

# Card of Course

<b>Description of Course:</b>	
Code of course	-----
Name of course	<b>Simulation of engineering systems</b>
Version of course	2013/2014
<b>A. Place of the course in system of study</b>	
Level of education	Intermediate
Degree of education	engineer
Kind of education	Full-time studies
Field of study	Transport
Profile of study	General academic profile
Specialization	Main field
Place of teaching of course	Faculty of Transport
Place of realization of course	Faculty of Transport
Coordinator of course	DSc. Bogdan Sowiński Ass. Professor
<b>B. General characteristic of the course</b>	
Block of courses	Main field
Group of courses	specialization
Level of course	Intermediate
Status of course	Faculty with choice limited
Language of course	English
Nominal semester	5
Academic year	2013/2014
Preliminary requirements	Mechanics, Computer Science
Limit of number of students	30

<b>C. Effects of education and manner of teaching</b>	
Purpose of course	The aim of the course is to familiarize students with the basics of creating mathematical models of engineering systems and their simulation study. These are the concept of a physical and mathematical model of technical system as well as the classification of mathematical models. During the lecture are also taught basic information on programming package Simulink.
Methods of evaluation	Lecture - exam. Class Project - on the basis of project made and shown in the exercises.
Effects of education	Look – table 1
Form of didactic studies and number of hours per week	Lecture – 1 hour, Exercises 2 hours
Contents of education	General discussion of the goals and concepts of mathematical modeling and simulation. Basics of modeling the dynamics of systems with constraints. Description of motion in the generalized coordinates. Constrained systems and differential equations of motion . Examples . Discussion of modeling MBS (multi body systems), and automatic generation of equations of motion . Discussion of MBS programs to study the dynamics of mechanical systems based on packet Adams . Introduction to finite element method - physical and mathematical interpretation. Discussion of FEM calculation programs for the study of statics technical systems on the basis of available packages. Examples of the use of the calculation of structural elements of transport. Examples of vehicle dynamics simulation studies. Development of simple mathematical models of technical systems and performance simulation with selected software packages.
Methods of verification of effects of education	Look – table 1
Examination	Yes
Literature	Devendra K. Chaturvedi: Modeling and Simulation of Systems Using MATLAB and Simulink, Taylor & Francis Group, 2010, Robert H. Cannon: Dynamics of Physical Systems, Courier Dover Publications, 2009
www of course	Does not have
<b>D. Student's job</b>	
Number of credits ECTS	3
Number of hours of student's job for achievement of education's effect (description):	90 hours, 15 hours of lecture, 30 hours of exercise; familiarization with the literature 10, Preparing to pass 15; calculations of simple technical system 20 (including consultation)

Number of credits ECTS on the course with direct participation of academic teacher	2 ECTS – 15 Lecture hours, 15 Consultation hours, 30 Exercises hours Total 60 hours
Number of credits ECTS on practical activities on the course	0
<b>E. Additional informations</b>	
Notes	
Date of last modernization	02.12.2013

**Table 1**

<b>General academic profile</b>			
<b>Course's effects</b>		<b>Field effects</b>	<b>Area effect</b>
<b>Knowledge</b>			
Effect:	Student has a theoretical knowledge of simulation studies, the types of mathematical models of technical systems	Tr1A_W01	T1A_W01 T1A_W07
Code of effect:	W01		
Verification:	Lecture - exam. Class Project - on the basis of project made and shown in the exercises		
Effect:	Student will know the basic numerical methods of solving ordinary differential equations	Tr1A_W06 Tr1A_W07	T1A_W02 T1A_W07 T1A_W08
Code of effect:	W02		
Verification:	Lecture - exam. Class Project - on the basis of project made and shown in the exercises		
Effect:	Student knows the basic mathematical models used in the studies of traffic and pedestrian motion; knows the basic mathematical models used in simulation studies the of dynamics of transport means	Tr1A_W08 Tr1A_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W08
Code of effect:	W03		
Verification:	Lecture - exam. Class Project - on the basis of project made and shown in the exercises		

<b>Skills</b>			
Effect:	Student has the technical expertise and efficiency in the numerical solution of ordinary differential equations	Tr1A_U02 Tr1A_U03	T1A_U02 T1A_U03 T1A_U04
Code of effect:	U01		
Verification:	Lecture - exam. Class Project - on the basis of project made and shown in the exercises		
Effect:	Student is able to apply appropriate methods to analyze the simulation of linear and nonlinear dynamical systems	Tr1A_U02 Tr1A_U03	T1A_U02 T1A_U03 T1A_U04
Code of effect:	U02		
Verification:	Lecture - exam. Class Project - on the basis of project made and shown in the exercises		
<b>Social competences</b>			
Effect:	Student understands the need for learning throughout life, especially in order to improve their professional competence.	Tr1A_K01	T1A_K01
Code of effect:	K01		
Verification:	conversation		