

Spring 2019

# PHYS 121-102: Physics II

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# Physics 121 Course Syllabus - Spring 2019 Version 1.1

## Instructors and Sections:

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- Vitaly Shneidman: T-452, [vitaly@njit.edu](mailto:vitaly@njit.edu), <http://web.njit.edu/~vitaly/121>, Sections 006, 008
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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 <http://web.njit.edu/~smm8166>.

## 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, which are published as bound books or 3 hole binder or E-text versions. We will not be using the 14<sup>th</sup> Edition of the text. The NJIT bookstore will have hard copy texts bound with the access code and E-text kit - ISBN = 0321928814 or 9780321928818). Any other version of the text containing Chapters 21 - 31 is OK. Many students use the E-text.

- **Mastering Physics Online Homework System:** Each student must obtain an access code kit that permits use of the online homework system. In addition to having an access code, each student must enroll in the Mastering Physics (MP) course for 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. Any access code kit must be for the right text (identified above) so check before buying.
- **Classroom Response System** called “iClickers”: Each student needs an “iClicker” (about \$40 at the bookstore). All used models are OK but those with an LED screen are better. Some older used clickers have illegible ID’s (an 8 character string on the back) so check before buying. Bring your clicker to each class. Some instructors do not use clickers - ask your instructor.
- **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> ; much information including lectures, samples exams, sample problems, grades and much more will be posted there for use by all Physics 121 students.
- Some instructors use **Moodle** - Ask your instructor 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, February 25    | 4:15 - 5:45 PM |
| ▪ Common Exam 2: Monday, March 25       | 4:15 - 5:45 PM |
| ▪ Common Exam 3: Monday, April 15       | 4:15 - 5:45 PM |
| ▪ Comprehensive Final Exam after May 10 | 2.5 hours long |

The final exam will emphasize the weeks of work after common exam 3, but also cover the whole course. In-class quizzes covering preceding or current work may also 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 (for example, due 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 makeup 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

**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.

**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.

**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.

## 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. Forming study groups can help 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 are usually covered in recitation class and the final submit deadline for each assignment 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.
- Begin 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:** Two sets of solved "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 Spring 2019 Physics 121 on Janow's web site (<http://web.njit.edu/~janow>)

**Class Participation:** Students are expected to 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 will have to create an account on the MP system if you do not have one already. You need a valid Mastering Physics access code to sign up for the course your instructor sets up on MP. Your instructor will announce a Mastering Physics course identifier for you to use when enrolling in your specific class. Use your NJIT email address as the logon ID for your account.

- The Mastering Physics login is <http://www.masteringphysics.com>. Click on "Student" in the upper left of the box. Respond "yes" that you have an access code (create an account if you do not already have one). 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 post office hours 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 Spring 2019 (Rev. 1.0)

(For section 102 - other sections' dates will differ)

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

Lecture Topics and Classes	Text (Y&F) Readings	Recitations & Assignments** HW due dates to be announced	Labs
<b>Monday, January 21</b>	<b>No Class</b>	<b>M. L. King Holiday</b>	
January 22 to 28 (Lab)			INTRO MATLAB I
January 28 (Lecture), Jan 29 to Feb 4 (Lab) Lecture 01: Vectors, Intro to Fields	Instr. Notes	Begin HW01 Use recitation period for Lecture 01	MATLAB II
February 4 (Lecture), Feb 5 to 11 (Lab) Lecture 02: Electric Charge & Force	Sec. 21.1 - 3	Begin HW02, PP02 Recitation: HW01	200E Charge & Force
February 11 (Lecture), Feb 12 to 18 (Lab) Lecture 03: Electric Field	Sec. 21.4 - 7	Begin HW03, PP03 Recitation: HW02.	201 E-field
February 18 (Lecture), Feb 19 to 25 (Lab) Lecture 04: Gauss' Law	Sec. 22.1 - 5	Begin HW04, PP04 Recitation: HW03. Review Session	202 Gauss Law
<b>Common Exam 1: February 25</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>	N/A
February 25 (Lecture) Feb 26 to Mar 4 Lecture 05: Electric Potential	Sec. 23.1 - 5	Begin HW05, PP05 Recitation: HW04.	203 Potential
March 04 (Lecture) Mar 5 to 11 (Lab) Lecture 06: Capacitance	Sec. 24.1- 6	Begin HW06, PP06 Recitation: HW05.	205 Capacitance
March 11 (Lecture), Mar 12 to 15, 25 (Lab) Lecture 07: Current, Resistance, DC Circuits, Intro to Kirchhoff's Rules	Sec. 25.1 - 5, Sec. 26.1 - 2	Begin HW07, PP07 & PP08A Recitation: HW06. Review Session	215 Ohms Law
<b>March 16 to March 24</b> Spring Break	<b>No Class</b>	<b>Spring Break</b>	N/A
<b>Common Exam 2: March 25</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>	N/A
March 25 (Lecture), Mar 26 to Apr 1 (Lab) Lecture 08: Multi-loop and RC Circuits	Sec. 26.2 - 5	Begin HW08, PP08B Recitation: HW07.	217 RC Ckts.
April 01 (Lecture), Apr 2 to 8 (Lab) Lecture 09: Charges & Currents in Magnetic Fields	Sec. 27.1 - 8	Begin HW09, PP09 Recitation: HW08	212 e/m for Electron
April 08 (Lecture), Apr 9 to 15 (Lab) Lecture 10: Sources of Magnetic Field. The Biot-Savart Law, Amperes Law <b>Monday April 08</b>	Sec. 28.1- 7	Begin HW10, PP10 Recitation: HW09.  <b>Last Day to Withdraw</b>	210 Helmholtz
<b>Common Exam 3: April 15</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>	N/A
April 15 (Lecture), Apr 16 to 22 (Lab) Lecture 11: Faraday's Law of Induction	Sec. 29.1 - 5	Begin HW11, PP11 Recitations: HW10	223 Faraday's Law
April 22 (Lecture), Apr 23 to 29 (Lab) Lecture 12: Inductance, RL Circuits	Sec. 30.1 - 4	Begin HW12, PP12. Recitations: HW11	218 RL Ckts.
April 29 (Lecture), Apr 30 to May 6 (Lab) Lecture 13: LC & LCR Circuits, EM Oscillations, AC Circuits	Sec. 30.5 - 6 Sec. 31.1 - 2	Begin HW13, PP13/14 Recitations: HW 12	221 LC Ckts.
May 06 (Lecture) Lecture 14: AC Circuits, Resonance, Review	Sec. 31.3 - 6	Begin HW14 Recitations: HW13/14	N/A
		<b>Last NJIT classes on May 07s</b>	N/A
<b>Reading Days: Wed/Thur May 08/09</b>	<b>No classes</b>	<b>Review Session</b>	
<b>Final Exam: May 10 through May 16</b>		<b>Comprehensive final exam:</b> <b>Chapters 21 - 31</b>	

