STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Numerical methods in techniques	**1010325321010344873**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**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)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**2 100%**
Technical sciences	**2 100%**

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

Initial-value problems for ordinary differential equations:
(Higher-order equations and systems of differential equations).
Numerical differentiation.
Boundary and initial-boundary value problems for partial differential equations ? finite difference methods.

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.Theory presented in connection with practice,
5.Theory presented in connection with the current knowledge of students,
6.Taking into consideration various aspects of the presented issues,
7.Presenting a new topic preceded by a reminder of related content known to students from other subjects;
Laboratories:
1.Laboratories supplemented with multimedia presentations (including drawings, photos)
2.Demonstrations,
3.Computational experiments;

Basic bibliography:

1. Kincaid, Cheney, Analiza numeryczna, WNT 2005,
2. Kącki, Równania różniczkowe cząstkowe w elektrotechnice, WNT, Warszawa,
3. Magnucka-Blandzi, Dondajewski, Gleska, Szyszka, Metody numeryczne w MatLabie. Wybrane zagadnienia, Wyd. Politechniki Poznańskiej 2013,
4. Burden, Faires ? Numerical analysis, Prindle, Weber and 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