



AOM5435 | Advanced Precision Agriculture

Fall, 2024
Online, 3 credits

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Office hours (optional):

- Odd week: Monday 3:30-4:30 pm
- Even week: Tuesday, 1:00-2:00 pm
- Or by appointment

<https://ufl.zoom.us/j/95392002049?pwd=7mlsYmYddpJuNbQaCqrUS0iR0j6kdS.1>

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Course Description

Principles and applications of technologies supporting precision farming and natural resource data management planning. Global positioning systems (GPS), geographic information systems (GIS), variable rate technologies (VRT), data layering of independent variables, automated guidance, Internet information access, computer software management.

Course Prerequisites

- Graduate student standing or permission of Instructor.
- This course is intended for graduate students in the Colleges of Agricultural and Life Sciences, Natural Resources and Environment, and Engineering.

Course Learning Objectives

This course covers information and technologies that are used for precision farming and their applications. In this course, you will:

1. Describe what precision agriculture is and why it is needed,

2. Explain the principles and applications of the Global Navigation Satellite System (GNSS),
3. Describe what a yield monitoring system is,
4. Identify current remote sensing technologies,
5. Become familiar with GIS (Geographic Information Systems) software and be able to utilize it,
6. Explore principles and applications of variable rate technologies (VRT),
7. Be able to identify sensing technology for precision agriculture,
8. Become familiar with the history of artificial intelligence and its applications in agriculture, and
9. Apply precision agriculture to an actual situation.

After learning these technologies, if time permits, more in-depth topics will be covered, such as yield calculation and yield map generation, soil property measurements (spectrometer and other devices), comparison of yield and soil test results, sensors for site-specific application, VRT system calibration and map generation based on recommended equations, economics, and profitability of precision agriculture, development of site-specific management plans, etc.

Learning Materials and Supplies



The Precision-Farming Guide for Agriculturists, by Morgan and Ess, Deere & Company, **2017. 4th Edition (ISBN: 0-86691-435-8)**

The textbook can be purchased in the UF Bookstore. Or, John Deere Publications: 1-800-522-7448, Order no. FP404NC, On-line:

<https://techpubs.deere.com/en-US/Search/Education>

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 grading will be based on the following items:

1. Watching the lecture recordings and completing the laboratory exercises are required.
2. Tests: There will be two (2) tests. There will not be a comprehensive final examination. Tests will help review course materials and achieve course objectives. The test problems will be similar to those in the homework and quizzes.
3. Homework will be available on Canvas after each chapter. These will be extremely useful for preparing quizzes and tests.
4. Quizzes will be given after each module. The quiz problems are from the lectures, lab exercises, and/or homework. Quizzes will help you study course materials and achieve course objectives.
5. There are 8 laboratory assignments. These hands-on assignments reinforce concepts taught within the lectures and offer you opportunities to work on various precision technologies.
6. Article Analysis and Critical Review: After watching each week's lecture, you will find a published journal article related to the lecture topic, write a summary, and submit it to E-Learning. The review will help you understand the current status and application of the technology.
7. Term project: You will work on a hands-on project related to the topics in this course during the semester, which will give you experience in implementing technologies. Example project topics are listed at the end of this syllabus. You will present your project near the end of the semester. The following are important due dates.
 - 1) Project outline: Monday, September 16 (50 pts) – Title, significance, and objectives.
 - 2) Progress report: Monday, October 21 (75 pts) – Up to “Materials and Methods” in Coversheet along with revised title, significance, and objectives.
 - 3) Final written report: Monday, December 2 (75 pts) – Full report with the Coversheet
 - 4) Presentation: Monday, December 2 (25 pts)
8. All assignments should be submitted on time in Canvas. Email submissions will NOT be accepted.

Late submission policy: All assignments are due by the deadline posted in Canvas. Thereafter a 10% reduction per business day.

Instructor Interaction Plan

- Expect an instructor response to email and Canvas message within 24 hours, during weekdays
- Please do not wait until the weekend to complete assignments, as I may not be available to answer emails or messages as quickly.
- Expect instructor feedback for submitted assignments within one week past the assignment deadline
- Grades for assessments will be released within one week of the deadline
- If you ever have questions or need clarification on instructor feedback, please message or attend office hours.

