

Cal Poly Pomona, Plasma Physics 422

Instructor: Dr. Nina Abramzon	email:nabramzon@csupomona.edu
Office: Building 8 Room 224	Phone: 869-4021
Office Hours: Mon, Wed 1:00 -2:00. By appointment : Tue 4:00-5:00	
Text: Principles of Plasma Processing / Chen & Chang	
Course website: On BlackBoard	

Course Description: Students learn about plasma and plasma applications. 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, plasma deposition, etching, and plasma sterilization.

Course Organization: In addition to the traditional presentation of lecture and demonstration material, each lecture will involve interactive learning sessions. During these sessions students will work in groups on a specific assigned question and will discuss the results with other students and with the instructor. The course will also include a laboratory component.

Course objectives:

- Students should gain knowledge of basic principles of plasma physics such as: 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, plasma deposition, plasma etching, and plasma sterilization.
- Students should develop the ability to research, read, understand, critically discuss a scientific article.
- Through oral presentation, students should improve their ability to coherently present complex material to others.
- To acquire basic training in experimental techniques used in the field of plasma physics

Prerequisites: Physics 133.

Grading:

Homework and class work	25%
Exam (11/12/2012)	35%
Presentation	15%
Laboratory experiment	25%

Exam: The exam is in class closed book.

Presentation: Towards the end of the quarter each student will participate in a 45 minute group presentation about applications of plasma physics. Groups will consist of 3 students, with each student speaking for 15 min during the presentation. **Each unexcused absence from a presentation will result in a half letter grade reduction.** See the instructor promptly with your excuse should you miss a presentation. More information about this activity will be provided during the quarter. **You must form a group by 10/3 and have a topic approved by 10/24**

Laboratory experiments: Toward the end of the quarter you will investigate experimentally topics related to plasma diagnostics and applications. More information about this activity will be provided during the quarter.

All work must be submitted by due date. **Late submission will result in 5% reduction from the assignment's grade per day.**

Rough course schedule Phy 422 Fall 2012

This is a rough schedule. The syllabus may be adjusted during the quarter.

Week 1: Introduction- Overview and applications

Kinetic Theory of Gases

Reading: p 103-119

Week 2: Gas phase collision processes

Reading: p.11-24, p 119-135

The structure of atoms and molecules

Collision cross sections

Week 3: Plasma Fundamentals

Reading: p.1-11

Plasma potential, Temperature, oscillations

Debye Length

Week 4: Making a plasma

Reading: p.25-30

The vacuum system

The gas handling system

The discharge power source

Week 5: Plasma Sources

Reading: p. 31-74

DC Glow discharge plasma (structure Ignition and regimes)

RF Glow discharge plasma

Week 6 and week 7: Plasma Diagnostics

Reading: p.75-8, p137-150, and p.151-167

Molecular collisions and spectra

Optical emission spectroscopy

Laser induced Fluorescence

Mass Spectrometry

Week 8: Plasma Applications & Laboratory experiments

Exam

Plasma Applications (Student presentations)

Laboratory experiments

Week 9 and Week 10: Plasma Applications & Laboratory experiments

Plasma Applications (Student presentations)

Laboratory experiments

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