STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Applied mathematics and mathematical methods**	Code **1010612211010343531**	
Field of study **Mechanika i budowa maszyn**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 1**
Elective path/specialty **Product engineering (Inżynieria produktu)**	Subject offered in: **English**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	

No. of hours	No. of credits
Lecture: **1** Classes: **1** Laboratory: **-** Project/seminars: **-**	**2**

Status of the course in the study program (Basic, major, other) **basic**	(university-wide, from another field) **university-wide**

Education areas and fields of science and art **the sciences** **Mathematical sciences**	ECTS distribution (number and %**)** **3 100%** **3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Mathematical analysis (Polytechnic course), Differential equations, Linear algebra.
2	**Skills**	Programming of digital computers in a high-level language (Fortran 2003, C++, Matlab)
3	**Social competencies**	Ability to work in a team. The ability to model and solve technical problems.

Assumptions and objectives of the course:

To familiarize the student with modern techniques used in calculation technique, modern programming tools and searching methods (for the scientific information and computer programs on the Internet).

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Numerical methods to solve differential equations, investigation of their convergence, consistency and stability - [K2A_W01]

2. Solving large linear systems of algebraic equations and large eigenvalue problems - [K2A_W01]

Skills:

1. The use of basic computer programs and libraries for numerical calculations and graphical presentation of results. Estimating the time calculation   - [K1A_U03]

Social competencies:

1. The complexity of the task that they are competent forces careful planning and allocation between groups of students of different specialties - [K2A_K03]

Assessment methods of study outcomes

Colloquium (1 x) and the final project.

Course description

1. Mathematical modeling.

2 Stability analysis (using eigenvalues and eigenvectors). Linear difference equations.

3. Numerical methods for solving ordinary differential equations.

4. Solving large systems of linear algebraic equations

5. Numerical methods for partial differential equations.

6. Fast Fourier transform (FFT) and its applications

Basic bibliography:

1. D. Kincaid and W. Cheney , Numerical analysis, WNT, Warszawa, 2002

2. R.J. LeVeque, Finite Difference Methods for Ordinary and Partial Differential Equations, SIAM, Philadelphia, 2007

3. A. Greenbaum and T. Chartier , Numerical Methods. Princeton 2012

Additional bibliography:

1. G. Strang, Computational Science and Engineering, Wellesley-Cambridge Press, MIT, 2007

Result of average student's workload

Activity	Time (working hours)
1. Analysis of the theoretical aspects	30
2. Solving homeworks	15
3. Programming digital machines	20

Student's workload

Source of workload	hours	ECTS
Total workload	65	3
Contact hours	20	0
Practical activities	20	0