

FALL 2019

EEL 4473/5486

ELECTROMAGNETIC FIELDS AND APPLICATIONS II (EEL 4473)

ELECTROMAGNETIC FIELD THEORY I (EEL 5486)

1. Text: Sadiku, M.N.O. Elements of Electromagnetics, 7<sup>th</sup> ed., Oxford
2. Instructor: M. A. Uman, Classroom 239 Larsen Hall,  
Hours: M-W-F, 4<sup>th</sup> Period, 10:40 am to 11:30 am
3. Instructor Office Hours: M-W-F, 11:40 am – 12:30 pm, or by appointment,  
311 Larsen Hall ([uman@ece.ufl.edu](mailto:uman@ece.ufl.edu))
4. Compact view of the course

Material	Number of Lectures	Sections and Chapter in Text
1. Review of Maxwell's equations	8	4.2, 4.5, 4.6, 4.8, 7.2-7.6, Chap. 9
2. Electromagnetic wave propagation	10	Chap. 10
3. Waveguides and Transmission Lines	11	11.1-11.4, 11.7, Chap. 12
4. Antennas, Frequency domain	7	Chap. 13, 9.6
5. Antennas, Time domain	2	Notes provided
6. Miscellaneous topics in plasma physics	3	Notes provided
Final Exam Weds. Dec. 11th	Time: 7:30 – 9:30 am	Place: 239 Larsen Hall

### 5. Grading

Hour tests, probably 3 or 4, will be given during lecture periods. Take-home tests may be substituted for some hour tests. The hour or take-home tests, in total, will count for 50% of the final grade. The final exam will nominally count for the other 50% (or a greater percentage if the results are significantly better than the hour tests). Homework may be assigned. All in-class tests will be closed book with one personal handwritten sheet of notes allowed and turned in as part of the test. Take-home tests will be non-collaborative re humans but otherwise open book and open any other material.

## COURSE OUTLINE

### 1. Review of Maxwell's equations: Ch. 9, Sections 4.2, 4.5, 4.6, 4.8, 7-2.-7.6

- Electromagnetic (EM) field quantities, units, and constants
- Maxwell's equations for static electric and magnetic fields
- Maxwell's equations for time-varying electric and magnetic fields
- Maxwell's equations in the time and frequency domains

### 2. Electromagnetic wave propagation: Ch. 10

- Waves in general
- Propagation in lossy dielectrics (general case)
- Propagation in lossless dielectrics
- Propagation in good conductors
- Plane wave reflection

### 3. Waveguides: Ch. 12, Sections 11.1-11.4, 11.7

- Transmission lines (TEM waves)
- Transverse magnetic (TM) waves in rectangular waveguides
- Transverse electric (TE) waves in rectangular waveguides
- Wave propagation in the guide
- Cavity resonators
- Transients (time-domain pulses) on transmission lines

4. Antennas, frequency domain: Ch. 13, Section 9.6

- Hertzian dipole
- Half-wave dipole and quarter-wave monopole
- Small loop antenna
- Antenna arrays

5. Antennas, Time-Domain: Notes provided

- Vector and scalar potentials
- Radiation from a short current pulse on a long antenna

6. Miscellaneous topics in EM interactions with plasma; Notes provided

- Definition of a plasma, Debye length
- Electromagnetic wave propagation in a plasma
- Electrostatic plasma oscillations

## Commitment to a safe and inclusive learning environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination.

It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@ufl.edu](mailto:nishida@ufl.edu)

### *Sexual Discrimination, Harassment, Assault, or Violence*

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

### GatorEvals Implementation – Fall 2019

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.