Course Name : Mathematical Analysis I

Course Code	Course Type	Regular Semester	Lecture (hours/week)	Seminar (hours/week)	Lab. (hours/week)	Credits	ECTS
CMP 113	A	Fall	3.00	1.00	0.00	3.50	5.00

Lecturer	Vladimir Muka, Msc
Assistant	Elsid Miraka, Msc
Course language	Albanian
Course level	Bachelor
Description	The calculus 1 course provides an advanced review of mathematics concepts developed in high school. In addition, this course is dedicated to the first concepts of caluculus: function, types of functions, limit and its computations, unidentified forms of limit, continuity of a function at a point and in an interval, differentiability, derivation techniques and application of derivatives in practice.
Objectives	The objective of the Calculus course 1 is to present calculus in a concise and meaningful way so that students can understand the full picture of the concepts they are learning and apply them to real-life situations
Core Concepts	1. The concept of a function. Domain, range. Algebraic operations with functions. Graph of the function 2. Linear function, polynomial function, rational function, exponential function, logarithmic function, trigonometric functions 3. The concept of limit. Unidentified forms. 4. The concept of continuity at a point and on a interval. 5. The concept of the derivative and differentiation.

Course Outline

Week	Topic
1	Linear equations. General equation of the line. The different forms of the equation of the line. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 3-18. Recommended literature Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen (2015) College Mathematics For Business, Economi cs, Lif e Sciences, and Socia l sciences/Thirteenth Edition page 23-40. Robert A. Adams, Christopher Essex (2018) Calculus A Complete Course/ Ninth Edition page 32-37 Ron Larson, Bruce Edwards (2023) Calculus with CalcChat and CalcView/ Twelfth Edition page 9-15.
2	Function definition. Domain, range. Graph of the function. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 23-34 Recommended literature Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen (2015) College Mathematics For Business, Economi cs, Lif e Sciences, and Socia l sciences/Thirteenth Edition page 42-53. James Stewart (2008) Calculus earlytranscendentals/ sixth edition page 39-48 Robert A. Adams, Christopher Essex (2018) Calculus A Complete Course/ Ninth Edition page 23-38.
3	Inverse function. New function from an old function. Composition of functions Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 35-48 Recommended literature Yunzhi Zou (2018) Single Variable Calculus page 14-27. Ron Larson, Bruce Edwards (2023) Calculus with CalcChat and CalcView/ Twelfth Edition page 21-30.
4	Quadratic function. Power functions. Polynomial function. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 51-73 Recommended literature Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey (2017) Calculus with Applications/ Eleventh Edition page 62-83 Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen (2015) College Mathematics For Business, Economi cs, Lif e Sciences, and Socia l sciences/Thirteenth Edition page 63-112. Robert A. Adams, Christopher Essex (2018) Calculus A Complete Course/ Ninth Edition page 23-46.

5	Rational function. Asymptotes of function. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 74-83 Recommended literature Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey (2017) Calculus with Applications/ Eleventh Edition page 62-83 Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen (2015) College Mathematics For Business, Economi cs, Lif e Sciences, and Socia l sciences/Thirteenth Edition page 63-112. Robert A. Adams, Christopher Essex (2018) Calculus A Complete Course/ Ninth Edition page 23-46.
6	The exponential function. Logarithmic function. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 82-98 Recommended literature Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey (2017) Calculus with Applications/ Eleventh Edition page 89-118 Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen (2015) College Mathematics For Business, Economi cs, Lif e Sciences, and Socia l sciences/Thirteenth Edition page 115-135. Peter D. Lax, Maria Shea Terrell (2014) Calculus With Applications/Second Edition page 81-100.
7	Trigonometric functions. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 99-108 Recommended literature Ron Larson, Bruce Edwards (2023) Calculus with CalcChat and CalcView/ Twelfth Edition page 33-40 Peter D. Lax, Maria Shea Terrell (2014) Calculus With Applications/Second Edition page 50-58.
8	Semi-final exam.
9	Finite limit of a function at a point. Infinite Limits and Limits at Infinity. One-Sided Limits. Indeterminate Form. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 109-130 Recommended literature Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, Christopher J. Stocker, (2019) Calculus for Business, Economics, Life Sciences, and Social Sciences/ fourteenth edition page 127-154 Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey (2017) Calculus with Applications/ Eleventh Edition page 134-147 Yunzhi Zou (2018) single variable calculus faqe 42-86.
10	Continuity of a Function. Interval and segment continuity. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 131-144 Recommended literature Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, Christopher J. Stocker, (2019) Calculus for Business, Economics, Life Sciences, and Social Sciences/ fourteenth edition page 131-166 Ron Larson, Bruce Edwards (2023) Calculus with CalcChat and CalcView/ Twelfth Edition page 74-88 Peter D. Lax, Maria Shea Terrell (2014) Calculus With Applications/Second Edition faqe 51-77 Laura Taalman, Peter Koh (2014) Calculus page 109-134.
11	The tangent line problem. Definition of derivative. Rules for differentiation. Derivatives of Exponential and Logarithmic Functions. Derivatives of Products and Derivatives of Quotients. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 145-164 Recommended literature James Stewart (2008) Calculus earlytranscendentals/ sixth edition page 173-195 Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, Christopher J. Stocker, (2019) Calculus for Business, Economics, Life Sciences, and Social Sciences/ fourteenth edition page 166-230 Ron Larson, Bruce Edwards (2023) Calculus with CalcChat and CalcView/ Twelfth Edition page 262-28.
12	Derivatives of Trigonometric Functions. Derivatives of higher orders. Chain Rule. Implicit Differentiation Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 165-176 Recommended literature James Stewart (2008) Calculus earlytranscendentals/ sixth edition page 189-220 Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, Christopher J. Stocker, (2019) Calculus for Business, Economics, Life Sciences, and Social Sciences/ fourteenth edition page 232-262.
13	L'Hopital's rules for calculating the limits of Indeterminate Forms. First derivative and graphs Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 177-186 Recommended literature Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, Christopher J. Stocker, (2019) Calculus for Business, Economics, Life Sciences, and Social Sciences/ fourteenth edition page 283-324 James Stewart (2008) Calculus earlytranscendentals/ sixth edition page 287-314 Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey (2017) Calculus with Applications/ Eleventh Edition page 267-288.
14	Local extrema of the function. Second derivative and graphs. Absolute maximum and minimum. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 187-198 Recommended literature Gary Chartrand, Ping Zhang (2011) Discrete Mathematics, page Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey (2017) Calculus with Applications/ Eleventh Edition page 290-327 Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, Christopher J. Stocker, (2019) Calculus for Business, Economics, Life Sciences, and Social Sciences/ fourteenth edition page 334-344 Ron Larson, Bruce Edwards (2023) Calculus with CalcChat and CalcView/ Twelfth Edition page 278-327.

