

EE403 Introduction to Plasma Processing (Elective)

Course Description and objectives:

Students learn about plasma applications such as plasma deposition, plasma etching, gaseous electronics, gas lasers and plasma materials processing. Topics include basic atomic theory, elementary kinetic theory of gases, motion of charges in electric and magnetic fields, plasma properties, plasma generation and devices, plasma-surface interactions, electrodes and discharge characteristics, plasma diagnostics and plasma simulation.

Textbook(s) and/or other required material:

- “Industrial Plasma Processing” by J Reece Roth, Institute of Physics Publishing, ISBN 0-7503-0318-2, 1995.
- “Plasma Processing for Semiconductor Fabrication” by W. Nicholas G. Hitchon, Cambridge Unive Pr (Short); ISBN: 0521591759, 1999.

Topics covered:

- Plasma applications
- Basic Atomic Theory
- Particle Collision
- Kinetic Theory of Gases
- Boltzmann Distribution
- Reaction Rates and Saha Equation
- Radiation and Equilibrium
- Plasma Properties
- Motion of Charges in Electric and Magnetic Field
- Characteristics of Plasma
- Electrodes
- DC and High Frequency Discharges

Lecture/laboratory Schedule:

Tuesdays and Thursdays 11:00 a.m. - 12:20 p.m.

Relationship of Course to Program Outcomes

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| (a) | 2 | Ability to apply knowledge of mathematics, science, and engineering to plasma processing problems. |
| (b) | 0 | |
| (c) | 0 | |
| (d) | 0 | |
| (e) | 2 | Homework assignments, preparation for presentation and exams are part of the engineering problem solving process. |
| (f) | 1 | Interaction with the instructor during lectures, office hours, individual meeting and grading procedures. No specific professional ethics lectures are given. |
| (g) | 2 | Individual presentation during the semester, homework assignments and class participation measure also the ability to communicate effectively with the instructor and other students. |
| (h) | 2 | Broad topics in plasma processing were discussed after each presentation and proposed solutions and their merits and societal implications are discussed. |

- (i) 2 Both undergraduate and graduate students present and discuss advance topics and research opportunities in the beginning of each lecture.
- (j) 2 Each student is assigned a special topic on current trends in the plasma processing area. They present their topics in class.
- (k) 2 Use of Matlab for homework, Powerpoint for presentations and students were required to access national database for solving their homework.
- (ee1) 2 A few lectures were devoted to teaching kinetic theory of gases.
- (ee2) 0
- (ee3) 2 Lectures and homework uses advanced mathematical tools to solve problems in contemporary plasma processing applications.
- (ee4) 0

Prepared by :

Kasra Etemadi, Associate Professor, June 15, 2002