



## **Department of Biosystems & Agricultural Engineering**

### ***Agricultural Electronics: Advanced Agricultural Electronics Networks Development***

**WHEN:** Spring 2010

**COURSE DETAILS:** BAE 5030 – Section 352 (3 hrs)

**INSTRUCTOR:** Dr. Marvin Stone

**PREREQUISITES:** BAE5413, MAE 4733 or equivalent, basics of C programming.

**MEETING TIME and PLACE:** 3:30-4:45PM, Ag Hall 210

**COURSE OBJECTIVES:** This course is designed for students who may work in the design, development, application, and performance issues of low-power embedded systems. Design of low-power micro-controller systems will be surveyed and laboratory exercises will reinforce the necessity of those techniques. Design tradeoffs regarding communications strategies, data rates, and power consumption will be examined for wireless and wired network based systems. A review of embedded C development and use of an IDE based development tool and debugger will be provided. The TI MSP430 will be used for hands-on development and students will need to purchase a development tool (\$20).

### **PRELIMINARY SUBJECT OUTLINE:**

1. Introduction to low-power embedded systems design
  - a. Basic embedded system development
    - i. Overview of the development process
    - ii. Familiarization with IDE based code development
    - iii. Review of “c” programming techniques for embedded systems
    - iv. Time-triggered and event triggered code
  - b. Hardware systems for embedded agricultural applications
    - i. Micro-controller selection
    - ii. Power supply systems
    - iii. Power sources
    - iv. Communication networks
  - c. Network technologies for embedded agricultural systems
    - i. Wireless systems
      1. Zigbee based systems
      2. Other wireless technologies
    - ii. Wired network systems
      1. CAN based networks
      2. High performance real-time wired networks
  - d. Power technologies
    - i. Charging and delivery electronics
    - ii. Stored charge systems
    - iii. Energy scavenging technologies
    - iv. Solar / wind / water flow systems
  - e. Future technologies
  - f. Applications

**COURSE STYLE:** The initial portion of the course will consist of conventional lecture and study assignment. A later portion of the course will be taught in a laboratory style and will have a “hands-on” embedded development exercises. A final student presentation will conclude the course.

**GRADING:**

Final presentation 25%, Class notebook 25%, Quizzes 25%, Homework 25%.