

**Agricultural and Biological Engineering Department
University of Florida**

**Agricultural Operations Management 4434
Precision Agriculture
Spring, 2021**

**Class number 10710 (Section 2C12)
Class number 10711 (Section 3E82)
Class number 26121 (Section WEB1)
Class number 27013 (Section WEB2)**

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.

IMPORTANT NOTE: This course will be taught using a hybrid model of face-to-face and online synchronous lectures and face-to-face laboratory sessions. Refer to the Online Course Privacy Related Issues, Face-to-Face Course Policy in Response to COVID-19 and the COVID-19 Safety Plan sections for additional information.

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Teaching Assistants

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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 Hours: Mon 12:50 PM – 2:45 PM (Period 6-7), Rogers Hall 129 / Zoom

Laboratory Hour: Rogers Hall 211 & various other locations

Class 10710: Tue 1:55 PM – 3:50 PM (Period 7-8), Rogers Hall 211

Class 10711: Thu 1:55 PM – 3:50 PM (Period 7-8), Rogers Hall 211

Class 26121: Wed 1:55 PM – 3:50 PM (Period 7-8), Rogers Hall 283

Class 27013: Fri 1:55 PM – 3:50 PM (Period 7-8), Rogers Hall 283

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

Office Hours: Feel free to make an appointment for office hours. 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://www.deere.com/en_US/services_and_support/manuals/john-deere-publishing.page).

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 basic principles and applications of the Global Navigation Satellite System (GNSS),
3. Become familiar with Geographic Information System (GIS) and be able to utilize it,
4. Understand how soil sampling is used for precision agriculture,
5. Describe what 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
	Variable rate application

Course Schedule (Dates are approximate)

Week (Date)	Lecture (Mon)	Lab (Tue-Fri)	DIY Quiz	Quiz	HW	Test
1 (1/11)	Module 1 – Introduction to precision agriculture	(Continue Module 1)				
2 (1/18)	Module 2 - Geodesy	(Continue Module 2)			#1	
3 (1/25)	Module 3 - GPS	Lab 1 – Introduction to precision agriculture	#1	#1	#2	
4 (2/1)	(Continue Module 3)	(Continue Module 3)	#2	#2		
5 (2/8)	Test 1 (2/8, No class)	Lab 2 - GPS	#3	#3	#3	Test 1
6 (2/15)	Module 4 – DGPS	Lab 3 – DGPS and RTK	#4	#4	#4	
7 (2/22)	Module 5 – GIS	Lab 4 – Lightbar guidance and candy hunting	#5	#5		
8 (3/1)	(Continue Module 5)	Lab 5 – GIS 1: Introduction	#6	#6	#5	
9 (3/8)	Module 6 – Soil sampling	Lab 6 – GIS 2: GPS data comparison	#7	#7	#6	
10 (3/15)	Test 2 (3/15, No class)	Lab 7 – GIS 3: Interpolation	#8	#8		Test 2
11 (3/22)	Module 7 – Yield mapping	(Continue Module 7)	#9	#9		
12 (3/29)	Module 8 – Remote sensing	(Continue Module 8)	#10	#10	#7	
13 (4/5)	Module 9 – Variable Rate Technology (VRT)	Lab 8 – Yield mapping	#11	#11	#8	
14 (4/12)	(Continue Module 9)	Lab 9 – VRT	#12	#12	#9	
15 (4/19)	Test 3 (4/19, No class)	No Lab (This course ends on 4/19)				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 lab period.
4. **Quizzes** will be given every Monday at the end of the lecture using Honorlock in the E-Learning. The quiz problems are from the previous week's lecture, lab exercise, homework, and DIY Quiz. The first quiz will be on **January 25**. Quizzes cannot be made up.
5. **DIY Quiz:** After Monday's lecture each week, you are required to upload three quiz problems with answers from the same week's lecture in the E-Learning. They will be due by 12:00 PM Monday in 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 **January 25**.
 - a. Every week the best quiz problem will be selected and given a 20% extra credit for the DIY Quiz. A 10% extra credit will be given to the first upload. You can upload your DIY Quiz starting at 3:00 PM Monday. No late submission is accepted for DIY Quiz.
6. **Late submission policy:** All assignments are due at the beginning of the class. After that, a 10% reduction/business day. See the detailed guidelines at the end of the syllabus.

