

Spring 2024

## ECE 361-002: Electromagnetic Fields I

Dong-Kyun Ko

Follow this and additional works at: <https://digitalcommons.njit.edu/ece-syllabi>

---

### Recommended Citation

Ko, Dong-Kyun, "ECE 361-002: Electromagnetic Fields I" (2024). *Electrical and Computer Engineering Syllabi*. 77.

<https://digitalcommons.njit.edu/ece-syllabi/77>

This Syllabus is brought to you for free and open access by the NJIT Syllabi at Digital Commons @ NJIT. It has been accepted for inclusion in Electrical and Computer Engineering Syllabi by an authorized administrator of Digital Commons @ NJIT. For more information, please contact [digitalcommons@njit.edu](mailto:digitalcommons@njit.edu).

## Course Syllabus - ECE 361 Electromagnetic Fields I (3.00)

TUE (7:30 – 8:50 AM), FRI (7:30 – 8:50 AM) / [Converged Learning \(GITC 3700\)](#)

▪ **Course Description:** Electromagnetics provides the mathematical description of all electrical phenomena, and therefore it is the physical foundation of Electrical and Computer Engineering discipline. This course introduces undergraduate students to the fundamentals of electric and magnetic fields. Topics covered include: (1) mathematics of vector analysis: vector algebra, orthogonal coordinate systems and vector calculus; (2) electric field due to elementary stationary charge; (2) magnetic field due to electric charge moving at constant velocity; (3) electric and magnetic forces; (4) stored electric and magnetic energies; (5) electric potential and vector magnetic potential; (6) definition of capacitance, resistance, and inductance; (7) properties of conductors, insulators and magnetic materials; (8) mathematical formulation of the physical laws that govern electromagnetic fields.

▪ **Prerequisites:** ECE 231, MATH 213, MATH 222

▪ **Textbook:** (1) M. Sadiku, Elements of Electromagnetics, 6th Ed., Oxford University Press, 2015, ISBN: 9780199321407; (2) Lecture slides ([Canvas will be used as course website: canvas.njit.edu](#))

▪ **Instructor:** Dr. Dong-Kyun Ko, phone: 973-596-3515, email: dong.k.ko@njit.edu, office: ECEC-215

▪ **Office Hours:** MON 10:00-11:30 am and THU 10:00-11:30 am at ECEC-215

▪ **Specific Course Learning Outcomes (CLO):**

1. Understand the mathematics of vector analysis and vector calculus
2. Gain an understanding of the fundamental laws of electrostatic fields
3. Gain an understanding of the fundamental laws of magnetostatic fields
4. Understand the definition of resistance, capacitance, and inductance
5. Understand material properties as they relate to capacitance and permittivity
6. Learn how to solve problems in electrostatic, magnetostatic, and electromagnetic fields

▪ **Relevant Student Outcomes:**

- (1) an ability to apply knowledge of mathematics, science and engineering (CLO1-6)
- (2) an ability to apply engineering design to produce solutions that meet specific needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors (CLO 1-6)
- (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies (CLO 1-6)

▪ **Course Outline:**

Week	Topics	Homework
1	Lecture 1: Introduction, Vector algebra Lecture 2: Coordinate systems and transformation	
2	Lecture 3: Vector calculus Lecture 4: Coulomb's law	HW#1
3	Lecture 5: Coulomb's law 2 Lecture 6: Gauss's Law	HW#2
4	Lecture 7: Electric Potential Lecture 8: Electric Energy	HW#3
5	<u>Review and Exam I Preparation</u> <a href="#">Exam I (2/19/2021)</a>	
6	Lecture 9: Conductors Lecture 10: Dielectrics	HW#4
7	Lecture 11: Boundary Conditions Lecture 12: Resistance and Capacitance	HW#5
8	Lecture 13: Poisson's and Laplace's Equations I Lecture 14: Poisson's and Laplace's Equations II	HW#6
9	Lecture 15: Method of Images <u>Review and Exam II Preparation</u>	
10	<a href="#">Exam II (3/30/2021)</a> Lecture 16: Biot-Savart's law	
11	Lecture 17: Ampere's law Lecture 18: Magnetic Flux Density and Maxwell's Equations	HW#7
12	Lecture 19: Magnetic Forces Lecture 20: Magnetic Torque and Moment	HW#8
13	Lecture 21: Magnetic Materials and Boundary Conditions Lecture 22: Inductors, Inductances, Magnetic Energy	HW#9
14	Lecture 23: Magnetic Circuits and Force on Magnetic Materials <u>Review and Final Exam Preparation</u>	HW#10
15	<a href="#">Final Exam (5/7/2021)</a>	

▪ **Grading:**

Homework: 15%

Exam I: 25%

Exam II: 30%

Final Exam: 30%

The final letter grade will be based on the following tentative curve:

A: 100-90      B+: 89-80

B: 80-72      C+: 71-61

C: 60-50      D: 49-35

F: <34

- **Exam and proctoring**

All exams (Exam I, Exam II, and Final Exam) will be conducted online during the designated class hours. All exams are open textbook and open slide notes. Proctoring will be administered via Webex webcam. Students are expected to remain connected to the Webex session until their exam is submitted.

- **Late Submission Policy:**

Late submissions will not be graded. There will be no make-up for homework assignments and exams. If you have any difficulties regarding access to computer / internet at home or have any issues related to medical conditions, you should contact the Office of the Dean of Students (this is a university protocol).

- **Academic Integrity:** *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: <http://www5.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).

- **Disclaimer:** Changes in the syllabus are possible. Students will be informed of those changes in class announcements.