

Tárgytematika / Course Description

Technological and information background of precision agriculture

N_DMA65

Tárgyfelelős neve /

Teacher's name: dr. Neményi Miklós

Félév / Semester: 2024/25/1

Beszámolási forma /

Assesment: Vizsga

Tárgy heti óraszám /

Teaching hours(week): 0/0/0

Tárgy féléves óraszám /

Teaching hours(sem.): 14/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

The aim of the course is to familiarize students with the near and distant perspectives of agricultural sustainability, with particular emphasis on the relationship between theories and their practical application. It demonstrates the benefits of developing and applying technical and IT systems to meet sustainability requirements. The aim: a paradigm shift in thinking. The lectures will place a special emphasis on the role of artificial intelligence as a decision support tool.

TANTÁRGY TARTALMA / DESCRIPTION

1	The first green revolution
2	Organic farming in EU after 2022; relationship between general and agricultural sustainability
3	The expectation of European green deal concerning agriculture
4	Regenerative agriculture in EU
5	Farm to fork
6	Organic farming vs yield
7	Management zones and VRA's
8	Decision support models in precision crop production
9	Big Data and artificial intelligence
10	The agricultural food demand and the challenges for sustainability; the 3rd green revolution; IoT with WSN – Small smart data logger tractors; the Mosonmagyaróvár IoT
11	Multispectral and hyperspectral early-stage detection of microorganisms
12	VR application: site specific seeding, spraying, mapping: soil compaction, EC, SMC

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESSMENT'S METHOD

Oral discussion or written essay in agreement with the course instructor.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Brase, A.T. (2006): Precision Agriculture. Thomson.

Fluck, R.C. (1992): Energy in Farm Production. Elsevier.

Jorgensen, S.E. (2001): Thermodynamics and Ecological Modelling. CRC Press, Boca Raton, FL.

Margulis, L. (1998): The Symbiotic Planet. Weidenfeld and Nicolson, London, UK.

Mesterházi, P.Á. (2003): Development of measurement technique for GPS-aided plant production. PhD Thesis.

Mike-Hegedűs, F. (2006): Applying fuzzy logic and neural networks to database evaluation in precision agriculture. PhD Thesis.

- Morowitz, H.J. (1968): Energy Flow in Biology. Academic Press.
- Neményi, M. (2012): Anthropogenic impacts on nature with special regard to agricultural technologies. The impact of urbanization, industrial, agricultural and forest technologies on the natural environment, edited by Neményi, M., Mesterházi, P.Á., Milics, G. (2006a): An Application of Tillage force Mapping as a Cropping Management Tool. Biosystems Engineering 94 (3), 351-357.
- Neményi, M. et al. (2022): Challenges of sustainable agricultural development with special regard to Internet of Things: Survey. Progress in Agricultural Engineering Sciences.
- Neményi, M. et al. (2023): Challenges of ecocentric sustainable development in agriculture with special regard to the internet of things (IoT), an ICT perspective. Progress in Agricultural Engineering Sciences.
- Neményi, M., Mesterházi, P.Á., Pecze, Zs., Stépán, Zs. (2003): The role of GIS and GPS in precision farming. Computers and Electronics in Agriculture 40 (1-3), 45-55.
- Neményi, M., Milics, G. (2009): Thermodynamic modeling of agro-ecological systems especially regarding the cost and efficiency of the technological energy input. 10th IAEE European Conference. Energy, Policies and Technologies for Sustainable Economies, Vienna, 2009. 09. 07.-10., pp. 37-38.
- Neményi, M., Milics, G. (2010): Optimization of biomass production by thermodynamic approach. In: Conference AgEng2010. International Conference on Agricultural Engineering. Clermont-Ferrand, France.
- Nyéki, A., Kerepesi, C., Daróczy, B., Benczúr, A., Milics, G., Nagy, J., Harsányi, E., Kovács, A.J., Neményi, M. (2021): Application of spatio-temporal data in site-specific maize yield prediction with machine learning methods. Precision Agriculture 22, 1397-1415.
- Nyéki, A., Teschner, G., Ambrus, B., Neményi, M., Kovács, A.J. (2020): Architecting farmer-centric internet of things for precision crop production. Hungarian Agricultural Engineering 71-78.
- Stafford, J. (2023): Precision Agriculture '23. Wageningen Academic Publishers, Wageningen.

AJÁNLOTT IRODALOM / RECOMMENDED MATERIAL

- Farooq, M., Pisante, M. (eds) (2019): Innovations in Sustainable Agriculture. Springer.
- Nordhaus, W. (2013): The Climate Casino. Yale University.
- Srinivasan, A. (2006): Handbook of Precision Agriculture. Food Products Press.
- + Relevant publications of the course instructors.