15	Optimization of functions. Optimizing the perimeter, area, revenue of a company, profit. Basic literature Adapted lectures in Albanian: Calculus. Vladimir Muka page 199-208 Recommended literature Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, Christopher J. Stocker, (2019) Calculus for Business, Economics, Life Sciences, and Social Sciences/ fourteenth edition page 346-355 James Stewart (2008) Calculus earlytranscendentals/ sixth edition page 322-330 Ron Larson, Bruce Edwards (2023) Calculus with CalcChat and CalcView/ Twelfth Edition page 374-394.
16	Final Exam

Prerequisites	The student must attend the course at a minimum rate of 75%.
Literature	• Leksione të përshtatura në shqip: Analiza matematike 1 -Vladimir Muka
References	• Ron Larson, (2022) Precalculus with Limits / Fifth Edition • Ron Larson, Bruce Edwards (2023) Calculus with CalcChat and CalcView/ Twelfth Edition • James Stewart, Daniel Clegg, Saleem Watson (2021) Calculus early transcendentals/ ninth edition • James Stewart (2008) Calculus early transcendentals/ sixth edition • Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, Christopher J. Stocker, (2019) Calculus for Business, Economics, Life Sciences, and Social Sciences/ fourteenth edition • Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen (2015) College Mathematics For Business, Economi cs, Lif e Sciences, and Socia l sciences/Thirteenth Edition • Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey (2017) Calculus with Applications/ Eleventh Edition • Larry J. Goldstein, David C. Lay, David I. Schneider, Nakhlé H. Asmar (2018) Calculus & its Applications • Robert A. Adams, Christopher Essex (2018) Calculus A Complete Course/ Ninth Edition • Yunzhi Zou/(2018) Single Variable Calculus

Course Outcome

1	Students will be able to understand the main concepts of mathematical analysis related to: function, types of function, limit of function, continuity of function, derivative of function.
2	Students will be able to analyze and draw conclusions on the graph of a function, the limit of the function, the continuity of the function, the derivative of the function.
3	Students will be able to apply the main concepts of the mathematical analysis of the limit of the function, the continuity of the function, the derivative of the function in the solution of exercises and problems.
4	Students will be able to solve problems on function optimization.

Course Evaluation

In-term Studies	Quantity	Percentage
Midterms	1	35
Quizzes	0	0
Projects	0	0
Term Projects	0	0
Laboratory	0	0
Class Participation	1	15
Total in-term evaluation percent		**50**
Final exam percent		**50**
Total		**100**

ECTS Workload (Based on Student Workload)

Activities	Quantity	Duration (hours)	Total (hours)
Course duration (Including the exam week: 16x Total hours of the course)	16	4	64
Study hours outside the classroom (Preparation, Practice, etc.)	14	4	56
Duties	0	0	0
Midterms	1	2	2
Final Exam	1	2	2
Other	1	1	1
Total Work Load			**125**
Total Work Load / 25 (hours)			**5.00**
ECTS			**5.00**