Course title: Mathematical Modelling

Teacher(s): Nada Ž. Damljanović

Course status: elective

Number of ECTS credits: 10

Condition: No

Course objectives

Introduction to advanced techniques and concepts of mathematical modelling. Training for monitoring and analysis of current scientific research in the field of mathematical modeling, construction and implementation of mathematical models.

Learning outcomes

Students are competent to use mathematical modeling methods and to model real phenomena and processes in practice and in vocational subjects in doctoral studies.

Contents

Theoretical classes

Systems and models. Discrete systems, graphs and automata. Dynamical systems, time dynamics of events, timed and hybrid automata. Models of stochastic type, distribution of events, Markov chains. Fuzzy models, uncertainty modeling, fuzzy logic and approximate reasoning. Fuzzy control, synthesis and analysis of fuzzy controllers. Models of multi-criteria analysis, decision-making using fuzzy logic. Applications to the modeling of organizational, business, production, service, information and computer systems.

Practical classes

Solving concrete problems based on the exposed theoretical concepts and principles. The course includes individual research study, active monitoring of scientific resources and their systematization, analysis, solving specific problems and preparation of scientific papers for publication.

Recommended literature

[1] Om Parkash (Ed.), Mathematical Modeling, Optimization and Information Technology, Lambert Academic Publishers, Germany, 2015.

[2] C. G. Cassandras, S. Lafortune, Introduction to Discrete Event Systems, Second Edition, Springer, 2008, https://www.academia.edu/11092288/Discrete_Event_Systems_Second_Edition_Introduction_to

[3] V. Novak, I. Perfilieva, A. Dvorak, Insight into Fuzzy Modeling, ; Wiley & Sons: Hoboken, NJ, USA, 2016.

[1] W. Kuich, A. Salomaa, EATCS Monographs on Theorrtical Computer Science: Semirings, Automata, Languages, Springer Verlag, 1986.

Number of active classes: 7	Theory: 5	Practice: 2

Teaching methods

The lectures are performed using classical methods of teaching in combination with video projector and active interaction with students. Knowledge of students is tested by homework, midterm exam, and final exam (written and oral). At the final, a comprehensive understanding of the exposed material is checked.

Evaluation (maximum number of points 100)

Homework: 10 points;
Seminar paper: 20 points;
Final exam: 70 points.