

## SYLLABUS MATHEMATICAL ANALYSIS-I (MAT233.2, CID 3855)

## Required and recommended for the students of "Applied Mathematics and Informatics" and "Software Engineering" Spring 2016 (January 18 – May 6)

#### 1. Instructor:

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- 2. <u>Class meetings:</u> 2 classes per week, (one lesson = 75 minutes), 15 working weeks.
- 3. <u>Consultations:</u> according to the preliminary arrangement with instructor.
- 4. <u>Brief course description:</u> The basic chapters of Mathematical Analysis are studied. The course contains the following sections: "Limits of a sequence and function", "Derivatives of functions of one and several variables", "Investigation of functions with usage derivative and elementary maximum-minimum problems", "The integral and its applications, techniques of integration". "Introduction to functions of the several variables".
- 5. Prerequisites: MAT131.

## 6. <u>Textbooks:</u>

## **Required:**

- 1. Edwards C.H., Jr. David E. Penney "Calculus and analytic geometry", Prentice-Hall, Inc., 1986.
- 2. Lial M., Miller C. Finite Mathematics and Calculus with application.-Scott, Foresman and Company. 1989.

### Additional:

- 3. Tomas G.B., Jr. Ross L. Finney "Calculus and analytic geometry", Addison-Wesley Publishing Comp., 1988.
- 4. Фихтенгольц Г.М. Основы математического анализа. Том 1. Санкт-Петербург, 1999.

- 5. Данко П.Е., Попов А.Г., Кожевникова Т.Я. Высшая математика в упражнениях и задачах. Часть 1. -М.: «Высшая школа», 1999.
- 7. <u>Objectives:</u> The primary objectives of this course are:
  - $\checkmark$  to develop abstract and logical (probative) thinking,
  - $\checkmark$  understanding how to set and solve problems,
  - $\checkmark$  acquiring as basic knowledge of mathematical analysis,
  - $\checkmark$  appreciating the value of continued mathematical education for the major.
- 8. **Expected outcomes.** After completing MAT 233.2 the student will be able to
  - ✓ Formulate and apply the concept of a function to a contextual (real-world) situation.
  - ✓ Demonstrate understanding of the basic concepts of the limit of a function, asymptotes and continuity.
  - ✓ Demonstrate understanding of the meaning of derivatives and compute the derivative of algebraic, exponential and logarithmic functions of one variable.
  - ✓ Use derivatives to solve problems involving rates of change, tangent lines and velocity (speed), acceleration and optimization.
  - ✓ Investigate the graph of a function with the aid of its first and second derivatives: asymptotes, continuity, tangency, monotonicity, concavity, extreme, inflection points, etc.
  - ✓ Demonstrate understanding of the meanings of definite and indefinite integrals, fundamental theorems of calculus.
  - ✓ Calculate integrals of polynomials, rational functions, exponential, logarithmic and trigonometric functions.
  - $\checkmark$  Use rules of integration to calculate definite and indefinite integrals.
  - $\checkmark$  Use integrals to solve applied problems.
  - ✓ Demonstrate understanding of functions of several variables and their graphs, compute partial derivatives.
  - ✓ Use partial derivatives to solve optimization problems.

# 9. <u>Method of Evaluating Outcomes:</u>

# Grading

Grades will be based on a total of 100 points, coming from:

Quiz 1	The instructor sets day and time	10 points
Midterm Exam	The instructor sets day and time	30 points

Quiz 2	The instructor sets day and time	10 points
Homework and class activity	Every class	10 points
Final Exam	Office of the Registrar sets day and time	40 points

The final grade of the student will calculated in conformity with a following scale:

### $0 \le F \le 40 < D \le 45 < C - \le 50 < C \le 60 < C + \le 65$

#### $65 < B - \le 70 < B \le 80 < B + \le 85 < A - \le 90 < A \le 100.$

#### Make-up Exams and Quizzes

- ✓ If the reason for missing any exam or quiz is not valid, then the grade 0 will be given for the missing exam or quiz.
- ✓ If a student misses both exams for any reasons, he/she will not be attested for the course.
- ✓ If the reason for missing the midterm exam is valid, the student's Final Exam will be worth up to 60 points. In this case, extra tasks will be included in the Final Exam.
- ✓ If the reason for missing the Final Exam is valid, the student can apply for the grade of "I".

## **Attendance Requirements**

It is important to attend classes to master the materials in the course. Attendance affects grades: students lose 1 point for any unexcused absence. Missing 10 or more classes for any reasons will result in a grade of F in the course.

#### **Academic Honesty**

The Applied Mathematics and Informatics Department has zero tolerance policy for cheating. Students who have questions or concerns about academic honesty should ask their professors or refer to the University Catalog for more information.

### Cell phones

We ask students to turn off their cell phones during math classes. Use of cell phones is entirely prohibited during the exams.

### Syllabus change

Instructors reserve the right to change or modify this syllabus as needed; any changes will be announced in class.

## 10. Course content and tentative academic calendar:

## 1 week

*Functions and its graphs.* Representations. Arithmetic operations on functions, functions superposition, inverse function. Elementary functions, their properties and graphs. The simplest transformations of the function graphs. [1]: p.8-28; [4]: p.37-58.

# 2-4 weeks.

- ☞ The theory of limits. The numerical sequence and its limit. Function limit, one-sided limits. Algebraic properties of limits. [1]:p.40-62; [4]:p.59-89.
- Continued functions of the one variable. Continuity of function, classification of breaks. Arithmetic operations on continued functions. Continuity of the elementary functions. Properties of the continued functions. [1]:p.63-90; [4]:p.117-138.

# 5,6 weeks.

Differentiation of function of the one variable. Derivative, its geometric sense and algebraic properties. Derivatives of the elementary functions. Derivatives of the higher order, Taylor formula. Theorems of the middle value [1]:p.92-115, 130-144; [4]:p.140-160, 168-194.

# 7,8,9 weeks.

Function analysis with the help of Derivatives. Monotony and Convexity of functions. Local maximum and minimum. Construction of graph. Uncertainty. [1]:p.172-213; [4]:p.195-214.

# 11,12 weeks.

- Conditional extreme problems and Lagrange method of multipliers for the two or three variables functions. [2]:p.940-948.

## <u>13-14 weeks.</u>

Indefinite integral and its properties, "table" integrals. The simplest methods of integration: change of variable, integration by parts, and integration of the simplest rational expressions. [1]:p.213-221; [4]:p.279-303.

## <u>15,16 weeks.</u>

- Definite integral and its properties. Newton Leibniz formula. Changing of the variable and integration by parts at the definite integral. Expression of the integral area. [1]: p.242-300; [4]:p. 320-344.
- Preparing for the final test.