Fall 2024

# PHYS 111 - All: Physics I Lecture

Physics Department

NJIT New Jersey Institute of Technology

**Jordan Hu College of Science and Liberal Arts**

# Department of Physics

**Course Outline** **Physics 111** **Fall 2024**

## General Information

- Description: Physics 111 is a calculus-based introduction to Mechanics, emphasizing fundamental concepts and applications. It is the first course in a three-course sequence. It includes motion in one and two dimensions, Newton's laws of motion and their applications, work and energy, linear momentum and collisions, rotational motion, and principles of conservation.
- Number of Credits: 3
- Corequisite: Math 111, Phys 111A.

**Note:** The Laboratory Course, PHYS 111A, must be taken concurrently with PHYS 111. The student must register for both the LECT/REC and the Lab Course. Withdrawal from either Course will cause a simultaneous withdrawal from both courses. Otherwise, the Lab course is run separately from the Lect/Rec course – **see** https://centers.njit.edu/introphysics/welcome/.

## Course-Section and Instructors:

| Course-Section | Instructor |
|---|---|
| Phys 111-001 | Professor S. Kane |
| Phys 111-003 | Professor S. Kane |
| Phys 111-005 | Professor M. Cooper |
| Phys 111-007 | Professor M. Cooper |
| Phys 111-009 | Professor H. Hijazi |
| Phys 111-011 | Professor H. Hijazi |
| Phys 111-013 | Professor M. Cooper |
| Phys 111-015 | Professor M. Cooper |



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|---|---|
| Phys 111-017 | Professor Ch. Zhou |
| Phys 111-019 | Professor Ch. Zhou |
| Phys 111-021 | Professor H. Hijazi |
| Phys 111-023 | Professor H. Hijazi |
| Phys 111-025 | Professor E. Vataj |
| Phys 111-027 | Professor R. Levy |
| Phys 111-029 | Professor R. Levy |
| Phys 111-031 | Professor O. Gokce |
| Phys 111-033 | Professor O. Gokce |
| Phys 111-035 | Professor E. Vataj |
| Phys 111-037 | Professor L. Maljian |
| Phys 111-101 | Professor O. Gokce |
| Phys 111-103 | Professor J. Yang |
| Phys 111-105 | Professor S. Piatek |
| Phys 111-107 | Professor O. Gokce |
| Phys 111-109 | Professor S. Piatek |
| Phys Honors 01/03 | Professor Shneidman |

**Office Hours for All Physics 111 Instructors**: https://physics.njit.edu/students/office

**Learning outcomes:** For this course, which is the first of the introductory Physics series, you can expect to be assessed on the following learning outcomes:

1. Manipulate vectors in components form and as magnitude/direction. Perform vector operations such as addition, subtraction, scalar, and cross products.
2. Recall the definitions and relationships involving position, velocity, speed, acceleration.
3. Apply the equations governing 1-D constant acceleration to mechanical systems for various initial conditions.

4. Apply the equations governing 2-D constant acceleration to mechanical systems for various initial conditions.
5. Comprehend the meaning of the equations governing net force and acceleration (Newton's Laws) for linear motion, and be able to manipulate them in conjunction with a free-body diagram to obtain any desired quantitative relationship.
6. Understand the extension of free-body diagrams and Newton's laws to rotational motion.
7. Understand the extension of free-body diagrams and Newton's laws to frictional forces.
8. Comprehend the definitions and application of work, energy, and conservation of energy principles to solving mechanical and non-conservative systems.
9. Comprehend the meaning of equations governing momentum, impulse, and collisions. Apply the equations governing momentum, impulse, and collisions mechanical systems for various initial conditions. Understand under what conditions momentum is conserved and how to use this relation to calculate unknown quantities based on physical relationships, initial conditions, and known quantities.
10. Define and calculate the center of mass of a system as well as the moment of inertia.
11. Extend the concepts and equations of 1-D constant acceleration to rotational motion for various initial conditions.
12. Understand the extension of linear motion equations to rotational motion. Comprehend the meaning of the equations governing rotational motion and acceleration, and be able to manipulate them in conjunction with a free-body diagram to obtain any desired quantitative relationship.
13. Understand the extension of work, energy, and conservation of energy principles to rotational motion.
14. Recall the definitions of angular momentum. Apply this concept to conservation of angular momentum.
15. Apply concepts of Newton's Laws to equilibrium of linear and rotational motion.
16. Understand the extension of conservation of energy and mass equations to fluid dynamics.
17. Understand the extension of Newton's Laws and energy concepts to gravitation.

