

# Physics 913: Electromagnetic Theory I (Fall 2023)

Mondays, Wednesdays, and Fridays, 11:30-12:20

Jorgensen Hall 247

**Instructor:** Evgeny Tsymbal

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*E-mail:* [tsymbal@unl.edu](mailto:tsymbal@unl.edu)

*Office Hours:* by agreement. Appointments to be made by e-mail or in class after the lecture

Fall Semester begins	21 August (Mon)
Labor Day (Student Holiday)	4 September (Mon)
Fall Semester Break	16 - 17 October (Mon-Tue)
Student Holiday	22 November (Wed)
Thanksgiving Vacation	23 - 26 November (Wed-Sun)
Last day of classes	8 December (Fri)

## Course outline

### 1. Electrostatics

Coulomb's law, Gauss's law, Scalar potential; Poisson and Laplace equations; Green's theorem; Green's function; Electrostatic energy, Capacitance; Method of images; Boundary value problems; Multipole expansion, Electrostatics of dielectrics; Electric polarization

### 2. Magnetostatics

Biot and Savart's law; Ampere's law; Vector potential; Fields from localized current distributions; Magnetic moment; Magnetic fields in matter; Magnetization; Boundary-value problems in magnetostatics; Scalar magnetic potential

### 3. Electrodynamics

Ohm's law, Electromotive force; Faraday's law, Energy in magnetic field, Inductance; Displacement current, Maxwell's equations

**Texts:** D. J. Griffiths, *Introduction to Electrodynamics*; J. D. Jackson, *Classical Electrodynamics*

**Reference:** A. Zangwill, *Modern Electrodynamics*

**Lecture Notes:** Lecture Notes will be provided and will cover all the material needed for the course. The Lecture Notes will be posted on Canvas in due course.

**Lectures:** Most lectures will be given in-person. In some cases, lectures may be delivered via zoom with the zoom link placed on Canvas (TBA). *Attendance of the lectures is important for successful performance in the course.*

**Practice Classes:** Three practice classes will be given before the midterm exams. The goal of these classes is to provide training in solving exam problems.

**Assignments:** Homework assignments will be posted on Canvas and will be normally due in a week from the day of assignment. There will be 9 assignments during the semester. All homework problems will have an equal weight of 10 points unless indicated otherwise.

Students are encouraged to discuss ideas and approaches to solve the assignment problems with other students. However, all students *are required to complete all derivations themselves. It is*

*not allowed to copy the work of others or use problem solutions obtained from any source. Homework is an important part of learning and essential for successful performance at exams.*

Students should bring homework solutions in written form to the class on the due date and put them on the instructor's desk in JH 247 before the class starts. Alternatively, students can place homework solutions in the instructor's mailbox *before the due time shown on the assignment. Delays beyond the due time are not allowed.*

**Exams:** All exams will be open book in class. Students are allowed to use homework solutions, lecture notes, and textbooks. *However, using internet is not allowed.* While having cell phones, laptop computers or other gadgets is not forbidden (e.g., to display lecture notes), they *must be switched to the airplane mode.* Also, *students are not allowed making electronic copies (photographs) of the exam problems.* Problem sheets need to be returned with the exam solutions.

**Midterm Exams:** Fri, Sept. 22, 11:30-12:20 (JH247)  
Mon, Oct. 23, 11:30-12:20 (JH247)  
Mon, Nov. 27, 11:30-12:20 (JH247)

**Final Exam:** Mon, Dec 11, 10:00-12:00 (JH247)

**Performance in class** reflects a student's contribution to the everyday work in the classroom. All students are expected to participate in discussions, answer and ask questions, i.e., be active during class time.

### Grading

Homework	30%
Midterm Exams	12%
Final Exam	30%
Performance in Class	4%

### Final grade:

A+	A	A-	B+	B	B-	C+	C	C-	D	F
93%	85%	80%	75%	70%	65%	60%	55%	50%	40%	<40%

**Ownership rights protection:** Any work and/or communication that you are privy to as a member of this course should be treated as the *Intellectual Property* of the instructor and is not to be shared outside the context of this course. *Students may not make or distribute screen captures, audio/video recordings of, or livestream, any class-related activity, including lectures and presentations, without express prior written consent from the instructor.*

**Students with disabilities** are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the UNL's policy to provide flexible and individualized accommodation to students with disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with Services for Students with Disabilities.

**UNL Course Policies and Resources:** Students are responsible for knowing the university policies and resources found at <https://go.unl.edu/coursepolicies>.