

清大物理系 “電動力學(一)” 任課老師:張存續  
“Electrodynamics (I)” (PHYS 531000 ) Prof. Tsun-Hsu Chang

Fall Semester, 2019

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Office hour: Tuesdays & Thursdays 1:00-2:30 pm  
@Physics Building Room 417

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**1. Description:** We have studied electromagnetism in two courses before: General Physics II (freshman) and Electromagnetism (sophomore). What is new in this course? Electrodynamics will deal with the “same” Maxwell equations but from a more in-depth perspective. We are going to introduce a powerful tool, the Green function, to solve the electrostatic, magnetostatic, and even electromagnetic problems. To do that, we unavoidably have to learn the mathematics in spherical and cylindrical coordinates.

**2. Textbook and References:**

J. D. Jackson, “Classical Electrodynamics”, 3rd edition, Chapters

- D. J. Griffiths, Introduction to Electrodynamics, 3rd.
- R. P. Feynman, R. B. Leighton, and M. Sands, The Feynman Lectures on Physics.

**3. Time:** Tuesdays (10:10-12:00) & Thursdays (10:10-12:00)

150 min will be used for lecture. Others may be used for Q&A, quiz, etc.

**4. Classroom:** General Building III (綜三館) 普實203

**5. Homework:** Doing homework is the best way to master the concepts of Electrodynamics. Some of the homework problems might be appeared in the exam.

**6. Conduct of Class :** Lecture notes will be projected sequentially on the screen during the class. Physical concepts will be emphasized, while algebraic details in the lecture notes will often be skipped. *Questions are encouraged.* It is assumed that students have at least gone through the algebra in the lecture notes before attending classes (*important!*).

**7. Grading Policy:**

**Midterm (~40%); Final (~40%); Quiz (~20%).** Class participation will be graded. The overall score will be normalized to reflect an average consistent with other courses.

## 8. Lecture Notes:

Starting from basic equations, the lecture notes follow Jackson closely with algebraic details filled in.

Equations numbered in the format of (1.1), (1.2)... refer to Jackson. Supplementary equations derived in lecture notes, which will later be referenced, are numbered (1), (2)... [restarting from (1) in each chapter.] Equations in Appendices A, B...of each chapter are numbered (A.1), (A.2)...and (B.1), (B.2)...

Page numbers cited in the text (e.g. p. 120) refer to Jackson.

Section numbers (e.g. Sec. 1.1) refer to Jackson. Main topics within each section are highlighted by **boldfaced** characters. Some words are typed in *italicized* characters for attention. Technical terms which are introduced for the first time are underlined.

## 9. Others:

- Electrodynamics is one of the most important courses for graduate students. After class, you had better spend at least 12 hours per week on this course.
- Those who have good grades can be waived from the Ph.D. qualifying examination. Good grades means that the score is A- or better, and the overall ranking is in the top 30%.

Week	Date	Content
一	09/10 (二)	<b>Introduction, evaluation etc. &amp; Chap.1 Introduction to Electrostatics</b>
	09/12 (四)	<b>Chap.1</b>
二	09/17 (二)	<b>Chap.1</b>
	09/19 (四)	<b>Chap.2 Boundary-Value Problems in Electrostatics I</b>
三	09/24 (二)	<b>Chap.2</b>
	09/26 (四)	<b>Chap.2</b>
四	10/01 (二)	<b>Chap.3 Boundary-Value Problems in Electrostatics II</b>
	10/03 (四)	<b>Chap.3</b>
五	10/08 (二)	<b>Chap.3</b>
	10/10 (四)	<b>National Day</b>
六	10/15 (二)	<b>Chap.3</b>
	10/17 (四)	<b>Chap.4 Multiples, Electrostatics of Macroscopic Media, Dielectrics</b>
七	10/22 (二)	<b>Chap.4</b>
	10/24 (四)	<b>Chap.4</b>
八	10/29 (二)	<b>Chap.4</b>
	10/31 (四)	<b>Chap.5 Magnetostatics, Faraday's Law, Quasi-Static Fields</b>
九	11/05 (二)	<b>Chap.5</b>
	11/07 (四)	<b>Midterm Chs. 1 – 4</b>
十	11/12 (二)	<b>Chap.5</b>
	11/14 (四)	<b>Chap.5</b>
十一	11/19 (二)	<b>Chap.5</b>
	11/21 (四)	<b>Chap.6 Maxwell Equations, Macroscopic Electromagnetism,</b>
十二	11/26 (二)	<b>Chap.6 Conservation Laws</b>
	11/28 (四)	<b>Chap.6</b>
十三	12/03 (二)	<b>Chap.6</b>
	12/05 (四)	<b>Chap.6</b>
十四	12/10 (二)	<b>Chap.6</b>
	12/12 (四)	<b>Chap.7 Plane Electromagnetic Waves and Wave Propagation</b>
十五	12/17 (二)	<b>Chap.7</b>
	12/19 (四)	<b>Chap.7</b>
十六	12/24 (二)	<b>Chap.7</b>
	12/26 (四)	<b>Chap.7</b>
十七	12/31 (二)	<b>Chap.7</b>
	01/02 (四)	<b>Final Chs. 5 – 7</b>
十八	01/07 (二)	<b>Make-up (if necessary)</b>
	01/09 (四)	<b>Make-up (if necessary)</b>

## Schedule

This table is for your reference only.

The practical schedule will depend on the students' learning condition.

Dates of quiz are to be determined.

# Grading Class Participation

Participation is graded on a scale from 0 (lowest) through 4 (highest), using the criteria below. The criteria focus on what you demonstrate and do not presume to guess at what you know but do not demonstrate. This is because what you offer to the class is what you and others learn from. I expect the average level of participation to satisfy the criteria for a “2”.

Grade	Criteria
0	<input type="checkbox"/> Absent
1	<input type="checkbox"/> Present, not disruptive. <input type="checkbox"/> Tries to respond when called on but does not offer much. <input type="checkbox"/> Demonstrates very infrequent involvement in discussion.
2	<input type="checkbox"/> Demonstrates adequate preparation: knows basic case or reading facts, but does not show evidence of trying to interpret or analyze them. <input type="checkbox"/> Offers straightforward information (e.g., straight from the case or reading), without elaboration or very infrequently (perhaps once a class). <input type="checkbox"/> Does not offer to contribute to discussion, but contributes to a moderate degree when called on. <input type="checkbox"/> Demonstrates sporadic involvement.
3	<input type="checkbox"/> Demonstrates good preparation: knows case or reading facts well, has thought through implications of them. <input type="checkbox"/> Offers interpretations and analysis of case material (more than just facts) to class. <input type="checkbox"/> Contributes well to discussion in an ongoing way: responds to other students’ points, thinks through own points, questions others in a constructive way, offers and supports suggestions that may be counter to the majority opinion. <input type="checkbox"/> Demonstrates consistent ongoing involvement.
4	<input type="checkbox"/> Demonstrates excellent preparation: has analyzed case exceptionally well, relating it to readings and other material (e.g., readings, course material, discussions, experiences, etc.). <input type="checkbox"/> Offers analysis, synthesis, and evaluation of case material, e.g., puts together pieces of the discussion to develop new approaches that take the class further. <input type="checkbox"/> Contributes in a very significant way to ongoing discussion: keeps analysis focused, responds very thoughtfully to other students’ comments, contributes to the cooperative argument-building, suggests alternative ways of approaching material and helps class analyze which approaches are appropriate, etc. <input type="checkbox"/> Demonstrates ongoing very active involvement.