

1. ECE 507: Plasma Physics and Applications
2. 3 credits: 2-75 minute lecture sessions/week
3. Jorge Rocca
4. None - Class notes
5. Course Information
 - a. Fundamental principles and industrial applications of plasmas
 - b. Prerequisites: ECE 342
 - c. Selected Elective: Electrical Engineering; Lasers & Optical Engineering; Computer Engineering
6. Goals for the Course
 - a. Course Learning Outcomes
 - i. Discuss the fundamental physical concepts, theory, and applications of plasmas
 - ii. Identify the different plasma regimes
 - iii. Identify and describe the practical applications of different plasma in industry
 - iv. Describe the low density plasmas that are used in processing by the semiconductor industry, glow discharges plasmas used by the lightning industry and the extreme regime of high density plasmas used for the efficient generation of extreme ultraviolet and x-ray radiation
 - b. Student Outcomes
 1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
 2. An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and welfare, as well as global, cultural, social, environmental, and economic factors
 3. An ability to communicate effectively with a range of audiences
 4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
 6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
 7. An ability acquire and apply new knowledge as needed, using appropriate learning strategies
7. Topics Covered
 - Concept of Plasma
 - Maxwell equations and single particle motion
 - Plasmas as Fluids
 - Particle collisions and radiation

DC glow discharges
RF-produced plasmas
Diagnostics for low density plasmas
High density plasmas
Plasma equilibrium and stability
Laser-produced plasmas
Diagnostics for dense plasmas
Application of dense plasmas