UNIVERSITY OF SOUTHERN MAINE
Department of Engineering

EGN 498 – Micro Electro Mechanical Systems (MEMS) Elective
Instructor: Mustafa G. Guvench, guvench@usm.maine.edu, JMC 123H, ph. 780-5581 Updated 1.2008
Schedule: Lecture: 2- 1hr and 15min. lectures/week

Course Description (Catalog):
Micro-electro-mechanical devices and systems (MEMS). Topics include microfabrication, principles of electromechanical energy conversion and transduction, sensors and actuators, materials used for MEMS and their thermal, electrical and mechanical properties, micro-electro-mechanical building structures and MEMS design.
Prerequisites: ELE 342 (Electronics I) or ELE 323 (Electromechanical Energy Conversion), and permission Lecture 3hrs.

Contribution to Professional Component: 70% Engineering Science, 30% Engineering Design

Textbook:

Topics:
1. Overview of MEMS and Microsystems, and their applications,
2. Thermo-Electro-Mechanical Working Principles of Microsystems,
3. Materials for MEMS, and their properties
4. Microsystem Fabrication: Processes and Technologies for MEMS,
5. Engineering Mechanics for Microsystems Design
6. Thermofluid Engineering for Microsystems Design
7. Scaling Laws
8. Microsystems Design and Packaging

Course Objectives:
1. Students will gain a fundamental understanding of standard microfabrication techniques and the issues surrounding them.
2. Students will know the major classes, components, and applications of MEMS devices/systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems.
3. Students will understand the unique requirements, environments, and applications of MEMS.
4. Students will apply knowledge of microfabrication techniques and applications to the design and manufacturing of an MEMS device or a microsystem.
5. Students will foster interest for further study.

Measurable Outcomes:
1. Students will be able to understand working principles of currently available microsensors, actuators, and motors, valves, pumps, and fluidics used in Microsystems.
2. Students will be able to apply scaling laws in the conceptual design of microdevices and systems.
3. Students will be able to choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process.
4. Students will demonstrate that they can build on what they learned in classroom by doing research, writing a report, and making a power point presentation on a topic of interest in Micro Electro Mechanical Systems (MEMS)

**Relationship to Program Outcomes***: BP2, BP3, BP4, PSAD2, PM2

**Assessment Methods:**
1. Graded exams.
2. Graded project
3. Graded assignments

**Grading Policy:**
Takehome examinations and homework assignments are required to be returned in electronic form and use of MathCad/Mathematica is expected in calculations. Homeworks are due the same day of the next week. Late homeworks receive zero credit. Only one assignment per term may be forgiven.

**Grade Distribution:**
- Exams 50%
- Project and Presentation 35%
- Assignments 15%

**Academic Support for Students with Disabilities:** Students who may need assistance due to a disability are encouraged to contact the Office of Academic Support for Students with Disabilities, Luther Bonney 242, ph. 780-4076, TTY 780-4395.

* Detailed Program Outcomes may be obtained from the Department Office.