

CRSS 4060 / 6060: ADVANCED TOPICS IN PRECISION AGRICULTURE SPRING SEMESTER, 2022

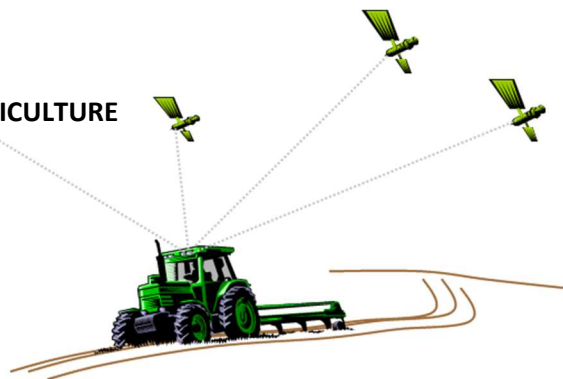
3 credit hours

Lectures on Monday and Friday at 09:10-10:00

Labs on Wednesday at 09:10-11:10

601 NESPAL South, Tifton Campus

1203 Miller Plant Sciences, Athens Campus



Prerequisites

CRSS 3030 – Principles of Precision Agriculture

Co-requisites

CRSS 4050 / 6050 – Improving Nutrient and Energy Efficiency with Geographic Information Systems or equivalent GIS course.

Instructors

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University of Georgia

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Office Hours

Because of social distancing requirements, please make an appointment if you would like a face-to-face meeting with one of the instructors. Otherwise, we are always available by phone or email.

Course Description

The course will emphasize concepts and analytical techniques used in precision agriculture to make management decisions such as geostatistics to analyze georeferenced data, development of management zones, integration of sensors with real-time control systems, and big data analytics. Lab exercises will provide experiential learning of topics covered during lectures.

STAY SAFE, BULLDOGS!

- ✓ Vaccinate. With every person we vaccinate, our community becomes safer and stronger.
- ✓ Unvaccinated? You are **strongly encouraged** to social distance and wear face coverings inside campus facilities.
- ✓ Continue to self-monitor for any symptoms of COVID-19. You are **required** to report a positive COVID-19 test through DawgCheck.
- ✓ Get tested if you are not fully vaccinated. Participation in surveillance testing still plays an important role in preventing further spread.
- ✓ If you feel sick, stay home.
- ✓ Wash your hands frequently and use hand sanitizer.

LEARN MORE AT
coronavirus.uga.edu

GEORGIA STRONG.
DAWG STRONG.

Course Goals

Provide students with a good understanding of the emerging areas in precision agriculture, the ability to analyze and evaluate spatially distributed data sets, and the experience to use key precision agriculture tools and technologies. Additional goals are to:

- extend critical thinking and problem solving abilities;
- improve written and oral communication skills; and
- learn how to create, present, and interpret maps.

Topical Outline

1. Global Navigation Satellite Systems
 - a. Quality metrics
 - b. Developments in differential correction
2. Remote Sensing
 - a. Sensors and applications in agriculture
 - b. Active vs Passive Remote Sensing
 - c. Spectral, spatial and temporal resolution
 - d. Satellite image analysis
 - e. UAV image analysis
3. Management zones
 - a. Data sets for management zones
 - b. Concepts and tools for delineating management zones
 - c. Effect of environmental variables such as climate on management zones
4. Geographic Information Systems
 - a. Data analysis – Statistics
 - b. Spatial and temporal analysis of data
 - c. Decision making
 - d. Profitability analysis
5. Geostatistics
 - a. What is it and how do we use it?
 - b. Applications to data sets relevant to precision agriculture
 - c. Applications through GIS platforms
6. Integration of sensors with real-time control systems / Telematics
 - a. Data acquisition / CAN Bus
 - b. Soil moisture and plant sensors integrated with variable rate irrigation
 - c. Soil nutrient and plant sensors integrated with variable rate fertilizer applicators
 - d. Other real-time sense and treat systems
 - e. Telematics Technology
 - f. Wireless Sensor Networks - Applications
7. Big data and the connected farm
 - a. Sensing systems and data flow
 - b. Data filtering and integration
 - c. Big data analytics
 - d. Data delivery and display

- e. Impact on overall farm efficiency
- f. Who are the end-users of big data and how do we apply the results to the farm?
8. Robotics in precision agriculture
 - a. Technology
 - b. Pattern recognition
9. Modeling in precision agriculture
10. Sales and marketing of precision ag equipment and services
11. Course project
 - a. Undergraduate students: optional
 - b. Graduate students: mandatory

The topical outline is a general plan for the course; deviations announced to the class by the instructor may be necessary.

Guest Lecturers

Experts in various aspects of precision agriculture will occasionally present lectures or provide demonstrations of products. Students will be notified in advance of appearance by guest lecturers. Attendance is mandatory during guest lectures.

