Agricultural and Biological Engineering Department
University of Florida

Agricultural Operations Management 4434
Precision Agriculture
Spring, 2024
Class number 10520 (Section PRCW)

Catalog Description:
AOM 4434 Precision Agriculture. *Credits: 3. Prereq: Junior standing.* Principles and applications of technologies supporting precision farming and planning for natural resource data management. Global positioning system (GPS), yield monitoring and mapping, remote sensing, geographic information system (GIS), variable rate technologies (VRT), data layering of independent variables, Internet information access, and computer software for management.

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This course is intended for students with upper-division standing in the Colleges of Agricultural and Life Science, Natural Resources and Environment, and Engineering. In addition to having Junior standing, students should be experienced in using MS Windows, a web browser, a word processor, a presentation tool, and a spreadsheet.

Lecture Hour: Mon 12:50 PM – 2:45 PM (Period 6-7), Rogers Hall **129**

Laboratory Hour: Wed 12:50 PM – 2:45 PM (Period 6-7), Rogers Hall **122** (not 129) & various other locations. During the GIS lab exercises, **you are required to bring your laptop**.

Course homepage: https://elearning.ufl.edu/.

Office Hours: My door is open to students at any time. You are welcome to visit me whenever I am available or by appointment. Online conference is available.

Text: *The Precision-Farming Guide for Agriculturists*, by Morgan and Ess, Deere & Company, **2017**. **4th Edition (ISBN: 0-86691-435-8,** John Deere Publications: 1-800-522-7448, Order no. FP404NC, On-line: https://techpubs.deere.com/en-US/Search/Education).
Course lecture notes will be available on the E-Learning course website.

Course Objectives: This course covers information and *state-of-the-art* technologies used for precision farming and their applications. In this course, we would like to:
1. Describe what precision agriculture is and why it is needed,
2. Explain the basic principles and applications of the Global Navigation Satellite System (GNSS),
3. Become familiar with Geographic Information Systems (GIS) and be able to utilize them,
4. Understand how soil sampling is used for precision agriculture,
5. Describe what a yield monitoring/mapping system is,
6. Identify current remote sensing technologies and
7. Explore principles and applications of variable rate technologies.

Lecture Topics:

Introduction to precision agriculture	Geographic information system
Geodesy	Soil sampling
Global navigation satellite system	Yield mapping
Differential GPS	Remote sensing Variable rate technologies

Laboratory Topics:

Introduction to precision agriculture	GIS 1 - Introduction
GPS	GIS 2 - GPS data comparison
DGPS & RTK	GIS 3 - Interpolation
Lightbar guidance & candy hunting	Yield mapping
Remote sensing (drone simulation)	Variable rate application

Course Schedule (Dates are approximate)

Week (Date)	Lecture (Mon)	Lab (Wed)	DIY Quiz	Quiz	HW	Test
1 (1/8)	Module 1 – Introduction to precision agriculture	(Continue Module 1)				
2 (1/15)	**MLK Holiday**	Module 2 – Geodesy Lab 1 – Introduction to precision agriculture				
3 (1/22)	(Continue Module 2)	Lab 1 – Student presentation	#1	#1		
4 (1/29)	Module 3 – GPS	(Continue Module 3)	#2	#2	#1	
5 (2/5)	Module 4 – DGPS	Lab 2 – GPS	#3	#3	#2	
6 (2/12)	(Continue Module 4)	**Test 1** (2/14, No lecture & lab)	#4	#4		Test 1
7 (2/19)	Module 5 – GIS	Lab 3 – DGPS and RTK	#5			
8 (2/26)	(Continue Module 5)	Lab 4 – Lightbar guidance and candy hunting	#6	#5	#3	
9 (3/4)	Module 6 – Soil sampling	Lab 5 – GIS 1: Introduction	#7	#6	#4	
10 (3/11)	**SPRING BREAK**					
11 (3/18)	Module 7 – Yield mapping	Lab 6 – GIS 2: GPS data comparison	#8	#7	#5	
12 (3/25)	(Continue Module 7)	**Test 2** (3/27, No lecture & lab)	#9	#8		Test 2
13 (4/1)	Module 8 – Remote sensing	Lab 7 – GIS 3: Interpolation	#10			
14 (4/8)	(Continue Module 8)	Lab 8 – Yield mapping	#11	#9	#6	
15 (4/15)	Module 9 – Variable Rate Technology (VRT)	Lab 9 – VRT / Lab 10 – Remote sensing (Drone)	#12	#10	#7	
16 (4/22)	(Continue Module 9)	**Test 3** (4/24, No lecture & lab)	#13	#11	#8	Test 3

Course grading will be based on the following items:

1. **Attendance** at lectures and laboratory exercises is required.

