1. Catalog Description: (3 credits) A continuation of EEL5225 focused on developing a framework to design microelectromechanical system (MEMS) transducer systems in the context of physical, technological, and economic constraints.

2. Pre-requisites: EEL5225 (or approval of instructor)

3. Course Objectives: To teach how to design MEMS transducers and to explore design tradeoffs, circuit/system issues, device performance, and manufacturing of microsystems.

4. Contribution of course to meeting the ABET professional component: N/A

5. Relationship of course to ABET program outcomes: N/A

6. Instructor: Dr. Toshi Nishida
   a. Office location: Larsen 219
   b. Telephone: 392-6774
   c. E-mail address: nishida@ufl.edu
   d. Web site: http://lss.at.ufl.edu
   e. Office hours: Tu Th 4 pm - 5:00 pm, or by appointment

7. Teaching Assistant: None
   a. Office location:
   b. Telephone:
   c. E-mail address:
   d. Office hours:

8. Meeting Times: Tu 7 per. (1:55-2:45 pm)/Th 7-8 pers. (1:55-2:45pm, 3:00-3:50pm)

9. Class/lab schedule: Some in-class demonstrations

10. Meeting Location: Black Hall 415

11. Material and Supply Fees: None

12. Textbooks and Software Required:
    MATLAB, MathCAD, Excel, or equivalent may be needed for homework.
    Finite-Element software (e.g. COMSOL, ANSYS, Coventorware, etc.)

13. Recommended Reading:
    Books:
   
    Primary Journals:
    J. Microelectromechanical Systems (IEEE/ASME)
    J. Micromechanics and Microengineering (IoP)
    Sensors and Actuators (Elsevier)

    Major Conferences:
Transducers ‘XX, Int. Conf. on Solid-State Sensors and Actuators, odd-numbered years since 1983, proceedings available from IEEE (US meetings), Elsevier (European meetings), IEE Japan (Japanese meetings).
Hilton Head ‘XX, Solid-State Sensors and Actuators Workshop, Hilton Head, SC, even-numbered years since 1984, proceedings available from Transducer Research Foundation.
Euroensors ‘XX, annual since 1987, proceedings published in special issues of Sensors and Actuators.
MEMS ‘XX, IEEE Workshop on Micro Electro Mechanical Systems, annual since 1989, proceedings available from IEEE.
COMS ‘XX, Commercialization of Micro and Nano Systems Conf., annual since 1996, proceedings available from MANCEF.
… plus many more area-specific conferences, e.g. PowerMEMS, μTAS, Optical MEMS, BioMedical, etc.
Informative Websites:
www.memsnet.org General MEMS and Nanotechnology Information
www.mems-exchange.org MEMS Exchange – MEMS Foundry Services
www.smalltimes.com News about MEMS, Nanotechnology, and Microsystems
www.mancef.com Micro and Nanotechnology Commercialization and Education Foundation
www.memsindustrygoup.org North American MEMS Industry Group

14. Course Outline:
Review of Transducers (1)
Domain Specifics (6)
- For example: Thermodynamics, Fluidics, etc
System Issues (8)
- For example: Interface Electronics, Noise, etc.
Advanced Modeling (8)
- Optimization Techniques
- Finite-Element Modeling
Case Studies (3)
- For example: Dual back-plate mic, Optical and BioMEMS
MEMS Manufacturing (3)
- Economics
- Yield, Statistical Analysis
- Test Structures
Device Characterization (3)
- MEMS Metrology
- Uncertainty Analysis
- Design of Experiments

15. Attendance and Expectations:
Students are expected to attend class lectures and arrive on time. Please turn off cell-phones, pagers, and other electronic devices.
16. Grading: Homework 20% 5-8 assignments
   Exam 1 20%
   Exam 2 20%
   Design Project 40%
   100%

17. Grading Scale: $\geq 90$ A, $\geq 89$ A-, $\geq 86$ B+, $\geq 80$ B, $\geq 79$ B-, $\geq 76$ C+, $\geq 70$ C, $\geq 69$ C- $\geq 66$ D+, $\geq 60$ D, $\geq 59$ D-, <59 E

18. Make-up Exam Policy:
   Homeworiks: **DUE AT BEGINNING OF CLASS PERIOD**
   -10% if turned in after lecture begins
   -20% if turned in after lecture ends (up to one business day late)
   Exams: No make-up unless prior written documentation from Dean of Students, Physician, or Judge.

19. Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

**UF Honor Statement: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.***

***CHEATING, COPYING, or PLAGERISM will result in a ZERO ON THE ASSIGNMENT, and DISCIPLINARY ACTION WILL BE PURSUED*** (see www.dso.ufl.edu/judicial/academic.php)

20. Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

21. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
   - University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
   - SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
   - Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
   - Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

22. Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.