DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR/TEAM/ DECLARING/CONDUCTINGCOURSE: prof. Antoni Mituś
DEPARTMENT: Faculty of Basic Technical Problems W11
SCIENTIFIC DISCIPLINE: Physical Sciences

COURSE CARD

Course name in Polish: Modelowanie zjawisk i procesów fizycznych metodami algebry komputerowej
Course name in English: Modelling of physical processes and phenomena using Computer Algebra Systems
Course language Polish / English*
University-wide general course type*:
The course is intended for all PhD students: YES / NO
1) BASIC COURSE
~~**2) SPECIALIST COURSE**~~
~~**3) SEMINAR**~~
~~**4) HUMANISTIC COURSE**~~
~~**5) LANGUAGE**~~

Subject code: NFQ100050W

* delete as applicable

	Lecture	Foreignlanguagecourse	Seminar	Mixedforms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam	Exam	Oralpresentation	Exam, inspection, evaluation classes
Number of ECTS points	**0**			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic programming skills
2. Basic English language

\

COURSE OBJECTIVES

C1 Acquire basic skill in using CAS *Maple*
C2 Acquire skills to use Maple for solving chosen problems in physics and for modeling of chosen phenomena and processes in physics

PROGRAM CONTENTS

Form of classes – lecture (Lec)		Number of hours
Lec1	Introduction into *Maple*: basic features of the programming language	6
Lec2	Introduction into *Maple*: elementary applications in mathematics and physics	4

Lec3	Variations on harmonic oscillator	4
Lec4	Oregonator: chemical reactions with oscillations	2
Lec5	Mathieu's oscillator, parametric resonance	2
Lec6	Phase portraits. Van der Pol's limit cycle	2
Lec7	Period doubling and chaos: Duffing's equation	2
Lec8	Van der Pol's equation: chaos.	2
Lec9	Calculus of variations: Fermat's principle, chaotic pendulum, geodesics	3
Lec10	Partial differential equations: string oscillations, diffusion	3
	Total hours:	**30**

TEACHING TOOLS USED
N1. Lecture N2. Computer lab (during the lecture)

ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge Has basic knowledge related to computer algebra system *Maple*	**P8S_WG**	Examination, discussion during the lecture
Knowledge Has a deepened know-ledge in	**P8S_WG**	Examination, discussion during the lecture
Skills	**P8S_UW, P8S_UK**	Examination, discussion during the lecture, computer lab activities during the lecture
Skills	**P8S_UW, P8S_UK**	Examination, discussion during the lecture, computer lab activities during the lecture
Social competence Awareness of the social role of a scientist	**P8U_K**	Discussion during the lecture

DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] R.H. Enns, *Computer Algebra Recipes for Mathematical Physics* (Birkhauser, Boston, 2005) [2] R.H. Enns, G.C. McGuire, *An Advanced Guide to Scientific Modeling* (Springer, New York, 2007) [3] A.C. Mituś, R. Orlik, G. Pawlik, *Wstęp do pakietu algebry komputerowej Maple* (Oficyna Wydawnicza DWSPiT, Polkowice, 2010)
SUBJECT SUPERVISOR(NAME AND SURNAME, E-MAIL ADDRESS)
prof. dr hab. Antoni C. Mituś, antoni.mitus@pwr.edu.pl