SYLLABUS

EE 600-3 Special Topic: *Foundations of Polymer MEMS*

We use polymers everyday without thinking about them. This is especially true of the BRB nanodevice and MEMS researchers who use polymers extensively in fabrication processing as well as the material of choice for realizing enhanced device functionality. In order to be more creative users we need to develop a background in polymers and their physical properties. This special topics course is designed to give engineers and science students a general reading background in polymers. The course includes readings on polymer properties from a leading textbook, together with independent readings and reports to the class by students on special topics of interest to them and their ongoing or potentially planned research.

Text & Readings: Sperling, 4th, *Introduction to Physical Polymer Science*. Wiley Interscience (2001).
Supplemental materials provide by the instructor
Additional individualized readings selected by students

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Goal: To develop a reading knowledge about polymers and their properties. To engage in discussions and share knowledge about polymers with each other to broaden our understanding, especially an increased understanding of potential device applications. To review fundamentals that help to unify ideas from across disciplines and technical areas.

Course Learning Outcomes: Students who complete this course will be able to:

1. Perform independent literature review leading to *successful completion* of a term paper and oral presentation on a polymer topic related to MEMS. *Successful completion* includes a masterful demonstration of being able to relate underlying fundamentals taught in class from Topics Coverage 1,3-11 to the final report topic.
2. Independently search for special topics related to polymers science, chemistry and application as it relates directly or peripherally to application to MEMS devices, application or fabrication.
3. Read advanced literature outside of traditional EE curriculum on polymer science including review of prerequisite physics and chemistry.

Grading:		
Written Final Report on special topic	25 %	(Warning: start early)
Oral Final Report during finals period	25 %	
Meaningful class participation	20 %	
5-10 one-page summaries of selected advanced readings	20 %	(Book, book chapter, review articles)
One 10 min. talk to class on fundamental background or other assignments to be determined	10 %	

University policy on academic dishonesty:

Plagiarism, copying of the work of others, cheating will be handled severely in accordance with University policy. University policy states that academic dishonesty can result in a failing grade or even dismissal from the University. On the other hand students are encouraged to discuss homework and projects. If you feel that you are entering a compromising situation, please discuss with the Professor early on. A specific problem encountered in a past readings class was plagiarism of reading materials from the web in place of writing original reports. This will not be tolerated.

OVERVIEW OF COURSE ACTIVITIES

Introduction: Start reading and discussing Sperling 1-2 chapters per week.
In discussion include linkages to our research and neat research we'd like to start.
Identify neat properties or topics we select for specialized reading.
Identify areas were we need special review of fundamentals (e.g. organic chemistry, quantum mechanics, thermodynamics/kinetics, mechanics.)

Transition: Discussions relating polymer properties to to UofL research projects

Topics of Special Interest: Selected by students

Polymer properties of interest:

Chemical structure
Melting, glass transitions, molecular weight
Suspension in solvents
Surface and wetting properties
Measurement procedures
Micro-nanostructure (block copolymers, folding, cross-linking)
Visco-elastic properties
Elastic properties
Adding electronic and optical properties

TOPICS COVERAGE BY CLASS SCHEDULE (estimated coverage)
(3 sessions/week, 50 min/session):

1. Reviews of fundamentals as needed (3 classes)
   (e.g. organic chemistry, thermodynamics/kinetics, mechanics.)
2. Discussions relating polymer properties to UofL Projects (3 classes)
3. Chemical structures of polymers (3 classes)
4. Thermodynamic properties of polymers (3 classes)
   (e.g. melting, glass transitions, molecular weight)
5. Properties of polymers suspended in solvents (3 classes)
6. Surface and wetting properties of polymers (2 classes)
7. Methods of measuring polymer properties (6 classes)
8. Micro/nanostructure (5classes)
   (block copolymers, folding, cross-linking)
9. Visco-elastic properties (4 classes)
10. Elastic and mechanical properties (3 classes)
11. Adding electronic and optical properties to polymers (2 classes)
12. Topics of Special Interest: Selected and presented by students (5 classes)