

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Równania różniczkowe zwyczajne**  
 Name in English: **Ordinary differential equations**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, part-time**  
 Kind of subject: **obligatory / university-wide**  
 Subject code: **MAT001734**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	20				
Number of hours of total student workload (CNPS):	90				
Form of crediting:	crediting with grade				
For group of courses mark (X) final course:					
Number of ECTS points:	3				
including number of ECTS points for practical (P) classes :					
including number of ECTS points for direct teacher-student contact (BK) classes:	2.10				

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Knowledge of differential calculus of functions of one and several variables.
2. Knowledge of one-variable integral calculus.
3. Knowledge of basic definitions and methods of linear algebra.

**SUBJECT OBJECTIVES**

- C1. Presentation of basic types of ODEs and methods of solving them, and their application in physics and engineering.  
 C2. Presentation of the method of Laplace transform for solving ODEs and system of ODEs.  
 C3. Introduction to qualitative theory of systems of ODEs.

**SUBJECT LEARNING OUTCOMES***relating to knowledge:*

- PEU\_W01 knows the most important types of DEs and methods for solving them,  
 PEU\_W02 knows the method for solving systems of linear DEs with constant coefficients,  
 PEU\_W03 knows the method of Laplace transform for solving ODEs.

*relating to skills:**relating to social competences:*

- PEU\_K01 understands the need for systematic and independent work on mastery of course material.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	First-order ODEs. Introduction and examples. Geometric interpretation of the first order ODE. Separable differential equations.	2
Lec 2	Homogeneous DEs. First-order linear ODEs.	2
Lec 3	Bernoulli's equation. Applications of first-order ODEs.	2
Lec 4	Introduction to second-order DEs. Introduction to linear second-order DEs.	2
Lec 5	Homogeneous linear ODEs. Reduction of order.	2
Lec 6	Nonhomogeneous linear ODEs. Variation of parameters.	2
Lec 7	Linear second-order ODEs with constant coefficients. The method of undetermined coefficients.	2
Lec 8	Introduction to systems of first-order DEs. Systems of linear first-order DEs. Nonhomogeneous systems of linear first-order DEs. Variation of parameters.	2
Lec 9	Solving initial value problems using the method of Laplace transform.	2
Lec 10	Asymptotic stability of equilibrium solutions to DEs and systems of DEs. Linearization method. Test.	2
Total hours:		<b>20</b>

TEACHING TOOLS USED
N1. Lecture - traditional method or using multimedia tools.
N2. Lists of problems.
N3. Tutorial.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEU_W01 PEU_W02 PEU_W03 PEU_K01	test
P(w)	P=F1	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [1] M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne. Teoria, przykłady, zadania, Oficyna Wydawnicza GiS, Wrocław 2016.
<b>SECONDARY LITERATURE:</b> [1] J. Muszyński, A. D. Myszkis, Równania różniczkowe zwyczajne, PWN, Warszawa 1984. [2] M.M. Matwiejew, Zadania z równań różniczkowych zwyczajnych, PWN, Warszawa 1976.

SUBJECT SUPERVISOR
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