

## PLASMA PHYSICS FOR EE'S

Course Number EEL 4930/EEL 5934 - Section 06EB/06HC

*Class Periods:* M, W, F, 7<sup>th</sup> period, 1:55 – 2:45 p.m.

*Location:* Classroom location – LARSEN HALL 310

*Academic Term:* SPRING 2017

1. Catalog Description – (3 credits) Plasma Physics for Electrical Engineers
2. Pre-requisites – EEL 3472
3. Course Objectives – To provide students with a basic foundation and understanding of plasma physics and its applications.
4. Instructor – Martin A. Uman, Distinguished Professor
  - a. Office location: 311 Larsen Hall
  - b. Telephone: 392-4038
  - c. E-mail address: [uman@ece.ufl.edu](mailto:uman@ece.ufl.edu)
  - d. Class web site: <https://ufl.instructure.com/courses/336217>
  - e. Office hours will be after class in Larsen 311
5. Class Time and Location: M,W,F 7<sup>th</sup> Period, 1:55 – 2:45 p.m., LAR 310
6. Digital copy of textbook material will be distributed
  - Title: “Introduction to Plasma Physics”
  - Author: Martin A. Uman
  - Publication date and edition: 1964, McGraw Hill
- a. ADDITIONAL TEXTBOOK REFERENCE is:
  - Title: “Principles of Plasma Physics”
  - Authors: Inan and Golkowski
  - Publication date and edition: 2011, Cambridge
7. Course Outline: Attached
8. Attendance and expectations – Attendance is mandatory. All cell phones must be silenced. Text messaging is not permitted during class or exams. Homework is due on Fridays. Cell phones and other electronic devices are to be silenced. No text messaging during class or exams. There are two (2) exams, one (1) midterm and one (1) final.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

9. Grading – **30% homework, 30% midterm exam, 40% final exam.**
10. Make-up Exam Policy – If you have a University-approved excuse and arrange for it in advance, or in case of documented emergency, a make-up exam will be allowed and arrangements can be made for making up missed work. University attendance policies can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Otherwise, make-up exams will be considered only in extraordinary cases, and must be taken before the scheduled exam. The student must submit a written petition to the

instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

11. Honesty Policy – UF students are bound by The Honor Pledge which states, *we, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code.* On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: ***On my honor, I have neither given nor received unauthorized aid in doing this assignment.*** The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.
12. Accommodation for Students with Disabilities – Students requesting classroom accommodation must first register with the Dean of Students Office That office will provide documentation to the student who must then provide this documentation to the course instructor when requesting accommodation.
13. UF Counseling Services – Resources are available on campus for students having personal problems or lacking clear career and academic goals. The resources include:
  - UF Counseling & Wellness Center, psychological and psychiatric services, 3190 Radio Road, 392-1575, online: <http://www.counseling.ufl.edu/cwc/Default.aspx>,
  - Career Resource Center, Reitz Union, career and job search services, 392-1601
  - University Police Department, 392-1111 or 911 for emergencies
14. Software Use – All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.
15. Course evaluation – Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at: <https://evaluations.ufl.edu> Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at: <https://evaluations.ufl.edu/results>.

## **Course Outline**

**Week 1** What is a Plasma? Phase Space, Distribution Functions, and Average Values

**Week 2** Random Current Density, and Kinetic Pressure

**Week 3** The Equations of Plasma Physics

**Week 4** The Behavior of Charged Particles in Electric and Magnetic Fields

**Week 5** Orbit Theory

**Week 6** The Interaction of Electromagnetic Waves with Plasmas

**Week 7** Magnetic and Kinetic Pressures

**Week 8** Plasmas Sheaths and Debye Length

**Week 9** Collisions and Radiation

**Midterm: Take home assigned on March 1, 2017 due on March 3, 2017 at 2:30 p.m.**

**Week 10 Spring Break**

**Week 11** Longitudinal Oscillations of Plasma Electrons and of Plasma Ions

**Week 12** Hydromagnetic Waves in Plasmas

**Week 13** Diffusion, Mobility, and Transport Phenomena

**Week 14** The Pinch Effect

**Week 15** Review

**Final Exam: April 27, 2017, 12:30 p.m. to 2:30 p.m.**