# SPRING 2016

# Introduction to partial differential equations (10 credits)

# 802635 S

# Lecturer - Valery Serov.

This course provides a self-contained treatment of classical partial differential equation of the second order at the beginning graduate level. It is assumed that the reader is familiar with elements of Fourier series, analysis 2 and with complex analysis. The approach which is used in the course is mostly classical and concrete, preferring explicit calculations to existential arguments. In the course are considered all classical problems: linear and nonlinear (quasilinear) equations of the first order, Laplace equation in $R^n$ and in bounded domains, potential theory, Green's function, Heat equation in $R^n$ and in bounded domains, Wave equation in $R^n$ and in bounded domains, d'Alembert formula for any dimensions, Fourier method and others. There are numerous examples and exercises.

On successful completion of this course, the student will be able to

- solve linear and quasilinear partial differential equations of first order using the method of characteristics
- apply the method of separation of variables to solve initial-boundary value problems for heat, wave and Laplace equations
- verify that a given function is a fundamental solution of a partial differential operator
- use single and double layer potentials to solve boundary value problems for Laplacian

There is lecture notes for the course in English which is prepared by the lecturer and it is partly based on the books:
D. Colton: Partial differential equations (an introduction), Dover Publications, 1988.
G. Folland: Introduction to partial differential equations, 2nd edition, Princeton University Press, 1995.

CONTENTS

7. The Dirichlet and Neumann problems.
8. Double and single layer potentials.
9. The Heat operator. The heat equation in bounded domains.
10. The Wave operator.
11. Fourier analysis of the Wave operator. The wave equation in bounded domains.

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Time and place:
Mondays, 14-16
Wednesdays, 8 -10

First lecture - 11.01.2016, M335

All welcome!