STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Numerical methods		**1010312411010340026**

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

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours					No. of credits
Lecture: **15**	Classes: **-**	Laboratory: **15**	Project/seminars: **-**		**3**

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

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

Responsible for subject / lecturer:

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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, initial value problems for ordinary differential equations), 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 engineering problems in the field of power 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++]
2. He knows the basic numerical methods used to solve engineering tasks - [K_W01++, K_W13++]

Skills:

1. He can select and apply appropriate computational methods to solve simple engineering tasks - [K_U06++, K_U08+++, K_U09 ++]
2. He can use at least one commercial computer package for solving simple problems by the numerical methods - [K_U08+++, K_U10++]
3. He can carry out measurements and computer tests of simple technical tasks, interpret the results and draw conclusions - [K_U03+, K_U15+++]

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+]

Assessment methods of study outcomes

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Lecture:
* assess the knowledge and skills in the written form,
* control of perception during lectures.

Laboratory:
* during the last laboratory the verifying of the ability to solve simple engineering problems 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

1. Floating point arithmetic, numerical errors,
2. Stability and accuracy of algorithms,
3. The approximation of functions (Interpolation, Taylor series),
4. Numerical integration,
5. Numerical differentiation,
6. Initial-value problems for ordinary differential equations and system of 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.Theory presented in connection with practice,
4.Theory presented in connection with the current knowledge of students,
5.Taking into consideration various aspects of the presented issues,
6.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, Warszawa,
2. Fortuna, Macukow, Wąsowski, Metody numeryczne, WNT, Warszawa,
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,

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	15
2. Participation in laboratory classes	15
3. Participation in consultations	4
4. implementation and verification the programs (time outside of the classroom laboratory)	5
5. preparation for laboratory classes	5
6. Preparing to pass laboratories	5
7. familiarization with the indicated literature and teaching materials	10
8. final exams (lectures+lab)	9

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Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	68	3
Contact hours	43	1
Practical activities	27	1

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