Course Syllabus

Micro/Nanomechanics, MECH 6v69
Special Topics in Mechanics and Materials
Fall 2016
Hours: Mon & Wed: 8:30 – 9:45 AM
Class Credits: 3 credits
Location: CB2 1.202

Instructor: Majid Minary
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Office hours: TBD

Prerequisite: It is strongly recommended that students have previously taken MECH 2320 and 6306 or equivalent courses.

Course Description: This course will introduce advance characterization techniques for materials at small scales. The emphasis will be on multifunctional materials, advanced composites, nanocomposites, bioinspired materials, nanofiber, nanowires, nanocrystalline materials, as well as traditional materials such as metals, ceramics and polymers. The characterization techniques will cover atomic force microscopy, nanoindentation, and micro/nanoscale tension/compression, piezoresponse force microscopy, nanoscale thermal and electrical measurements, fracture measurements. Aspect of advanced manufacturing such as additive manufacturing, electrospinning, and freeze casting will be also introduced.

Required Textbooks and Materials:
There is no required textbook.

Suggested Course Materials:
High impact Journal papers will be provided throughout the course for reading.

Assignments & Grading:
- Mid-term exam 20%
- Final exam 30%
- Reports – Homework- Projects 40%
- Class attendance and participation in class discussion 10%

Selected Topics

- **Atomic force microscopy (AFM)**
- **Nanoindentation**- Instrumentation and Analysis
- ***In situ* SEM experimentation –** Nanomanipulation, sample preparation, tension, compression, bending, etc. and analysis
- **Advanced nanomaterials:** Nanofibers, nanowires, carbon nanotubes, nano-cellulose, nano-composites, bioinspired materials.
- **Mechanics of biomaterials:** soft and hydrated materials, biopolymers (silk, collagen, cellulose, melanin, etc)
- **Multifunctional materials:** Piezoelectricity, pyroelectricity, electrocaloric and elastocaloric materials, smart fabrics, etc.
- **Processing and manufacturing techniques:** Electrospinning, spin-coating, freeze casting, 3D nanomanufacturing, 3D printing, etc.
- **Overview of experimental fracture mechanics**
- **Overview of fatigue experiments**
- **Experimental aspects of testing small scale polymeric, and composite materials.**
- Spectroscopic methods: XRD, FTIR, Raman, UV-vis, DSC
- **Characterization techniques:** dynamic mechanical analysis, Thermomechanical analysis, viscoelastic properties
- **Mechanics in emerging applications:** flexible materials and sensors, smart fabrics and textiles, 3D-printed materials.
- **Overview of industrial applications**

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.
Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.