- I will post an announcement at least once a week to give updates and class feedback.
- I will monitor and read the discussions. I may post to the entire class, within groups, or message you individually concerning the discussion to give you feedback.
- I invite your feedback in both midterm and end-of-term GatorEvals and plan to continuously improve student experience within the course. Your opinion is highly valued.

Required Technology & How to Obtain the Technology

- Textbook: see the Learning Materials and Supplies section.
- Hardware/software: A computer/laptop and Internet access. Microsoft Office.
- Required peripherals: speakers and a microphone.
- Accounts: Gatorlink account
- All learning tools used, such as Perusall, PlayPosit, and Honorlock, are integrated into the Canvas course, and no purchase or downloading is necessary. Instructions on how to use each of these are in the Canvas course orientation module.
- A UF-owned Garmin GPS receiver will be provided to you through an equipment loan; see Canvas course for more information.
- All software that is required is free and available through GatorApps; see Canvas course for more information; some downloading is required.

Required Technology & Digital Information Literacy Skills

Technical skills:

- Using the learning management system
- Using email with attachments
- Creating and submitting files in commonly used word processing program formats
- Downloading and installing software
- Using spreadsheet programs
- Using presentation and graphics programs
- Using apps in digital devices
- Using web conferencing tools and software

Digital information literacy skills:

- Using online libraries and databases to locate and gather appropriate information
- Using computer networks to locate and store files or data
- Using online search tools for specific academic purposes, including the ability to use search criteria, keywords, and filters
- Analyzing digital information for credibility, currency, and bias (e.g., disinformation, misinformation)
- Properly citing information sources
- Preparing a presentation of research findings

Communication Guidelines

- Use **Course Question Discussion Board**, for general course questions that others may have too.
- Use **Canvas Inbox (messaging tool)** for questions that are specific to your grades or submissions.
- **Email & phone correspondence** are for (1) setting a meeting time for office hours, (2) DRC accommodations; (3) emergency situations; or (4) highly sensitive situations.
- A respectful tone is used by all community members in all forms of communication.
- Written communication, both formal and informal, uses the official language of instruction rather than popular online abbreviations and graphic elements such as those sometimes used in social media.
- Video interactions reflect a respectful tone in verbal communications and body language.
- Spelling, punctuation, and grammar are correct.

Technical Support

UF Computing Help Desk & Ticket Number: All technical issues require a UF Helpdesk Ticket Number. The UF Helpdesk is available 24 hours a day, 7 days a week. <https://helpdesk.ufl.edu/> | 352-392-4357

Weekly Course Schedule

All due dates are Sunday at 11:59 pm. Please keep in mind faculty are unavailable to assist with questions on the weekend, be sure to review all assignments and labs in advance of the weekend.

Week & Dates	Lecture	Lab	DIY Quiz	Quiz	HW	Test
Week 1 (8/22-9/1)	Module 1 – Introduction to precision agriculture					
Week 2 (9/2-9/8)	Module 2 – Geodesy	Lab 1 – Introduction to precision agriculture				
Week 3 (9/9-9/15)	Module 3.1 – GPS	Lab 1 – Student presentation	#1	#1	#1	
Week 4 (9/16-9/22)	Module 3.2 Term Project Outline due Module 4.1 – DGPS		#2			
Week 5 (9/23-9/29)	Module 4.2	Lab 2- GPS	#3	#2	#2	
6 (9/30-10/6)	Module 5.1 – GIS	Lab 3 – DGPS and RTK	#4	#3		
Week 7 (10/7-10/13)	Module 5.2	Lab 4 – Lightbar guidance and Geocaching	#5			

Week 8 (10/14-10/20)	Module 6 – Soil sampling Test 1: 10/16		#6	#4	#3	Test 1
Week 9 (10/21-10/27)	Module 7.1 – Yield mapping Term Project Progress Report due	Lab 5 – GIS 1: Introduction	#7		#4	
Week 10 (10/28-11/3)	Module 7.2	Lab 6 – GIS 2: GPS data comparison Return GPS Device	#8	#5	#5	
Week 11 (11/4-11/10)	Module 7 – 8.1 - Remote sensing	Lab 7 – GIS 3: Interpolation	#9	#6		
Week 12 (11/11-11/17)	Module 8.2	Lab 8 – Yield mapping	#10			
Week 13 (11/18-11/24)	Module 9 - Variable rate technology (VRT)	Lab 9 – VRT / Lab 10 – Remote sensing (Drone)	#11	#7	#6	
Week 14 (11/25-12/1)	Module 10 – AI History & Application		#12	#8	#7	
Week 15 (12/2-12/8)	Term project Final Report & Presentation Test 2: 12/4		#13	#9	#8	Test 2

