

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Równania różniczkowe zwyczajne A**  
 Name in English: **Ordinary differential equations A**  
 Main field of study (if applicable): **Control Engineering and Robotics**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, full-time**  
 Kind of subject: **obligatory / university-wide**  
 Subject code: **MAT001500**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	30				
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. Knows differential calculus of functions of one and two variables.
2. Knows integral calculus of functions of one variable.
3. Knows the theory and applications of numerical series and power series.
4. Can do calculations using complex numbers.
5. Knows basic concepts of linear algebra.

**SUBJECT OBJECTIVES**

- C1. Knows basic types of ordinary differential equations and methods to solve them.  
 C2. Can construct differential equations as mathematical models applied in physics and technology.  
 C3. Can apply operator calculus to solve linear differential equations with constant coefficients and systems of such equations  
 C4. Knows basic methods of investigation of stability of equilibrium points.

**SUBJECT EDUCATIONAL EFFECTS***relating to knowledge:*

- PEK\_W01 Knows basic types of differential equations and methods to solve them  
 PEK\_W02 Knows methods to solve systems of linear differential equations with constant coefficients  
 PEK\_W03 Knows operator calculus

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

- PEK\_K01 Can, without assistance, search for necessary information in the literature

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Ordinary differential equations of first order: Examples and preliminary notions. Graphical interpretation of a first order equation. Separable differential equations.	2
Lec 2	Homogeneous equations. Linear equations of first order.	2
Lec 3	Bernoulli equations. Examples of models resulting in first order differential equations.	2
Lec 4	Preliminary notions for ordinary differential equations of order two. Special types of second order differential equations solvable by reduction to first order equations.	2
Lec 5	Preliminary notions for linear second order differential equations. Homogeneous linear differential equations of order two. Reduction of order method.	2
Lec 6	Inhomogeneous linear differential equations of order two. Method of variation of parameters.	2
Lec 7	Linear differential equations of order two with constant coefficients.	2
Lec 8	Method of undetermined coefficients. Examples of problems leading to differential equations of order two.	2
Lec 9	Systems of ordinary differential equations. Preliminary notions. Homogeneous systems of linear differential equations.	2
Lec 10	Eigenvalues and eigenvectors of a matrix. Systems of linear differential equations with constant coefficients (simple eigenvalues).	2
Lec 11	Systems of linear differential equations with constant coefficients (simple eigenvalues) (continued).	2
Lec 12	Inhomogeneous systems of linear differential equations. Method of variation of parameters.	2
Lec 13	Applications of the Laplace transform to solve linear differential equations with constant coefficients.	2
Lec 14	Elements of stability theory. Graphical interpretation. Introduction to the method of linearization.	2
Lec 15	Test.	2
Total hours:		<b>30</b>

TEACHING TOOLS USED
N1. Lecture - traditional method N2. Lists of exercises to solve N3. Students self work (exercises solving) N4. Consultations

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation <i>F - forming (during semester) P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEK_W01 PEK_W02 PEK_W03 PEK_K01	Test, crediting with grade
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 2011.
<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.

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**MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT  
MAT001500 - Ordinary differential equations A  
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY Control Engineering and Robotics**

<b>Subject educational effect</b>	<b>Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)</b>	<b>Subject objectives</b>	<b>Programme content</b>	<b>Teaching tool number</b>
PEK_W01	K1AiR_W04	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9	N.1 N.2 N.3 N.4
PEK_W02	K1AiR_W04	C.3	Lec10 Lec11 Lec12 Lec13	N.1 N.2 N.3 N.4
PEK_W03	K1AiR_W04	C.4	Lec14 Lec15	N.1 N.2 N.3 N.4
PEK_K01	K1AiR_K01	C.1 C.2 C.3 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1 N.2 N.3 N.4