



REPUBLIKA E SHQIPËRISË

“ISMAIL QEMALI” UNIVERSITY
FACULTY OF TECHNICAL AND NATURAL SCIENCES
COMPUTER SCIENCE DEPARTMENT

SYLLABUS

Calculus 1

Curriculum Developer		Assoc. Prof. Rozana Liko <i>Mathematician (DIND)</i> <i>Ph.D. in Applied Mathematics</i>							
Credits and hours	Credits	Hour in the classroom						Individual study	Total
		Lectures	Seminars	Labs	Practise	Course project	Total		
	6 ECTS	45	30	0	0	0	75	75	150
Course Typology		A - Basic disciplines							
Academic year /semester		2025-2026/ First year, first semester							
Nature and requirement of the course		Mandatory course							
Study program		Bachelor in Computer Engineering							
Course Code		MAT154E							
Email of curriculum developer / lecturer		rozana.liko@univlora.edu.al							

SUMMARY AND LEARNING OUTCOMES

Course Description	This course aims to provide students with basics knowledge of functions, on the study of functions and their changes through derivatives. It begins with the concept of limits, emphasizing the importance of continuity. Derivatives are calculated to determine the rate of change of functions and to identify maxima and minima. An important part of the course is the application of the rules of differentiation and integration.
Course Objectives	▪ Develop the ability to identify and analyze various functions, including polynomials, trigonometric functions, and exponential functions. ▪ Understand the concept of derivatives as a tool to measure the rate of change of functions and to identify maxima and minima. ▪ Use the analysis of the behavior of functions to identify critical points, such as maxima and minima. ▪ Use integration to calculate areas and solve other problems in the natural sciences and engineering.
Expected Outcomes	At the end of the course, students will be able to recognize these basic concepts: ☐ Developing analytical skills: Students will be able to interpret and analyze mathematical functions accurately. ☐ Mastering derivative techniques: They will know how to calculate and use derivatives to identify maxima, minima, and the behavior of functions.



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	☐ Applying integration: They will master integration techniques and will know how to apply this knowledge to calculating areas. ☐ Increasing problem-solving skills: Students will be able to solve complex problems and apply calculus concepts in practical situations and in various fields such as physics and engineering..
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FUNDAMENTAL CONCEPTS

- Function
- Limit
- Continuity
- Derivation
- Integration

Week	COURSE TOPICS	Reference Literature	Teaching Methodology
I.	Topic 1 - Introduction to the course syllabus. Introduction to the objectives and basic concepts of this course and its teaching requirements. Topic 2 - Functions and mathematical models. Injectivity, surjectivity and bijectivity. Topic 3 - Functions defined by parts, even or odd functions. Seminar 1 - Functions and mathematical models. Injectivity, surjectivity and bijectivity. Seminar 2 - Functions defined by parts, even or odd functions.	<i>Syllabys MAT 154 E</i> [1] page. 10-13 [1] page. 24-38	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
II.	Topic 4 – Monotone functions. Topic 5 – Algebraic functions.. Topic 6 – Transcendent functions. Seminar 3 - Monotone functions. Seminar 4 - Algebraic functions, Transcendent functions.	[1] page. 38-41 [1] page. 42-48 [1] page. 49- 54	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
III.	Topic 7 – Transformations of functions. Topic 8 – Combinations of functions. Topic 9 – Inverse functions. Seminar 5 - Transformations and Combinations of functions. Seminar 6 - Inverse functions.	[1] page. 55-61 [1] page. 62-70 [1] page. 71-80	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
IV.	Topic 10 – The Tangent and velocity Problems. Topic 11 – The limit of a function. Topic 12 – One-sided limits and infinite limits. Seminar 7 - Limit of functions. Seminar 8 - One-sided limits and infinite limits.	[1] page. 81-86 [1] page. 87-93 [1] page. 94-100	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour



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Week	COURSE TOPICS	Reference Literature	Teaching Methodology
V.	<i>Topic 13 – The precise definition of the limit..</i> <i>Topic 14 – Rules of the limits.</i> <i>Topic 15 – Rules of the limits.</i> <i>Seminar 9 - Rules of the limits.</i> <i>Seminar 10 - Rules of the limits.</i>	[1] page. 104-105 [1] page. 106-110 [1] page. 111-116	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
VI.	<i>Topic 16 – Continuity.</i> <i>Topic 17 – Limits at infinite points. Horizontal asymptotes.</i> <i>Topic 18 – Infinite limits at infinite points.</i> <i>Seminar 11 - Continuity.</i> <i>Seminar 12 - Limits at infinite points.</i>	[1] page. 118-130 [1] page. 130-136 [1] page. 136-142	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
VII.	<i>Topic 19 – Tangents, speeds and rates of change..</i> <i>Topic 20 – Definition of the derivative. Interpretation of the derivative as a ratio</i> <i>Topic 21 – The derivative as a function.</i> <i>Seminar 13 - The derivative as a function.</i> <i>Seminar 14 - The derivative.</i>	[2] page. 137 – 142 [1] page. 143-149 [1] page. 150-156	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
VIII.	<i>Topic 22 – Derivation of polynomial and exponential functions.</i> <i>Topic 23 – The product and quotient rules</i> <i>Topic 24 – Derivatives of trigonometric functions</i> <i>Seminar 15 - Derivation of polynomial and exponential functions.</i> <i>Seminar 16 - Exercises on the derivative of product and ratio.</i>	[1] page. 173-181 [1] page. 184-190 [1] page. 191-197	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour



