Department of Materials Science and Engineering
University of Maryland, College Park, Maryland

1. **ENMA 465 – Microprocessing Materials**

2. **Credits and contact hours – 3 credits.** The University of Maryland follows the Maryland Higher Education Commission's policies on "contact hours;" specifically, one semester hour of credit will be awarded for a minimum of 15 hours, of 50 minutes each of actual class time, exclusive of registration, study days, and holidays.

   Schedule: meets two 75 minute periods (lecture)

3. **Instructor's or course coordinator's name: Profs. Gary Rubloff and Ichiro Takeuchi**

4. **Text book, title, author and year:** none required
   a. **Optional supplementary materials:** Introduction to Microfabrication, 2nd edition, 2010, Sami Franssila, Wiley. Fabrication Engineering at the Micro- and Nanoscale, Third Edition; Stephen A. Campbell, Oxford Press, paperback (978-0-1-9532017-6); Fundamentals of Semiconductor Fabrication, Gary S. May and Simon M. Sze, Wiley 2004, ISBN 0-471-23279-3; Silicon VLSI Technology (Fundamentals, Practice and Modeling) by James D. Plummer, Michael D. Deal, and Peter B. Griffin, Introduction to Microelectronic Fabrication, 2nd edition, Richard C. Jaegar (1988), Addison-Wesley Modular Series on Solid State Devices, ISBN 9780201444940

5. **Specific course information**
   a. **Brief description of the content of the course (catalog description):** Micro and nanoscale processing of materials. Emphasis on thin film processing for advanced technologies.
   b. **Pre-requisites or co-requisites:** ENMA 300. Permission of the Department.
   c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 465 is a required course for Materials Science and Engineering majors.

6. **Specific goals for the course:**
   a. **Specific outcomes of instruction**: The outcomes of the course are as follows:

      1. Provide an overview of thin film microprocessing, from chemical and physical fundamentals at the microscopic level to applications in microelectronics, nanotechnology, and other areas.

2. Identify and understand key concepts which transcend the various embodiments of microprocessing, so that students will be able to recognize the role of these concepts in diverse applications.

b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed in this course.

ABET A: Ability to apply mathematics, science and engineering principles
ABET B: Ability to design and conduct experiments, analyze and interpret data
ABET C: Ability to design a system, component, or process to meet desired needs
ABET E: Ability to identify, formulate and solve engineering problems
ABET K: Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

7. Brief list of topics to be covered.

1. Overview of microprocessing & design project
2. Physical vapor deposition
3. Vacuum technology
4. Patterning - litho & wet etch
5. Thermal oxidation
6. Chemical vapor deposition
7. Plasma processing
8. Diffusion and interfacial reaction
9. Nanostructure fabrication processes - ALD, VLS
10. Selective reaction and self-alignment
11. Surface & thin film characterization