CRSS 4030/6030
Sensors in Precision Agriculture

MW 10:20 - 11:10 AM
Lab Fr 10:20 AM -12:20 PM
Tifton: TDC, Rm 533
Athens: Miller Plant Science – Rm 3406

INSTRUCTORS: **Dr. Glen Rains**
Professor
Entomology
Tifton, GA
Voice – 229-386-3520
E-mail – grains@uga.edu

Canicius (Cani) Mwitta
Post-Doctoral Associate
E-mail – cmwitta@uga.edu

COURSE OBJECTIVES OR EXPECTED LEARNING OUTCOMES:

Objectives:
1. Introduction to converting real-world information to digital signals
2. Learn the different communications protocols for sending and receiving digital signals
3. Learn the principles and tools for geo-referencing and geo location
4. Understand the various techniques for yield monitoring
5. Examine measurements of soil properties
6. Understand the various techniques and sources of remote sensing
7. Learn the current and potential future methods of sensing for biotic and abiotic stress
8. Learn how to use a simple microcontroller to measure sensory data

PREREQUISITES:

CRSS 3030

CREDITS:

3 hours; 2 lectures, 1 lab

TEXTS:

There will be multiple handouts provided and reading assignments during the Semester. These will be placed on eLC

GRADES:

A – 90-100
B – 80-89
C – 70-79
D – 60-69
F – Below 60

Exams (2) – 20%
Lab – 35%
Homework and pop quizzes – 35%
Comprehensive Final Exam – 10%

ATTENDANCE:

Students are expected to attend class on a regular basis. If you are absent from class, it is your responsibility to make up any work that is missed. Make-up work must be completed within a week of original due date of return of student to class after the approval of the instructor. Please see Dr. Rains or Kade if you must miss a class or lab. Make-up work and exams need to be completed promptly.

<u>DO NOT check e-mail, surf the web, or play games during the lecture</u>

Please turn-off cell phones during class.

ACCADEMIC HONESTY:

Students are reminded that they are bound by the University's Academic Honesty Policy. If you have misplaced your copy, the policy is posted on the Web at:
http://www.uga.edu/honesty/ahpd/culture_honesty.htm

All academic work must meet the standards contained in "A Culture of Honesty". Each student is responsible to inform themselves about those standards before performing any academic work.

TOPICAL OUTLINE:

An in-depth examination of sensing mechanisms for precision agricultural practices. Classroom and lab exercises will in general examine sensing technologies, commercial instruments and applications, hands-on testing and data collection in real-world precision agricultural applications.
Grading system: A-F
Credit Hours: 2 hours lecture, 2 hour lab
Required prerequisites: CRSS 3030, Principles of Precision Agriculture
Primary Delivery Mechanisms: Lecture

Topical Outline:

1. Basic electronics and electrical circuits
2. Basic introduction to sensing and transduction electronics

    a. Collecting Data
    b. Errors in Data (noise, nonsense data)
    c. A/D and D/A
    d. Communications Standards
3. GNSS Data and interpretation
    a. Google Maps and GNSS Location
    b. GNSS receivers: Accuracy and Uses
4. Yield Monitoring Techniques and Commercial Sensors
    a. Grains
    b. Cotton
    c. Other Crops
5. Soil Sensing Equipment and Analysis
6. Remote Sensing Techniques
    a. Visual imaging
    b. Spectral Imaging
    c. Aerial, Satellite, Handheld
    d. Active vs. passive sensing
7. Pressure and temperature sensing
8. Converting Data to Information
9. Sensing with Unmanned Systems in Precision Agriculture
10. Precision Sensing
    a. IoT

LABS:

One lab per week will be performed and a written report of the lab turned in at the following lab meeting. A mixture of individual and partnered lab projects will be assigned. Effort will be made to allow the lab exercises to be completed during lab time, but additional lab time may be necessary. This does not include lab reports. A lab report outline will be provided and discussed during the first lab period.

Labs will be a mixture of informational sessions, getting hands on experience with current sensing techniques, and using a microcontroller to collect sensor data.

HELP OUTSIDE CLASSROOM:

Help is available to you should you have difficulty with this course. Please make an appointment to line up a help session immediately after class or by using email. These appointments will vary depending on the instructor's schedule.

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.