Grading Policy

Assignment Type	Percent of Final Grade
Tests (2)	30%
Quizzes	15%
DIY Quiz (12)	5%
Homework (article summaries, discussions, homework assignments, lecture video review questions)	5%
Lab Assignments (8)	15%
Term Project	30%

Grading Scale

91-100%	A
89-91%	A -
86-89%	B +
82-86%	B
79-82%	B -

76-79%	C +
72-76%	C
69-72%	C -
66-69%	D +
59-62%	D -
Below 59%	E

Attendance & Make-up Work

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. [UF Attendance Policies](#)

Academic Honesty

University of Florida students are bound by the Honor Pledge. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity by abiding by the Student Honor Code." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see [Student Conduct Code Process](#).

Student Privacy Disclaimer:

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.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in

preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or guest lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Course Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. 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 the [GatorEvals site](#). Summaries of course evaluation results are available to students at [GatorEvals Public Data](#).

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.

Services for Students with Disabilities

A statement related to accommodations for students with disabilities such as:
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the [Disability Resource Center](#). It is important for students to share their accommodation letter with their instructor and discuss their access needs as early as possible in the semester.

Campus Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

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 <https://umatter.ufl.edu/> to refer or report a concern and a team member will reach out to the student in distress.
- *Counseling and Wellness Center*: Visit <https://counseling.ufl.edu/> 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 <https://shcc.ufl.edu/>
- *University Police Department*: Visit <https://police.ufl.edu/> or call 352-392-1111 (or 9-1-1 for emergencies).
- *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 <https://ufhealth.org/locations/uf-health-shands-emergency-room-trauma-center>
- *GatorWell Health Promotion Services*: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit <https://gatorwell.ufsa.ufl.edu/> or call 352-273-4450.

Academic Resources

- *E-learning technical support*: Contact the UF Computing Help Desk at 352-392-4357 <https://it.ufl.edu/helpdesk/> or via e-mail 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*: 1317 Turlington Hall, 352-392-2010. General study skills and tutoring.
- *Writing Studio*: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.
- *Student Concern*: [Report Student Concerns or Conduct](#)

Student Complaints:

- Residential Course: <https://www.sfa.ufl.edu/written-student-complaints/>
- Online Course: <https://pfs.tnt.aa.ufl.edu/state-authorization-status/#student-complaint>

Additional Information

Instructors may choose to clarify in their syllabus their teaching philosophy, expectations for classroom behavior, utilization of e-learning, and other information that will help students succeed in the course.

Tips to be successful in this course:

- Do not miss any lectures or labs
- Submit all assignments on time
- Fill out blanks in the lecture notes during lectures
- Learn how to solve Homework problems
- Practice questions in Respondus StudyMate Games
- Review textbook, lecture notes, and lab handouts regularly

Privacy and Accessibility Policies

Students are advised to protect their log-in and private information and that all these technologies have been vetted and are approved as compliant to UF privacy standards.

For information about the privacy policies of the tools used in this course, see the links below:

- Honorlock
 - [Honorlock Privacy Policy](#)
 - [Honorlock Accessibility](#)
- Instructure (Canvas)
 - [Instructure Privacy Policy](#)
 - [Instructure Accessibility](#)
- Microsoft
 - [Microsoft Privacy Policy](#)
 - [Microsoft Accessibility](#)
- Perusal
 - [Perusal Accessibility](#)
 - [Perusal Privacy](#)
- PlayPosit
 - [PlayPosit Privacy Policy](#)
 - [PlayPosit Accessibility](#)
- Respondus
 - [Respondus Privacy Policy](#)
 - [Respondus Accessibility](#)
- Sonic Foundry (Mediasite Streaming Video Player)
 - [Sonic Foundry Privacy Policy](#)
 - [Mediasite Accessibility \(PDF\)](#)
- VoiceThread
 - [VoiceThread Privacy Policy](#)
 - [VoiceThread Accessibility](#)
- YouTube (Google)
 - [YouTube \(Google\) Privacy Policy](#)
 - [YouTube \(Google\) Accessibility](#)
- Zoom

- [Zoom Privacy Policy](#)
- [Zoom Accessibility](#)