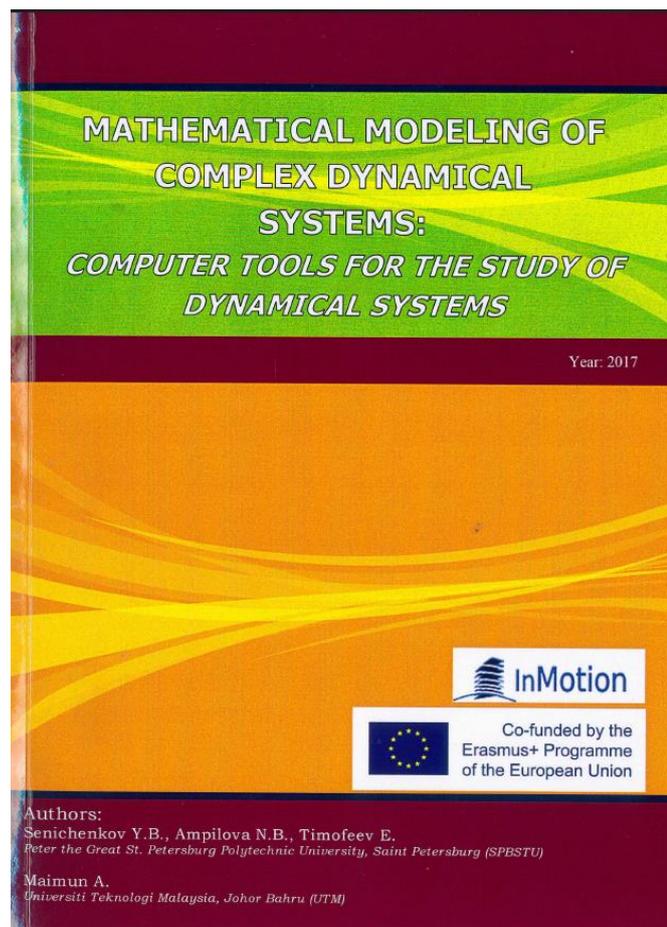


**Mathematical modeling of complex dynamical systems**  
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**Problem book abstract**



Modern visual modeling environments provide unique opportunities for constructing, debugging, testing, and visualizing the behavior of models of objects under study. The expressiveness of modeling languages makes the process of building and exploring models creative and exciting. By building models, we can experiment using special tools for planning, conducting and processing the results of a computer experiment, automating routine operations; thereby expanding the range of learning tasks that help to master the material more quickly and more thoroughly. The development of research tools for complex dynamic systems, as well as creation of tool libraries, is an important scientific task, but, with certain simplifications, is also an interesting educational task.

The proposed library of visual modeling tool, Rand Model Designer (RMD), can be used both by teachers in preparation for classes, and by students in the course of “Mathematical modeling of complex dynamic systems”. This tool enables visualization of the behavior of dynamic systems

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using traditional time diagrams and phase portraits, Lamerey diagrams, Poincaré sections, bifurcation diagrams. Thanks to the special capabilities of the modeling language, we can, for example, automatically build the Jacobi matrix, find its eigenvalues, influence the structure of the system being solved, use, and compare various numerical methods. Completion of the training task from the routine procedure gradually becomes a study itself.

The proposed task book includes two options for use: "passive" (students use ready-made tools in completing the task), and "active" (the necessary tools are created independently).

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### Target group

The book is intended for bachelors and masters of all engineering specialties related with computer modeling and simulation of complex dynamical systems.

### Book imprints

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