אוניברסיטת
בן-גוריון בנגב

The Department of Mathematics

2017–18–B term

Course Name Partial Differential Equations

Course Number 201.1.0101

Course web page
`https://www.math.bgu.ac.il//en/teaching/spring2018/courses/partial-differential-equations`

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Office Hours `https://www.math.bgu.ac.il/en/teaching/hours`

Abstract

Requirements and grading[1]

Course topics

1. Second order linear equations with two variables: classification of the equations in the case of constant and variable coefficients, characteristics, canonical forms.

2. Sturm-Liouville theory.

3. String or wave equation. Initial and boundary value conditions (fixed and free boundary conditions). The d'Alembert method for an infinitely long string. Characteristics. Wave problems for half-infinite and finite strings. A solution of a problem for a finite string with fixed and free boundary conditions by the method of separation of variables. The uniqueness proof by the energy method. Well-posedness of the vibrating string problem.

4. Laplace and Poisson equations. Maximum principle. Well-posedness of the Dirichlet problem. Laplace equation in a rectangle. Laplace equation in a circle and Poisson formula. An ill-posed problem - the Cauchy problem. Uniqueness of a solution of the Dirichlet problem. Green formula in the plane and its application to Neumann problems.

[1] Information may change during the first two weeks of the term. Please consult the webpage for updates

5. Heat equation. The method of separation of variables for the one-dimensional heat equation. Maximum principle. Uniqueness for the one-dimensional heat equation. The Cauchy problem for heat equations. Green?s function in one dimension. If time permits: Green?s function in the two dimensional case.

6. Non-homogeneous heat equations, Poisson equations in a circle and non-homogeneous wave equations.

7. If time permits: free vibrations in circular membranes. Bessel equations.