MODELING AND SIMULATION II

TRACK: Cybernetics and control technology
ACADEMIC YEAR: 2017/2018, Winter Semester
LECTURER: M.Sc. Daniel Georgiev, Ph.D.
UN 528/UN 405/UN456
georgiev@kky.zcu.cz
WWW: ccy.zcu.cz/index.php/Courses

PURPOSE

Design and analysis of a wide spectrum of systems is enabled through the process of modeling and simulation. This course is focused on the application of this process, which comprises methods of mathematical analysis, stochastic simulation, validation, ... etc. Coursework is founded on smart grid case studies.

OUTLINE

The course includes 13 lectures with associated exercise sessions.

LECTURE PLAN

LEC01 30.9 - syllabus, case study, DES modeling.
LEC02 7.10 - UMDES library, model composition, properties.
LEC03 14.10 - allowable languages, rule based design, supervisors
LEC04 21.10 - intro to discrete Markov chains.
LEC05 4.11 - analysis of discrete Markov chains.
LEC06 11.11 - simulation of Markov chains.
LEC07 18.11 - Monte Carlo method
LEC08 25.11 - Markov Chain Monte Carlo.
LEC09 2.12 - hypothesis testing.
LEC10 9.12 - Wasserstein pseudo-metric, final project.
LEC11 16.12 - review.
LEC12 21.12 - reserved time for project consultation.

REQUIREMENTS

The course is graded on a curve. The final grade includes intermediate homework assignments and a final exam.

60% Assignments - DES 1/2 Markov Chains, Simulation
40% Final exam focused on methods of stastical validation.

RECOMMENED LITERATURE

Provided literature is made up of course notes, annotated source code, and technical articles. Note that not all material discussed in lecture is included in the lecture notes. Hence, the responsiblity is up to you to attain the taught materials. The following are the references.

J. A. Sokolowski and C. M. Banks (editors); Modeling and simulation fundamentals: Theoretical Underpinnings and Practical Domains; John Wiley & Sons, 2010. (Sokolowski ‘10)

L. G. Perez, A. J. Flechsig, and V. Venkatasubramanian; Modeling the Protective System for Power System Dynamic Analysis; IEEE Trans. on Power Systems, 9(4), 1994. (Perez ’94)

C. G. Cassandras and S. Lafortune; Introduction to Discrete Event Systems; Kluwer Academic Publishers, 1999. (Lafortune ‘99)

I. A. Hiskens and M. A. Pai; Trajectory Sensitivity Analysis of Hybrid Systems; IEEE Trans. on Circuits and Systems - Part I, 47(2), 2000. (Hiskens ’00)

I. A. Hiskens and P. J. Sokolowski; Systematic Modeling and Symbolic Assisted Simulation of Power Systems, 16(2), 2001. (Hiskens ‘01)

J. Lygeros; Lecture notes on hybrid systems; Department of Electrical and Computer Engineering; University of Patras, 2004.