## Course material

Access to electronic version of the textbook and online homework can be obtained through purchasing of: **Mastering Physics with Pearson eText -- Standalone Access Card -- for University Physics with Modern Physics (by Young & Freedman), 15th edition, ISBN: 9780135206348**. Note: only the card for the 15th edition will allow you the access eText and homework; similarly, you must login through **Pearsonmastering.com** (other addresses, even from the same publisher, can bring you to the wrong course). However, if you would also like a hardcopy version of the textbook, you can use any recent edition of the Young & Freedman's text. We use Chapters 1 to 13 which sometimes you can get separately from the rest.

Homework assignments will be posted on-line. Students login, download and solve the assigned problems, and submit answers to the automated grading system.

For your own reference, record your login ID and password. Instructors cannot access forgotten logins or passwords.

Specific Information for the enrollment in Pearson Mastering (PM) homework system is given in the pdf "Student Registration Instructions for Canvas" posted on Canvas course.

- **Verify Enrollment Duration: During the registration process, double-check the duration of your enrollment to ensure that it covers the entire duration of the semester.**

NJIT Canvas System: lecture notes, problems, grades, etc. are posted on Canvas (PHYS 111 _____). So, check there often.

**Attendance** will be taken at all classes and exams. More than 3 unexcused absences (in total) is excessive. If you have excusable absences contact your instructor or the Dean of Students (973.596.3466, Room 255 Campus Center). Students may sign in only for themselves on attendance sheets; do not sign in for absent students.
Attendance sheets are the official university documents; signing the attendance sheet on behalf of another student is considered as "Misuse of Documents". No student shall intentionally furnish false information nor shall a student forge, alter, destruct, or misuse any university documents or data.

**Withdrawal**: If you must withdraw from the course, do it officially through the Registrar before the last withdrawal date. If you simply stop attending and taking exams your instructor will have to assign a failing grade in the course.

**Help:** Visit or email your instructors if you are having trouble with the course; do not simply hope for a miracle and fall further behind. The Physics Dept. office on the 4th floor of Tiernan has specific information on tutoring. Physics tutoring is available through the CAPE organization, and possibly elsewhere.

**Grading:** Your final letter grade in Phys 111 will be based on a composite score for term's work that includes the common exam scores, the final exam, lecture/recitation quizzes, and the homework score.

***Final Letter Grades***: Here are the approximate weights to be used for calculating the composite score:

- **48%** for all three common exams (16% each)
- **32%** for the final exam
- **10%** for the total of homework work
- **10%** for the **IN-CLASS** quizzes (during lecture or recitation period, be prepared to have canvas app on phone, iPad or laptop. Note: Quizzes taken remotely will be disregarded and counted against you).

The cutoff percentages for various letter grades will be:

| Percentage | Letter Grade |
|---|---|
| > 85% | A |
| 85 - 80 | B+ |
| 80 – 70 | B |
| 70 - 65 | C+ |
| 65 - 55 | C |
| 55 - 50 | D |
| < 50 | F |

Final grades are not negotiable: A score of 84.99% is a B+, not an A.