Tests: Test 1: Mon, **February 8** Test 2: Mon, **March 15** Test 3: Mon, **April 19**

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>

Face-to-Face Course Policy in Response to COVID-19

- We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.
- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms ([Click here](#) for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. [Click here](#) for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

COVID-19 Safety Plan

Student Requirements

Face Coverings Face coverings are to be supplied by students and worn throughout the duration of the face-to-face synchronous session on UF property. If the student forgets their face covering, then one may be provided by the instructor if available. If one is not available, then the student will be asked to leave and reschedule his/her class session.

Social Distancing Social distancing must be observed throughout the duration of the face-to-face synchronous session – this is defined as maintaining a minimum physical distance of six (6) feet between the student, their peers, instructors, and TAs.

Student Illness If a student does not feel well and/or is running a fever or displaying any other symptoms of illness, they are NOT to attend the face-to-face synchronous session. Please see contingency plans for student illness for more information.

Instructor Requirements

Face Coverings Instructors and TAs will supply their own face coverings and wear them throughout the duration of the face-to-face synchronous session while on UF property.

Social Distancing Social distancing must be observed throughout the duration of the face-to-face synchronous session. A minimum physical distance of six (6) feet will be maintained between all participants. In instances where an instructor or TA must breach the social distancing barrier to assist with hands-on instruction, the student and instructor/TA should not pose a public health safety risk due to other public health requirements being employed (mandatory face coverings, hand washing/sanitizing, etc.). Breaching the social distance barrier will only be done when absolutely necessary and for the minimum period of time required to accomplish the learning objective.

Instructor or TA Illness If an instructor or TA does not feel well and/or is running a fever or displaying other symptoms of illness, they will not attend the face-to-face synchronous session. For more information, please see the instructor illness contingency plans.

Ingress/Egress Process

Students will be asked to follow the ABE safety protocol for safe traffic inside Frazier Rogers Hall. Please see the Agricultural and Biological Engineering Safety Plan 1-1-2021 available in the Start Here page in the E-Learning.

Cleaning Procedures

Classrooms will be cleaned by university custodial staff in between uses. The instructor and TA will examine the classroom prior to each face-to-face synchronous session to ensure cleaning has occurred. Instructors and TA will clean and sanitize the classroom and equipment as needed prior to students arriving for a laboratory session. When available, different keyboards and pointing devices will be used for each laboratory session to allow thorough cleaning between sessions. To help minimize risks of contamination, students will also be asked to wear gloves throughout the laboratory sessions.

Laboratory Sessions

Small-group laboratory sessions will be planned and scheduled with the students to keep the number of participants in the laboratory to a maximum of five (5). For GIS lab exercise, each student will have its own station for all laboratory work. Stations will be spaced by a minimum distance of six (6) feet from one another.

Contingency Plans

Students Illness If a student does not feel well and/or is running a fever or displaying any other symptoms of illness, they are NOT to attend the face-to-face synchronous session. In that case, they will be required to notify the instructor for alternative online instructional options that will include recorded lecture/laboratory demonstrations, instructor-provided data set, and alternative assignments to meet educational objectives.

Instructor Illness If an instructor does not feel well and/or is running a fever or displaying other symptoms of illness, they will not attend the face-to-face synchronous session. In that case, alternative online instructional activities that will include recorded lecture/laboratory demonstrations, instructor-provided data set and alternative assignments to meet educational objectives will be used and administered by the TA.

Cancellation of Face-to-Face Laboratory Sessions In the event face-to-face instruction is canceled by the University of Florida at any time during the semester, the use of contingency material developed prior to the start the semester will be used to accomplish learning objectives through an online teaching environment.

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 14

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 1 pm on Monday, your submission is considered 1-day late (10% deduction). (I am sorry about this strict rule, however I have to enforce the rule fairly for all of you.)
- Example 2: If your assignment is due Monday and you submit it at 3 pm on Tuesday, your submission is considered to be 2-days late (20% deduction).
- All assignments should be submitted to the E-Learning. No email submission is allowed.
- If you show any extra efforts on your assignments and activities during lectures and lab exercises, there is a **high potential for an extra credit** and high impact on your final grade. Examples include active participation in class discussion and volunteering during the lab exercises.
- There is +alpha for determining your final grade based on your participation and activities during the semester.