

Fall 2019

# PHYS 121-003: Physics II

Rich Janow

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# Physics 121 Course Syllabus - Fall 2019 Version 1\_0

## Instructors and Sections:

- Janow, Rich: T-423B, [janow@njit.edu](mailto:janow@njit.edu), <http://web.njit.edu/~janow>, Sections 001, 003, 011, 013
- Opyrchal, Halina: [halina.opyrchal@njit.edu](mailto:halina.opyrchal@njit.edu), Sections 007, 009
- Opyrchal, Jan: [jan.opyrchal@njit.edu](mailto:jan.opyrchal@njit.edu), Sections 005, 105
- Thomas, Benjamin: T-423E, [benjamin.thomas@njit.edu](mailto:benjamin.thomas@njit.edu), Section 015
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- Maljian, Libarid; Section 103

Office hours will be posted on instructor's individual schedules. Other times by appointment.

## 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. The topics covered are listed below.

### 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", 13th Edition, authors Young & Freedman (Pearson, 2012). We use Chapters 21 to 31 in Volume 2. The 13<sup>th</sup> edition is available as an E-text sold online or at the NJIT bookstore bundled with an access code good for the 13<sup>th</sup> edition homework system. The ISBN is 9780321741257. Used hard copies will be available at the bookstore and/or from online booksellers; there will be no new hard copies of the 13<sup>th</sup> edition text. Many students are comfortable using only the e-text. We are not using the newer 14<sup>th</sup> or 15<sup>th</sup> editions of this text this term.**

- **Mastering Physics Online Homework System:** Each student must obtain an access code kit that permits use of the online homework system specifically for the 13<sup>th</sup> edition homework system. In addition to having a valid access code, each student must enroll in the Mastering Physics (MP) course within his/her Physics 121 section using a course identifier code to be supplied by each instructor. Homework assignments will be posted on-line in Mastering Physics and will be automatically graded. Specific information will be available directly from all the instructors, and/or their web sites. The access code kit must be for the 13<sup>th</sup> edition specifically.
- The older “Mastering Physics” platform that we are using (the one you may have used in previous terms) is reached for login using the following url: <http://www.masteringphysics.com>. We are NOT using the newly-introduced “Modified Mastering Physics” platform, reached through a different url.
- **Classroom Response System** called “iClickers”: Each student needs an “iClicker” (about \$40 at the bookstore). Used models are OK but preferably with an LED; some older clickers have illegible ID’s (an 8 character string on the back) so check before buying. Bring your clicker to each class. Ask you instructor whether he/she uses clickers.
- **Web Sites:** Instructors may post lecture notes, problems, grades, etc. on their web sites. So check there often. Janow’s web site is at <http://web.njit.edu/~janow>.; check there for lectures, sample exams, grades, and more.
- The Moodle learning management system is being phased out **in favor of “Canvas”**. Janow’s classes are not using Moodle or Canvas; ask other instructors what their policy is during the first week of class.

## 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 clicker use and attendance. Here are the approximate weights to be used for calculating term averages:

- **48%** for all three common exams (16% each)
- **32%** for the final exam
- **20%** for the total of homework plus short in-class quizzes plus participation measures, with the 20% value distributed at each instructors’ discretion and announced during the first week of class. Homework will be worth about **10% to 20%**.

The conversion of term average values to letter grades will use the following cutoff values:

- **85% for A, 75% for B+, 65% for B, 56% for C+, 50% for C, and D or F below 50%.**

**Examinations:** There will be three multiple choice Common Exams plus a comprehensive multiple choice Final Exam. Extra credit problems will not be offered on any of these. The schedule is:

- |  |                |
|--|----------------|
| ▪ Common Exam 1: Monday, October 7           | 4:15 - 5:45 PM |
| ▪ Common Exam 2: Monday, October 28          | 4:15 - 5:45 PM |
| ▪ Common Exam 3: Monday, November 18         | 4:15 - 5:45 PM |
| ▪ Comprehensive Final Exam after December 16 | 2.5 hours long |

The final exam will emphasize the work covered after common exam 3, but also re-caps the whole course. In-class quizzes covering preceding or current work may be given during lectures and/or recitations, and the grades may count toward your final course grade. There will be no make-up quizzes and normally no make-up common exams.

