

## NSAC Graduate Module Outline

### **Title: GIS and Remote Sensing Applications**

**Instructor:** Dr. Hong Li (*Department of Plant and Animal Sciences*)

**Timing:** Summer 2010

#### **Module description:**

This graduate module is to address the needs of GIS and remote sensing technology in agricultural research. This module will introduce principle, concepts and theory of GIS and remote sensing with a focus on GIS and remote sensing tools, spatial interpolation mapping, geostatistics using ArcView and SAS, and interpretation of data and images obtained using radiometers, hyperspectrometers, thermal and infrared cameras, satellites, and high-altitude aircraft.

1. Basics, concepts and applications of Geographical Information Systems (GIS)
  - 1.1 Functions of GIS systems
  - 1.2 Basic geographic concepts: features, attributes & theme
  - 1.3 Map projection systems and coordinate systems
  - 1.4 Categories of GIS data
  - 1.5 Geo-processing procedures
  - 1.6 Creating soil/plant polygons, organizing views and calculating areas of polygons
  - 1.7 Spatial interpolation, classification analysis and geostatistics
2. Principle, theory and applications of remote sensing
  - 2.1 Electromagnetic energy sources and radiation principles
  - 2.2 Generalized processes of remote sensing
  - 2.3 Electromagnetic spectrum
  - 2.4 Multistage remote sensing concepts
  - 2.5 Radiometers, hyperspectral and thermal sensors
  - 2.6 Thermal and infrared imaging
  - 2.7 Characteristics of plant/soil/water spectral reflectance
  - 2.8 Remote sensing data and image interpretation
  - 2.9 Calculations of spectral index and interpretation
3. Case studies: GIS and remote sensing applications in agriculture
  - 3.1 Irrigation, fertilization, soil moisture, organic matter, and thermal images
  - 3.2 Plant growth status, vegetation health patterns, and soil/water quality
  - 3.3 GIS and remote sensing in insect/disease management

#### **Format:**

This module will consist of 8 hours of lecture and discussion (2 hours/week, 4 weeks). Each student will complete 2 assignments and give 1 oral presentation.

#### **Method of evaluation:**

The final grade will be based on assignments (60%) and oral presentation (40%).

#### **Prerequisites:**

Admission into the graduate program.

An undergraduate course in engineering or plant/soil environmental science.