Syllabus Fall 2017

Special Topic ST:PHY6938 Electrodynamics III

Credits: 3(3,0). TuTh 12-1:20 pm, Chem 203

Prof: Robert E. Peale, PS423, Robert.peale@ucf.edu

Office hours: By appointment.

**Prerequisites:** PHY5346 Electrodynamics I and PHY6347 Electrodynamics II

**Course Description:** Advanced topics in propagation, radiation, and scattering of electromagnetic waves, electro- and magneto-statics.

**Goals and objectives:** Learn theory of and develop problem solving tools for classical relativistic (non-quantum) electrodynamics of particles, conductors, and dielectrics. Topics covered in this graduate elective will be those missed in the prerequisite core courses EDI & II.

**Required texts:** L.D. Landau and E.M. Lifshitz, Classical Theory of Fields, 4th revised edition & L.D. Landau, E.M. Lifshitz, and L. P. Pitaevskii, Electrodynamics of Continuous Media, 2nd edition.

**Course calendar:**

First month: Magnetic dispersion, spatial dispersion, screening, polaritons. Energy loss by charged particles. Exam 1.

Second month: Surface impedance of metals. Propagation of electromagnetic waves in inhomogeneous medium. Electromagnetic oscillations in hollow resonators. The propagation of electromagnetic waves in waveguides. The scattering of electromagnetic waves by small particles. The absorption of electromagnetic waves by small particles Exam 2.

Third month: Conducting ellipsoid. Dielectric ellipsoid. Permittivity of a mixture. Dielectric properties of crystals. Ferroelectrics. Exam 3.

Fourth month: Geometrical optics, intensity, the angular eikonal, narrow bundles of rays, image formation with broad bundles of rays, the limits of geometrical optics, diffraction, Fresnel diffraction, Fraunhofer diffraction. Final exam.

**Course assignments (assignments and exams)**: Homework will be assigned each class period. There will be four evenly spaced exams, including the final, based on homework assignments. Class participation will be recorded and will contribute to the grade.

**Methods of evaluation:** Homework presentations will be graded and will count for 30% of the final grade. Exams count for 15% of the final grade each. Class participation will count as 10%. + and – grades will be given. The final course grade will be available on myucf.

**PHYSICS DEPT MISSED WORK POLICY:** M*aking up missed work is permitted only for UCF-sanctioned activities and bona fide medical or family reasons.* ***Authentic justifying documentation must be provided in every case (in advance for UCF-sanctioned activities).*** *The form of the make-up will be determined by the instructor.*

Date Section Subject

LL8

Aug 22 79 Magnetic dispersion

Aug 24 103 Spatial dispersion

Aug 29 106 Polaritons

Aug 31 113 Ionization loss by fast particles in matter, non-relativistic

Sep 5 Problem Presentations

Sep 7 Problem Presentations

**Sep 12 Exam 1**

Sep 14 87 The surface impedance of metals

Sep 19 88 Propagation of waves in an inhomogeneous medium

Sep 21 89 The reciprocity principle

Sep 26 90 Electromagnetic oscillations in hollow resonators

Sep 28 91 The propagation of electromagnetic waves in waveguides

Oct 3 92 The scattering of electromagnetic waves by small particles

93 Absorption of electromagnetic waves by small particles

Oct 5 Problem Presentations

Oct 10 Problem Presentations

**Oct 12 Exam 2**

Oct 17 4 A conducting ellipsoid

Oct 19 4

Oct 24 8 A dielectric ellipsoid

Oct 26 9 The permittivity of a mixture

Oct 31 13 Dielectric properties of crystals

Nov 2 Problem Presentations

**Nov 7 Exam 3**

(vol. 2)

Nov 9 53, 54 Geometrical optics, Intensity

Nov 14 55, 56 The angular eikonal, Narrow bundles of rays

Nov 16 57, 58 Image formation with broad bundles of rays, limits of geometrical optics

Nov 21 59, 60 Diffraction, Fresnel diffraction

Nov 23 No class Thanksgiving

Nov 28 61 Fraunhofer diffraction

Nov 30 Problem and Lab presentations

**Dec 7 10 a.m.-12:50 p.m. Exam 4 (Final exam)**