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Week	COURSE TOPICS	Reference Literature	Teaching Methodology
IX.	<i>Topic 25 – The chain rule</i> <i>Topic 26 – Implicit differentiation. Derivates of higer order.</i> <i>Topic 27 – Derivatives of logarithmic functions</i> <i>Seminar 17- Derivation of trigonometric functions.</i> <i>Seminar 18 - The chain rule.</i>	[1] page. 198-207 [1] page. 209-217 [1] page. 208-223	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
X.	<i>Topic 28 – Linear approximations and differentials.</i> <i>Topic 28 – Hyperbolic functions and thier derivates.</i> <i>Topic 30 – Maximum and minimun value.</i> <i>Seminar 19 - Derivation of logaritmic functions.</i> <i>Seminar 20 – implicit differentiation. Hyperbolic function.</i>	[1] page. 250-256 [1] page. 257-263 [1] page. 274-282	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
XI.	<i>Topic 31 – The mean value theorem.</i> <i>Topic 32 – How derivatives affect the shape of a graph.</i> <i>Topic 33 – Indeterminate Forms and L'Hospital's Rule.</i> <i>Seminar 21 - Maximum and minimum value.</i> <i>Seminar 22 - The mean value theorem.</i>	[1] page. 284-289 [1] page. 290-300 [1] page. 301-309	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
XII.	<i>Topic 34 – Summary of curve sketching.</i> <i>Topic 35 – Optimization problems.</i> <i>Topic 36 – Newton's Method.</i> <i>Seminar 23 - How derivatives affect the shape of a graph.</i> <i>Seminar 24- Indeterminate Forms and L'Hospital's Rule.</i>	[1] page. 310-318 [1] page. 325-337 [1] page. 338-350	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hours
XIII.	<i>Topic 37 – Antiderivatives.</i> <i>Topic 38 – Areas and Distances.</i> <i>Topic 39 – The Definite Integral.</i> <i>Seminar 25- Summary of curve sketching.</i> <i>Seminar 26- Optimization problems. Newton's Method.</i>	[1] page. 344-350 [1] page. 360-370 [1] page. 371-379	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour
XIV.	<i>Topic 40 – Properties of definite integral.</i> <i>Topic 41 – The Fundamental Theorem of Calculus.</i> <i>Topic 42 – Indefinite Integrals.</i> <i>Seminar 27– Areas and distances.</i> <i>Seminar 28 – Definite integral.</i>	[1] page. 379-384 [1] page. 386-396 [1] page. 397-406	Lecture 1 hour Lecture 1 hour Lecture 1 hour Seminar 1 hour Seminar 1 hour



KNOWLEDGE ASSESSMENT							
ATTENDANCE		Attendance for lectures and seminars is mandatory at 75%. Otherwise, the student loses the right to take the exam. Absences are the personal responsibility of the student, as are any missed assignments or tests. A student who has less than 75% attendance for the period relevant to any partial exam, during which they will be tested, will not be allowed to take the corresponding exam and will be graded with an M (Missing). If the student has attended the course but does not show up for the next exam, they will be graded NP (Not Present).					
CONTINUOUS ASSESSMENT	Assessment Method	Assessment Time	Learning Topics to be Assessed	Maximum Points	Knowledge Testing Method	Test Content	
	Partial Exam	Week 7-8	1-15	25 points	Written exam	Concepts and exercises	
	Final Exam	End of the semester	16-45	60 points	Written exam	Concepts and exercises	
	Continuous Assessment* (Course Assignment*)	During the semester	-	15 points	Written report and oral presentation	Exercises	
	* Continuous Assessment – The student will realize a project, that will start at the beginning of the semester.						
	The conversion of points to the final grade is as follows:						
	0 - 40 points	41 - 50 points	51 - 60 points	61 - 70 points	71 - 80 points	81 - 90 points	91 - 100 points
	4	5	6	7	8	9	10
LITERATURE							



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Primary literature	[1] J. Stewart, Single variable calculus: Early transcendentals, 7th Edition, Brooks/Cole, Cengage Learning, 2012 ISBN 13: 978-0-538-49790-9
Recommended literature	[2] Thomas' Calculus, Including second Order Differential Equations, 11-th edition.
FINAL REMARKS FROM THE COURSE INSTRUCTOR	
Provisions	Students are expected to develop values and an ethics that reflect their interests and behavior from a professional perspective. Students must respect individual differences, be cooperative, and in accordance with ethical rules, they should respect ethnic differences and assist individuals with disabilities with inclusive and supportive attitudes.
Delays	Delays in lectures and seminars will not be tolerated.
Academic integrity and copyright	Each test or written work must be completely individual and original. Plagiarism (mixed combinations) or theft of information through various means will not be allowed.

HEAD OF DEPARTMENT OF COMPUTER SCIENCES
Dr. Alketa HYSO