## Exams

There will be three Common Exams plus a comprehensive Final Exam. The schedule is:

• **Common Exam 1**: Monday, October 07, 2024; 4:15 -- 5:45 PM
• **Common Exam 2**: Monday, November 04, 2024; 4:15 -- 5:45 PM
• **Common Exam 3**: Monday, November 25, 2024; 4:15 -- 5:45 PM

- **Comprehensive Final Exam** TBA, 2.5 hours long

The final exam will emphasize the work covered after common exam 3, but also re-caps the whole course.
**Note:** Common Exams and Final Exam are all going to be Multiple-Choice questions. Students are going to submit exam questions and scantron cards to be collected at the end of each exam. There is not going to be any partial credit for multiple-choice questions, however students are required to show work to support their answers.
**It is the student's responsibility to take the exam in the class that is scheduled.**

In-class quizzes covering the preceding or current work may be given during lectures and/or recitations. Those scores count toward your final course grade. **There are no make-ups for in class activities**. Students missing a quiz will receive a grade of zero for that item.

## Missed Exams

The general policy is that students who miss a common exam will receive a score of zero for that Exam. That score will be included in the calculation of your final grade. Students that miss two common exams automatically fail the course. Students who anticipate an absence from a common exam should discuss their situation with the Dean of Students PRIOR TO their absence. In order to be qualified to receive an "excused absence" for the common exam (a very rare occurrence), the student should present documentation for not being able to take the test as scheduled. As is the standard policy of NJIT, the student should present this document to the **Dean of Students - (973) 596-3466, Room 255 Campus Center** for evaluation. BOTH the Physics 111 instructor and Dean of Students must concur in permitting a "excused absence" for the common exam. Students who miss common exams that do not present documentation within 7 days of the common exam will receive a score of zero for the common exam.

In the event that the above qualification is met, a separate make-up test for the missed common quiz will not be offered. Instead, the final exam grade will be considered for giving a grade for the missed test.

Conflict common exams are usually held from 6:00 to 7:30 PM on exam days; contact Ms. Oertel (christine.a.oertel@njit.edu) for arrangements.

## Course Policies

It is expected that NJIT's University Code on Academic Integrity will be followed in all matters related to this course.
***"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code.***

***Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"***

- Students are required to agree to the NJIT Honor Code on each exam.

- Online resources, varying from AI tools to YouTube to the internet itself, can be unreliable sources for learning physics. Material might be accurate, partially correct, subtly misleading, or completely wrong—and it can be difficult to tell the difference. If you choose to use such technologies for physics-related questions, you do so at your own risk.

- Please do not eat, drink, or create noise in class that interferes with the work of other students or instructors.
  Interfering with an instructor's ability to conduct the class or the ability for other students to learn is considered as "Disruptive Conduct".

  The use of any internet services other than following the instructor's course notes and e-textbook is disruptive for the instructor and the other students.

- Students are strictly prohibited from using phones, earphones, headphones, smartwatches, wireless devices, laptops, or any messaging devices during exams.

- Calculators without wireless capabilities are allowed during exams, but sharing calculators is not permitted.

- **Student recordings**: Unauthorized student recordings of class sessions are prohibited. If a student needs to record a class because of accommodation, they need to reach out to the Office of Accessibility Resources and Services (OARS).
  https://www.njit.edu/registrar/njit-policy-recording-classes

- If the student cannot be continuously present in the exam room for the entire duration of the scheduled exam for any physical/medical reason, the student needs to seek accommodation through OARS in order to take the exam separately.

- Needless to say, do not contact any "tutoring services" for help during an exam.

