

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE:
DEPARTMENT

COURSE CARD

Course name in Polish: Metody inżynierii systemów

Course name in English: Methods of Systems Engineering

Course language Polish / English*

University-wide general course type*:

1) ~~basic science course (mathematics, physics, chemistry, computer science or other) :~~

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2) ~~humanities course:~~

3) ~~management course:~~

4) ~~English language:~~

5) ~~didactics of higher education course:~~

**Specialized courses for PhD students receiving education in
discipline*:**

1) specialized interdisciplinary course in discipline:

2) ~~interdisciplinary course in the field of several disciplines:~~

3) ~~seminar in discipline or interdisciplinary:~~

Subject code: ITQ100136W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	15		15	
Grading	Exam	Exam	oral presentation	Exam, inspection, evaluation classes

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

None.

COURSE OBJECTIVES

C1 Systems engineering offers general approaches and methods for modeling, analysis, and synthesis (decision-making) of various types of systems investigated in different scientific disciplines. The course justifies the possibility to use these methods for specific systems not only appropriate for computer science but also other technological applications.

C2 The usage of acquired knowledge for the formulation and solution of selected modeling, analysis, or synthesis problem for a system of a type compatible with a Ph.D. student's thesis.

PROGRAM CONTENTS

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Form of classes – lecture (Lec)		Number of hours
Lec1	Technological and non-technological applications of systems engineering.	1
Lec2	Static, graph, and logic models of input-output systems.	2
Lec3	Dynamic models of input-output systems.	2
Lec 4	Foundations of machine learning and their application in the analysis of systems.	2
Lec 5	Optimal decision making	2
Lec 6	Multi-stage decision making.	2
Lec 7	Multi-criteria decision making.	2
Lec 8	Decision making – uncertain case.	2
Total hours:		15

Form of classes – seminar (Sem)		Number of hours
Sem1	Essential and technical introduction to a seminar.	1
Sem2	Ph.D. students' presentations along with the resultant discussion on the selected topic from lectures illustrated by a case study relevant to elaborated Ph.D. thesis. <i>Seminars follow lectures.</i>	14
Total hours:		15

TEACHING TOOLS USED
N1. Lecture of a classic form. N2. Consultations. N3. Review of the literature. N4. Multimedia presentations as well as discussion.

ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Ph.D. student knows foundations and applications of analysis and synthesis for input-output systems.	P8S_WG	N1, N2, N3
Ph.D. student can use selected methods of systems engineering for formulating an own research problem and propose an adequate solution method.	P8S_UW	N2, N3, N4

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PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Techniki informacyjne w badaniach systemowych, Hryniewicz O., Kacprzyk J., Kulczycki P. (red.), WNT, Warszawa 2006.
- [2] Józefczyk J., Wybrane problemy podejmowania decyzji w kompleksach operacji, Oficyna Wydawnicza PWr, Wrocław 2001.
- [3] Automatyka, robotyka i przetwarzanie informacji, Kacprzyk J., Korbicz J., Kulczycki P. (red.). PWN, Warszawa 2019.
- [4] Up to date articles from leading journals.

SECONDARY LITERATURE:

- [1] Michalewicz Z., Fogel D.B., Jak to rozwiązać, czyli nowoczesna heurystyka, WNT, Warszawa 2006.
- [2] Bubnicki Z., Analysis and Decision Making in Uncertain Systems, Springer Verlag 2004.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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