

Fall 2020 Syllabus
PHYS 707, Advanced Electromagnetic Theory

Instructor: Dr. Todd Pittman
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Office Hours: Wed. 1 – 3 pm.

Lectures: Wed & Fri 9:00 - 10:15
Location: Online (synchronous)

Primary Course Text: *Modern Electrodynamics* by A. Zangwill

Non-required reference texts: *Classical Electrodynamics* by J.D. Jackson
Introduction to Electrodynamics by D.J. Griffiths

Course Introduction

PHYS 607 / PHYS 707 is a two-semester sequence on electromagnetic theory. To a first approximation, PHYS 607 covered electrostatics (Zangwill Chapters 1 - 15) and PHYS 707 will cover electrodynamics (Zangwill Chapters 16 - 22).

This is essentially a class on Maxwell's equations (they're awesome!) and the behavior of electromagnetic fields in situations relevant to the research areas at UMBC.

Course Overview

I've decided to break with tradition and make this more of an "applied" course than a traditional "EM II" course. Rather than grind through the entire 2nd half of Zangwill, we'll go through Chapters 16 – 18 (and possibly 19) of Zangwill, and then get into a series of semi-independent 1-week "Applied Modules" that are directly relevant to the 4 main research areas in the UMBC Physics Department. Students will do the 1st four Applied Modules. If time permits at the end of the semester, I'll do 1 – 2 more Applied Modules.

Applied Modules

Students will fully prepare and execute 1-week Applied Modules. You are essentially the “Professor” for your 1-week module. This means you’ll prepare and deliver lectures, hand out a reference material package, and prepare and grade a HW set. The ground rules for the modules are to start with Maxwell’s equations, and then use them to lead into your topic.

Each student will also write an independent (sole author) paper on his/her topic (~ 5 – 10 pages, journal format). These papers will be handed out as the key component of your reference material package. Your papers will be graded by your peers as well as Dr. Pittman.

The general format of the 1-week Applied Modules will be:

- *Wednesday*: ~ 30 - 40 minute lecture during 2nd half of class. Hand out reference material package and HW set.
- *Friday*: ~ 50 - 70 minute lecture/discussion.
- *Tuesday*: HW sets due by noon. Peer assessments due by noon. Grade HW sets Tuesday PM.
- *Wednesday*: HW “return and review” during 1st half of class.

Additional Applied Module info:

- Topics and the schedule will be chosen in early September.
- Detailed grading rubrics for the written papers and the HW sets will be given when topics are assigned.
- Detailed rubrics for peer assessment of the written papers and Applied Modules will be given when topics are assigned.
- You will have ~6 – 8 weeks to prepare your modules.
- **All students will turn in their Applied Module package (written papers, reference materials, HW sets and solutions, outline of lectures) on the same due day in late October (TBD).** You’ll then participate in the other modules, and wait for your turn to lead your module.

Course Schedule

- *Early September:* Brief electrostatics review.
- *Early September:* Applied Module topics and schedule chosen.
- *September/October:* Zangwill Chapters 16 – 18 (and maybe 19).
- *Mid/late October:* 1 or 2 possible dedicated in-class Applied Module prep sessions.
- *Late October:* All 4 Students turn in completed Applied Module materials.
- *Late October – Mid-December:* Applied Modules
 - Applied Module 1 (Student 1)
 - Applied Module 2 (Student 2)
 - Applied Module 3 (Student 3)
 - Applied Module 4 (Student 4)
 - Applied Module 5 (Dr. Pittman; as time permits)
 - Applied Module 6 (Dr. Pittman; as time permits)

Course Grading

We will have ~ 6 – 10 HW sets throughout the semester (2 - 4 on the Zangwill Chapters, 4 - 6 on the Applied Modules). HW sets on the Student modules will be graded by the Student “Professor”, and reviewed by me. The overall course grade is determined by the following weightings:

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| • Average of HW set scores | 50% |
| • Individual paper average peer score | 10% |
| • Individual paper Dr. Pittman score | 20% |
| • Applied Module peer assessment | 10% |
| • Applied Module Dr. Pittman assessment | 10% |

Academic Integrity

As with all courses, Academic Integrity is required in PHYS 707:

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory.

Special Note: For complete UMBC Policies and Resources during COVID-19, please see:

<https://fdc.umbc.edu/files/2020/08/Template-Language-for-Syllabi-on-Blackboard-for-Fall-2020.docx>
