Course name : **Ordinary Differential equations**		
Type of study: **Mathematics/Informatics**	Type of study: **Full-time**	Examination: **Exam**
Course characteristics: **Compulsory**	Level: **First (B.Sc.)**	Year: **Autumn / Spring semester**
Type of classes: **lectures, tutorials**	Hours per week: **2 L, 2T**	ECTS points: **6 ECTS**

COURSE DESCRIPTION

COURSE OBJECTIVE

C1. Making the students familiar with the methods to solve certain types of differential equations and systems of differential equations.

C2. Acquaint students with theorems to existence and uniqueness of solutions of differential equations.

C3. Develop skill in formulating differential equation models which find applications to engineering, physics, biology and economics.

PREREQUISITES/ ASSUMED BACKGROUND

1. Course of the calculus of one and several variables (mathematical analysis).
2. Course of linear algebra.
3. Ability to use different sources of information.
4. Ability to work independently and in a group.
5. Ability to correctly interpret and present their own activities.

TEACHING-LEARNING OUTCOMES and COMPETENCES TO BE ATTENDED

LO1. – student is able to solve the selected differential equations and systems of linear differential equations andis able to give the proper interpretation of the solutions.

LO2. – student is able to formulate and sketch the proof ofthe selected theorems on existence and uniqueness of solutions of differential equations.

LO3. – student is familiar with applications of differential equations.

COURSE CONTENT

Lectures - Topics	Hours
L1 - Introduction to differential equations. Definitions and terminology. Differential equations as mathematical models.	2
L2 - First order differential equations: separable equations, homogeneous equations.	2
L3 - First order linear differential equations, Bernoulli equation.	2
L4 - Modeling with first-order differential equations.	2
L5 - Exact equations. Riccati differential equation.	2
L6 - Theorems on existence and uniqueness of solutions of Differential equations.	2
L7 - Second order differential equations. Reduction of order.	2
L8 - Cauchy-Euler equations. Higher order differential equations.	2
L9 - Method of variation of parameters.	2

L10 - Method of undetermined coefficients. Modeling with higher order differential equations.	**2**
L11 - Series solutions of linear differential equations.	**2**
L12 - Stability of solutions of differential equations.	**2**
L13 - Systems of linear first-order differential equations. Homogenous linear systems.	**2**
L14 - Non-homogenous linear systems.	**2**
L15 - Plane autonomous systems.	**2**
Σ	**30**
Tutorials - Topics	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 linearfirst-order differential equations.	**4**
T14 –Stability of solutionsof differential equations.	**2**
T15 - Test.	**2**
Σ	**30**

TEACHING TOOLS

1. – lectures using multimedia presentations
2. – blackboard and chalk or whiteboards and pens

RECOMMENDED AND ADDITIONAL BIBLIOGRAPHY

Lecture notes.
D.G. Zill, M.R. Cullen, Differential equations with boundary-value problems. Thomson Brooks/Cole 2005.
W. F. Trench, Elementary differential equations with boundary-value problems, 2013

TEACHERS

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ADDITIONAL NOTES

Links to course unit teaching materials can be found on the http://www.pcz.pl/english/ects-subjects website for current students.