

Fall 2023

## PHYS 121 - 013: Physics II Lecture

Jan Opyrchal

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**DEPARTMENT OF PHYSICS**

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**COURSE OUTLINE**

**PHYSICS 121-013**

**Fall 2023**

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**Class Schedule**

Day and Time: **Tuesday, 8.30 AM – 9.50 AM**      **Room: KUPF 105**  
**Thursday, 8.30 AM – 9.50 AM**      **Room: TIER 107**

Delivery Mode: Face-to-Face (Delivery of instruction is structured around in-person classroom meeting times. Instruction is delivered in person and students are expected to attend class).

**Instructor Information**

Instructor: Dr. Jan Opyrchal

Office: 410 Tier

Office Hour: Friday, 10.00 AM 11.20 AM

<https://njit.webex.com/njit/j.php?MTID=m5a0c3ff5f2dc816c095ed2a3a5cf99f5>

Phone:

E-Mail: [jan.opyrchal@njit.edu](mailto:jan.opyrchal@njit.edu)

**General Information**

- Description: Physics 121 is a calculus-based introduction to electricity and magnetism, emphasizing fundamental concepts and applications. It is the second course in a three-course sequence.
- Pre-requisites (all with grade of C or better): Physics 111 or 111H, and Math 111 or 111H.
- Co-requisites: Physics 121A (the lab course) and Math 112 (Calculus-II).
- Physics 121A Laboratory must be taken along with Physics 121 unless it has been passed previously. A student who drops Physics 121 automatically drops the lab (and vice versa, no exceptions). Physics 121A is otherwise a totally separate course from Physics 121 in that the lab instructors set the requirements and grades. The lab manual (Physics 121A Laboratory Manual 9th Edition) can be purchased at the NJIT bookstore. The most up-to-date lab schedule will be posted at <https://centers.njit.edu/introphysics/welcome>.

**Learning Expectations, Goals, Outcomes**

Students will be expected to demonstrate understanding and mastery of calculus-based classical electricity and magnetism up to AC circuits, not including Maxwell's Equations or beyond. The topics covered include electric charge, electric and magnetic fields, forces on stationary and moving charges and currents due to electrostatic and magnetic fields, electrostatic potential and potential energy, Gauss' Law, capacitance, current, resistance, DC circuits, the Biot-Savart Law, Ampere's Law, Faraday's Law, inductance, RC circuits, LR circuits, LCR circuits, AC circuits including "phasor diagrams" and resonant oscillations.

In any/all of the above subject areas, students should be able to do the following:

- Recall and use the conceptual and mathematical definitions and be able to explain them.
- Understand the conceptual and mathematical relationships between quantities used.

- Explain and manipulate equations and techniques developed in the text, lectures, problem examples, and in the course of working problems.
- Use symmetry arguments, sketches and diagrams, graphs, algebra, trigonometry, and basic integral and differential calculus methods for reasoning about nature and in setting up and solving textbook-level problems.
- Critically evaluate the soundness and precision of their own reasoning and answers, explain and interpret their solutions to problems in a way that shows understanding, and identify and appraise the range of applicability of their results, and state the limitations of their solutions.
- Apply the skills above to successfully solve textbook-level problems with numeric, symbolic, or conceptual answers.

Learning outcomes are assessed by means of 3 common exams, a final exam, scores on homework assignments, in-class quizzes, and class participation scores.

## Materials for Physics 121

- **Textbook (Abbreviation: Y&F): “University Physics”, 15th Edition, authors Young & Freedman (Pearson, 2020). We use Chapters 21 to 31 in Volume 2.** Most students now buy the e-text, which is bundled with the Modified Mastering Physics homework system. The ISBN is **9780135206348**. Students may also use the old 13<sup>th</sup> and 14<sup>th</sup> editions of the same text for reading assignments, as the sections numbers match. The end-of-chapter problems are numbered differently. Many students are comfortable using only the e-text.
- **Mastering Physics Online Homework System:** Each student must obtain an access code kit that allows access to the online homework system specifically for the 15<sup>th</sup> edition of “University Physics”. In addition to having a valid access code, each student must enroll in the Mastering Physics (MP) “course” for his/her Physics 121 section using a course identifier code supplied by each instructor.
- Homework assignments will be posted on-line in Mastering Physics and will be automatically graded. Specific Information for the **Pearson Mastering (PM)** homework system are as follows:

You first create an account on the PM platform and then need a valid Pearson Mastering access code to sign up for the course.

