic Processes	
	Thurs (3/20)	**Lecture 2:** 1st Law of Thermodynamics Part 1	15.3 - 15.4 1st Law of Thermodynamics
	Fri (3/21)	**Homework 11 Due at 11:59 pm**	15.1 - 15.4

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12	Sun (3/23)	**Prelab Due at 11:59 pm**	15.5 Specific Heat
	Mon (3/24)	**Homework 12a Due at 11:59 pm**	15.1 - 15.4
	Tues (3/25)	**Lecture 1:** 1st Law of Thermodynamics Part 2	15.5 - 15.7 Phase Change
	Wed (3/26)	**Lab:** Experiment XII:A - Specific Heat	15.5 Specific Heat
	Thurs (3/27)	**Lecture 2:** 2nd Law of Thermodynamics Part 1	16.1 Irreversible Processes
	Fri (3/28)	**Homework 12b Due at 11:59 pm**	16.1 Irreversible Processes
13	Sun (3/30)		
	Mon (3/31)	**Homework 13a Due**	Chapter 15 and 16.1
	Tues (4/1)	**Lecture 1:** 2nd Law of Thermodynamics Part 2	16.1 - 16.3 Entropy
	Wed (4/2)	**Lab:** Heating and the Microscopic Model	16.1 - 16.3 Entropy
	Thurs (4/3)	**Lecture 2:** Heat Engines and Pumps Part 1	16.4 Engines & Pumps
	Fri (4/4)	**Homework 13b Due at 11:59 pm**	Chapter 16
14	Sun (4/6)	**Prelab Due at 11:59 pm**	16.4 Engines & Pumps
	Mon (4/7)	**Homework 14a Due at 11:59 pm**	Chapter 16
	Tues (4/8)	**Lecture 1:** Heat Engines and Pumps Part 2	16.4 Engines & Pumps
	Wed (4/9)	**Lab:** Experiment XII: C - Heat Engines	16.4 Engines & Pumps
	Thurs (4/10)	**Lecture 2:** Unit 3 Exam Review Part 1	Chapters 15 & 16
	Fri (4/11)	**Homework 14b Due at 11:59 pm**	Chapters 15 & 16
15	Sun (4/13)		
	Mon (4/14)	**Homework 15a Due at 11:59 pm**	Chapters 15 & 16
	Tues (4/15)	**Lecture 1:** Unit 3 Exam Review Part 2	Chapters 15 & 16
	Wed (4/16)	**Lab:** Unit 3 Exam	Chapters 15 & 16
	Thurs (4/17)	**Lecture 2:** Vibrational Motion & Mechanical Waves	Chapter 10
	Fri (4/18)	**Homework 15b Due at 11:59 pm**	Chapter 10
16	Sun (4/20)		
	Mon (4/21)	**(Last Day of Classes)**	
	Tues (4/22)		
	Wed (4/23)	**First Day of Final Exams**	
	Thurs (4/24)		
	Fri (4/25)		

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