## Physics 111 Class Schedule for Fall 2024

| TOPIC | TEXT STUDIES | NOTES | Recommended Problems |
|---|---|---|---|
| Week 1<br>Units, Physical Quantities, and Vectors | Chapt.1 | | 6, 31, 36, 40, 56,71, 85 |
| Week 2<br>Motion in One Dimension | Chapt. 2 | | 1, 7, 15, 30, 31, 38, 68 |
| Week 3<br>Motion in Two Dimensions | Chapt. 3 | Optional: Sect. 3.5 | 8, 10, 16, 28, 30, 34, 57, |
| **Common Exam 1 - October 07** | **Chapters 1, 2, 3** | **Covers: Units, Vectors, Motion in One Dimension, Kinematics in 1D & 2D motion** | |
| Week 4<br>Newton's Laws of Motion | Chapt. 4 | | 2, 7, 8, 19, 23, 30, 38 |
| Week 5<br>Applying Newton's Laws, I | Chapt. 5 | Optional: Sect. 5.5 | 1, 6, 15, 25, 34, 36, 45, 74 |
| Week 6<br>Work, Kinetic Energy | Chapt. 6 | Refresh: scalar (dot) product | 1, 7, 8, 10, 28, 37, 45, 85 |
| Week 7<br>Potential Energy, Conservation of Energy | Chapt. 7 | Optional: Sect. 7.5 | 5, 14, 30, 31, 39, 57, 60, 72 |
| **Common Exam 2 – November 04** | **Chapters 4, 5, 6, 7** | **Covers: Newton's laws and Applications, Work, Kinetic Energy, Potential Energy and Energy Conservation,** | |
| Week 8<br>Linear Momentum and Collision | Chapt. 8 | Optional: Sect. 8.6 | 10, 21, 30, 42, 44, 46, 75 |
| Week 9<br>Rotation, Moment of Inertia, Rotational Energy | Chapt. 9 | | 6, 9, 12, 27, 33, 37, 49, 53 |
| Week 10<br>Dynamics of Rotational Motion | Chapt. 10 – Sections 1-6 | Refresh: vector (cross) product | 1, 6, 14, 15, 16 |
| Week 11<br>Dynamics of Rotational Motion (cont.); angular momentum | Chapt. 10 – Sections 1-6 | | 24, 38, 42 |
| **Common Exam 3- November 25** | **Chapters 8, 9 and 10** | **Covers: Momentum and Collisions, Rotational Kinematics, Dynamics of Rotational Motion** | |

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|---|---|---|---|
| Week 12<br>Static Equilibrium | Chapt. 11 – Sections 1-3 | | 13, 15, 17, 23, 51, 53, 69 |
| Week 13<br>Fluid Mechanics | Chap.12 – Sections 1-5 | | 11, 21, 26, 34, 41, 49 |
| Week 14<br>Universal Gravitation<br>Review | Chap. 13 | Optional: Sect. 13.6, 13.7 | 4, 14, 18, 25, 31, 32 |
| **Final Exam** | | **Comprehensive Exam Chapters 1 to 13** | |

*** The professor will discuss changes to the syllabus during class if they arise.**

## Fall 2024 Academic Calendar

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|---|---|---|
| Sept | 2 | Labor Day. University Closed |
| Sept | 3 | First Day of Classes |
| Sept | 9 | Last Day to Add/Drop a Class |
| Sept | 9 | Last Day for 100% Refund, Full or Partial Withdrawal |
| Sept | 10 | W Grades Posted for Course Withdrawals |
| Sept | 16 | Last Day for 90% Refund, Full or Partial Withdrawal - No Refund for Partial Withdrawal after this date |
| Sept | 30 | Last Day for 50% Refund, Full Withdrawal |
| Oct | 21 | Last Day for 25% Refund, Full Withdrawal |
| **Nov** | **11** | **Last Day to Withdraw from Classes** |
| Nov | 26 | Thursday Classes Meet |
| Nov | 27 | Friday Classes Meet |

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|---|---|---|
| Nov | 28 | Thanksgiving Recess Begins. No Classes |
| Dec | 1 | Thanksgiving Recess Ends |
| Dec | 11 | Last Day of Classes |
| Dec | 12 | Reading Day 1 |
| Dec | 13 | Reading Day 2 |
| Dec | 14 | Saturday Classes Meet |
| Dec | 15 | Final Exams Begin |
| Dec | 21 | Final Exams End |
| **Dec** | **23** | **Final Grades Due** |