



## Course Description – MATHEMATICS (Basic Course 2)

Svetlana Lebed, Assistant Professor,  
Alexander Dvornichenko, Senior Lecturer  
Higher Mathematics Department, BrSTU

## Contents

|                                       |   |
|---------------------------------------|---|
| 1 Introduction.....                   | 1 |
| 2 Overview .....                      | 1 |
| 3 Course objectives .....             | 1 |
| 4 Course duration .....               | 1 |
| 5 Prerequisites .....                 | 2 |
| 6 Teaching and learning methods ..... | 2 |
| 7 Course content .....                | 2 |
| 8 Method of evaluation .....          | 3 |
| 9 References .....                    | 3 |

## 1 Introduction

The document provides a description of a training course on mathematics.

## 2 Overview

The course includes practical tasks on functions of several variables, integrals, differential equations, infinite sequences and series. The course of mathematics is based on the knowledge and practical skills obtained by students during Basic Course 1. The issues addressed are the basis for exploring the subsequent sections of the course.

## 3 Course objectives

By the end of the semester students should be able to understand:

- the main concepts of functions of several variables, integrals, differential equations, infinite sequences and series
- differentiation and integration of functions
- solution of differential equations
- representations of functions as power series

## 4 Course duration

231 hours:

Lectures – 52 hours

Practical classes – 70 hours  
Independent work – 103 hours

## 5 Prerequisites

Knowledge of Basic Course 1 of mathematics is required.

## 6 Teaching and learning methods

The course is organized as a combination of lectures, practical tasks (problem solving), individual work of a student.

|                    | Topics                                | Lecture(in-class hours) | Practice(in-class hours) |
|--------------------|---------------------------------------|-------------------------|--------------------------|
| 1.                 | <b>Functions of several variables</b> | 10                      | 10                       |
| 2.                 | <b>Integrals.</b>                     | 14                      | 22                       |
| 3.                 | <b>Differential equations</b>         | 16                      | 22                       |
| 4.                 | <b>Infinite sequences and series</b>  | 12                      | 16                       |
| <b>Total hours</b> |                                       | 52                      | 70                       |

## 7 Course content

### *Lecture 1-5.Functions of several variables.*

Functions of Two Variables. Partial Derivatives. Differentials. The Chain Rule. Higher Derivatives. Maximum and Minimum Values.

### *Lecture 6-12.Integrals.*

Antiderivative. Indefinite Integrals. Techniques of Integration(integration by the introduction of derivative under the sign of differential, integration by parts, replacement of variable in the indefinite integral, integration of rational functions, trigonometric integrals, integration of nonrational functions). Areas and Distances. The Definite Integral. Rules of the Calculation of the Definite Integral. Improper Integrals. Applications of Integration(areas between curves, volumes, arc length, work). Applications to Physics and Engineering.

### *Lecture 13-20.Differential equations.*

Modeling with Differential Equations. Separable Equations. Linear Equations. Second-Order Linear Equations. Nonhomogeneous Linear Equations. Systems of the Differential Equations.

## ***Lecture 21-26. Infinite sequences and series.***

Series. The Integral Test. The Comparison Tests. The Ratio and Root Tests. Alternating Series. Power Series. Representations of Functions as Power Series. Trigonometric polynomials and series. Definition of Fourier series. Fourier Cosine and Fourier Sine Series.

### **8 Method of evaluation**

| <b>Evaluation Item</b> | <b>The Number of Times</b> | <b>Evaluation Proportion</b> | <b>Remarks</b>     |
|------------------------|----------------------------|------------------------------|--------------------|
| attendance             |                            | 20%                          | 80% of the classes |
| midterm exam           |                            |                              |                    |
| final exam             | 1                          | 30%                          |                    |
| final report           |                            |                              |                    |
| homework               |                            | 20%                          |                    |
| test                   | 2                          | 30%                          |                    |

#### **Basic Grading Scale**

$\geq 90\%$  : 9

$\geq 80\%$  : 8, 7

$\geq 60\%$  : 6, 5

$\geq 50\%$  : 4

$< 50\%$  : 1 – 3

### **References**

1 Stewart James Calculus Early Transcendental. 2008. pp. 1308.

2 R.J. Beerends, H.G. terMorsche, J.C. van der Berg Fourier and Laplace Transforms / Cambridge university press. 2003. pp.447.