**Missed Exams:** Students who miss a common exam will receive a score of zero for that exam unless they present a valid excuse within 7 days of the exam. Students expecting to be absent from a common exam should discuss their situation with their instructor PRIOR TO their absence. Students who miss two or more common exams automatically fail the course unless they have acceptable excuses. In order to qualify for a (rare) “make-up” common exam a student needs to document the reason for not being able to take the test as scheduled (due for example to an exam conflict or documented illness). NJIT policy requires the documentation to be presented to a student’s Physics 121 instructor AND to the Dean of Students, both of whom must agree to permit a “make-up” exam. 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

**Honor Code Violations or Disruptive Behavior:** NJIT has a zero-tolerance policy for cheating of any kind and for disruptive student behavior. Violations will be reported to and judged by the Dean of Students. The penalties range from failure in the course plus disciplinary probation up to expulsion from NJIT. Avoid situations where your own behavior could be misinterpreted as dishonorable.

- Students are required to agree to the NJIT Honor Code on each exam.
- Turn off all phones, wireless devices, laptops, and messaging devices of all kinds during classes and exams.
- Please do not eat, drink, or create noise in class that interferes with the work of other students or instructors.

**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.

**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 (page 4)** lists the topics covered, text readings, and homework assignments, exam dates, etc. week by week throughout the term. Some of the information may be tailored to your own section's 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 student participates in real discussion and independent thought.

Each week's 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 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.
- **Students who do not submit homework are automatically lowering their term average by 10 - 20%.**

**Practice Problems:** "Practice problems" (abbreviated "PP") are posted for each week. These are the solved homework assignments from earlier textbooks. They are referred to as **PP01** for week 01, **PP02** for week 02, etc. You can find them under Fall 2019 Physics 121 on Janow's web site (<http://web.njit.edu/~janow>)

**Class Participation:** Students are expected to initiate and participate in class discussions by asking and answering questions, participating in clicker exercises, 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.

### Specific Information for the Mastering Physics (MP) homework system:

- You need a valid Mastering Physics account and access code to sign up for the course your instructor sets up on MP. Your instructor will announce the course identifier for you to use when enrolling in your specific class. Use your NJIT email address as the logon ID for your account. Input your name exactly as it appears on NJIT's records: last name first, followed by a comma and your first and possibly middle name. Likewise, enter your 9 digit NJIT ID where indicated.
- 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.

**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 their schedules) and will also meet with students at other mutually convenient times.

### Tutoring:

The Physics Dept usually provides drop-in tutoring on a regular schedule (to be posted). More information will be available from your instructor or the Physics Department office on the 4<sup>th</sup> floor of Tiernan shortly after the term starts. Physics tutoring is also available through the Learning Centers.

### 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.

### Counseling:

The Center for Counseling and Psychological Services is committed to assisting students experiencing high levels of personal challenge and stress.

# Physics 121 Class Schedule for Fall 2019 (Rev. 1.0)

(For sections 001, 003, 013, 015 - other sections' schedules may differ slightly)

\*\* PP = Solved practice problems posted on <http://web.njit.edu/~janow> (then navigate)

