

Course title: Reality modelling methods

ECTS credit allocation (and other scores): 2

Semester: spring

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English /Polish

Number of hours per semester: 30 classes

Course coordinator/ Department and e-mail: Mariusz Bodzioch / WMil, mariusz.bodzioch@matman.uwm.edu.pl

Type of classes: classes

Substantive content

CLASSES: Models and modelling. Identification, evaluation and exploration of a model. Deterministic and stochastic models. Continuous and discrete models. Evolutionary processes. Cellular automata. Monte Carlo method. Genetic algorithms. Simple neural networks.

Learning purpose: A review of mathematical, information technology and physical concepts, techniques and methods that play a fundamental role in the modelling of physical, biological and social processes and phenomena. Building an intuition to enable the construction of models describing real-life phenomena and situations, analysing them, and interpreting them appropriately.

On completion of the study programme the graduate will gain:

Knowledge: The student knows mathematical, information technology and physical concepts, techniques and methods relating to mathematical modelling; differences between continuous and discrete, deterministic and stochastic models; methods of model evaluation and verification.

Skills: The student can construct models describing various real-life phenomena as well as analyse and interpret them; critically evaluate the results of experiments and observations; synthesise knowledge in various fields of science.

Social Competencies: The student is prepared to learn throughout life; demonstrate the importance of exact sciences in the development of other scientific fields and disciplines; retrieve the necessary information in the literature.

Basic literature: 1) I. Białynicki-Birula, I. Białynicka-Birula, *Modelowanie rzeczywistości*, WNT, 2007; 2) R. Rudnicki, *Modele i Metody Biologii Matematycznej, Cześć II: Modele probabilistyczne*, IMPAN, 2022; 3) M. Romaniuk, *Metody Monte Carlo*, Oficyna Wydawnicza Politechniki Warszawskiej, 2019.

Supplementary literature: 1) D. Kahnemann, *Pułapki myślenia. O myśleniu szybkim i wolnym*, Media Rodzina, 2012.

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 1.23 ECTS points.

Student's independent work: 0.77 ECTS points.