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| FACULTY: | **Faculty of Mechanical and Energy Engineering**  Department of Biomedical Engineering |
| FIELD OF STUDY: | **Biomedical Engineering** |
| ERASMUS COORDINATOR OF THE FACULTY: | Igor Maciejewski, DSc, PhD |
| E-MAIL ADDRESS OF THE COORDINATOR: | igor.maciejewski@tu.koszalin.pl |
| COURSE TITLE: | **Computer methods in biomedical engineering** |
| LECTURER’S NAME: | Łukasz Szparaga, PhD |
| E-MAIL ADDRESS OF THE LECTURER: | lukasz.szparaga@tu.koszalin.pl |
| ECTS POINTS FOR THE COURSE: | 5 |
| COURSE CODE (USOS): | 0911>1000-MKwIB |
| ACADEMIC YEAR: | 2025/2026 |
| SEMESTER: (W – winter, S – summer) | S |
| HOURS IN SEMESTER: | 45 |
| LEVEL OF THE COURSE:  (1st cycle, 2nd cycle, 3rd cycle) | 1st cycle |
| TEACHING METHOD:  (lecture, laboratory, group tutorials, seminar, other-what type?) | Lecture (30h), practice (15h) |
| LANGUAGE OF INSTRUCTION: | * **English full time scheme for classes with 5 and more International Erasmus+ students enrolled/accepted;** * **English 50% individually with the teacher + Polish 50% with Polish students or individual project work- scheme for classes with less than 5 International Erasmus+ students enrolled/ accepted;** |
| ASSESSMENT METOD:  (written exam, oral exam, class test, written reports, project work, presentation, continuous assessment, other – what type?) | written reports |
| COURSE CONTENT: | Introduction to the theory of partial differential equations - diffusion equations. Definition of a cellular automaton. Neighborhood, boundary conditions and initial conditions.  Using the MatLAB environment to create models of cellular automata.  Deterministic cellular automata: The use of cellular automata to model biological processes. SIS, SIR, SEIR epidemic development model. Reaction-diffusion models.  Transforming analytical models into CA models on the example of spatial models of population development. Cancer growth model.  Probabilistic cellular automata - a model of biofilm development on the surface of biomaterials.  Models of population dynamics - Malthus's single population model. Models of population dynamics - logistic models. Models of tumor growth dynamics - Gompertz equation |
| ADDITIONAL INFORMATION: | General knowledge of IT, computers, numerical calculations. Knowledge of physics, chemistry and electrochemistry in terms of biosensors.  Basic knowledge of materials science and biomedical engineering. |