# ASM 305: GPS and Precision Agriculture

Instructor:   Dev Shrestha                    Office: JML 81B
                                              Phone: 208 885 7545
                                              E-mail: devs@uidaho.edu
Meeting:                                      Lecture: JML 42 (MW) 8:30-9:20 AM
                                              Lab: JML 82 (T) 2:00 – 4:50 PM
Office hours:                                 MW; 9:30-11:30 AM (Walk-ins welcome)

## Course description

This course will cover the fundamentals of Global Positioning System (GPS) and precision agricultural components. The course covers both principle and practices in precision agriculture such as GPS, Geographic Information System (GIS), yield monitors, soil sampling, and variable rate applications (VRA). Hardware and software that are commercially available are examined and compared for their value and utility. Economics and environmental aspects of agriculture are discussed. The course consists of two 50-minutes lectures and one three-hour lab per week for 15 weeks.

## Learning outcomes

Through active learning in this course, by the end of the semester you should have greater competency in the following skills, understandings and appreciations related to precision agriculture. They are consistent with the university's learning outcomes.

1. Learn and integrate -
   - Understand the philosophy and need behind precision agriculture
   - Understand the fundamental enabling technologies such as GPS, GIS, Yield Monitors, Crop modeling, and VRA technologies
2. Think and create -
   - Analyze spatial and temporal variability information
   - Decision making on appropriate level of technology need
   - Risk assessment through crop modeling in decision making
3. Communicate -
   - Evaluate and develop management strategy. Present the analysis in written form
   - Evaluate the risk involved with variable rate application and technologies and communicate with potential clients
4. Practice citizenship -
   - Understand the components of sustainability in production agriculture
   - Understand in how precision agriculture can help reduce the environmental impact from agriculture and enhance sustainability
   - Understand the future of agricultural technologies and how students can be a part of this development.

# Books

**Text:**        The Precision - Farming Guide for Agriculturists, 2010 Edition
                                        By: Ess, D. and Morgan, M.

**Reference:**
- Handbook of Precision Agriculture: Principles And Applications by: Ancha Srinivasan
- Class handouts, Web references

# Tentative class schedule

| Date | Title |
|---|---|
| 26-Aug | Introduction to Precision agriculture |
| 28-Aug | Components of precision agriculture |
| 2-Sep | Labor day - UI closed |
| 4-Sep | GPS - Introduction, triangulation, components |
| 9-Sep | Error sources and analysis in position measurement |
| 11-Sep | Differential and RTK GPS |
| 16-Sep | GPS communication hardware and cost analysis |
| 18-Sep | Auto guidance system hardware and software |
| 23-Sep | Remote sensing and image analysis I |
| 25-Sep | Remote sensing and image analysis I |
| 30-Sep | Coordinate system and map projection |
| 2-Oct | Introduction to spatial analysis and GIS |
| 7-Oct | Understanding and characterizing spatial variability |
| 9-Oct | Soil sampling and testing (Hardware included) |
| 14-Oct | Yield monitoring and mapping |
| **16-Oct** | **Midterm exam** |
| 21-Oct | Out of town |
| 23-Oct | Out of town |
| 28-Oct | Managing spatial and temporal variability |
| 30-Oct | Concepts of DSSAT crop modeling I |
| 4-Nov | Concepts of DSSAT crop modeling II |
| 6-Nov | Concepts of DSSAT crop modeling I |
| 11-Nov | Concepts of variable rate application (VRA) |
| 13-Nov | Components of VRA |
| 18-Nov | Sensors  and actuators used in VRA |
| 20-Nov | Cost analysis of VRA |
| 25-Nov | -----------------Fall recess----------------------------- |
| 27-Nov | -----------------Fall recess----------------------------- |
| 2-Dec | Risk assessment in using VRA |
| 4-Dec | Economic analysis |
| 9-Dec | Risk management and other technological issues |
| 11-Dec | Course Review |

## Tentative Lab Schedule

| Date | Lab title |
|---|---|
| 27-Aug | Web resources for Precision Agriculture |
| 3-Sep | Using a handheld GPS and Measuring Distance between Two Points. |
| 10-Sep | Analyzing GPS error |
| 17-Sep | Differential and RTK GPS |
| 24-Sep | Communicatin with GPS unit |
| 1-Oct | Connecting a  lightbar guidance system |
| 8-Oct | Navigating and using lightbar guidance system |
| 15-Oct | Introduction to SMS field management software |
| 22-Oct | Out of town |
| 29-Oct | Remote sensing and image analysis |
| 5-Nov | Introduction to DSSAT crop model I |
| 12-Nov | Introduction to DSSAT crop model II |
| 19-Nov | Creating a prescription map |
| 26-Nov | ------------------Fall recess---------------------------- |
| 3-Dec | Variable rate application I |
| 10-Dec | Variable rate application II |

The laboratory reports are due the following week a lab is completed. Only one lab report per group is adequate. The lab reports should be professional looking and free of errors.  Other details will be discussed in the class.

## Grading:

| | | | |
|---|---|---|---|
| Class Attendance | 10% | Laboratory Reports | 20% |
| Homework | 20% | Midterm Exam [1] | 20% |
| Final Exam[2] | 30% | | |

**Disability Support Services Reasonable Accommodations Statement:**
Reasonable accommodations are available for students who have documented temporary or permanent disabilities.  Please notify your instructor(s) during the first week of class regarding accommodation(s) needed for the course.  All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 306.

---

[1] MIDTERM EXAM: Wednesday, October 16, 8:30 AM – 9:20 AM
[2] FINAL EXAM: Thursday, December 19, 7:30 AM – 9:30 AM