Course title: Fuzzy Systems	**Neptun code: GEIAL456-a**
Course coordinator: Dr. Szilveszter Kovács, PhD, dr. habil., professor	
type of lesson and number of lessons: **lecture (2)**	
method of evaluation: colloquium	
curriculum location of the subject: (autumn/spring semester): autumn and spring	
pre-study conditions *(if any)*: -	

The task and purpose of the subject:

The main goal of the subject is the introduction of the basics of Fuzzy Logic Systems in the field of Computational Intelligence, as well as their combined models with neural, genetic and reinforcement learning methods.

Course description:

The subject summarizes the basic concepts of fuzzy sets and fuzzy logic. It discusses the main characteristics of fuzzy operations, covering a variety of t-norm and s-norm families. It describes the concept of fuzzy relation and the fuzzy composition. Based on the fuzzy composition, some classical fuzzy reasoning methods are introduced (Zadeh-Mamdani, Takagi-Sugeno). After the discussion of the classic fuzzy control algorithms, it covers the fuzzy rule interpolation method that can make decisions based on incomplete knowledge. As an application example, it discusses behavior-based (hierarchical fuzzy) control structures. Following a brief description of the basics of artificial neural networks, some combined neuro fuzzy systems are presented. The course also covers simple genetic algorithms, reinforcement learning methods, and their continuous state fuzzy extension. During the exercises, in parallel with the presentation of the different computational intelligence algorithms and methods, some of their possible application examples are also explained.

Required literature:

1. George J. Klir, Bo Yuan: Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995
2. Michael Negnevitsky: Artificial Intelligence: a guide to intelligent systems, Addision Wesley, 2002, ISBN 0-201-71159-1.

Recommended literature:

1. J.-S. R. Jang, C.-T. Sun, E. Mizutani: Neuro-Fuzzy and Soft Computing, Prentice Hall, 1997, ISBN 0-13-261066-3
2. Richard S. Sutton, Andrew G. Barto, Reinforcement Learning: An Introduction. MIT Press, ISBN 0-262-19398-1, 1998.