STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Numerical methods**		Code **1010341751010340026**
Field of study **Mathematics in Technology**	Profile of study (general academic, practical) **(brak)**	Year /Semester **3 / 5**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	

No. of hours				No. of credits
Lecture: **30**	Classes: **15**	Laboratory: **45**	Project/seminars: **-**	**6**

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

Education areas and fields of science and art
 	
technical sciences
    Technical sciences
	ECTS distribution (number and %**)**
	
	6 100%
	    6 100%

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	The student has a knowledge of mathematics (range: linear algebra, differential and integral calculus, initial value problems for ordinary differential equations), and computer science (for programming in high level language)
2	**Skills**	The student is able to solve math problems analytically within the range specified above. The student is able to implement a computer program.
3	**Social competencies**	The student is aware of the need to expand their competences. He understands the need for learning.

Assumptions and objectives of the course:

Learning of numerical methods and apply them to solve mathematical and simple engineering problems.

The support of mathematical and engineering calculations by relevant IT tools.

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

Knowledge:

1. The student has basic knowledge about numerical methods allow solving simple problems in the field of technical sciences. Student knows the IT tools used to perform numerical calculations. - [K_W09]

2. The student has an organized and theoretical background in computer-aided calculations. - [K_W12]

3. The student knows at least one computer package supporting numerical and symbolic calculations. - [K_W15]

4. - [-]

Skills:

1. The student can choose and apply the appropriate approximate calculation method to solve a simple technical problem. - [K_U08]

2. The student is able to formulate correct algorithm and describe its implementation; He speaks at least one programming language - [K_U20]

3. The student is able to perform measurements and computer tests, interpret the results and draw conclusions. - [K_U26]

4. The student applies the principles of health and safety at work. - [K_U27]

Social competencies:

1. The student knows the limitations of their knowledge and understands the need for further education - [K_K01]

2. The student is aware of the validity of the effects of engineering calculations, and responsibility for making decisions. - [K_K04]

3. The student can find information in the literature himself, also in English. - [K_K05]

Assessment methods of study outcomes

Lecture

* Assessment of knowledge and skills shown in the written exam.

* Control of perception during lectures.

Auditorium exercises:

* assessment of problem solving skills in numerical methods

* checking skills during each class and two colloquia during the semester.

Laboratory exercises:

* ocena wiedzy i umiejętności wykazanych podczas pisemnych sprawdzianów

* Tests and rewarding knowledge necessary for the accomplishment of the problems in the area of laboratory tasks,

* Continuous assessment on each lesson - Bonus for increasing skills in using learned methods.

Obtaining additional points for the activity in the classroom, and in particular for:

* Propose to discuss additional aspects of the subject;

* The effectiveness of the application of acquired knowledge when solving a given problem;

* Comments relating to the improvement of teaching materials;

Course description

1. Floating point arithmetic, numerical errors,
2. Stability and accuracy of algorithms,
3. Solutions of nonlinear equations in one variable,
4. The approximation of functions (Interpolation, Taylor series),
5. Numerical integration,
6. Numerical differentiation,
7. Initial-value problems for ordinary differential equations.

Update 2017:

Applied methods of education:

Lectures:

1.Lecture with multimedia presentation (including: drawings, photos) supplemented by examples given on the board,

2.Lecture conducted in an interactive way of formulating questions to a group of students or indicated specific students,

3.Student activity is taken into account during the course of the assessment,

4.The initiating of discussion during the lecture,

5.Theory presented in connection with practice,

6.Theory presented in connection with the current knowledge of students,

7.Taking into consideration various aspects of the presented issues,

8.Presenting a new topic preceded by a reminder of related content known to students from other subjects;

Auditorium exercises:

1.Solving examples of tasks on the blackboard,

2.Exercises supplemented with multimedia presentations (including drawings, photos),

3.Detailed review of task solutions by the teacher and discussions on comments,

4.Initiating the discussion on solutions;

Laboratory exercises:

1.Laboratories supplemented with multimedia presentations (including drawings, photos)

2.Detailed review of the reports by the teacher and discussion of the comments,

3.Demonstrations,

4.Work in teams,

5.Computational experiments;

Basic bibliography:

1. Fortuna, Macukow, Wąsowski, Metody numeryczne, WNT,

2. Kincaid, Cheney, Analiza numeryczna, WNT 2005,

3. Magnucka-Blandzi, Dondajewski, Gleska, Szyszka, Metody numeryczne w MatLabie. Wybrane zagadnienia, Wyd. Politechniki Poznańskiej 2013,

Additional bibliography:

1. Burden, Faires, Numerical analysis, Prindle, Weber and Schmidt, Boston,

2. Rosłoniec, Wybrane metody numeryczne z przykładami zastosowań w zadaniach inżynierskich, Oficyna Wydawnicza politechniki Warszawskiej 2008

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Participation in classes	15
3. Participation in laboratory classes	45
4. Participation in consultations related to the implementation of the educational process, in particular laboratory exercises	4
5. Implementation and verification the programs (time outside of the classroom laboratory)	5
6. Preparation for auditorium classes / laboratory classes	12
7. Preparation for tests	12
8. Familiarization with the indicated literature / educational materials (10 pages of text of scientific = 1h)	15
9. Preparing for the exam and taking part in the exam	13

Student's workload

Source of workload	hours	ECTS
Total workload	151	6
Contact hours	96	4
Practical activities	58	2