Lecture Topics and Classes Dates cover Tuesdays to Mondays	Text (Y&F) Readings	Recitations & Assignments** (exact due dates to be announced)	Labs
<b>Monday, September 2</b>	<b>No Class</b>	<b>Labor Day Holiday</b>	
<b>September 03 to 09</b> Lecture 01: Vectors, Intro to Fields Lecture 02: Electric Charge & Force	Instructor Notes Sec. 21.1 - 3	Use recitation periods for Lecture 01 & Lecture 02 <b>Begin HW01, HW02, PP02</b>	<b>INTRO MATLAB I</b>
<b>September 10 to 16</b> Lecture 03: Electric Field	Sec. 21.4 - 7	<b>Recitations: HW01/02 Two Assignments</b> <b>Begin HW03, PP03</b>	<b>MATLAB II</b>
<b>September 17 to 23</b> Lecture 04: Gauss' Law	Sec. 22.1 - 5	<b>Recitations: HW03.</b> <b>Begin HW04, PP04</b>	<b>200E Charge &amp; Force</b>
<b>September 24 to 30</b> Lecture 05: Electric Potential	Sec. 23.1 - 5	<b>Recitations: HW04. Review Session</b> <b>Begin HW05, PP05</b>	<b>201 E-field</b>
<b>October 01 to 07</b> Lecture 06: Capacitance	Sec. 24.1- 6	<b>Recitations: HW05.</b> <b>Begin HW06, PP06</b>	<b>202 Gauss Law</b>
<b>Common Exam 1: October 07</b> <b>Monday, 04:15 - 5:45 P. M.</b>		<b>Covers Lectures + HWs 01, 02, 03, 04</b> <b>Vectors &amp; Fields + Ch. 21 + Ch 22</b>	-
<b>October 08 to 14)</b> Lecture 07: Current, Resistance, DC Circuits, Intro to Kirchhoff's Rules	Sec. 25.1 - 5, Sec. 26.1 - 2	<b>Recitations: HW06.</b> <b>Begin HW07, PP07 &amp; PP08A</b>	<b>203 Potential</b>
<b>October 15 to 21</b> Lecture 08: Multi-loop and RC Circuits	Sec. 26.2 - 5	<b>Recitations: HW07.</b> <b>Begin HW08, PP08B</b>	<b>205 Capacitance</b>
<b>October 22 to Oct 28</b> Lecture 09: Charges & Currents in Magnetic Fields	Sec. 27.1 - 8	<b>Recitations: HW08. Review Sessions</b> <b>Begin HW09, PP09</b>	<b>215 Ohms Law</b>
<b>Common Exam 2: October 28</b> <b>Monday, 04:15 - 5:45 P. M.</b>		<b>Covers Lectures + HWs 05, 06, 07</b> <b>Chapters 23, 24, 25, &amp; 26.1</b>	-
<b>October 29 to November 04</b> Lecture 10: Sources of Magnetic Field. The Biot-Savart Law, Amperes Law	Sec. 28.1- 7	<b>Recitations: HW09</b> <b>Begin HW10, PP10</b>	<b>217 RC Ckts.</b>
<b>November 05 to 11</b> Lecture 11: Faraday's Law of Induction	Sec. 29.1 - 5	<b>Recitations: HW10.</b> <b>Begin HW11, PP11</b>	<b>212 e/m for Electron</b>
<b>Monday Nov 11</b>		<b>Last Day to Withdraw</b>	
<b>November 12 to 18</b> Lecture 12: Inductance, RL Circuits	Sec. 30.1 - 4	<b>Recitations: HW11</b> <b>Begin HW12, PP12.</b>	<b>210 Helmholtz</b>
<b>Common Exam 3: November 18</b> <b>Monday, 04:15 - 5:45 P. M.</b>		<b>Covers Lectures &amp; HW 08, 09, 10</b> <b>Chapters 26.2-5, 27, 28</b>	-
<b>November 19 to 25</b> Lecture 13: LC & LCR Circuits, EM Oscillations, AC Circuits	Sec. 30.5 - 6 Sec. 31.1 - 2	<b>Recitations: HW12</b> <b>Begin HW13, PP13</b>	<b>223 Faraday's Law</b>
<b>November 26 to December 01</b> <b>Thanksgiving Break Thursday &amp; Friday</b>		<b>11/26: Thursday Schedule on Tuesday</b> <b>Cancel Recitation Classes</b> <b>11/27: Friday Schedule on Wednesday</b>	<b>218 RL Ckts.</b>
<b>December 02 to 08</b> Lecture 14: AC Circuits, Resonance	Sec. 31.3 - 6	<b>Recitations: HW 13</b> <b>Begin HW14, PP14</b>	<b>221 LC Ckts.</b>
<b>Week 15 (December 09 to 11</b> Use final lecture periods as Recitation 14	Sec. 31.3 - 6	<b>Recitations: HW14 on Mon, Wed.</b> <b>Last NJIT classes on Wed Dec 11</b> <b>Cancel Wed Rec periods</b>	<b>221 LC Ckts.</b>
<b>Reading Days: Thurs/Fri Dec 12/13</b>	<b>No classes</b>	<b>Review Sessions</b>	
<b>Final Exam: Dec 16 through Dec 20</b>		<b>Comprehensive final exam:</b> <b>Chapters 21 - 31</b>	