University of Puerto Rico
Mayagüez Campus
College of Agricultural Sciences
Department of Agricultural and Biosystems Engineering
Agricultural and Environmental Systems

COURSE SYLLABUS

GENERAL INFORMATION:

COURSE TITLE:	**Precision Agriculture Technologies**
COURSE NUMBERING:	SAGA 4230
CONTACT HOURS /CREDITS:	45 hours / Three credits
PREREQUISITES, COREQUISITES AND OTHER REQUIREMENTS:	Prerequisite: SAGA4015 or SAGA4041

COURSE DESCRIPTION:

ENGLISH: Study of the fundamentals of precision technologies used in modern agriculture for crop production. Discussion of global positioning system (GPS) receivers, geographical information systems (GIS) software, automatic tractor guidance systems, variable rate technologies, and sensing technologies. This course is offered in person.

SPANISH: Estudio de los fundamentos de las tecnologías de precisión utilizadas en la agricultura moderna para la producción de cultivos. Discusión de los receptores de sistemas de posicionamiento global (GPS), software de sistemas de información geográfica (GIS), sistema de guía de tractores autónomos, tecnologías de índice variable y tecnologías de detección con sensores. Curso presencial.

LEARNING OBJECTIVES:

At the end of the course students will be able to:

a. Explain the principles and applications of core precision agriculture technologies, including GPS, GIS, remote sensing, and variable rate technologies.
b. Collect and process data using GPS, GIS, and other precision tools, applying data analysis techniques in precision farming contexts.
c. Present analyzed data and findings, effectively communicating insights from precision agriculture technologies for agricultural decision-making.

SUGGESTED TEXTBOOK: *Shannon, D. K., D.E. Clay, N.R. Kitchen (Editors). 2018. Precision Agriculture Basics. ASA, CSSA, and SSSA, Madison, WI. ISBN: 978-0-89118-366-2. Latest edition.*

COURSE OUTLINE AND TIME DISTRIBUTION:

TOPIC	TIME DISTRIBUTION (HOURS)
I. Introduction to precision agriculture	1.5
II. Satellite-Based Positioning Systems (GPS)	6
III. Geographic Information Systems (GIS)	7.5
IV. Remote sensing	6
V. Soil sampling and analysis	4.5
VI. Variable rate technologies	5
VII. Yield monitoring and mapping	6.5
VIII. Technical presentations	6
IX. Exams	2
TOTAL HOURS	**45**

INSTRUCTIONAL STRATEGIES:

Some of the following may be used:

☒ Lecture	☐ Project Based Learning
☐ Discussion	☐ Seminars or Workshops
☐ Cooperative Learning	☐ Problem Based Learning (PBL)
☐ Case Studies	☐ Flipped Classroom
☐ Lectures with Guest Speakers	

MINIMUM OR REQUIRED RESOURCES AVAILABLE:

RESOURCE	FACE-TO-FACE
Classroom or laboratory	Institution
Account in the institutional learning management platform (e.g. Moodle or Blackboard)	Institution
Institutional email account	Institution
Computer with high-speed internet access or mobile device with data service	Student
Programs or applications: word processor, spreadsheets, presentation editor	Student
Webcam or mobile with camera and microphone	Student

RESOURCE	FACE-TO-FACE
Integrated or external speakers	Student
Whiteboard	Institution
Digital projector	Institution

Other: Tractor equipped with GPS and auto guidance system and other precision agriculture technologies for demonstrations and practice exercises. Computer center with necessary software.

ASSESSMENT TECHNIQUES: (Examples of evaluation techniques)

Assessment Technique	Relative Weight
☒ Exams (2 @ 30%)	60%
☒ Final Exam	30%
☒ Short quizzes	5%
☒ Oral presentations	5%
Total:	**100%**

Standard scale: 90 to 100 A; 80 < 90 B; 70 < 80 C; 60 < 70 D; < 60 F

REASONABLE MODIFICATION (REASONABLE ACCOMMODATION):

The University of Puerto Rico (UPR) acknowledges the right of students with disabilities to an inclusive, equitable, and comparable post-secondary education. In accordance with its policy toward students with disabilities, based on federal and state legislation, every qualified student with disabilities is entitled to equal participation in those services, programs, and activities that are physically, mentally or sensorially natured and have thus substantially affected one or more major life activities, such as their area of post-secondary studies. They have the right to receive reasonable accommodation or modifications. If you require accommodation or reasonable modification in the course, you must inform the professor without the need to disclose your condition or diagnosis. Simultaneously, you should promptly request the Office of Services for Students with Disabilities (OSEI) of the unit or campus for your need for modification or reasonable accommodation.