**The pearsonmastering.com homework course ID is: “opyrchal71114” or “NJIT\_F2023\_PHYS121\_013”**

For your own reference, record the unique course identifier announced by your instructor, and your login ID and password. Instructors cannot access forgotten logins or passwords.

**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 121-013). So check there often.

## Grading

Final Letter Grades will be based on a **term average** for the semester’s work that includes the three common exam scores, the final exam, the term’s homework score, in-class quiz scores, and participation measures for attendance.

**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 exams have usually 16 questions. 1 point per question makes 16 points maximum.**
- **Final Exam may have 32 questions. 1 point per question makes 32 points maximum.**

Then the formula would be:  $E1 + E2 + E3 + Fin + HW\%*10 + LQ\%*10$

The cutoff percentages for various letter grades will be:

| Percentage  | Letter Grade |
|-------------|--------------|
| $\geq 85\%$ | A            |
| $\geq 75$   | B+           |
| $\geq 65$   | B            |
| $\geq 56$   | C+           |
| $\geq 50$   | C            |
| $\geq 45$   | D            |
| $< 45$      | 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, September 25, 2023; 4:15 -- 5:45 PM
- **Common Exam 2:** Monday, October 30, 2023; 4:15 -- 5:45 PM
- **Common Exam 3:** Monday, November 27, 2023; 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 no 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 121 instructor and Dean of Students must concur in permitting an "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](mailto: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: <https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>*

*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](mailto:dos@njit.edu)”*

- Students are required to agree to the NJIT Honor Code on each exam.
- 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”.  
<https://www.njit.edu/dos/sites/njit.edu.dos/files/Code%20of%20Student%20Conduct-Updated%20October%202022.pdf>

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.

- Turn off all phones, wireless devices, laptops, and messaging devices of all kinds during classes and exams.
- Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
- **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.

**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.  
<https://www.njit.edu/dos/sites/njit.edu.dos/files/Code%20of%20Student%20Conduct-Updated%20October%202022.pdf>

**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.

### **Course Work**

The Class Schedule (see below) lists the topics covered, text readings, and homework assignments, exam dates, etc. week by week throughout the term. Some details may be subject to change depending on the class schedule. Be sure to do the homework problems: it is almost impossible to succeed in physics courses without working a lot of problems. It will not help to use someone else’s solutions. It can help to form study groups so long as each group member participates in real discussion and independent thought.

Each weekly work unit starts with a lecture and includes a related homework assignment. Some of the homework problems will usually be covered in recitation class and the final HW submit deadline is typically about a week after material is introduced in lecture class.

- Read the assigned sections of the text before the lecture covering that material.
- Read the instructor’s lecture notes before class (if provided) and bring them to class.
- Work on homework problems before they are covered in recitation and certainly before they are due.
- The Mastering Physics online system shows the applicable homework due dates and keeps track of scores.

**Class Participation:** Students are expected to initiate and participate in class discussions by asking and answering questions, doing quizzes, working actively with others during in-class group assignments. When students participate in an active learning environment they become more engaged, learn more, enjoy the course more, and have better success in the course.

**Help:** If you are having trouble in this course visit or email your instructor; do not simply hope for a miracle and fall further behind. All instructors hold office hours (see above) and will also meet with students at other mutually convenient times.

The Physics Dept. office on the 4<sup>th</sup> floor of Tiernan has specific information on tutoring. Physics tutoring is available through the CAPE organization, and possibly elsewhere.

**Academic Support and Students Affairs, Academic Advising Centers:** These organizations assist students who need to make academic decisions, sometimes needing support to progress toward successful graduation.

