Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
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Smart AgroTech: Data-Driven Agriculture (269537)

Nositelji predmeta

izv. prof. dr. sc. Darija Lemić, **izv. prof. dr. sc. Monika Zovko**

Opis predmeta

The course objectives are designed to provide students with an understanding of how advanced technology can be applied in agriculture, especially in the context of addressing challenges such as climate change and stress intensification. It focuses on the use of various sensors to monitor soil moisture and detect plant abiotic (water) stress and biotic stress, enhancing water management and Integrated Pest Management (IPM). The curriculum emphasizes the importance of data analysis from these technologies, teaching students to interpret information for informed agricultural decisions. Integrated pest management and digital technologies in pest monitoring are highlighted as crucial components in tackling pest-related challenges sustainably. Additionally, students will learn the principles of machine learning to develop predictive models for water management and pest control, highlighting the role of IoT sensors in real-time environmental monitoring. Through practical projects and seminars, the course aims to equip students with the skills to design decision support systems, demonstrating the impact of technology in modern agriculture. By the end of the course, students will have a robust understanding of how to apply advanced sensing technologies and data analytics to address critical challenges in modern agriculture, making them valuable contributors to the field of precision agriculture.

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ECTS: **6.00**

Engleski jezik: **R2**

E-učenje: **R2**

Sati nastave: 60
Predavanja: 26
Laboratorijske vježbe: 4
Vježbe u praktikumu: 8
Seminar: 14
Terenske vježbe: 8

Izvođač predavanja

- izv. prof. dr. sc. Monika Zovko
- izv. prof. dr. sc. Darija Lemić
- prof. dr. sc. Gabrijel Ondrašek
- izv. prof. dr. sc. Ivana Pajač Živković
- doc. dr. sc. Marko Reljić

Izvođač vježbi

- Sandra Skendžić, mag. ing. agr.
- doc. dr. sc. Marko Reljić

Izvođač seminara

- Sandra Skendžić, mag. ing. agr.
- doc. dr. sc. Marko Reljić

Ocjenjivanje

Dovoljan (2): 60
Dobar (3): 71
Vrlo dobar (4): 81
Izvrstan (5): 91

Vrsta predmeta

- Graduate studies / Environment, agriculture and resource management (Izborni predmet, 4. semestar, 2. godina)

Oblici nastave

- Lectures
- Auditory Exercises
- Consultations
- Practicum
- Experiments in classes
- Seminars

Ishodi učenja i način provjere

Ishod učenja	Način provjere
Master and analyze adapted interdisciplinary knowledge and demonstrate technical skills in the domain of agriculture,	Written exam

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environmental protection and related natural, engineering and biotechnical sciences relating to theoretical and practical assessment and evaluation of biological, physical and hydrological components of the natural as well as anthropogenized, notably agricultural, environment and their interactions	
Explain the theoretical bases and concepts of natural resource assessment; theoretical and practical bases for application of appropriate experimental techniques in analysis and appraisal of physical, chemical and biological components of natural and modified eco- and agro-ecosystems, their interactions, using advanced techniques such as modeling, geostatistics, GIS and remote imaging	Written exam
Critically consider the issues of balance and sustainability of agro-ecosystems and food production, food safety and resource protection, primarily soil and water; acquire practical understanding of how available research and monitoring techniques can be used for efficient planning of environmental management	Written exam
Recognize and explain the principles of applying socio-economic analyses and risk assessment analyses for the environment and resource management, point out the importance of natural resources as production factors in agriculture and overall economy and explain the relationship between the environment and agriculture and ecologically acceptable policies of agricultural development	Written exam
Explore and critically evaluate the functioning of natural and agro-ecosystems using the interdisciplinary, holistic approach; analyze the role of edaphic, biological, climatic and hydrological factors and appraise the impact of agriculture and other anthropogenic activities upon natural resource	Written exam
Design and implement a research project, apply appropriate analytical procedures using new methods, all based on the clear definition of the problem, posed hypothesis and adequately selected methods	Written exam
Assess the sustainability of the measures applied in agriculture and environmental management systems, including techniques for the development of indicators, criteria and benchmarks (points of reference for a measurement) as well as critical thresholds; incorporate the concept of sustainable development into all phases of project implementation	Written exam
Plan and define the logical framework for implementation of a developmental project, including application of modern research techniques in agriculture and environmental protection, devise an adequate experimental design, master the modeling techniques for the appertaining scientific disciplines and, finally, be able to evaluate the obtained results and present them in the form of a professional report.	Written exam
Critically appraise the sustainability of the agro-ecosystem management system in terms of understanding the diversity and experiences in historical context, recognize the current needs and trends in sustainable development of rural areas, notably the role of agriculture.	Written exam
Understand and interpret correctly relevant data on the environment and ecology, present them pointing to the importance of particular data, using adequate statistical methods and providing evidence-based proofs for conclusions and proposed measure	Written exam
Formulate and test hypotheses using logical and consistent quantitative and qualitative criteria	Written exam

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Tjedni plan nastave

1. Week 1: Introduction to Smart AgroTech. Overview of the course. Introduction to precision agriculture and smart technologies
2. Week 2: Understanding Climate Change Impacts on Crop Production. Throughout the course: Supplementary materials and discussions on e-learning platforms to reinforce weekly topics and prepare for seminars and exercises.
3. Principles of Smart and Digital Agriculture
4. Advanced Sensing for Soil and Plant Monitoring
5. Advanced Sensing for Soil and Plant Monitoring
6. Risk Evaluation and Decision Making in Pest Management Implementation and Management of Pest Monitoring Programs
7. Automatic Pest Monitoring Systems in Orchards and Vineyards
8. Data Collection, Curation and Statistical Analysis
9. Modeling and Prediction by Machine Learning and Artificial Intelligence
10. Pest damage identification using proximal sensing (crop spectroscopy)
11. Simulation of pest infestation in the field
12. EU Policy Analysis and Debate
13. Time series analysis
14. Testing predictive models
15. Development Sessions; Integrating Technology and Agriculture through Case Studies

Obvezna literatura

1. selected chapters from the book:Hyperspectral Remote Sensing of VegetationEdited ByPrasad S. Thenkabail, John G. Lyon
2. selected chapters from the book: Abrol, D. P. (Ed.). (2013). Integrated pest management: current concepts and ecological perspective.
3. Internal scripts and ppt presentations