Department of Mathematics

Course Profile

Course Number: MATH101	**Course Title: Calculus I**
Required / Elective: Required	**Prerequisites:** None
Catalog Description: 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.	**Textbook / Required Material:** Thomas' Calculus Early Transcendentals 11th Edition / Weir, Hass, Giordano, Addison - Wesley Publishing Company, 2006
Course Structure / Schedule: (3+0+2) 4 / 7 ECTS	
Extended Description: 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.	
Design content: None	**Computer usage:** No particular computer usage required.

Course Outcomes: By the end of the course the students should be able to:

1. prepared for Calculus II and calculus-based subjects in science and engineering **[1, 2, 3, 7],**
2. have a knowledge of the fundamental definitions and theorems of elementary calculus **[1,2,3,6,7]** ,
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],**
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].**

[1] Demonstrate the ability of solving problems by using techniques from calculus, linear algebra, differential equations, probability and statistics,

[2] Demonstrate knowledge of mathematics to construct, analyze and interpret mathematical models,

[3] Demonstrate the ability to apply mathematics to the solutions of problems,

[6] Have a basic knowledge of the main fields of mathematics, including analysis, algebra, differential equations, differential geometry,

[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
TOTAL	**175 hrs …… to match 25x7 ECTS**

Prepared by: Banu Uzun	Revision Date: 08.02.2010