

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

1. ENMA 312 – Experimental Methods in Materials Science

- 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 one 75 minute period weekly (lecture) and one three hour period per week (lab)

3. Instructor's or course coordinator's name: Profs. Luz Martinez-Miranda and Marina Leite and Dr. Aldo Ponce

4. Text book, title, author and year: none required

- a. Other supplemental materials:** Notes supplied by faculty. A good reference: Understanding the Properties of Matter, M. De Podesta, Taylor and Francis, second edition, 2002, available in the bookstore

5. Specific course information

- a. Brief description of the content of the course (catalog description):**
Introduction to experimental methods in materials characterization; synthesis of colloidal nanoparticles; X-ray diffraction and light scattering; optical microscopy; thermal conductivity and expansion; electrical measurements; heat capacity; computational materials design.
- b. Pre-requisites or co-requisites:** ENMA 300 or permission of the department; Co-requisite: ENMA460. Restriction: Junior standing or higher.
- c. Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 312 is a required course for Materials Science and Engineering majors.

6. Specific goals for the course:

- a. Specific outcomes of instruction:** At the end of this course, the student should be able to
1. Describe a variety of experimental methods to measure structural, electrical and thermal properties of materials.
 2. Identify what specific property(ies) a particular method describes.

3. Identify the most appropriate method or methods to probe specific materials' properties.
4. Identify the limitations of a specific measurement method.
5. Describe how different methods can be used to describe the behavior of a particular material.
6. Understand the relationship between a material's properties, and the method used to prepare (process) it.
7. Understand how the relationship above can be used to improve products.

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 D: Ability to function on multidisciplinary teams.

ABET E: Ability to identify, formulate and solve engineering problems

ABET G: Ability to communicate effectively.

ABET I: Recognition of the need for and an ability to engage in life-long learning.

ABET J: Knowledge of contemporary issues.

ABET K: Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

7. Brief list of topics to be covered.

Nanostructures

Materials Synthesis of ZnO

Light Scattering

X-Ray diffraction

LED

Computational materials design

Optical Microscopy

PDLC/Ellipsometry

DSC/TGA

Thermal properties