KARTA PRZEDMIOTU

I. Dane podstawowe

Nazwa przedmiotu	Computer modeling and simulations (Modelowanie i symulacje komputerowe)
Nazwa przedmiotu w języku angielskim	Computer modeling and simulations
Kierunek studiów	Informatyka
Poziom studiów (I, II, jednolite magisterskie)	I
Forma studiów (stacjonarne, niestacjonarne)	stacjonarne
Dyscyplina	Informatyka
Język wykładowy	Angielski

Koordynator przedmiotu/osoba odpowiedzialna	dr hab. Aliaksandr Chychuryn prof. KUL

Forma zajęć *(katalog zamknięty ze słownika)*	Liczba godzin	semestr	Punkty ECTS
wykład	30	III	5
konwersatorium			
ćwiczenia			
laboratorium	30	III	
warsztaty			
seminarium			
proseminarium			
lektorat			
praktyki			
zajęcia terenowe			
pracownia dyplomowa			
translatorium			
wizyta studyjna			

Wymagania wstępne	1. Knowledge of basis for computing; 2. Programming skills; 3. The ability to search for information on the Internet; 4. Knowledge of basis for mathematical analysis and algebra in the first year in education of computer science

II. Cele kształcenia dla przedmiotu

1. The student understands what is computer modeling and simulation;
2. The student knows the basic rules for applying the capabilities of Mathematica and Matlab;
3. The student knows the basic capabilities of the environment WebMathematica

III. Efekty uczenia się dla przedmiotu wraz z odniesieniem do efektów kierunkowych

Symbol	Opis efektu przedmiotowego	Odniesienie do efektu kierunkowego
WIEDZA		
W_01	define the concepts of modeling and simulation	K_W01
W_02	analyze approaches to solving of differential and algebraic equations in the Mathematica / Matlab program	K_W01
W_03	formulate the differences between various methods of visualization and animation programs available	K_W01
W_04	select online sources of knowledge, which can be traced to ready-made examples of models in various fields prepared in Mathematica code (WebMathematica 3.3)	K_W01, K_W06
W_05	know basic applications of programs MatLab, Scilab and WolframAlpha	K_W05
UMIEJĘTNOŚCI		
S_01	can use different data collections available in Mathematica and Matlab programs	K_U06, K_U11
S_02	can create visualizations of known models	K_U06, K_U11
S_03	is able to create simulations of known models	K_U06
S_04	can use MatLab, Scilab and WolframAlpha programs	K_U03
S_05	can solve simple models using the MatLab, Scilab and Mathematica programs, containing differential equations with initial conditions	K_U17
KOMPETENCJE SPOŁECZNE		
SC_01	formulate opinions about selected models	K_K01

IV. Opis przedmiotu/ treści programowe

COURSE CONTENTS:
1. Introduction to the modeling and simulation.
Concept of modeling. Kinds of computer simulations. Examples of the models.
Mathematical models and numerical methods. Differential equations and mathematical models.
Modeling with the Mathematica/MatLab system.
2. First Steps with Mathematica/MatLab. Numbers. Types of Numbers. Exact and Approximate Results. Numerical Precision. Arbitrary-Precision Numbers.
Algebraic Calculations. Symbolic Computation. Transforming Algebraic Expressions. Linear Algebra. Solving Linear Systems.
Numerical Methods in Mathematica/MatLab. The Uncertainties of Numerical Mathematics.
Numerical Equation Solving. Numerical Solution of Polynomial Equations. Numerical Root Finding.
Numerical Solution of Differential Equations.
Symbolic calculations. Series and Limits. Differentiation. Integration. Indefinite Integrals. Definite Integrals. Differential Equations.
3. Visualization and graphics in Mathematica/MatLab.
Graphics for Functions (2D, 3D). Basic Graphics Primitives. Basic Graphics Options.
Graphics for 2D Data. The numerical Data. Basic Image transformation. View and Animation. Basic Manipulation.
4. Programming in Mathematica/MatLab. Wolfram Language.
Simple Programming. Modeling and simulation with Mathematica/MatLab (simple examples).
5. Web- Mathematica. WolframAlpha. Demonstration Projects in the Mathematica codes.

V. Metody realizacji i weryfikacji efektów uczenia się

Symbol efektu	Metody dydaktyczne *(lista wyboru)*	Metody weryfikacji *(lista wyboru)*	Sposoby dokumentacji *(lista wyboru)*
WIEDZA			
W_01	Conventional lecture, Problem lecture, Conversational lecture multimedia presentation	Test / Exam	Evaluated test / written test
W_02	Conventional lecture, Problem lecture, Conversational lecture multimedia presentation	Test / Exam	Evaluated test / written test
W_03	Conventional lecture, Problem lecture, Conversational lecture multimedia presentation	Test / Exam	Evaluated test / written test
W_04	Conventional lecture, Problem lecture, Conversational lecture multimedia presentation	Test / Exam	Evaluated test / written test
W_05	Conventional lecture, Problem lecture, Conversational lecture multimedia presentation	Test / Exam	Evaluated test / written test
UMIEJĘTNOŚCI			
S_01	Practical classes, Discussion	Test/ Presentation	Protocol / Evaluated test / written test
S_02	Practical classes, Discussion	Test/ Presentation	Protocol / Evaluated test / written test
S_03	Practical classes, Discussion	Test/ Presentation	Protocol / Evaluated test / written test
S_04	Practical classes, Discussion	Test/ Presentation	Protocol / Evaluated test / written test
S_05	Practical classes, Discussion	Test/ Presentation	Protocol / Evaluated test / written test
KOMPETENCJE SPOŁECZNE			
SC_01	Discussion	Presentation	Presentation rating card

VI. Kryteria oceny, wagi…

Assesment of classes: 1 colloquium (80%), 1 demonstration project (20%)

Oral exam

VII. Obciążenie pracą studenta

Forma aktywności studenta	Liczba godzin
Liczba godzin kontaktowych z nauczycielem	**90**
Liczba godzin indywidualnej pracy studenta	**70**

VIII. Literatura

Literatura podstawowa
1. Edwards C. Henry, Penney David E. Differential Equations and Boundary Value Problems: Computing and Modeling. - Pearson Prentice Hall. 2008. - 816 p. 2. Giordano Frank R., Fox William P., Horton Steven B. A First Course in Mathematical Modeling. - Brooks/Cole, Boston. 2014. - 676 p. 3. Wagon S. Mathematica in Action: Problem Solving Through Visualization and Computation, Third Edition. - New York: Springer-Verlag, 2010. - 680 p. 4. Pratap Rudra, MatLab 7 for scientists and engineers. Warszawa: PWN, 2010.
Literatura uzupełniająca
1. Grzymkowski R., Kapusta A., Kuboszek T., Slota D. Mathematica 6. - Gliwice: Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, 2008. - 718 p. 2. Ruskeepää, Heikki. Mathematica Navigator: Mathematics, Statistics, and Graphics. - Burlington, San Diego, London: Elsevier, - 3rd ed. 2009. - 1112 p. OTHER LEARNING RESOURCES www.wolframalpha.com www.demonstrations.wolfram.com www.wolfram.com/learningcenter/tutorialcollection www.virtualregion.kul.pl