

**Department of Mathematics**

**Course Profile**

<b>Course Number: MATH101</b>	<b>Course Title: Calculus I</b>
<b>Required / Elective:</b> Required	<b>Prerequisites:</b> None
<b>Catalog Description:</b> Functions, graphs, limits and continuity. Derivatives, derivative rules, chain rule, implicit differentiation. Applications of derivatives. Indefinite integrals, integration by substitution, definite integrals. Applications of integrals. Transcendental functions.	<b>Textbook / Required Material:</b> Thomas' Calculus Early Transcendentals 11 <sup>th</sup> Edition / Weir, Hass, Giordano, Addison - Wesley Publishing Company, 2006
<b>Course Structure / Schedule: (3+0+2) 4 / 7 ECTS</b>	
<b>Extended Description:</b> Functions and Graphs; Identifying Functions; Combining Functions; Exponential Functions. Inverse Functions and Logarithms; Rates of Changes and Limits; Calculating Limits Using the Limit Laws. The Precise Definition of a Limit; One-Sided Limits and Limits at Infinity; Infinite Limits and Vertical Asymptotes. Continuity, Intermediate Value Theorem. Tangents and Derivatives; The Derivative as a Function; Differentiation Rules. The Derivative as a Rate of Change; Derivatives of Trigonometric Functions; The Chain Rule and Parametric Equations. Implicit Differentiation; Derivatives of Inverse Functions and Logarithms; Inverse Trigonometric Functions. Linearization and Differentials; Extreme Values of Functions; The Mean Value Theorem. Monotonic Functions and the First Derivative Test; Concavity and Curve Sketching. Indeterminate Forms and L'Hopital's Rule. Antiderivatives; Sigma Notation and Limits of Finite Sums. The Definite Integral; The Fundamental Theorem of Calculus. Indefinite Integrals and the Substitution Rule; Substitution and Area Between Curves. Volumes by Slicing and Rotation About an Axis. Volumes by Cylindrical Shells; Lengths of Plane Curves.	
<b>Design content:</b> None	<b>Computer usage:</b> No particular computer usage required.
<p><b>Course Outcomes:</b> By the end of the course the students should be able to:</p> <ol style="list-style-type: none"> <li>1. prepared for Calculus II and calculus-based subjects in science and engineering [1, 2, 3, 7],</li> <li>2. have a knowledge of the fundamental definitions and theorems of elementary calculus [1,2,3,6,7] ,</li> <li>3. complete routine derivations associated with calculus, recognize elementary applications of differential and integral calculus, and be literate in the language and notation of calculus [2, 3],</li> <li>4. have the skills of appropriate level for modeling and solving complicated mathematical problems arising in various natural sciences as well as in electronic and computer sciences [3].</li> </ol> <p><b>[1] Demonstrate the ability of solving problems by using techniques from calculus, linear algebra, differential equations, probability and statistics,</b></p> <p><b>[2] demonstrate knowledge of mathematics and mechanics to construct, analyze and interpret real world problems,</b></p>	

**[3] Demonstrate the ability to apply mathematics to the solutions of problems,**  
**[6] have a basic knowledge of the main fields of mathematics and mechanics, including differential equations, elasticity theory, fluid mechanics,**  
**[7] Have an ability to function both independently and as a member of a multidisciplinary team.**

**Recommended reading:**

Calculus with analytic geometry / C.H. Edwards, Jr., David E. Penney. Englewood Cliffs, N.J., Prentice Hall, c1994. 4th ed.

Calculus with analytic geometry / Howard Anton; in collaboration with Albert Herr. New York, Wiley, c1995. 5th ed.

Calculus with analytic geometry / Richard A. Silverman. Englewood Cliffs, N.J., Prentice-Hall, c1985.

**Teaching methods:** Lectures, tutorials, appropriate handouts which provide students with graphs or formulas.

**Assessment methods:** Midterm exams, final exam

**Student workload:**

Pre-reading .....	8 hrs
Lectures .....	45 hrs
Tutorials .....	30 hrs
Preparatory reading .....	25 hrs
Problem solving and homework .....	40 hrs
Discussion.....	20 hrs
Midterm and final exams.....	7 hrs
<b>TOTAL .....</b>	<b>175 hrs ..... to match 25x7 ECTS</b>

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