University of Zagreb Faculty of Agriculture
Svetošimunska cesta 25, 10000 Zagreb
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GreenTech solutions in pest management (226352)

Course coordinator

Assoc. Prof. Darija Lemić, PhD

Course description

This course aims to present innovative green solutions for sustainable pest management by using modern technological solutions to ensure environmental sustainability. Such agro-based technologies are referred to as GreenTech solutions (GT). GT encompasses a constantly evolving group of methods or materials, from energy generation techniques, non-toxic active ingredients, novel application methods to the use of artificial intelligence in the service of production productivity. GreenTech solutions reduce the use of pesticides by changing application and formulation patterns. It is also defined as environmentally healing technology that reduces environmental damage caused by products and technologies for the benefit of people. Students will learn about the use of new GreenTech solutions in pest management. They will also be introduced to the possibilities of current modern methods for a fast and efficient research approach. Through laboratory exercises, students will become familiar with the use of GreenTech in pest management experiments. Through group discussions, students will be able to identify the environmental benefits of green technologies and their role in sustainable agriculture. In the seminars, students will independently propose projects based on green technologies in pest management and their impact on agriculture and society based on the acquired knowledge and literature review.

ECTS: **3.00**

English language: **L3**

E-learning: **L2**

Teaching hours: 30
Lectures: 14
Practicum: 10
Seminar: 6

Lecturer

- Helena Virić Gašparić, PhD
- Prof. Marko Vinceković, PhD

Associate teacher for exercises

- Slaven Jurić, PhD

Grading

Sufficient (2): 60-70%
Good (3): 71-80%
Very good (4): 81-90%
Excellent (5): 91-100%

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Type of course

- Graduate studies / Environment, agriculture and resource management (Elective course, 4 semester, 2 year)

Types of instruction

- Lectures
- Assessments
- Laboratory practice/exercises
- Field work
- Experiments in classes
- Seminars
- Design exercises

Learning outcomes

Learning outcome	Evaluation methods
Discuss and argue the advantages and disadvantages of GreenTech solutions in terms of sustainable pest management. Identify suitable technology for income generation through sustainable agriculture i.e. organic farming. Plan and organize the use of GreenTech solutions in pest management. Prepare research plan and conduct research based on GreenTech solutions. Review challenges and available policy options for adoption of green technology. Define control programs and decide on implementation of most appropriate GreenTech solution in pest management. Integrate the acquired skills for further training. Become aware of the possibilities of creating and implementing new solutions through various programs.	Written and oral examinaton.

Working methods

Students' obligations

Student must obtain regular attendance and active participation in all forms of coursework.
Attendance records will be maintained by the subject coordinator and associates.
In order to meet the requirement of the course, a student must be present in 80% of the lectures and properly fulfil the duties associated with the seminar.
Participation in field work within organized filed trip is preferable.
Preparation and public presentation of seminar papers is mandatory.
Preparation for the final written and oral examination is mandatory in the scheduled examination dates.

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Weekly class schedule

1. Developing technologies in Agriculture - Developing technologies such as robotics, cellular agriculture, AI and machine learning, etc., are link between sustainability and increased productivity. Green Technology and Rural Environmental Concerns. Legal Framework.
2. Green Technology Initiative - Green technology in focus for poverty alleviation, clean agriculture, rural environment and income generation. Environmental impact of smart products.
3. Indicators for Agricultural Science and Technology - Key energy and economic indicators. Summary of costs and benefits. Assessment of technology for deployment.
4. Ozone as a tool in sustainable pest management - Main ozone characteristics. Its use in agriculture. Advantages and disadvantages.
5. Electrical Air Vehicles (EAV) in pest management - Types and specification of EAV. Advantages and disadvantages of their use in agriculture. Future prospects in pest monitoring.
6. Novel agro-ecological formulations - Encapsulation of bioactive compounds - Definitions and concepts of encapsulated formulations. Prospects in pest management and plant nutrition.
7. Encapsulated polyphenol-based extracts as green insecticides for sustainable management - Encapsulation procedure. Physical and chemical properties of encapsulated formulations.
8. Use of ozone in pest management - Laboratory experiment and establishing a research procedure for pest control by application of ozone.
9. Rapid detection of harmful organisms - Definitions and concepts of EAV. Estimation of performance.
10. Field work - Field experiment on pest detection using EAV.
11. Field work - Sensor controlled AI based agriculture.
12. Seminars - Presentation of seminar papers and individual experiments.
13. Seminars - Presentation of seminar papers and individual experiments.
14. Seminars - Presentation of seminar papers and individual experiments.
15. Seminars - Presentation of seminar papers and individual experiments.

Obligatory literature

1. Internal script and power point presentations.
2. UNITED NATIONS. A Feasibility Study On The Application Of Green Technology For Sustainable Agriculture Development

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Recommended literature

1. Pajač Živković, I., Jurić, S., Vinceković, M., Galešić, M.A., Marijan, M., Vlahoviček-Kahlina, K., Mikac, K.M., Lemic, D. (2020). Polyphenol-based microencapsulated extracts as novel green insecticides for sustainable management of polyphagous brown marmorated stink bug (Halyomorpha halys Stål, 1855). Sustainability, 12(23): 10079.
2. Kadoić Balaško, M., Mikac, K.M., Bažok, R., Lemić, D. (2020). Modern Techniques in Colorado Potato Beetle (Leptinotarsa decemlineata Say) Control and Resistance Management: History Review and Future Perspectives. Insects, 11(9): 581.
3. Lemic, D., Jembrek, D., Bažok, R., Pajač Živković, I. (2019). Ozone Effectiveness on Wheat Weevil Suppression: Preliminary Research. Insects. 10 (357): 1-11.
4. Bogue, R. (2017.). Sensors key to advances in precision agriculture. Sensor Review 37: 1–6.
5. Filho, F. H. I., Heldens, W. B., Kong, Z., de Lange, E. S. (2019.). Drones: innovative technology for use in precision pest management. Journal of Economic Entomology, 113: 1 – 25.
6. Armanda, D.T., Guinée, J.B., Tukker, A., 2019. The second green revolution: Innovative urban agriculture's contribution to food security and sustainability – A review. Glob.Food Secur. 22, 13–24.
7. Klerkx, L and Rose D (2020). Dealing with the game-changing technologies of Agriculture 4.0: How do we manage diversity and responsibility in food system transition pathways? Global Food Security 24: 1 – 7, 100347.
8. Rijswijk, K., Klerkx, L., Turner, J. A. (2019). Digitalisation in the New Zealand Agricultural Knowledge and Innovation System: Initial understandings and emerging organisational responses to digital agriculture, NJAS - Wageningen Journal of Life Sciences, Volumes 90–91,100313.
9. Fagella, D. (2020). AI in Agriculture – Present Applications and Impact. Available at: https://emerj.com/ai-sector-overviews/ai-agriculture-present-applications-impact/