Tárgytematika / Course Description
Biological, technological, and technical basics of precision crop production and plant protection
N_DMA01

Tárgyfelelős neve /
Teacher's name: dr. Neményi Miklós

Félév / Semester: 2021/22/1

Beszámolási forma /
Assesment: Vizsga

Tárgy heti óraszáma /
Teaching hours(week):   0/0/0

Tárgy féléves óraszáma /
Teaching hours(sem.):   30/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

The aim of the course is to familiarize students with the relationship between natural ecology and agricultural ecology in order to show the different characteristics of the two systems using different models. It presents the characteristics of nature conservation and environmental protection. Within agricultural ecology, it focuses primarily on the growth and development of plants, detailing the GIS (remote sensing) and technical conditions of precision, site-specific crop production systems. It covers the different sensory processes and their technical conditions. The programme analyses how to make crop production technologies sustainable.

The so-called decision support models will be presented that describe the growth and development of plants and their relationship with precision plant production. These models can also be linked to climate change models.

It analyses different energy input-output models. This allows optimum energy input to be used to exploit soil potential. The course specifically covers the alternatives of using renewable energies for fossil-neutral crop production technologies.

TANTÁRGY TARTALMA / DESCRIPTION

1. Characteristics of natural and agro-ecological systems. What is the difference between nature protection and environmental protection?

2. Characteristics of a sustainable agricultural ecology. Thermodynamic modelling of ecology.

3. The preconditioning, location-specific crop production technologies for geospatial conditions.

4. The technical conditions of precision, site-specific crop production technologies (tillage, sowing, plant

protection).

5. The technical conditions of precision, site-specific crop production technologies (chemical pest control, nutrition supplements).

6. The technical conditions of precision, site-specific crop production technologies (harvesting).

7. On-the-go sensing techniques.

8. Creating maps that provide different information (yield maps, weed maps, nutrition maps, etc.).

9. Method for the creating of management zones (fuzzy logic, neural networks).

10. The role of renewable energy sources in fossil-neutral crop production technologies.

11. Structure of plant growth models and their data requirements. Implementation of arable field measurements required for the data requirements of models and the validation of models.

12. Case studies related to the growth and development of a given hybrid of maize and of wheat in addition to different inputs.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

Meeting the conditions set by the supervisor.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Brase, T. A. (2006) Precision Agriculture. Thomson Delmar Learning.

Csiba, M., Kovács, A. J., Virág, I., Neményi, M. (2012): The most common errors of capacitance grain moisture sensors: effect of volume change during harvest. Precision Agriculture. Vol. 14, pp. 215-223.

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

Jorgensen, S. E. (2001) Thermodynamics and Ecological Modelling. CRC Press.

Margulis, L. (1998): The symbiotic planet. Weidenfeld and Nicolson, London

Mesterházi, P. Á. (2003): Development of measurement technique for GPS-aided plant production. PhD Thesis. Supervisor: Prof. Dr. Miklos Neményi. University of West Hungary, Mosonmagyaróvár.

Mike - Hegedűs, F. (2006): Applying fuzzy logic and neural networks to database evaluation in precision agriculture. PhD Thesis. Supervisor: Prof. Dr. Miklós Neményi. University of West Hungary. Mosonmagyaróvár.

Morowitz, H. J. (1968): Energy flow in biology. Academic Press

Nag, A. (2009) Biosystems Engineering. McGraw Hill.

Nagy, V., Milics, G. ,Smuk, N., Kovács, A. J., Balla, I., Jolánkai, M., Deákvári, J., Szalay, K. D., Fenyvesi, L., Štekauerová, V., Wilhelm, Z., Rajkai, K., Németh, T., Neményi, M. (2013): Continuous field soil moisture content mapping by means of apparent electrical conductivity (ECa) measurement. Hydrology and Hydromechanics. Vol. 61, No. 4, pp. 305, 312.

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: M. Neményi, B. Heil. Nemzeti Tankönyvkiadó, Budapest. Pp 13-

Neményi, M., Mesterházi, P. Á., Milics, G. (2006a): An Application of Tillage force Mapping as a Cropping Management Tool. Biosystems Engineering. Vol. 94, 3, pp. 351-357.

Neményi, M., Mesterházi, P. Á., Pecze, Zs., Stépán, Zs. (2003): The role of GIS and GPS in precision farming. Computers and Electronics in Agriculture. Vol. 40, 1-3. pp. 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., ISSN 1559-792X

Neményi, M., Milics, G. (2010): Optimalization of biomass production by thermodynamic approach. In: Conference AgEng2010. Internationale Conference on Agricultural Engineering. Clermont-Ferrand, France

Neményi, M., Milics, G., Mesterházi, P. Á. (2006b): Precision, site specific crop production, possibilities on water regime control. In: Proceedings of 6th International Conference on Influence of Anthropogenic Activity of Water Regime of Lowland Territory, edited by J. Ivanko, D. Pavelková, M Gombos, A. Tall, Michalovce, Slovakia, Slovak Academy of Sciences, CD.

Németh, T. – Neményi, M. – Harnos, Zs. (2007) A precíziós mezőgazdaság módszertana. JATE Press.

Nyéki, A., Milics, G., Kovács, A. J., Neményi, M. (2013): Improving yield advisory models for precision agriculture with special regards to soil compaction in maize production. Precision Agriculture '13 (edited by John V. Stafford). Leida, Spain, July 7-11 2013.Wageningen Academic Publishers, pp. 443-451.

Pimentel, D. (1980) Handbook of Energy Utilizatíon in Agriculture. CRC Press.

Srinivasan, A. (2006) Handbook of Precision Agriculture. Food Products Press.