

Fall 2023

PHYS 621 - 001: Classical Mechanics

Satoshi Inoue

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Class Schedule:

Class: Classical Electrodynamics

Day and Time: Thursday and 6:00-8:50 pm

Room: Faculty Memorial Hall 411

Delivery Mode: Face-to-Face (Delivery of instruction is structured around in-person classroom meeting times. Instruction is delivered in person and students are expected to attend class).

General Information

The goal of this class is to acquire enough knowledge and ability in classical electrodynamics (starting from Coulomb's law to Maxwell equations) to be able to apply them to research. Since this is a graduate-level EM class, a proper understanding of the physical significance of the formulas is required, rather than memorizing them. Basic Math knowledge (Vector analysis, differential equation, simple special function etc.) is a prerequisite.

Instructor Information

Instructor: Satoshi Inoue

Center for Solar-Terrestrial Research (CSTR), New Jersey Institute of Technology (NJIT)

Office: 423C (Tiernan Hall)

Office Hour: Tuesday (1:30-3:30 pm) in person or virtual, other times by appointment

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1) **Textbook** Jackson, J. D., "Classical Electrodynamics", 3rd edition, J. Wiley is primarily used. David J. (Griffiths, "Introduction to Electrodynamics" 4th Edition will be also used in conjunction with Jackson book.)

2) **Lecture Quiz**; The Quiz is given at the beginning of the class.

3) **Homework**; Homework will be assigned weekly.

4) **Midterm and Final Exam**; The Midterm exam will be asked from Chapters 1-3, and the Final exam will be asked from Chapters 4– 6 (Depending on the situation, the Final exam will be asked from the whole area, Chapters 1-6). **Review the slides and problems provided in the class.**

Final Letter Grades: Here are the approximate weights to be used for calculating the composite score:

- **80%** for the midterm and final exams
(Only final or midterm + final, a better grade will be considered.)
- **10%** for the lecture quiz and homework work
- **5%** for the attendance
- **5%** for the final report

The cutoff percentages for various letter grades will be:

| Percentage | Letter Grade |
|------------|--------------|
| > 80% | A |
| 75 - 80 | B+ |

| | |
|---------|----|
| 70 – 75 | B |
| 65 - 70 | C+ |
| 55 - 65 | C |
| < 55 | F |

Final grades are not negotiable: A score of 79.99% is a B+, not an A.

| TOPIC | TEXT STUDIES | NOTES |
|---|--------------|------------------|
| Week 1 (9/7/23) Introduction to electrostatics | Chapter 1 | 1.1-1.5 |
| Week 2 (9/14/23) Introduction to electrostatics | Chapter 1 | 1.6-1.11 |
| Week 3 (9/21/23) Boundary-value problems, I | Chapter 2 | 2.1-2.7 |
| Week 4 (9/28/23) Boundary-value Problems, I | Chapter 2 | 2.8-2.10 |
| Week 5 (10/5/23) Boundary-value problems, II | Chapter 3 | 3.1-3.3, 3.5-3.6 |
| Week 6 (10/12/23) Boundary-value problems, II | Chapter 3 | 3.7-3.9 |
| Week 7 (10/19/23) Multipoles, Electrostatics of Macroscopic Media, Dielectrics | Chapter 4 | 4.1-4.4 |
| Week 8 (10/26/23) Midterm Exam (Chapters 1-3) and make-up class | | |
| Week 9 (11/2/23) Multipoles, Electrostatics of Macroscopic Media, Dielectrics | Chapter 4 | 4.4, 4.7 |
| Week 10 (11/9/23) Magnetostatics | Chapter 5 | 5.1-5.3 |
| Week 11 (11/16/23) Magnetostatics | Chapter 5 | 5.4-5.10 |
| Week 12 (11/21/23) Magnetostatics | Chapter 5 | 5.15-5.18 |
| Week 13 (11/30/23) Maxwell Equations | Chapter 6 | 6.1-6.3 |
| Week 14 (12/7/23) Maxwell Equations | Chapter 6 | 6.7-6.10 |