University of Minnesota, Spring 2019

SOIL4111 Introduction to Precision Agriculture (3 credits)

Course Syllabus

You can find this syllabus online:

http://yanglab.dl.umn.edu/teaching

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Instructor

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Meeting Time and Place

Lectures:	Borlaug Hall 375, Tue 3:00-4:55pm
Labs:	Skok Hall 35, Thu 3:00-3:50pm

Overview of the course

Precision agriculture (PA) is an agricultural system that is progressively changing agriculture in the United States and around the world. PA is bringing an information revolution in agriculture based on new technologies. Precise spatial and temporal management of inputs can be used to increase farm productivity, profitability, sustainability, environmental protection, food safety, and quality of life. PA applies to most agricultural systems and technological management levels.

Course goals and objectives

Students will be introduced to essential aspects of PA concepts including: soil and crop spatial variability; new technologies such as GIS, DEM, GPS， sensors, variable rate machinery, PA software, remote sensing; geostatistics, sampling, experimental designs; precision integrated crop management; data acquisition, processing, and management; and socio-economical and e-marketing aspects.

By the end of this course students should be able to:

1. Understand basic concepts of Precision Agriculture, including:
    a. soil and crop spatial variability; precision integrated crop management; geostatistics.
    b. technologies such as GIS, DEM, GPS, sensors, variable rate machinery, PA software and remote sensing.
    c. How to use spatial information for improved soil and crop management.
    d. environmental, socio-economical, and e-marketing aspects.
2. Develop a better understanding and retention of material through hands-on modules, group discussions, problem solving, and group projects
3. Appreciate value of precision agriculture from on-farm and agribusiness visits.
4. Understand potentials and limitations of applying the concept of PA to various countries/regions.

Course materials

Morgan M. and D. Ess. 2010. The precision-farming guide for agriculturists. 3rd Ed. John Deere Publishing. Moline, Illinois, USA.

Potash & Phosphate Institute (PPI). 2008. Site-Specific Management Guidelines [Online]. Available at: http://www.ipni.net/ (verified 15 Jan. 2008).

Pierce, F. J., and E. J. Sadler (eds). 1997. The state of site-specific management for agriculture. ASA Misc. Publ., ASA, CSSA, and SSSA, Madison, WI.

Expectations from students

To read and note the information contained in this syllabus.

To attend lecture and recitation sessions. Both the lecture and recitation sessions will include active learning exercises along with traditional lectures. Active learning activities include small and large group discussions based on specific questions or case studies, problem solving, and small group work on projects. These exercises will require that you work with your classmates to solve or discuss specific problems. Natural resource management professionals frequently work in group settings. These projects will give you an opportunity to develop skills that you will need to work in this type of setting. Because many of the recitation sessions will involve group work, your absence will affect your group and will be noticed. Please let your instructor know ahead of time if you will not be able to attend a session.

To provide feedback. Given the interdisciplinary nature of the course, frequent course evaluations will be carried out through the semester to assess course effectiveness.

To come prepared for class. If a reading or case-study assignment is listed for a class, please read it before that class. We will be discussing the reading assignments during the lecture session in small groups and with the class as a whole.

To ask questions. We encourage you to critically evaluate what you read and what is discussed in class. Also, if you don't understand something, please ask. Chances are that you are not the only person with that question. If

at any time during the course you have concerns about how you are doing in the class, need more information about something covered in lecture or recitation, or want help in preparing for an exam, please come see us.

To hand in assignments on time. Assignments will not be accepted after the due date unless you have spoken with the course coordinators before the due date.

To prepare assignments in a professional manner. Correct spelling and grammar are expected. Hand-written answers to short exercises are acceptable unless your handwriting is difficult to decipher; if this is the case, you should type your answers.

To actively participate in small group discussions.

To complete and submit course evaluations at end-of-term. The course evaluations are used to help improve the course and as feedback for the instructor.

Assessments and Grading

Your grade will be based on the following assignments and exams:

Assignment	Grade percentage
Laboratory reports	30%
Project reports	20%
Midterm exam 1	15%
Midterm exam 2	15%
Final exam	20%

A program with 2 bonus points besides the 100 points:
There will be four bonus assignments during the semester to make it a total of 2 extra points. In each bonus assignment, the student is required to read a journal paper and write a half to one page brief summary. Every assignment is worth 0.4 points.
Late submission of lab reports and project reports will be reduced by 20% total points/day.

Final course grades will be based on the following ranges:

A > 92	B 82-88	C 72-78	D 60-68
A- 90-92	B- 80-82	C- 70-72	F <60
B+ 88-90	C+ 78-80	D+ 68-70	

The University of Minnesota Uniform Grading Standards provides the following definitions for course grades, which apply to this course:

A	4.00
A-	3.67

Represents achievement that is outstanding relative to the level necessary to meet course requirements.

B+	3.33
B	3.00
B-	2.67

Represents achievement that is significantly above the level necessary to meet course requirements.

C+	2.33
C	2.00
C-	1.67

Represents achievement that meets the course requirements in every respect.

D+ 1.33
D 1.00
Represents achievement that is worthy of credit even though it fails to meet fully the course requirements.

F -0-
Represents failure and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (see Section III (1)).

Examination Policy for Common Courses

- There are **NO MAKE-UP MIDTERM EXAMS**. Students who fail to take an exam will receive a score of zero unless they have a legitimate excuse.
- There will be **NO MAKE UP FINAL EXAMS**, except in rare situations where the student has a legitimate reason for missing an exam, including illness, death in the family, accident, requirement to appear in court, etc. **To properly report their absence during a midterm or final exam, students must do the following**: Send an email to ceyang@umn.edu, the instructor, and/or the coordinator of the course with a detailed explanation of the situation. Please include your student ID number and indicate that you will be visiting the Office for Students Affairs to validate the absence.

Detailed course outline

Date	Topic
Week 1	Introduction to the course. Overview and status of Precision Agriculture (PA)
Week 2	Positioning systems, GPS and DGPS
Week 3	Positioning system continued, Geodesy
Week 4	Sampling in space and time
Week 5	On-farm experiments ***PROJECT: PROPOSAL DUE***
Week 6	Spatial variability ***FIRST MIDTERM***
Week 7	Geographic Information System (GIS)
Week 8	Yield mapping ***PROJECT: MIDTERM REPORT DUE***
Week 9	Remote sensing
Week 10	Remote sensing
Week 11	Variable rate technologies ***SECOND MIDTERM***
Week 12	Aspects of PA economics ***PROJECT: FINAL REPORT DUE***
Week 13	PA impacts on the environment / Applications of PA
Week 14	***Guest lectures/Course project presentation***
Week 16	***FINAL EXAM (covers all materials)***

Note: This syllabus is subject to change based on the needs of the class.