SYLLABUS OF A MODULE

Polish name of a module	**Równania różniczkowe zwyczajne**
English name of a module	**Ordinary Differential Equations**
ISCED classification - Code	0541
ISCED classification - Field of study	*Mathematics*
Languages of instruction	*English*
Level of qualification:	*1*
Number of ECTS credit points	*6*
Examination:	*EW*
Available in semester:	*Y*

Number of hours per semester:

Lecture	Exercises	Laboratory	Seminar	E-learning	Project
30 E	30	0	0	0	0

MODULE DESCRIPTION

Module objectives

O1. Making the students familiar with the methods to solve certain types of differential equations and systems of differential equations

O2. Acquainting the students with theorems to existence and uniqueness of solutions of differential equations

O3. Developing skill in formulating differential equation models which are found in applications within engineering, physics, biology and economics

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of linear algebra and calculus of one and several variables
2. Ability to use different sources of information
3. Ability to work both independently and in a group

4. Ability to correctly interpret and present student's own activities

LEARNING OUTCOMES

LO 1 – student is able to solve the selected differential equations and systems of linear differential equations and is able to give the proper interpretation of the solutions

LO 2 – student is able to formulate and sketch the proof of the selected theorems on existence and uniqueness of solutions of differential equations

LO 3 – student is familiar with applications of differential equations

MODULE CONTENT

Type of classes – Lectures	**Number of hours**
Lec 1 – Introduction to differential equations. Definitions and terminology. Direction fields. Modeling with differential equations.	**3**
Lec 2 – First order differential equations: separable equations, homogeneous equations.	**3**
Lec 3 – First order linear differential equations. Bernoulli equation.	**3**
Lec 4 – Exact equations – definitions, method of solution. Integrating factor.	**3**
Lec 5 – Second order differential equations. Basic concepts. Linear second order differential equations with constant coefficients.	**3**
Lec 6 – Nonhomogeneous second order DE. Variation of parameters technique.	**3**
Lec 7 – Method of undetermined coefficients. Second order linear differential equation with variable coefficients - Euler equation.	**3**
Lec 8 – Systems of linear first-order differential equations. Basic theory.	**3**
Lec 9 – Homogenous linear systems. Method of solution.	**3**
Lec 10 – Non-homogeneous linear systems. Solutions to the nonhomogeneous systems.	**3**

Type of classes – Tutorials	Number of hours
T1 – Classification of differential equations. Basic concepts and examples. Direction fields, isoclines, integral curves.	**3**
T2 – Solving separable and homogeneous differential equations.	**3**
T3 – Solving first order linear differential equations and Bernoulli equations.	**3**
T4 – Solving exact differential equations. Integrating factor.	**3**
T5 – Solving second order differential equations.	**3**
T6 – Solving nonhomogeneous second order DE. Variation of parameters technique.	**3**
T7 – Solving nonhomogeneous second order DE. Method of undetermined coefficients. Euler equation.	**3**
T8 – Solving systems of linear first-order differential equations with real and complex eigenvalues.	**3**
T9 – Solving nonhomogeneous systems of differential equations using undermined coefficients and variation of parameters.	**4**
T10 – Test	**2**

TEACHING TOOLS

1. – lecture with using multimedia presentations
2. – tutorials

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE

F1. - assessment of preparation for exercises
F2. - assessment of the ability to apply the acquired knowledge while doing the exercises
F3. - assessment of activity during classes
S1. - assessment of the ability to solve the problems posed

S2. - assessment of mastery of the teaching material being the subject of the lecture - exam

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	**Forms of activity**	**Average number of hours required for realization of activity**
1. Contact hours with teacher		
1.1	Lectures	30
1.2	Tutorials	30
1.3	Laboratory	
1.4	Seminar	
1.5	Project	
1.7	Examination	5
	Total number of contact hours with teacher:	65
2. Student's individual work		
2.1	Preparation for tutorials and tests	40
2.2	Preparation for laboratory exercises, writing reports on laboratories	
2.3	Preparation of project	
2.4	Preparation for final lecture assessment	
2.5	Preparation for examination	20
2.6	Individual study of literature	15
	Total number of hours of student's individual work:	75
	Overall student's workload:	140
Overall number of ECTS credits for the module		6
Number of ECTS points that student receives in classes requiring teacher's supervision:		2,6
Number of **ECTS** credits acquired during practical classes including laboratory exercises and projects :		1

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. Lecture notes
2. Zill D. G., Cullen M. R., Differential equations with boundary-value problems, Thompson Brooks/Cole 2005
3. Trench William F., Elementary differential equations with boundary – value problems, 2013
4. Polyanin A. D., Manzhirow A., V., Mathematics for engineers and scientists, Chapman & Hall/CRC, 2007

MODULE COORDINATOR (NAME, SURNAME, DEPARTMENT, E-MAIL ADDRESS)

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