STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematics		**1010324331010340025**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**general academic**	**2 / 3**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

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

No. of hours				No. of credits
Lecture: **30**	Classes: **18**	Laboratory: **-**	Project/seminars: **-**	**5**

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 %)
the sciences	**5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	The basic knowledge of differential and integral calculus is obligatory. The ability of calculating partial derivatives is advisable.
2	**Skills**	Students should be able to reformulate some formulas and equations, and to calculate derivatives and integrals.
3	**Social competencies**	Students should know the boundedness of their knowledge and understand the need of further education.

Assumptions and objectives of the course:

The in-depth getting to know of differential equations. Using this knowledge both in the theory, and in applications in technical sciences.

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

Knowledge:

1. Students have the basic knowledge of differential and integral calculus for function of several variables - [K_W01+++]
2. Students can classify different types of differential equations - [K_W01+++]
3. Students know different methods of solving ODE - [K_W01+++]
4. Students know qualitative properties of differential equations and understand their meaning in the science - [K_W01+++]

Skills:

1. Students should be able to calculate line integrals - [K_U10+]
2. Students should be able to solve differential equations - [K_U10+]
3. Students should apply differential equations in physics and other technical sciences - [K_U10+]

Social competencies:

1. Students should be able to formulate proper questions leading to best knowledge of the problem - [K_K01+]

Assessment methods of study outcomes

Lecture
A written exam.
Tutorials
Short tests during the term (50%) and final test at the end of the term (50%) (additional points for activity).

Course description

Applied methods of teaching: lectures on the blackboard; tutorials - solving problems on the blackboard and discussing solutions.

Line integrals.

Definition of first order ordinary differential equation (ode). General solutions, solution curves. Initial value problem. Direction fields.Equations without y. Equations without x. Equations with separated variables. Homogeneous equations. Homogeneous and nonhomogeneous linear first order differential equations. Bernoulli equation. An Exact equations (+ integrating factors). Methods of solving such equations. Orthogonal curves. Applications of first order equations.

Definition of second order ordinary differential equation. Initial value problem. Order reducing. Homogeneous and nonhomogeneous linear second order differential equations. Linear independence. The Wronskian. Applications in physics.

Linear higher order equations with constant coefficients.

Linear systems of differential equations.. Such systems arise in many physical applications.

The Laplace transforms. Applications of the Laplace transforms to solve initial value problems for constant coefficient second order differential equations.

UPDATE: 2016/2017

Basic bibliography:

1. W.F. Trench, Elementary differential equations, Digital Trinity (on demand).
2. L. Brand, Differential and difference equations, John Wiley & Sons, Inc, New York 1966.
3. F. Chorltoni, Ordinary differential and difference equations, D. Van Nostrand Company LTD, London 1965.
4. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne, GiS, Wrocław 2007.
5. N.M. Matwiejew, Zadania z równań różniczkowych zwyczajnych, PWN, Warszawa 1976.
6. M. Gewert, Z. Skoczylas, Elementy analizy wektorowej, GiS, Wrocław 2004.

Additional bibliography:

1. W.W. Stiepanow , Równania różniczkowe, PWN, Warszawa 1956.
2. R. Gutowski, Równania różniczkowe zwyczajne, PWN, Warszawa 1971.
3. I.G. Pietrowski, Równania różniczkowe zwyczajne, PWN, Warszawa 1967.
4. J. Muszyński, A.D. Myszkis, Równania różniczkowe zwyczajne, PWN, Warszawa 1984.

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Tutorials	18
3. Homeworks preparing for tutorials and exams	48
4. Meetings with the lecturer	4

Student's workload

Source of workload	hours	ECTS
Total workload	100	5
Contact hours	48	3
Practical activities	18	2