University of Wisconsin - Madison
College of Engineering [EGR]
Last Offered: 2014-2015 Fall [1152]
Direct Link to this Syllabus:

1. **E C E 528, Plasma Processing and Technology**
2. **Credits : 3**  **Contact Hours : 2.5**
3. **Textbook and Materials :** Principles of Plasma Discharges and Material Processing; Lieberman and Lichtenberg; 2nd; 2005

   a. **Other Supplemental Materials :** None

   • **Specific Course Information :**

   a. **Brief description of the content of the course (Course Catalog Description) :**
   Introduction to basic understanding and techniques. Plasma processing of materials for semiconductors, polymers, plasma spray coatings, ion implantation, etching, arcs, extractive metallurgy and welding. Plasma and materials diagnostics.
   
   b. **Pre-requisites or Co-requisites :** Physics 322 or ECE 320 or equiv or cons inst
   
   c. **This is a Selected Elective course.**

   • **Specific Goals for the Course :**

   a. **Course Outcomes :**

   1. Specify or establish plasma properties over a wide parameter range.
   2. Explain the concepts of thermionic emission, secondary emission, ionization, charge exchange, confinement, and stability.
   3. Use a combination or resources (class text, class notes and literature) to solve problems.
   4. Solve problems involving DC (hot cathode, magnetron, arc jet) and RF (capacitive, inductive, helicon, surface wave, arc jet) sources.
   5. Solve problems and develop designs for systems involving plasma etching and thin and thick film deposition.
6. Write a paper based on literature survey of a particular plasma processing technique.

- **ABET Student Learning Outcomes:**
  
  (a) Ability to apply mathematics, science and engineering principles.
  (b) Ability to design and conduct experiments, analyze and interpret data.
  (e) Ability to identify, formulate and solve engineering problems.
  (f) Understanding of professional and ethical responsibility.
  (h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.
  (i) Recognition of the need for and an ability to engage in life-long learning.
  (j) Knowledge of contemporary issues.
  (k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

- **Brief List of Topics to be Covered:**
  
  - Basic plasma and gas discharge concepts
  - Glow discharge plasmas
  - RF plasmas
  - Computer simulation techniques
  - Plasma source ion implantation
  - Sputtering
  - Plasma chemistry, etching and polymerization
  - Diamond and diamond-like films
  - Diagnostics/Probes
  - Optical diagnostics: LIF and OGS
  - Arcs and arc jets
  - Plasma torches and sprays