

Course title: **Computer Modelling**

Institute/Division: Faculty of Computer Science and Telecommunications (Division of Computer Science)

Course code: F3-CoM

Erasmus subject code: Informatics, Computer Science

Number of contact hours: 45 hours

Course duration: 1 semester

ECTS credits: 6

Course description:

The course is divided into three parts:

- 1) Ordinary Differential Equations (ODEs) – you will learn what are ODEs and how to solve them using computer (finite difference methods – Runge-Kutta). Then you will learn how to model nature using ODEs.
- 2) Partial Differential Equations (PDEs) – you will learn what are PDEs and how to solve using computer classical PDEs like advection, wave, heat and diffusion equations.
- 3) Monte Carlo methods – you will learn how to solve problems using random numbers. This include random walking and simulated annealing problems.

Each part ends with group project that is related to modeling real world problems using methods learned from the course.

We will use C/C++ and Python as programming languages. I will introduce basic concepts for Python language, so only some basic experience in computer programming is needed.

Literature:

- [1] R.H. Landau, M.J. Paez, C.C. Bardeianu, 'Computational Physics', Wiley 2015
- [2] W-H Steeb, 'The nonlinear Workbook', World Sceintific 2011
- [3] S. Teukolsky et al., 'Numerical Recipes', Cambride 2007
- [4] K. Gustafson, 'Introduction to Partial Differential Equations and Hilbert Space Methods', Dover 1997

Course type: Lectures + Computer laboratory

Assessment method: Group projects

Prerequisites: Basic programming skills, e.g., in C/C++ or similar language. Programming in Python will be an advantage however is not required.

Primary target group: Engineers and computer scientists who are interested in using computers to describe surrounding world.

Lecturer: Radosław Kycia

Contact person: : Radosław Kycia, rkycia@pk.edu.pl

Deadline for application: 15th of January

Remarks: