

SYLLABUS OF A MODULE

Polish name of a module	Równania Różniczkowe Zwyczajne
English name of a module	Ordinary Differential Equation
ISCED classification - Code	0541
ISCED classification - Field of study	<i>Mathematics</i>
Languages of instruction	<i>English</i>
Level of qualification:	1 – BSc (EQF 6)
Number of ECTS credit points	6
Examination:	<i>EW – exam written</i>

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. Differential equations as mathematical models.	2
Lec 2 – First order differential equations: separable equations, homogeneous equations.	2
Lec 3 – First order linear differential equations.	2
Lec 4 – Modeling with first-order differential equations.	2
Lec 5 – Exact equations. Bernoulli differential equation.	2
Lec 6 – Theorems on existence and uniqueness of solutions of Differential equations.	2
Lec 7 – Second order differential equations. Reduction of order.	2
Lec 8 – Cauchy-Euler equations. Higher order differential equations.	2
Lec 9 – Method of variation of parameters for first and second order DE.	2
Lec 10 – Method of undetermined coefficients. Modeling with higher order differential equations.	2
Lec 11 – Series solutions of linear differential equations.	2
Lec 12 – Stability of solutions of differential equations.	2
Lec 13 – Systems of linear first-order differential equations. Homogenous linear systems.	2
Lec 14 – Non-homogeneous linear systems.	2
Lec 15 – Plane autonomous systems.	2
Type of classes – Tutorials	Number of hours
T1 – Classification of differential equations. Direction fields, isoclines, integral curves.	2
T2 – Solving separable and homogeneous differential equations.	2
T3 – Solving first order linear differential equations and Bernoulli equations.	2
T4 – Modeling with first-order differential equations	2
T5, T6 – Solving exact and Riccati differential equations.	4
T7 – Solving second order differential equations.	2
T8 – Test	2
T9, T10 – Solving higher order differential equations. Method of variation of parameters. Method of undetermined coefficients	4
T11 – Series solutions of linear differential equations.	2
T12, T13 – Solving of systems of linear first-order differential equations.	3
T14 – Stability of solutions of differential equations.	3
T15 – 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	
1.6	Consulting teacher during their duty hours	5
1.7	Examination	5
Total number of contact hours with teacher:		70
2. Student's individual work		
2.1	Preparation for tutorials and tests	30
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	10
Total number of hours of student's individual work:		60
Overall student's workload:		130
Overall number of ECTS credits for the module		6
Number of ECTS points that student receives in classes requiring teacher's supervision:		2,8
Number of ECTS credits acquired during practical classes including laboratory exercises and projects :		

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)

Dr inż. Anita Ciekot, Department of Mathematics, anita.ciekot@im.pcz.pl