Warsaw University
of Technology

COURSE OFFERED IN THE DOCTORAL SCHOOL

Code of the course	4606-ES-0000EGI-0318	Name of the course	Polish	**Zaawansowane algorytmy i programy bilansów cieplnych**
			English	**Advanced algorithms and programs of heat balances**
Type of the course	specialized			
Course coordinator	dr hab. inż. Jarosław Milewski	Course teacher	dr hab. inż. Jarosław Milewski	
Implementing unit	Wydział Mechaniczny Energetyki i Lotnictwa	Scientific discipline / disciplines*	Environmental engineering, mining and power engineering; materials engineering; chemical engineering	
Level of education	Doctoral studies	Semester	winter	
Language of the course	~~Polish~~/English			
Type of assessment	Grading	Number of hours in a semester	45	ECTS credits: 3
Minimum number of participants	10	Maximum number of participants	20	Available for students (BSc, MSc): ~~Yes~~/No

Type of classes		Lecture	Auditory classes	Project classes	Laboratory	Seminar
Number of hours	in a week	3		3		
	in a semester	6		39		

* does not apply to the Researcher's Workshop

1. Prerequisites

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2. Course objectives

1. Power plant scheme as modeling object.
2. Conservation laws of mass, energy and momentum.
3. Review of software which is suitable for power plant evaluation, optimization and case analysis.
4. Practical utilization of the software.

3. Course content (separate for each type of classes)

Lecture

1. Introduction
2. Engineering software review

Laboratory

1. Rotating equipment models
2. Heat transfer models
3. Piping models
4. Control theory models
5. Chemical reactors models
6. Optimization procedures

4. Learning outcomes

Type of learning outcomes	Learning outcomes description	Reference to the learning outcomes of the WUT DS	Learning outcomes verification methods*
Knowledge			
K01	Knowledge of the laws of conservation of mass, energy and momentum and their impact on the development of civilization	SD_W1	Test
K02	Basic knowledge of programs used for heat balances	SD_W3	Test
K03	Knowledge of the systems present in the power plant	SD_W3	Test
Skills			
S01	Experience in advance power plant modeling and optimization.	SD_U1 SD_U2 SD_U3	class work
Social competences			
SC01	Proving the validity of the assumptions made, accepting constructive criticism.	SD_K1	class work

*Allowed learning outcomes verification methods: exam; oral exam; written test; oral test; project evaluation; report evaluation; presentation evaluation; active participation during classes; homework; tests

5. Assessment criteria
Assessment based on a test in the last class of the semester and activity in course.

6. Literature
Primary references:
[1]
[2]
[3]
Secondary references:
[1]
[2]

7. PhD student's workload necessary to achieve the learning outcomes**		
No.	Description	Number of hours
1	Hours of scheduled instruction given by the academic teacher in the classroom	45
2	Hours of consultations with the academic teacher, exams, tests, etc.	10
3	Amount of time devoted to the preparation for classes, preparation of presentations, reports, projects, homework	20
4	Amount of time devoted to the preparation for exams, test, assessments	15
	Total number of hours	**90**
	ECTS credits	**3**

** 1 ECTS = 25-30 hours of the PhD students work (2 ECTS = 60 hours; 4 ECTS = 110 hours, etc.)

8. Additional information	
Number of ECTS credits for classes requiring direct participation of academic teachers	
Number of ECTS credits earned by a student in a practical course	