## Physics 121 – 013 Class Schedule for Fall 2023

| Topic  | Text Studies             | Notes   | Recommended Problems   |
|--|--------------------------|---|--|
| Week 01,<br>Vectors, Coulomb's law   | Chapt. 1<br>Chapt. 21    | Instructor Notes<br>Sec. 21.1-3                 | 1.42, 1.43, 21.3, 21.4, 21.15  |
| Week 02,<br>Electric Field   | Chapt. 21                | Sec. 21.4 – 7                                   | 21.25, 21.27, 21.38, 21.40,<br>21.57, 21.67, 21.79, 21.83,<br>21.86              |
| Week 03,<br>Gauss' Law   | Chapt. 22                | Sec. 22.1 – 5                                   | 22.4, 22.9, 22.14, 22.22, 22.23,<br>22.29, 22.42, 22.52*                         |
| <b>Common Exam 1 –<br/>September 25</b>  |                          | <b>Covers: Vectors,<br/>Chapter 21</b>          |  |
| Week 04,<br>Electric Potential   | Chapt.23                 | Sec. 23.1 – 5                                   | 23.3, 23.4, 23.8, 23.10, 23.14,<br>23.69, 23.71*                                 |
| Week 05,<br>Capacitance  | Chapt.24                 | Sec. 24.1– 6                                    | 24.3, 24.4, 24.11, 24.18, 24.20,<br>24.23, 24.33, 24.39, 24.51                   |
| Week 06,<br>Current, Resistance, DC<br>Circuits, Intro to Kirchhoff's<br>Rules | Chapt.25 &<br>Chapt. 26  | Sec. 25.1 - 5, Sec. 26.1 –<br>2                 | 25.3, 25.16, 25.18, 25.32, 25.47,<br>25.70, 26.5, 26.7                           |
| Week 07,<br>Multi-loop and RC Circuits   | Chapt.26                 | Sec. 26.2 – 5                                   | 26.22, 26.25, 26.28, 26.37,<br>26.44, 26.48, 26.54                               |
| Week 08,<br>Charges & Currents in<br>Magnetic Fields                           | Chapt. 27                | Sec. 27.1 – 8                                   | 27.1, 27.5, 27.14, 27.25, 27.33,<br>27.59, 27.64*                                |
| <b>Common Exam 2 – October<br/>30</b>  |                          | <b>Covers: Chapters 22,<br/>23, 24, 25</b>      |  |
| Week 09,<br>Sources of Magnetic Field.<br>The Biot-Savart Law,<br>Amperes Law  | Chapt.28                 | Sec. 28.1- 7                                    | 28.4, 28.10, 28.14, 28.21, 28.23,<br>28.29, 28.33, 28.38, 28.42,<br>28.42, 28.64 |
| Week 10,<br>Faraday's Law of Induction,  | Chapt. 29                | Sec. 29.1 – 5                                   | 29.2, 29.6, 29.7, 29.10, 29.15,<br>29.18, 29.22, 29.24, 29.29,<br>29.33, 29.48*  |
| Week 11,<br>Inductance, RL Circuits,   | Chapt. 30                | Sec. 30.1 – 6                                   | 30.3, 30.5, 30.8, 30.11, 30.21,<br>30.33, 30.42, 30.60                           |
| Week 12,<br>LC & LRC Circuits, EM<br>Oscillations, AC Circuits,                | Chapt. 30 &<br>Chapt. 31 | Sec. 31.1 – 3                                   | 31.2, 31.4, 31.5, 31.5, 31.10,<br>31.11, 31.13                                   |
| <b>Common Exam 3 –<br/>November 27</b>   |                          | <b>Covers: Chapters 26,<br/>27, 28</b>          |  |
| Week 13,<br>Driven AC Circuits   | Chapt.31                 | Sec. 31.4 - 6                                   | 31.25, 31.27, 31.30, 31.36,<br>31.50   |
| Week 14,<br>Review   |                          |   |  |
| <b>Final Exam</b>  |                          | <b>Comprehensive Exam<br/>Chapters 21 to 31</b> |  |

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

## Fall 2023 Academic Calendar

|            |           |  |
|------------|-----------|--|
| Sept       | 4         | Labor Day. University Closed   |
| Sept       | 5         | First Day of Classes   |
| Sept       | 11        | Last Day to Add/Drop a Class   |
| Sept       | 11        | Last Day for 100% Refund, Full or Partial Withdrawal   |
| Sept       | 12        | W Grades Posted for Course Withdrawals   |
| Sept       | 18        | Last Day for 90% Refund, Full or Partial Withdrawal - No Refund for Partial Withdrawal after this date |
| Oct        | 2         | Last Day for 50% Refund, Full Withdrawal   |
| Oct        | 23        | Last Day for 25% Refund, Full Withdrawal   |
| <b>Nov</b> | <b>13</b> | <b>Last Day to Withdraw from Classes</b>   |
| Nov        | 21        | Thursday Classes Meet  |
| Nov        | 22        | Friday Classes Meet  |
| Nov        | 23        | Thanksgiving Recess Begins. No Classes   |
| Nov        | 26        | Thanksgiving Recess Ends   |
| Dec        | 13        | Last Day of Classes  |
| Dec        | 14        | Reading Day 1  |
| Dec        | 15        | Reading Day 2  |
| Dec        | 16        | Saturday Classes Meet  |
| Dec        | 17        | Final Exams Begin  |
| Dec        | 23        | Final Exams End  |



|            |           |                         |
|------------|-----------|-------------------------|
| <b>Dec</b> | <b>25</b> | <b>Final Grades Due</b> |
|------------|-----------|-------------------------|