Textbook

A textbook is not required. Reading materials will be supplied by instructor and will include benchmark research articles, manuals, and other materials.

Grading

The grade you receive in this course will be determined from your performance on two announced exams, weekly quizzes, homework assignments and lab reports, a team design project, a comprehensive final exam, and class participation. These factors will be weighted as follows:

- Midterm Exam 10%
- Homework Assignments/Reports/Projects/Presentations 70%
- Final Exam 10%
- Class Participation 10%

Active class participation is important for you to achieve the learning goals of the class. To receive maximum credit for class participation you must

- attend every class period (lecture or laboratory);
- arrive on time and remain for the entire class period;
- you are actively engaged and attentive throughout the class period; and
- participate in the class discussion and ask and answer questions.

Per Board of Regents policy, I reserve the right to drop students from the class roll who miss more than 5 class periods. Such students will be given a WF grade.

Final grades will be assigned as follows:

- A 93 and above
- A- 90-92
- B+ 87-89
- B 83-86
- B- 80-82
- C+ 77-79
- C 73-76
- C- 70-72
- D+ 67-69
- D 63-66
- D- 60-62
- F 59 and below

Up to thirty percent of the grade on written assignments (homework assignments and papers) and oral presentations will be based on quality of communication. Spelling, grammar, punctuation, and clarity of writing are evidence of written communication quality. Enunciation, voice projection, clarity and logical order of the presentation and effective use of visual aids are evidence of oral communication quality.

Policy for Late Assignments and Missed Exams and Quizzes

- Most labs will be conducted in the field or off-campus and cannot be made up. Lab reports for missed labs will not be accepted and will be assigned a grade of zero.
- There will be no make-ups for missed quizzes. Any missed quiz will be recorded as a zero.
- Exams can be made up only with a note from a doctor or if you can document extenuating circumstances. Any unexcused missed exam will be recorded as a zero.
- Homework assignments will be accepted up to one week beyond the due date. The penalty for submitting a late assignment is one letter grade.
- Homework assignments may be submitted late without penalty in case of illness, extenuating circumstances, or if prior arrangements are made with the instructors. All late assignments are due within a week of the original due date or within a week of when a student returns from an illness.

Food and Drink in the Classroom

University policy prohibits tobacco products, food or drink in all labs and classrooms.

Academic Honesty

Students are reminded that they are bound by the University's Academic Honesty Policy. We take this very seriously. A Culture of Honesty, the University's policy and procedures for handling cases of suspected dishonesty, can be found at: <https://honesty.uga.edu/>

The UGA Student Honor Code states: "I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others."

All academic work must meet the standards contained in "A Culture of Honesty." Each student is responsible for informing themselves about those standards before performing any academic work.

For this course, all lab reports and other assignments can be discussed with your classmates but any work you turn in must be your own.

Plagiarism of online and other sources will not be tolerated. Any assignment that includes plagiarized materials will be assigned a grade of zero. A second infraction will result in referral to UGA's Office of Academic Honesty.

Definition of Plagiarism

(https://honesty.uga.edu/Academic-Honesty-Policy/Prohibited_Conduct/)

Submission for academic advancement the words, ideas, opinions or theories of another that are not common knowledge, without appropriate attribution to that other person. Plagiarism includes, but is not limited to, the following acts when performed without appropriate attribution:

- Directly quoting all or part of another person's written or spoken words without quotation marks, as appropriate to the discipline;
- Paraphrasing all or part of another person's written or spoken words without notes or documentation within the body of the work;
- Presenting an idea, theory or formula originated by another person as the original work of the person submitting that work;
- Repeating information, such as statistics or demographics, which is not common knowledge and which was originally compiled by another person;
- Purchasing (or receiving in any other manner) a term paper or other assignment that is the work of another person and submitting that term paper or other assignment as the student's own work.

Help Outside and Within the Classroom

Help is available to you should you have difficulty with this course. Please make an appointment to see the instructors if you need help.

Students with disabilities who require reasonable accommodations in order to participate in course activities or meet course requirements should contact the instructor during regular office hours or by appointment. For more information, please visit the University's Disability Resources Center at: www.drc.uga.edu or (706) 542-8719.

Mental Health and Wellness Resources

If you or someone you know needs assistance, you are encouraged to contact Student Care and Outreach in the Division of Student Affairs at 706-542-7774 or visit <https://sco.uga.edu>. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services.

UGA has several resources for a student seeking mental health services (<https://www.uhs.uga.edu/bewelluga/bewelluga>) or crisis support (<https://www.uhs.uga.edu/info/emergencies>).

If you need help managing stress anxiety, relationships, etc., please visit BeWellUGA (<https://www.uhs.uga.edu/bewelluga/bewelluga>) for a list of FREE workshops, classes, mentoring, and health coaching led by licensed clinicians and health educators in the University Health Center.

Additional resources can be accessed through the UGA App.

