Course Syllabus

I. General Information

Course name	Differential equations
Programme	Mathematics
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BA
Form of studies (full-time, part-time)	Full-time
Discipline	Mathematics
Language of instruction	English

Course coordinator	dr hab. Ihor Korol

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	30	IV	5
tutorial			
classes	30	IV	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Introduction to mathematics, Calculus I, Calculus II

II. Course Objectives

C1. To acquaint students with selected methods of solving ordinary differential equations.
C2. Developing knowledge and skills regarding the application of ordinary differential equations.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	The student knows the basic concepts of ordinary differential equations and understands the geometric interpretation of a differential equation.	K_W01, K_W03, K_W05
W_02	The student knows the basic theorems on the existence and uniqueness of the solution to the initial problem.	K_W02, K_W04, K_W07
SKILLS		
U_01	The student knows how to examine the existence of a solution to the initial problem	K_U01, K_U02, K_U04
U_02	Student is able to solve elementary ordinary differential equations using appropriate analytical methods.	K_U01, K_U02, K_U04, K_U21
U_03	Students are able to use differential equations in various theoretical and practical problems	K_U03, K_U05, K_U06,K_U22
SOCIAL COMPETENCIES		
K_01	Students precisely formulate questions to deepen the understanding of the subject and complement the missing elements of reasoning	K_K01
K_02	Students present opinions on the applicability of differential equations methods taking into account own knowledge and skills	K_K01,K_K05

IV. Course Content

Definition of ordinary differential equation. Definition of the solution of ordinary differential equation. Geometric interpretation of the first order differential equation. Initial value problem. Examples of applications of differential equations in different fields of science. Existence and uniqueness of solutions of initial value problem.
The theory of n-order linear differential equations.
Systems of first order linear differential equations. Linear space of homogeneous system solutions, fundamental system, fundamental matrix.
Systems of nonhomogeneous first order linear differential equations.
Systems of linear equations with constant coefficients and algebraic methods of solving them.
The stability theory.
Critical points of autonomous differential systems.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
KNOWLEDGE			
W_01	conventional lecture, discussion, practical classes	test, written exam, oral exam	evaluated test, protocol
W_02	conventional lecture,	test, written exam, oral	evaluated test, protocol

	discussion, practical classes	exam	
SKILLS			
U_01	conventional lecture, discussion, practical classes, laboratory classes	test, written exam, oral exam	evaluated test, protocol
U_02	conventional lecture, discussion, practical classes, laboratory classes	test, written exam, oral exam	evaluated test, protocol
U_03	conventional lecture, discussion, practical classes, laboratory classes	test, written exam, oral exam	evaluated test, protocol
SOCIAL COMPETENCIES			
K_01	conventional lecture, discussion, practical classes, laboratory classes, problem-based learning	test, written exam, oral exam	evaluated test, protocol
K_02	conventional lecture, discussion, practical classes, laboratory classes, problem-based learning	test, written exam, oral exam	evaluated test, protocol

VI. Grading criteria, weighting factors.....

LECTURE:
The completion of classes is required. Written exam constitute the final grade:
91 – 100% excellent
81 – 90% very good
71 – 80% good
61 – 70% satisfactory
51 – 60% sufficient
less than 51% fail
CLASSES:
At least 80% of attendance is required. Two tests together constitute the final grade:
91 – 100% excellent
81 – 90% very good
71 – 80% good
61 – 70% satisfactory
51 – 60% sufficient
less than 51% fail
Detailed assessment rules are given during lectures and classes.

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	**90**
Number of hours of individual student work	**60**

VIII. Literature

Basic literature

1. E. J. Bredensteiner, Differential Equations, McGRAW-HILL.
2. D. G. Zill, M. R. Cullen, Differential Equations with Boundary-Value Problems, Loyola Marymount University.
3. S. Ahmad, A. Ambrosetti, A Textbook on Ordinary Differential Equations, Springer

Additional literature

1. J. Niedoba, W. Niedoba, Równania różniczkowe zwyczajne i cząstkowe. UWMD, Kraków, 2001.
2. S. Łanowy, F. Przybylak, B. Szłek, Równania różniczkowe. WPS, Gliwice, 2000.
3. M. Borsuk, Wykłady z równań różniczkowych i całkowych. UWM, Olsztyn, 2000.
4. A. Palczewski Równania różniczkowe zwyczajne. Teoria i metody metodyczne z wykorzystaniem komputerowego systemu obliczeń symbolicznych. WNT, Warszawa, 1999.
5. W.I. Arnold, Równania różniczkowe zwyczajne, PWN Warszawa, 1975.
6. L. S. Pontriagin, Równania różniczkowe zwyczajne, PWN Warszawa, 1976.
7. W. W. Stiepanow, Równania różniczkowe, PWN, Warszawa, 1984.
8. L. Włodarski., W. Krysicki, Analiza matematyczna w zadaniach. Warszawa: Wydawnictwo Naukowe PWN, 2001.
9. A. Filippow, Zbiór zadań z równań różniczkowych. Moskwa, 1961, 2004 (in russian).
10. Gewert M., Skoczylas Z. Równania różniczkowe zwyczajne. Teoria, przykłady, zadania. Wrocław, 2002.