

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

1. **ENMA 445 – Soft Liquid Crystals and Structured 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 per week

3. **Instructor's or course coordinator's name:** Prof. Luz Martinez-Miranda
4. **Text book, title, author and year:** Peter J. Collings and Michael Hird, Introduction to Liquid Crystals, Taylor and Francis, 1997.
  - a. **Other supplemental materials:** Peter J. Collings, Liquid Crystals: Nature's Delicate Phase of Matter, Princeton, 2nd edition, 2002. Articles provided in class plus faculty notes provided in the powerpoint presentations

**5. Specific course information**

- a. **Brief description of the content of the course (catalog description):** Elective course on the properties and behavior of liquid crystals and related soft materials, and their relationship to biomaterials and to applications.
  - b. **Pre-requisites or co-requisites:** MATH246, PHYS270, and PHYS271 and 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 445 is an elective 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 answer the following questions:
    1. What are liquid crystals?
    2. How do the properties of anisotropy, self-ordering, and nanometric size relate to the liquid crystal?
    3. How makes liquid crystals ideal for applications?
    4. How do liquid crystals relate to biomaterials?
    5. How can the knowledge of liquid crystals and their properties be extended to other materials?

**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 G: Ability to communicate effectively

ABET H: The broad education necessary to understand the impact of engineering solutions in a global and societal context

ABET J: Knowledge of contemporary issues.

**7. Brief list of topics to be covered:**

1. Introduction
2. More detailed look at the behavior of anisotropic fluids
3. Calamitic liquid crystals
4. Discotic liquid crystals
5. Polymeric liquid crystals
6. Chiral liquid crystals
7. Lyotropic liquid crystals
8. How to determine phases in the liquid crystal and other changes
9. Liquid crystals in Electric and Magnetic fields
10. Theoretical considerations