STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Modeling of energettic processes		**1010632221010638571**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mechanika i budowa maszyn	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Gas technology and renewable energy	**English**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **-**	Classes: **-**	Laboratory: **-**	Project/seminars: **1**	**1**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**1 100%**
Technical sciences	**1 100%**

Responsible for subject / lecturer:

dr inż. Rafał Ślefarski
email: rafa.slefarski@put.poznan.pl
tel. 616652218
Faculty of Machines and Transport
ul. Piotrowo 3 60-965 Poznań

Responsible for subject / lecturer:

mgr inż. Joanna Jójka
email: joanna.jojka@doctorate.put.poznan.pl
tel. tel. 61 665 2218
Faculty of Machines and Transport
ul. Piotrowo 3 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge from thermodynamics, fluid mechanics, programming and computional numerical methods
2	**Skills**	Can use the scientific method for problem solving, experimenting, and making conclusions, as well as the concepts in the description of programming languages. Student is able to deal with specific problems that arise during the writing of programs.
3	**Social competencies**	Knows the limitations of his or her own knowledge and skills, understands the non-technical aspects and results of engineering activity and their importance. Demonstrates self-reliance in solving problems, acquiring and improving knowledge and skills.

Assumptions and objectives of the course:

The aim of the course is an introduction of software tools for problems involving chemical kinetics, thermodynamics, and/or transport processes. Students acquire knowledge and skills in a modeling of power cycles and understatement of differences between simplified analytical calculation results and a numerical solution in the field of heat and mass transfer with reacting mixture flow.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has an extended knowledge in the area of physics, thermodynamics, fluid mechanics and a combustion of gaseous fuels, necessary for solving engineering and scientific problems within his or her area of study. [K2A_W04] - [-]

2. Has an extended knowledge in the area of information technology concerning computer programming and software for engineering calculations and simulation of physical systems. - [K2A_W05] - [-]

Skills:

1. Is able to freely use an international language in contacts with professionals from the same field of study.- [K2A_U01] - [-]

2. Is able to use a common numerical computations system for programming a simple simulation task with limited degrees of freedom. - [K2A_U02] - [-]

3. Is able to create a basic computational program for thermodynamic cycles optimization purposes with elementary numerical methods. - [K2A_U03] - [-]

4. Is able to freely use knowledge in the area of thermodynamics and fluid mechanics for simulation of the thermodynamic processes with specialized computer software. -[K2A_U04] - [-]

Social competencies:

1. Understands the need for lifelong learning; is able to inspire and organize the learning process of others. - [K2A_K01] - [-]
2. Is able to set priorities for realization of undertaken tasks. - [K2A_K04] - [-]
3. Is able to think and act in an entrepreneurial manner. - [K2A_K05] - [-]

Assessment methods of study outcomes

Project classes - evaluation reports made exercises and final project

Course description

Construction of computer programs. Introduction to software tools for problems involving chemical kinetics, thermodynamics, and/or transport processes. Domain discretisation methods. Modeling of heat and mass transfer. Modeling of combustion processes. Design and processing of chemical reaction mechanisms. Thermodynamic properties of flammable mixture. Surface chemistry. Description of the physical process. Simplified analytical calculations of designed process. Design of the computational program for thermodynamic cycles parameters calculation and optimization purposes with elementary numerical analysis. Simulation of the process with specialized computer software. Result presentation methods and discussion. Comparison between simplified analytical calculation results and a numerical solutions in the field of heat and mass transfer with reacting mixture flow.

Basic bibliography:

1. T. Poinsot and D. Venante, Theoretical and Numerical Combustion
2. J. Warnatz, Combustion
3. D. G. Goodwin, Cantera User?s Guide

Additional bibliography:

1. A. Kowalewicz, Podstawy procesów spalania
2. J. Chomiak, Combustion: A study In Theory, Fact and Application
3. K. Kuo, Principles of Combustion

Result of average student's workload

Activity	Time (working hours)
1. Preparation for the project	5
2. Participation in the seminar	15
3. Consultation for the project	5
4. Preparation of project	15
5. Presentation of the results of the project	2

Student's workload

Source of workload	hours	ECTS
Total workload	42	1
Contact hours	22	1
Practical activities	0	0