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) **general academic**	Year /Semester **3 / 5**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**

Cycle of study: **First-cycle studies** **(Polish Qualifications Framework level six)**	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) **Basic**	(university-wide, from another field) **university-wide**

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

Responsible for subject / lecturer:

Dr inż. Barbara Szyszka
email: Barbara.Szyszka@put.poznan.pl
tel. 61 665 27 63
Faculty of Electrical Engineering
ul. Piotrowo 3A 60-965 Poznań

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) [K_W01 (P6S_WG), K_W02 (P6S_WG), K_W03 (P6S_WG), K_W06 (P6S_WG)]
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 [K_U01 (P6S_UW), K_U04 (P6S_UW)]
3	**Social competencies**	The student is aware of the level of his knowledge [K_K01 (P6S_KK)] The student is aware of deepening and expanding knowledge [K_K02 (P6S_KK)]

Assumptions and objectives of the course:

Understanding the basic numerical methods. Applying them to solve mathematical problems and simple engineering problems. Supporting mathematical and engineering calculations with appropriate IT tools. Verification of obtained solutions.

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

Knowledge:

1. The student has knowledge about the use of mathematical methods and tools in the field of numerical methods [K_W01 (P6S_WG)]
2. The student has theoretically founded knowledge of numerical methods [K_W06 (P6S_WG)]
3. The student knows at least one software package or programming language [K_W06 (P6S_WG)]

Skills:

1. The student is able to use knowledge in higher mathematics [K_U01 (P6S_UW)]
2. The student can use numerical tools and methods to solve simple engineering problems [K_U03 (P6S_UW)]
3. The student can construct the algorithm of solving a simple engineering task and implement it and test it in the chosen development environment [K_U04 (P6S_UW)]
4. The student is able to operate the devices in accordance with general requirements and knows how to apply the principles of health and safety at work in a computer laboratory [K_U09 (P6S_UW)]
5. The student can use the knowledge and methods and tools to solve typical engineering tasks [K_U10 (P6S_UW)]
6. The student knows how to use a foreign language to the extent that it is possible to use English-language software [K_U13 (P6S_UK)]

Social competencies:

1. The student is aware of the level of his knowledge [K_K01 (P6S_KK)]
2. The student is aware of deepening and expanding knowledge to solve technical problems [K_K02 (P6S_KK)]
3. The student is able to think and act in a creative way, is aware of the responsibility for the effects of the work of the team, as well as its individual participants [K_K03 (P6S_KO)]

Assessment methods of study outcomes

Lectures
* assessment of knowledge and skills demonstrated on the exam.
* control of perception during lectures.
Auditory exercises:
* assessment of the ability to solve tasks in the field of numerical methods
Laboratory exercises:
* assessment of skills related to the implementation of project tasks
* assessment of student preparation for laboratory classes and assessment of skills related to the implementation of laboratory exercises
* assessment of teamwork skills

Course description

1. Floating point arithmetic, numerical errors,

2. Stability and accuracy of algorithms.

3. Numerical solutions of nonlinear equations and systems of equations (selected methods)

4. The approximation of functions (Interpolation, Taylor series)

5. Numerical integration (selected methods).

6. Numerical differentiation.

7. Initial-value problems for first-order ordinary differential equations (selected one-step methods).

Applied learning methods:
lectures and auditorium classes:
lecture with multimedia presentation supplemented with examples given on the board,
lecture conducted in an interactive manner with formulating questions for students,
taking into account the students' activity during the class when issuing the final grade,
during the lecture initiating the discussion,
theory presented in connection with practice,
theory presented in connection with the current knowledge of students,
taking into account different aspects of the issues presented,
presentation of a new topic preceded by a reminder of related content known to students in other subjects;
laboratories:
laboratories supplemented with multimedia presentations,
reviewing reports by the laboratory's leader,
work in teams,
computational experiments;

Update 2018.

Basic bibliography:

1. Fortuna, Macukow, Wąsowski, Metody numeryczne, WNT: PWN, 2017,

2. Kincaid, Cheney, Analiza numeryczna, WNT 2006,

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&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 exercise classes	15
3. participation in laboratory classes	45
4. participation in lecture consultations	2
5. participation in consultation regarding exercises	2
6. participation in consultations regarding laboratories	2
7. preparation for exercises and to pass the exercises	10
8. preparation for laboratory classes and for completion of laboratories	20
9. preparation for the exam	32
10. participation in the exam	2

Student's workload

Source of workload	hours	ECTS
Total workload	160	6
Contact hours	98	4
Practical activities	67	2