

WROCLAW UNIVERSITY OF TECHNOLOGY – PHD STUDIES

FACULTY OF Fundamental Problems of Technology
SUBJECT 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: english
University-wide general course type: 1) <u>basic course (mathematics, physics, chemistry, other)</u> 2) humanity course 3) managerial skills 4) English language 5) other modern language Departmental course developing professional skills: 1) specialized course 2) <u>interdisciplinary course</u> 3) seminar (interdisciplinary, specialized, departmental)
Type of course (obligatory, optional): optional
Educational effects according to ZW 26/2017: P8S_WG, P8S_UW, P8S_UK, P8S_KR
Subject code: FZP9386

*delete as applicable

	Lecture	Laboratory	Seminar
Number of hours of organized classes in University (ZZU)	30		
Number of hours of total student workload (CNPS)	90		
Form of crediting	Exam **	Exam / crediting with grade*	Oral presentation
Number of ECTS points	3		
including number of ECTS points for practical (P) classes			
including number of ECTS points for direct teacher-student contact (BK) classes	2		

*delete as applicable **In case of didactic courses also inspections and evaluation classes

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. Basic programming skills 2. Basic English language

SUBJECT OBJECTIVES	
C1	Acquire basic skill in using CAS <i>Maple</i>

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C2	Acquire skills to use Maple for solving chosen problems in physics and for modeling of chosen phenomena and processes in physics
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SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01

has basic knowledge related to CAS *Maple*

PEK_W02

has advanced knowledge in classical and quantum physics

relating to skills:

PEK_U01

can use *Maple* for solving/modelling of chosen problems/phenomena in physics

PEK_U02

can analyze exemplary *Maple* worksheets

relating to social competences:

PEK_K01

awareness of the role of popularization of science

PROGRAMME CONTENT

Form of classes - lecture		Number of hours
Lec1	Introduction into <i>Maple</i> : basic features of the programming language	6
Lec2	Introduction into <i>Maple</i> : 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. Solitons	2
Lec9	Calculus of variations: Fermat's principle, chaotic pendulum, geodesics	3
Lec10	Partial differential equations: string oscillations, diffusion	3
	Total hours	30

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

EVALUATION OF ACHIEVED SUBJECT EDUCATIONAL EFFECTS		
Evaluation: F – forming (partial) C – concluding	Educational effect number	Way of evaluating achievement of educational effects
F1	PEK_W01, PEK_W02 PEK_U01, PEK_U02, PEK_K01	control of correctness of implementation of Maple worksheets, discussions
F2	PEK_W01, PEK_W02 PEK_U01, PEK_U02, PEK_K01	seminar-like presentation of a solution/ modeling of chosen problem/process in physics/mathematics or other areas
C= F1/4+3*F2/4		

PRIMARY AND SECONDARY LITERATURE
<p><u>PRIMARY LITERATURE:</u></p> <p>[1] R.H. Enns, <i>Computer Algebra Recipes for Mathematical Physics</i> (Birkhauser, Boston, 2005)</p> <p>[2] R.H. Enns, G.C. McGuire, <i>An Advanced Guide to Scientific Modeling</i> (Springer, New York, 2007)</p> <p>[3] A.C. Mituś, R. Orlik, G. Pawlik, <i>Wstęp do pakietu algebry komputerowej Maple</i> (Oficyna Wydawnicza DWSPiT, Polkowice, 2010) (in polish)</p>

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