Course Description – MATHEMATICS (Basic Course 1)

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Contents

1 Introduction

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

2 Overview

The course includes practical tasks on linear algebra, analytic geometry, introduction to mathematical analysis and differential calculus of one-variable functions. The course of mathematics is based on the knowledge and practical skills gained by students in secondary school. 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 analytic geometry, linear algebra, mathematical analysis of functions of one variable
- methods for solving models of algebraic problems
- using geometric methods in mathematical models
- the use of differential calculus in economic and engineering tasks

4 Course duration

191 hours:
Lectures – 48 hours

Practical classes – 48 hours
Independent work – 95 hours

5 Prerequisites

Knowledge of the school course 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.	**Linear algebra**	10	10
2.	**Analytic geometry. Conic section**	12	12
3.	**Introduction to mathematical analysis**	8	6
4.	**Differential calculus of one-variable functions**	18	20
Total hours		48	48

7 Course content

Lecture 1-5. Linear algebra.

The Algebra of Matrices. Determinants. The Inverse of a Matrix. System of Linear Equations. Gauss-Jordan Elimination Method. Method of Inverse Matrix. Cramer's Rule. The concept of own vectors and own values of matrix (linear transformation). Characteristic equation of a matrix.

Lecture 6-11.Analytic geometry .Conic section.

The Algebra of Vectors. The Dot Product of Two Vectors. The Cross Product of Two Vectors. The Mixed Product of Two Vectors. Lines and Planes. Lines in the plane. Planes. Lines in Space. Parabolas. Ellipses. Hyperbolas. Conic surfaces.

Lecture 12-15.Introduction to mathematical analysis.

Functions. Composite Functions. One-to-one Functions and Their Inverse Functions. The Limit of a Function. Computations of Limits. Asymptotes And Their Use In Graphing. Equivalent Infinitesimal Function. Continuity. The Maximum-Value Theorem and The Intermediate-Value Theorem.

Lecture 16-24. Differential calculus of one-variable functions.

The Derivative. Differentiation Rules. Implicit Differentiation. Logarithmic Differentiation. Calculus With Parametric Curves. Linear Approximations And Differentials. Higher Derivatives. L'Hopital's Rule. The Hyperbolic Functions And Their Inverses. Using The First Derivative When Graphing a Function. Concavity And The Second Derivative. Guidelines For Sketching a Curve.

8 Method of evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
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 Aufmann R. and ets. College algebra. 1990. pp. 553.
2 Stein Sh. Calculus and analytic geometry. 1987. pp.1061.
3 Stewart J., Redlin L., Watson S. Precalculus Mathematics for Calculus. 2009. pp. 1062.
4 Stewart James Calculus Early Transcendental. 2008. pp. 1308.