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

1. **ENMA 481 – Introduction to Electronic and Optical 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: Prof. Ichiro Takeuchi**

4. **Text book, title, author and year:** Principles of Electronic Materials and Devices, Third Edition by S.O. Kasap

5. **Specific course information**
   a. **Brief description of the content of the course (catalog description):** Electronic, optical and magnetic properties of materials. Emphasis on materials for advanced optoelectronic and magnetic devices and the relationship between properties and the processing/fabrication conditions.
   b. **Pre-requisites or co-requisites:** ENMA 300 or permission of ENGR-Materials Science & Engineering department.
   c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 481 is an elective course for Materials Science and Engineering majors.

6. **Specific goals for the course:**
   a. **Specific outcomes of instruction:** The main objectives of this course are to:
   1. Know how are electrical, optical and magnetic properties are related to the crystal structure and electronic structure of materials.
   2. Understand how band structure relates to these properties
   3. Be able to anticipate how materials processing/device fabrication will affect materials properties and device performance
   4. Demonstrate the ability to analyze and interpret experimental data based on these principles.

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 to design
ABET B: Ability to design and conduct experiments, analyze and interpret data.
ABET D: Ability to function on multidisciplinary teams

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. Review of relevant materials science
2. Relevant solid state and quantum physics
3. Dielectric materials
4. Interconnects
5. Semiconductor materials
6. Semiconductor devices
7. Magnetic materials
8. Ferroelectric materials
9. Optical materials
10. Superconductors
11. Thin film and device fabrication