



Course title: DIFFERENTIAL EQUATIONS I

ECTS credit allocation (and other scores): 5

Semester: spring

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 30 lectures + 30 classes = 60 hours

Course coordinator/ Department and e-mail: Erasmus coordinator Anna Szczepkowska/ WMil,
erasmuswmil.uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES:

Homogeneous equations. Equations with separated variables. Linear equations of the first order, Bernoulli equation, exact differential equation. The integrating factor. Differential equations of higher orders. Solution of the first order equations with constant coefficients (right side - a quasi polynomial). Homogeneous linear equation of n-th order with constant coefficients. Linear not homogeneous equation of n-th order with constant coefficients (right side - a quasi polynomial). Method of variation of constant. Normal linear homogeneous and not homogeneous system with constant coefficients. Regular theory of perturbations. Solving Cauchy problem for differential equations with constant coefficients. Solving Cauchy problem for systems of differential equations with constant coefficients using Laplace transform.

LECTURES:

Ordinary differential equation. Theorem on the existence and uniqueness of the solution of the Cauchy problem. The general solution, the particular solution and the general solution. The equation of the first order with constant coefficients (right side - a quasi polynomial). Linear homogeneous and not homogeneous (right side - a quasi polynomial) equations with constant coefficients. Wronskian. Liouville formula. Linear not homogeneous equation of any right-hand side (the method of variation of constant). Normal linear system with constant coefficients. Banach space. The principle of contracting map. Theorem on the existence and uniqueness of the solution of the Cauchy problem for the normal system of equations and for equation of n order. Regular theory of perturbations. Operational calculus and its application to the solutions of the Cauchy problem. PDE of 2nd order: change of variables, initial-value problem. d'Alembert formula. Boundary value problems. The Cauchy problem for the wave equation.

LEARNING PURPOSE

To familiarize students with the basic types of differential equations, systems of differential equations and methods of solving them.

On completion of the study programme the graduate will gain:

Knowledge:

The student knows the basic types of ordinary differential equations and methods of solving them

The student knows the notion of normal linear system and method of solving it.

The student knows the notion of partial differential equations of 2nd order, their classification and types.

The student knows the basic theorems of the theory of ordinary differential equations and their proofs
The student notes the importance of differential equations and application of differential equations in different fields of knowledge

Skills:

The student knows how to solve basic types of differential equations of any order and systems of ordinary differential equations
Student is able to talk about mathematical problems using understandable, colloquial language.

Social Competencies:

The student knows the limits of his own knowledge and understands the need for further education
Student can precisely formulate questions to deepen their understanding of issues relating to differential equations
The student is aware of the need to respect the principles of the code of ethics
The student is aware of the importance of strictly sciences for the maintenance and development of other fields of science
The student can search for information in the literature

BASIC LITERATURE

1) Michał Borsuk , Wykłady z równań różniczkowych i całkowych., wyd. wyd. UWM, 2000 , s. 191; 2) Aleksej Filippow, Zbiór zadań z równań różniczkowych. (Ros. Сборник задач по теории дифференциальных уравнений.), wyd. Regular and Chaotic mechanics , 2000 , s. 175; 3) Marian Gewert, Zbigniew Skoczylas, Równania różniczkowe zwyczajne. Teoria, przykłady, zadania., wyd. Oficyna Wydawnicza GiS, Wrocław, 2002 , s. 192; 4) Jerzy Ombach, Wykłady z równań różniczkowych, wyd. Uniwersytet Jagielloński, Kraków, 1999 , s. 314

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 2,38 ECTS points,

Student's independent work: 2,62 ECTS points,