Card of Course

Description of Course:	
Code of course	----------
Name of course	**Mathematical Modelling and Numerical Simulation of Selected Thermodynamic and Flow Problems in Automotive Vehicles (internal combustion engine, braking system)**
Version of course	2013/2014
A. Place of the course in system of study	
Level of education	Intermediate
Degree of education	bachelor
Kind of education	Full-time studies
Field of study	Transport
Profile of study	General academic profile
Specialisation	Main field
Place of teaching of course	Faculty of Transport / Warsaw University of Technology
Place of realization of course	Faculty of Transport / Warsaw University of Technology
Coordinator of course	Andrzej Wolff, DEng. – doctor in the Faculty of Transport at Warsaw University of Technology
B. General characteristic of the course	
Block of courses	Main field
Group of courses	elective of program *Erasmus*
Level of course	Intermediate
Status of course	Faculty with choice limited
Language of course	English or German
Nominal semester	--------
Academic year	2013/2014
Preliminary requirements	Thermodynamics (or Thermal engines theory), Motor vehicles motion theory (or Car dynamics)

Limit of number of students	maximum 6 students (3 groups of 1-2 persons)
C. Effects of education and manner of teaching	
Purpose of course	To familiarise the student with mathematical modelling and numerical simulation of selected thermodynamic and flow problems in automotive vehicles (internal combustion engine, braking system)
Methods of evaluation	Computational project – checking of simulation results and a report in a written form
Effects of education	Look – table 1
Form of didactic studies and number of hours per week	Consultations with the person responsible for the semester project: 1 hour / week
Contents of education	Mathematical modelling and simulation investigations of selected thermodynamic and flow problems in automotive vehicles. Individual projects (student groups of 1-2 persons) of the following subjects: 1. Numerical simulation of heat transfer process in automotive brakes; 2. Numerical simulation of a gas flow through the labyrinth seal of a piston ring pack; 3. Numerical simulation of hydrodynamic lubrication of piston rings of an internal combustion engine 4. Numerical simulation of the working cycle of an internal combustion engine 5. Numerical simulation of heat transfer in cylinder of a chosen Diesel internal combustion engine
Methods of verification of effects of education	Look – table 1
Examination	No
Literature	**1)** Incropera F. P., DeWitt D. P., Bergman T. L, Lavine A. S., *Introduction to Heat Transfer,* John Willey & Sons, 2006.; **2)** Gillespie T. D., *Fundamentals of vehicle dynamics*. SAE, Inc. Warrendale 1994; **3)** Heywood J. B., *Internal Combustion Engine Fundamentals,* McGraw-Hill Science Engineering, 1988; **4)** Sonntag R. E., Borgnakke C., Van Wylen G.J., *Fundamentals of Thermodynamics*, John Willey & Sons, 2002; **5)** Taylor C. F., *Internal Combustion Engine in Theory and Practice,* MIT Press, 1985; **6)** John J., *Gas Dynamics*, Prentice Hall, 2006.
www of course	Does not exist
D. Student's job	
Number of credits ECTS	3

Number of hours of student's job for achievement of education's effect (description):	**75 hours**, including: work with academic teacher 10 hours, studying the literature 15 hours, familiarising with software 18 hours, independently performing of the project 30 hours, defense of the project 2 hours
Number of credits ECTS on the course with direct participation of academic teacher	**0,5 ECTS points** (work with academic teacher 10 hours)
Number of credits ECTS on practical activities on the course	**3 ECTS points** (75 hours, including: work with teacher 10 hours, studying the literature 15 hours, familiarising with software 18 hours, independently performing of the project 30 hours, defense of the project 2 hours)

E. Additional informations

Notes	---
Date of last modernization	21.10.2013

Table 1

General academic profile			
Course's effects		**Field effects**	**Area effect**
Knowledge			
Effect:	The student has ordered and theoretically founded knowledge concerning thermodynamic and flow phenomena in automotive vehicles		
Code of effect:	W_01	Tr1A_W08	T1A_W03
Verification:	Checking of the performed project (description and results), and oral interview (defense of the project)		
Effect:	The student knows the basic calculation methods of solving the fundamental physical processes taking place in automotive vehicles		
Code of effect:	W_02	Tr1A_W01	T1A_W07

Verification:	Checking of the performed project (description and results), and oral interview (defense of the project)		
Effect:	The student has knowledge of the design and operation of some vehicle systems (internal combustion engine, braking system). He knows the basic methods of empirical testing of vehicle systems		
Code of effect:	W_03	Tr1A_W09	T1A_W04
Verification:	Checking of the performed project (description and results), and oral interview (defense of the project)		
Skills			
Effect:	The student has the ability to obtain information from the literature, integrate information and draw conclusions and opinions		
Code of effect:	U_01	Tr1A_U01	T1A_U01
Verification:	Checking of the performed project (description and results), and oral interview (defense of the project)		
Effect:	The student is able to independently plan and conduct an experiment (physical, modelling, simulation) and interpret the results		
Code of effect:	U_02	Tr1A_U09	T1A_U08
Verification:	Checking of the performed project (description and results), and oral interview (defense of the project)		
Effect:	The student can make a critical analysis of the functioning of the existing technical solutions (range of skills and references depends on the subject of the project)		
Code of effect:	U_03	Tr1A_U17	T1A_U13
Verification:	Checking of the performed project (description and results), and oral interview (defense of the project)		
Effect:	The student can design a device / object / system / process / typical for the specialization being studied		

Code of effect:	U_04	Tr1A_U23	T1A_U16
Verification:	Checking of the performed project (description and results), and oral interview (defense of the project)		
Social competences			
Effect:	The student can set priorities for implementation of the task specified by himself or other persons		
Code of effect:	KS_01	Tr1A_K04	T1A_K04
Verification:	Checking of the performed project (description and results), and oral interview (defense of the project)		