2. **Homework** will be assigned after each chapter is finished and will be due at the beginning of the class.

3. **Laboratory assignments** will be handed out for every laboratory session. The lab assignments are due at the beginning of the next lab period.

4. **Quizzes** will be given <u>every Monday</u> at the end of the lecture. The quiz problems are from the previous week's lecture, lab exercise, homework, and DIY Quiz. The first quiz will be on **January 22**. <u>Quizzes cannot be made up.</u>

5. **DIY Quiz**: After Monday's lecture each week, you must upload three quiz problems with answers from the same week's lecture in the E-Learning. They will be due by **noon on Monday of the following week**. The question format should be similar to the homework problems. See an example at the end of this syllabus. The first DIY Quiz will be due **at noon on January 22**.

6. The best DIY quiz problem will be selected and given a 20% extra credit every week. A 10% extra credit will be given to the first upload. You can upload your DIY Quiz starting at **3:00 PM Monday**. <u>No late submission is accepted for DIY Quiz.</u>

7. **All assignments should be submitted to E-Learning.** No email/paper submissions will be accepted.

8. **Late submission policy:** <u>All assignments are due at the beginning of the class.</u> After that, a 10% reduction/business day. See the detailed guidelines at the end of the syllabus.

Tests: Test 1: Wed, **February 14**   Test 2: Wed, **March 27**   Test 3: Wed, **April 24**

Grading will be based on the following items and weights:

Tests (3):	15% each	91 – 100%	A	72 – 76%	C
Quiz:	20%	89 – 91%	A-	69 – 72%	C-
DIY Quiz:	10%	86 – 89%	B+	66 – 69%	D+
Homework:	10%	82 – 86%	B	62 – 66%	D
Lab assignment:	15%	79 – 82%	B-	59 – 62%	D-
		76 – 79%	C+	Below 59%	E

Grades and Grade Points: For information on current UF policies for assigning grade points, see https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

Attendance and Make-Up Work: Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Online Course Privacy Related Issues: Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Online Course Evaluation Process: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Software Use: All faculty, staff, and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or

criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Academic Honesty: UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. Click here to read the Honor Code. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Services for Students with Disabilities: 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc. The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

Campus Resources: Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources.

Health and Wellness
- *U Matter, We Care*: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.
- *Counseling and Wellness Center*: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.
- *Student Health Care Center*: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.
- *University Police Department*: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).
- *Sexual Assault Recovery Services (SARS):* Student Health Care Center, 392-1161.
- *UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website

Academic Resources
- *E-learning technical support*: Contact the UF Computing Help Desk at 352-392-4357 or via email at helpdesk@ufl.edu.
- *Career Connections Center*: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

- *Library Support*: Various ways to receive assistance with respect to using the libraries or finding resources.
- *Teaching Center*: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

- *Writing Studio:* 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.
- *Career Resource Center*, First Floor JWRU, 392-1601, https://career.ufl.edu/.

- Student Complaints Residential Course: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/.
- Online Student Complaints: http://www.distance.ufl.edu/student-complaint-process

Format of DIY quiz: The format of DIY quiz is below.

>DIY Quiz-Due date
>Questions:
>   1. Question 1…
>   2. Question 2…
>   3. Question 3…
>Answers:
>   1. Answer 1…
>   2. Answer 2…
>   3. Answer 3…

Example
>DIY Quiz-Jan 22
>Questions:
>   1. What are the three objectives for precision agriculture?
>   2. What does SSCM stand for?
>   3. What geodetic datum do GPS receivers use primarily?
>Answers:
>   1. Reduce waste, increase profits, and maintain the quality of the environment
>   2. Site-specific crop management
>   3. WGS84 and NAD83

Assignment submission guidelines – The following rules will be strictly enforced!

- Submit on time, i.e., "at the beginning of the class"!

- For Monday's lectures, as it starts at 12:50 pm, one-day late submission starts from 12:51 pm until 12:50 pm the next day (24-hour period).

- Example 1: If your assignment is due Monday and you submit it at 12:51 pm, it is considered one day late (10% deduction). (I am sorry about this strict rule, but I have to enforce it fairly for all of you to help you finish them on time.)

- Example 2: If your assignment is due Monday and you submit it at 3 pm on Tuesday, your submission is considered to be two days late (20% deduction).

- All assignments should be submitted to the E-Learning. No email/paper submissions are allowed.

- If you show extra effort on your assignments and activities during lectures and lab exercises, there is a **high potential for extra credit** and a high impact on your final grade. Examples include **active participation in class discussions** and **volunteering during lab exercises**.

- There is a **+alpha** for determining your final grade based on your active participation during the semester, such as volunteering in lab activities, answering questions during lectures, and engaging in discussion.