

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

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE:

Prof. of WUST, Piotr Ruta, PhD, Eng.

Department of Mechanics of Structures and Urban Engineering (W2/K3)

COURSE CARD

Course name in Polish: : *Mathematica* jako uniwersalne narzędzie analizy symbolicznej i numerycznej

Course name in English: *Mathematica* as a versatile tool of symbolic and numerical analysis

Course language: Polish / ~~English~~*

University-wide general course type*:

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

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 course in discipline:

2) interdisciplinary course in the field of several disciplines:

3) seminar in discipline or interdisciplinary:

Subject code: ILQ100168W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30	-	-	-
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has necessary advanced knowledge in the selected fields of mathematics (analysis, algebra).

COURSE OBJECTIVES

- C1. Refreshing knowledge in the selected fields of mathematics, such as algebra, mathematical analysis, differential equations.
- C2. Learning the methods of the mathematical modelling and symbolic numerical analysis of engineering problems.
- C3. Developing skills of creating numerical algorithms.

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

PROGRAM CONTENTS

Form of classes – lecture (Lec)		Number of hours
Lec1	Introduction: course description, <i>Mathematica</i> software package presentation.	2
Lec2	Introduction: <i>Mathematica</i> software package presentation cont. Language basics: variables, expressions, formulas.	2
Lec3	Language basics: functions and procedures.	2
Lec4	Language basics: lists and operations on lists.	2
Lec5	Language basics: transformation of formulas, algebraic operations and transformations.	2
Lec6	Language basics: basic 2D and 3D graphical procedures.	2
Lec7	Solving algebraic equations and inequalities. Linear algebra and matrix operations.	2
Lec8	Differential and integral calculus. Series. Approximation and interpolation.	2
Lec9	Solving differential equations.	2
Lec10	Solving differential equations cont.	2
Lec11	Optimization procedures. Predefined mathematical functions.	2
Lec12	Numerical operations and functions.	2
Lec13	Data import and export.	2
Lec14	Dynamic interaction.	2
Lec15	Presentation of selected additional problems.	2
	Total hours:	30

TEACHING TOOLS USED

- N1. Multimedia presentations.
N2. Conventional lecture.
N3. Practical classes.
N4. Office hours.

ACHIEVED SUBJECT LEARNING OUTCOMES

Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8S_WG	has knowledge at an advanced level of discipline and subject matter relevant to the field of research carried out, including the most recent research findings and scientific achievements, student has a sound knowledge of basic subjects such as mathematics
Skills	P8S_UW	student has scientific and technological skills relevant to methods and methodology of conducting scientific research and critical evaluation of the results obtained,

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

		is able to creatively interpreted the results obtained and to search for their application
Social competence	-	-

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

1. S. Wolfram, The Mathematica book, Wofram Media, 1999 (lub wydania późniejsze).

SECONDARY LITERATURE:

1. Drwal G., Grzymkowski R., Kapusta A., Słota D., Mathematica dla każdego, WPKomp. J. Skalmierskiego, Gliwice 1996.
2. Bellomo, Nicola, Luigi Preziosi, Antonio Romano Mechanics and dynamical systems with Mathematica, Boston : Birkhauser, 2000.
3. W.Glabisz, Mathematica w zagadnieniach mechaniki konstrukcji, Oficyna Wydawnicza Politechniki Wrocławskiej 2003.
4. W. Szcześniak, Dynamika analityczna i "Mathematica" w zadaniach i przykładach obliczeniowych., Oficyna Wydawnicza Politechniki Warszawskiej 2005.

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

Prof. of WUST, Piotr Ruta, PhD, Eng., piotr.ruta@pwr.edu.pl