CORONAVIRUS INFORMATION FOR STUDENTS

Masks and Face Coverings

For Fall Semester 2021, UGA strongly encourages that face coverings be worn at all times when in university facilities. The Centers for Disease Control (CDC) strongly recommends the following precautions to keep you and your family safe:

- **Get vaccinated and boosted!**
- Quarantine if you are exposed and unvaccinated
- Isolate when you have symptoms
- Don't come to class if you think you may be ill
- Wear a mask
- Social distance
- Avoid crowds and poorly ventilated spaces
- Wash your hands often
- Cover sneezes and coughs
- Monitor your health daily

Face coverings and social distancing:

Following guidance from the University System of Georgia, face coverings are no longer required inside campus facilities, including classrooms. However, unvaccinated individuals are strongly encouraged to continue wearing face coverings while inside campus facilities and socially distancing from others when possible.

How can I obtain the COVID-19 vaccine?

University Health Center is scheduling appointments for students through the UHC Patient Portal (https://patientportal.uhs.uga.edu/login_dualauthentication.aspx). Learn more here – <https://www.uhs.uga.edu/healthtopics/covid-vaccine>.

What do I do if I have COVID-19 symptoms?

Students showing COVID-19 symptoms should self-isolate and schedule an appointment with the University Health Center by calling 706-542-1162 (Monday-Friday, 8 a.m.-5p.m.). Please DO NOT walk-in. For emergencies and after-hours care, see, <https://www.uhs.uga.edu/info/emergencies>.

What do I do if I test positive for COVID-19?

If you test positive for COVID-19 at any time, you are **required to report it** through the [DawgCheck Test Reporting Survey](#). We encourage you to stay at home if you become ill or until you have excluded COVID-19 as the cause of your symptoms. UGA adheres to current CDC quarantine and isolation guidance and requires that it be followed.

Guidelines for COVID-19 Quarantine Period (Revised 6/7/21)

Students who are fully vaccinated **do not** need to quarantine upon exposure unless they have symptoms of COVID-19 themselves. All others must follow the following recommendations.

Students who **are not fully vaccinated and have been directly exposed to COVID-19 but are not showing symptoms should self-quarantine for 10 days**. Those quarantining for 10 days must have been symptom-free throughout the monitoring period and continue self-monitoring for COVID-19 symptoms for a total of 14 days. Please correspond with your instructor via email, with a cc: to Student Care & Outreach at sco@uga.edu, to coordinate continuing your coursework while self-quarantined.

Students, faculty and staff who have been in close contact with someone who has COVID-19 are no longer required to quarantine if they have been fully vaccinated against the disease and show no symptoms.

Monitoring conditions:

Note that the guidance referenced in this syllabus is subject to change based on recommendations from the Georgia Department of Public Health, Centers for Disease Control, Governor's Office or University System of Georgia. For the latest on UGA policy, you can visit www.coronavirus.uga.edu.

Expectations for Class Participation

Participation is graded using the criteria below. *Additional criteria may also be used.* With such a small number of students in the class, I expect everyone to receive participation grades of 8 to 10.

Grade	Criteria
0	<ul style="list-style-type: none"> • Misses 4 or more class periods. Class period is defined as a lecture or lab.
2	<ul style="list-style-type: none"> • Misses 3 class periods. • Is on time to class and is respectful to instructor and peers. • Not frequently involved in discussion. • Provides minimal response to questions. • <i>Demonstrates minimal involvement.</i>
4	<ul style="list-style-type: none"> • Misses 2 class periods. • Is on time to class and is respectful to instructor and peers. • Adequately prepared for class. • Answers questions but does not ask questions. • Participates actively in labs but does not contribute to discussions. • <i>Demonstrates occasional involvement.</i>
6	<ul style="list-style-type: none"> • Misses no more than 1 class period. • Is on time to class and is respectful to instructor and peers. • Well prepared for class. • Answers questions well and ask questions frequently. • Participates actively in labs and contributes to discussions. • <i>Demonstrates consistent involvement.</i>
8	<ul style="list-style-type: none"> • Misses no more than 1 class period. • Is on time to class and is respectful to instructor and peers. • Well prepared for class. • Answers questions well and ask questions frequently. • Participates actively in labs and contributes to discussions. • Contributes well to discussion by adding relevant information learned outside the classroom. • <i>Demonstrates very active involvement.</i>
10	<ul style="list-style-type: none"> • Misses no more than 1 class period. • Is on time to class and is respectful to instructor and peers. • Well prepared for class. • Answers questions well and ask questions frequently. • Participates actively in labs and contributes to discussions. • Contributes well to discussion by adding relevant information learned outside the classroom. • Contributes well to discussion in an ongoing way: responds to other students' points, thinks through own points, questions others in a constructive way, offers and supports suggestions that may be counter to the majority opinion. • <i>Demonstrates excellent involvement.</i>