

## DESCRIPTION OF THE COURSE

Name of the course: <b>Systems Modelling and Simulation</b>	Code: BIE59	Semester: 7
Type of teaching: Lectures and laboratory work Course work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 4

**COURSE STATUS IN THE CURRICULUM:** Compulsory for the students specialty Industrial Engineering BEng programme of the English Language Faculty of Engineering.

**AIMS AND OBJECTIVES OF THE COURSE:** At the end of the course the students are expected to be able to apply the methodology for modelling and simulation of continuous, discrete time as well as discrete-event systems, to have basic knowledge on simulation software (MATLAB, SIMULINK, GPSS, Pspice) and use it in solving of engineering problems, analysis and validation of the results.

**DESCRIPTION OF THE COURSE:** The main topics concern: System models – physical similarity and analogy principles; Model transformation and reduction; Constructing and using complex models; Simulation modelling - modelling of time, Monte Carlo simulation, verification and validation of models, model analysis, design of simulation experiments; Continuous processes simulation - numerical integration methods, accuracy and stability of the solution, aliasing effect; Computer simulation of large circuits and systems - sparse matrix approach, modified nodal approach, structural graphs, sparse matrices, assessment of effectiveness; Building blocks and subsystems, links and interfaces, input and output, types of analyses (analogue, discrete, analogue-discrete, mixed-mode, synchronous and asynchronous digital simulation); Simulation of discrete-event systems and queuing systems; Software tools and languages- MATLAB, GPSS, PSpice, etc.

**PREREQUISITES:** Control Theory, Elements of Industrial Automation, Electrical Engineering, Electronics, Computing, Fluid Mechanics, Physics, Thermodynamics, Industrial Manufacturing Systems.

**TEACHING METHODS:** Lectures, using slides, case studies, laboratory and course work, work in teams, protocols and course work description preparation and defence.

**METHOD OF ASSESSMENT:** Two one-hour assessments at mid and end of semester (62%), laboratories (18%), course work - two off assignments (20%).

**INSTRUCTION LANGUAGE:** English.

### **BIBLIOGRAPHY:**

1. Yordanova S., E.Gadjeva. System Modelling and Simulation. Technical University of Sofia, Sofia, 2003, 143, ISBN 954-438-350-6;
2. MATLAB with SIMULINK, User's Guide. The Math Works Inc., 1992;
3. Chisman J. Introduction to Simulation Modeling using GPSS/PC. Prentice Hall, 1992. ISBN 0-13-473695-8;
4. Chapra St.C., R.P.Canale. Numerical Methods for Engineers. Second Edition. McGraw-Hill Inc., N.Y., 1988. ISBN 0-07-079984-9;
5. D. Matko, B. Zupancic, R. Karba. Simulation and Modelling of Continuous Systems. A Case Study Approach. Prentice Hall, N.Y., 1992.