# Programming, Numerics and Optimization

*by **Łukasz Jankowski***

A one-semester course (15 x 1.5h) on basic programming, numerical and optimization techniques that are indispensable for a researcher in engineering.

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Objectives

1. Introducing the principles of *numerical computations* (conditioning, stability, etc.) and *selected numerical techniques* for linear systems, ordinary differential equations and optimization (including structural optimization).
2. Providing a foundation for implementing some of these techniques in any programming language (C++ is used within the course).
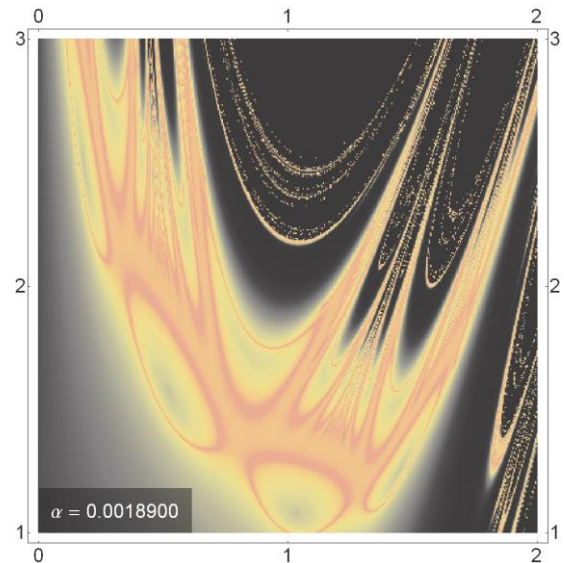
Abilities after completing the course

1. The students will obtain a broad picture of commonly used numerical techniques for linear systems, ordinary differential equations and (structural) optimization.
2. The students will achieve a general understanding of the internals/pitfalls of frequently used functions of mathematical/engineering software packages. As a result, they should be able to use these functions more consciously and less in a black-box manner.
3. In their practice, the students sooner or later encounter problems that are too large, too fine or that run too slow to be fully coded using standard tools of mathematical software packages (Matlab, Mathematica, Scilab, etc.). The course will prepare the students for developing customized solutions to such problems.

Assessment
Based on homeworks.

Lecture notes & homeworks
Available online at (tab *lectures*)
http://info.ippt.pan.pl/~ljank

Lecture language
Polish or English (as requested)

Venue
IPPT PAN, online
Each **Tuesday 9:30–11:30**, starting **March 2, 2021**