The University of Puerto Rico at Mayagüez (RUM) recognizes that each student has an inherited right to request reasonable accommodation according to Law 51: Law for Integral Educational Services for People with Disabilities. Every student has the right to receive reasonable accommodation if he/she presents the necessary evidence to be evaluated by the Office of Services to Students with Disabilities (OSEI-RUM), and the related information can be found at the following link: https://www.uprm.edu/cms/index.php/page/85. If your case is approved by OSEI-RUM, you will receive reasonable accommodation in your courses and evaluation, and you must contact each professor for course registered. For additional information contact OSEI-RUM at the Office of the Dean of Students, DE 12, via telephone 787-832-4040 extensions 6734 or 6735, email: oseirum@uprm.edu, at the virtual office: https://meet.google.com/yvd-nrqo-mor, or join by telephone: (US)+1 475-558-0169 PIN: 814 895 818#.

ACADEMIC HONESTY:

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Section 6.2 of the UPR General Student Regulations (Certification No.13, 2009-2010, Board of Trustees) provides that academic dishonesty includes, but is not limited to: "fraudulent actions, obtaining grades or academic degrees by false or fraudulent simulations, copying all or part of another's academic work, copying all or part of another's answer to questions on an examination, taking or having another take any oral or written test or examination on behalf of another, and aiding or facilitating another person to engaging such conduct." Any of these actions will be subject to disciplinary sanctions in accordance with the disciplinary procedure provided in the UPR General Student Regulations in force. To ensure the integrity and security of user data, all hybrid, distance-learning and online courses shall be offered through the institutional learning management platform or through tools required by the course, which uses secure connection and authentication protocols. The system authenticates the user identity using the username and password assigned through the student institutional account. The user is responsible for keeping secure, protecting, and not sharing their password with others.

POLICY AND PROCEDURES TO MANAGE SEX AND GENDER-BASED DISCRIMINATION AT THE UNIVERSITY OF PUERTO RICO:

The Policy and procedures to Manage Sex and Gender-Based Discrimination at the University of Puerto Rico, Certification No. 107 (2021-2022) of the Governing Board, certifies that the University of Puerto Rico, as an institution of higher learning and a workplace, safeguards the rights and offers a safe space for those who interact therein, whether they be students, employees, contractors, or visitors. It seeks to promote an environment that respects diversity and the rights of the university community. This policy provides a protocol for handling situations related to the following prohibited conduct in the workplace or in the academic setting: discrimination based on sex, gender, pregnancy, sexual harassment, sexual violence, domestic violence, dating, violence, and stalking.

CONTINGENCY PLAN IN CASE OF AN EMERGENCY OR INTERRUPTION OF CLASSES

In the event of an emergency or interruption of classes, the professor will contact the students through the institutional email or other available means to coordinate the continuity of the course.

The contingency plan must preserve the modality in which the course was created and programmed in the course offering.

Certification 23-29 of the Academic Senate establishes that a face-to-face course may have up to 25% of the hours at a distance and if necessary, this option may be used.

DIVERSITY, EQUITY, AND INCLUSION

The University of Puerto Rico is committed to establishing an environment that values diversity, promotes equity and equality, and aspires to the full inclusion of its entire university community. Courses will be offered in an inclusive and equitable environment, ensuring the participation of students with diverse backgrounds, experiences, and abilities. Thus, the University of Puerto Rico reiterates its dedication to upholding the principles of diversity, equity, and inclusion in its academic programs.

GRADING SYSTEM

☒ Quantifiable (letters, A, B, C, D, F) ☐ Not Quantifiable (Pass, Fail)

BIBLIOGRAPHY:

Berckmans, D. (Editor). 2022. Advances in precision livestock farming. Burleigh Dodds Science Publishing; 1st edition. ISBN 1786764717.

Cammarano, D., F. K. van Evert, and C. Kempenaar (Editors). 2023. Precision Agriculture: Modelling. Springer Nature Switzerland AG. ISBN 978-3-031-15257-3.

Ess, D. T. and M. T. Morgan. 2010. The Precision Farming Guide for Agriculturists. Third Edition. John Deere Publishing. Illinois. ISBN 0-86691-358-0. Latest edition.

Jupp, L. 2024. Precision Farming from Above. W&M Publishing. ISBN 1917265336.

Kerry, R. and A. Escola (Editors). 2023. Sensing Approaches for Precision Agriculture. Springer Nature Switzerland AG. ISBN 978-3-030-78433-1.

Marco, A. 2023. REVOLUTIONIZING AGRICULTURE WITH AI: Smart Farming Technology, Precision Crop Management, Machine Learning Solutions, Robotics Innovations, and Sustainable Data-Driven Farming Practices. Independently published. ISBN 979-8857211649.

Pedersen, S. M. and K. M. Lind (Editors). 2017. Precision Agriculture: Technology and Economic Perspectives. Springer International Publishing AG. ISBN 978-3-319-68713-1. Latest edition.

Shannon, D. K., D.E. Clay, N.R. Kitchen (Editors). 2018. Precision Agriculture Basics. ASA, CSSA, and SSSA, Madison, WI. ISBN: 978-0-89118-366-2. Latest edition.

Zaman, Q. (Editor). 2023. Precision Agriculture: Evolution, Insights and Emerging Trends. Academic Press. ISBN: 0443189536. 1st Edition