STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Numerical methods in techniques**		Code **1010325321010344873**
Field of study **Electrical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 2**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **part-time**	

No. of hours				No. of credits
Lecture: **10** Classes: **-** Laboratory: **10** Project/seminars: **-**				**2**

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 %**)** **100 2%** **100 2%**

Responsible for subject / lecturer:

dr inż. Barbara Szyszka
email: Barbara.Szyszka@put.poznan.pl
tel. 616652763
Wydział Elektryczny
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	The student has an expanded and in-depth knowledge of mathematics (range: linear algebra, matrix functions, differential calculus of several variables, solving ordinary differential equations of the first and higher orders, solving partial differential equations of the first order and second order, initial and boundary value problems)
		computer science (for programming in high level language)
		and numerical methods (for studies of the first degree).
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.
		Can solve simple tasks in the area of electrical engineering using numerical methods for studies of the first degree.
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 advanced numerical methods and apply them to solve complex engineering problems in the field of electrical engineering.

The support of engineering calculations by relevant IT tools.

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

Knowledge:

1. He knows the theoretical basis of approximate methods of calculation and computer techniques used to solve complex technical issues. - [K_W01++, K_W02+++]

2. He knows the advanced numerical methods used to solve engineering tasks. - [K_W02+++, K_W18+++,]

Skills:

1. He can select and apply appropriate computational methods to solve complex engineering tasks - [K_U01+++, K_U16++,]

2. He can use at least one commercial computer package in order to solve complex tasks by the numerical methods. - [K_U16++,]

3. He can carry out measurements and computer tests of complex technical tasks, interpret the results and draw conclusions. - [K_U02++, K_U16++,]

4. Can apply their knowledge in mathematics, computing and advanced numerical methods to technical issues. - [K_U01+++, K_U16++,]

Social competencies:

1. It is aware of the validity of the effects of engineering calculations - [K_K01++, K_W02+,]

2. Understands the need to learn and become familiar with scientific journals - [K_K01++, K_K02+,]

Assessment methods of study outcomes

Lecture:

* assess the knowledge and skills in the written form during the last lecture,

* control of perception during lectures.

Laboratory:

* during the last laboratory the verifying of the ability to solve complex engineering problems in the area of electrical engineering using the computer program

* Rewarding knowledge necessary to carry out laboratory tasks.

* continuous assessment, during each lesson - rewarding the increase of the ability to use the new methods,

* assess the knowledge and skills related to the implementation of the tasks.

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

* proposal to discuss additional aspects of the task;

* the effectiveness of applying knowledge when solving a given problem;

* comments relating to the improvement of teaching materials;

Course description

Numerical differentiation of the function in two variables,

Initial and boundary value problems.

Initial value problems for ordinary differential equations (higher order equations and systems of differential equations)

Selected numerical methods for solving partial differential equations,

Numerical solutions of nonlinear systems of equations.

Basic bibliography:

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

2. Kącki, Równania różniczkowe cząstkowe w elektrotechnice, WNT, Warszawa,

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

4. Burden, Faires ? Numerical analysis, Prindle, Weber&Schmidt, Boston,

Additional bibliography:

1. Kącki, Równania różniczkowe cząstkowe w zagadnieniach fizyki i techniki, WNT, Warszawa

2. Zarowski, An introduction to numerical analysis for electrical and computer engineers, Wiley

3. Silverster P.P., Ferrari R.L., Finite elements for electrical engineers, Cambridge Univ. Press

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	10
2. Participation in laboratory classes	10
3. Participation in consultations (lectures+lab)	4
4. preparation for laboratory classes	5
5. Preparing to pass lectures and laboratories	10
6. final exams	2

Student's workload

Source of workload	hours	ECTS
Total workload	41	2
Contact hours	24	1
Practical activities	17	1