Course code C.11. **Course item** ……

1. INFORMATION ABOUT THE COURSE

A. Basic information

Course title	Computer Engineering Simulation
Field of study	Computer Aided Engineering
Cycle	*Second*
Study profile	*Academic*
Study mode	*Full-time*
Specialisation	*Not relevant*
Unit responsible for the field of study	*Faculty of Mechanical Engineering*
Lecturer	*Dr Adam Dittmar-Wituski*
Introductory courses	*Not relevant*
Prerequisites	*Knowledge of basic programming, electronics*

B. Semester/ weekly timetable

Semester	Lectures	Classes	Laboratories	Project classes	Seminars	Field experience	ECTS credits
I	15	-	30	-	-	-	4

LEARNING OUTCOMES (acc. to National Qualifications Framework)

No.	Description of learning outcomes	Reference to learning outcomes for the field of study	Reference to learning outcomes for the area of study
KNOWLEDGE			
K1	After finishing of the course the student has the detailed knowledge needed to model engineering physical objects. use the computers in the measurements and technical measurements programming	CAE_W01	T2A_W02
K2	After finishing the course student has knowledge about control algorithms and classification of control systems.	CAE_W02	T2A_W03, T2A_W07
K3	After completing the course student has knowledge about simulation packets in Matlab(Simulink) and/or LabView Simulation and Control module.	CAE_W04	T2A_W04, T2A_W05
K4	After completing the course the student has knowledge of data exchange between different CAD and simulation environments; knows ways of solving these problems.	CAE_W03	T2A_W04, T2A_W05
SKILLS			
S1	The Student can model an engineering physical object and is able to design simulation.	CAE_U01	T2A_U09, T2A_U17

S2	After the end of the course the student is able to prepare a report on the results in foreign language and interpret the results and draw conclusions from them	CAE_U08	T2A_U03, T2A_U10
S3	The Student knows how to configure and use simulation software Matlab-Simulink/LabView.	CAE_U01	T2A_U09, T2A_U17
S4	The Student is able to design a 3d simulation.	CAE_U03	T2A_U02, T2A_U07, T2A_U19
S5	The Student can obtain knowledge and information regarding the tasks of the simulation project, using the Internet and publishing of literature.	CAE_U07	T2A_U01
S6	The Student can plan and carry out computer simulations, interpret the results and draw conclusions.	CAE_U12	T2A_U08
S7	The Student can evaluate the usefulness and the possibility of the use of new developments in the field of computer simulations in engineering work	CAE_U15	T2A_U12
SOCIAL COMPETENCES			
SC1	The Student understands the need to raise their qualifications, understands the need to constantly adapt their knowledge and skills to the changes taking place in the simulation and control software.	CAE_K01	T2A_K01
SC2	The Student can pull together and work in a group, taking different roles.	CAE_K03	T2A_K03
SC3	He can think and act creatively.	CAE_K06	T2A_K06

2. TEACHING METHODS

Multimedia lecture, laboratory, design exercises.

2. METHODS OF EXAMINATION

Written exam with a lecture, preparation of the project: a computer program – simulation of physical object and/or control system (e.g. PID controller). Submission of a report containing a discussion and interpretation of the results of measurements carried out in the laboratory.

3. COURSE CONTENT

Specify the content separately for each type of classes in accordance with point I.B.	LECTURES 1 Overview of the LabView software package in the field of simulation and visualization of dynamic processes. 2 Overview of the software package Matlab symbolic operation and visualization of dynamic processes. 3 Introduction to the Simulink software package. 4 Solving homogeneous and heterogeneous differential equations of first and second order using analytical and numerical methods. 5 Laplace transform and inverse Laplace transform. 6 Solving differential equations in the state space using the Laplace transform. 7 The concept of transmittance. 8 Construction of the transfer function for various mechanical physical systems. 9 Simulation of mechanical system response to pulse, jump, ramp, periodic and free excitation. 10 Active components in electrical systems in terms of the complex impedance. 10 Construction of the transfer function for various electrical systems. 11 Simulation of the response of electrical system to pulse jump, ramp periodic and free signal. 12 PID controller. 13 Simulation of regulation and controlling physical systems using PID controllers. LABORATORIES 1. Develop a LabView-ControlDesign&Simulation/Matlab-Simulink project: simulation of physical engineering object with regulation, for example: a. temperature stabilization with PID controller - simulation and real system control; b. simulation of liquid level in the container with inlet and outlets; c. simulation of temperature in a heater. 2. Simulation of RLC circuits. 3. Simulation of mechanical objects. 4. Simulation of hydraulic damper. 5. Simulation of simple and reversed pendulum. 6. Simulation of heat transfer.

4. VALIDATION OF LEARNING OUTCOMES

(Each learning outcome from the list requires validation methods to ensure that it was achieved by a student.)

Learning outcome	Form of assessment (for example:)					
	Oral examination	Written examination	Colloquium	Project	Report	……
K1		x		x		
K2		x		x		
K3		x		x		

K4		x		x		
S1				x		
S2				x		
S3				x		
S4				x		
S5				x		
S6				x		
S7				x		
SC1		x			x	
SC2					x	
SC3					x	

5. LITERATURE

Basic literature	1. Stewart Robinson, Simulation: The Practice of Model Development and Use,John Wiley & Sons, Chichester, 2004 (ISBN 0-470-84772-7). 2. Introduction to LabView in 3 Hours for Control Design and Simulation, National Instruments, www.ni.com.
Supplementary literature	1. Matlab-Simulink users guide, Mathworks Inc. 2. LabView control and simulation module, National instruments. 3. Practical Applications and Solutions Using LabView Software, Silviu Folea, ed., Published by InTech Janeza Trdine 9, 51000 Rijeka, Croatia, 2011. 4. V.P.Singh, System Modeling and Simulation, New Age International Publ., 2009

6. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student's activity	Student workload– number of hours (for example:)
Participation in classes indicated in point 2.2	45
Preparation for classes	20
Reading assignments	20
Other (preparation for exams, tests, carrying out a project etc)	15
Total student workload	100
Number of ECTS credits allocated by the lecturer	**4**
Final number of **ECTS credits (determined by the Programme Council for the Field of Study)**	4