

Spring 2021

## PHYS 721-102: Electromagnetics II

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## Physics 121 Course Syllabus - SPRING 2021

PHYS 121 102: Physics II, 14602

PHYS 121 104: Physics II, 14603

Instructor: Professor Ken K. Chin, [chin@njit.edu](mailto:chin@njit.edu), (973)596-3297

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Office hours: 5 PM, the day of class.

### 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.

Mode of Instruction: The instruction mode may switch between face-to-face (traditional), online synchronous, and converged instruction modes. In the converged mode, variable fractions of the students may attend virtually and in-person, with the instructor attending in-person from a campus classroom. In online synchronous mode both students and oinstructors may be located anywhere. For a given class the mode may depend on the instructor, external Pandemic events, and other factors.

## 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 xxxxxxxxx. 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 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 15<sup>th</sup> edition text specifically.**
- **The newer “Modified Mastering Physics” platform that we are now using for the first time is reached for login using the following new url: <https://www.pearsonmylabandmastering.com/northamerica/>. We are no longer using the url from past semesters. The assignments have the same look and feel.**
- **Classroom Response System called “iClicker Cloud”:** Each student will use his smart phone to respond to class quiz or poll questions and to signify attendance in virtual or face-to-face class. Bring your registered smart phone to class. Ask your instructor whether he/she uses clickers. Detailed instructions will follow.
- **Web Sites:** Instructors may post lecture notes, problems, grades, etc. on their own web sites. So check there often. Janow’s web site is at <http://web.njit.edu/~janow.>; check there for lectures, sample exams, grades, etc.
- **The “Canvas” course management system may be used for exams and quizzes. Ask instructors what the 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 score, the term’s homework score, possibly 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, requiring solving 70% of assigned problems.
- 30% in class test
- $80+20+30 = 130 \Rightarrow 130/1.3 = 100$
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- 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. There will be no extra credit problems. Exams may be face-to-face or virtual, possibly using a remote proctoring system; the choices are to be announced. The exam schedule is:

- Common Exam 1: Week 4, 1.5 hours
- Common Exam 2: Week 8, 1.5 hours
- Common Exam 3: Week 12, 1.5 hours
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- Comprehensive Final Exam 2.5 hours, final week

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 will automatically fail the course unless they have acceptable, documented excuses (for example 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. 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.

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, messaging devices of all kinds during exams, except laptop computers with permitted browsers to be described virtual classes and exams
- Please do not create noise or distractions in class that interfere with the work of other students or instructors.
- Needless to say, do not contact any “tutoring services” for help during or preceding an exam.

Attendance: 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 when attendance is taken; 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 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.

- **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 two 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 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. The Physics Dept usually provides drop-in or virtual 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 make progress.

## Physics 121 Class Schedule for SPRING 2021

### PART 1 ELECTROSTATICS - ELECTRIC FIELD AND ELECTRIC POTENTIAL

- W1 Ch. 21 Electric Field
- W2 Ch. 22 Gauss's Law
- W3 Ch. 23 Electric Potential
- W4 Review, CE1

### PART 2 CAPCITOR AND RESISTOR, OHM'S LAW, DC CIRCUIT

- W5 Ch. 24 Capacitor
- W6 Ch. 23 Current, Resistor, Ohm's Law
- W7 Ch. 26 DC Circuit
- W8 Review, CE2

Mar. 15 - W9 Spring Recess

### PART 3 MAGNETISM

- W10 Ch. 27 Magnetic Force
- W11 Ch. 28 Magnetic Field
- W12 Ch. 29 Electromagnetic Induction, CE3

### PART 4 INDUCTOR, GENERATOR, AND AC CIRCUIT

- W13 Ch. 30 Inductor
- W14 Ch. 31 AC Circuit

FINAL Final week, in class