

# Course Syllabus

## ELEG 4213 MICROSENSORS, MEMS AND SMART DEVICES

### Class Schedule:

- Lecture in the class room: Monday 3:40-5:00 pm. Room# 1610, ENRC building
- Lab work at High Density Electronics Center: Wednesday 2:40-5:00 pm

### Instructor:

Vijay K. Varadan, office: ENRC 634, phone 575-5407, email: vjvesm@uark.edu  
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**Objectives:** The aim of this class is not only to make students familiar with recent developments and process technology of the microsensors, MEMS, and smart devices in the classroom, but also to give them hands on experience for the fabrication processes using micro-fabrication tools in the cleanroom. In the classroom, the first part of this lecture will review briefly on various application fields of the microsensors, MEMS, and smart devices. Then we will concentrate on the materials and on processes required to make different kinds of the microdevices. Most of these technologies have been derived from silicon integrated circuit (IC) technologies, so the standard microelectronics technology to produce ultra large-scale integrated circuits and package them will also be reviewed. Then, the new techniques that have been developed to make microsensors and microactuators, such as bulk and surface silicon micromachining will be followed. In addition, the emerging technology of microstereolithography that can be used to form true three-dimensional micromechanical structures will be included.

For the hands-on-experience of the microfabrication and MEMS technologies, the student will learn how to fabricate smart sensors on silicon wafers using microfabrication tools in the cleanroom. The fabrication process will include metal thin film e-beam evaporation, dielectric thin film growing using oxidation tube furnace, electrochemical deposition, and various kinds of chemical processes.

**Grades:** Grades will be based upon performance on homework, exams, and the lab report.

The weighting for different areas is:

- Midterm exam 20%
- Final exam 40%
- Homework 10%
- Lab work 30%

### Reference texts:

1. Julian W. Gardner, Vijay K. Varadan, and Osama O. Awadelkarim, "Microsensors MEMS and Smart Devices," John Wiley & Sons, 2001
2. Vijay K. Varadan, Xiaoning Jiang, Vasundara V. Varadan, "Microstereolithography and other Fabrication Techniques for 3D MEMS," John Wiley & Sons
3. Vijay K. Varadan, K. J. Vinoy, and K. A. Jose, "RF MEMS and their Applications," John Wiley & Sons
4. S. Wolf and R. N. Tauber, "Silicon Processing for the VLSI Era, Volume 1-Process Technology,