



**University at Buffalo**

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### **SAMPLE SYLLABUS**

This document is published only as an indication of what is typically taught in this course.

Instructors have the responsibility of deciding on the topics to be omitted, additional topics to be included, and the emphasis, ordering, and pacing of presentation of topics.

# **MTH 121: Survey of Calculus and Its Applications I**

**Number of Course Credits: 4**

## **Course Description**

For students in social, biological, and management sciences. Limits, continuity, differentiation of algebraic and exponential functions; applications; introduces integration.

## **Required Text(s) & Materials**

L. Goldstein, D. Lay, D. Schneider, and N. Asmar, Calculus and Its Applications, 15<sup>th</sup> edition.

## **Prerequisites**

Pre-Req: 70/100 or better on both Fundamentals & Algebra parts of the Math Readiness Assessment, or C or better in ULC148, MTH 108, MTH 113, MTH 114 MTH 115, a D or better in MTH 121, MTH 131, or MTH 141 or 3 on AP Calculus or 4 or 5 on AP Pre-Calculus.

## **Notes**

- This is the first course in a 2-semester sequence of calculus for students of social, biological, and management sciences.
- This course is a controlled enrollment (impacted) course. Students who have previously attempted the course and received a grade other than W may repeat the course in the summer or winter; or only in the fall or spring semester with a petition to the College of Arts and Sciences Deans' Office.

## Learning Outcomes

At the end of this course a student will be able to:	Method of Assessment
<ul style="list-style-type: none"> <li>- recognize linear, polynomial, rational, and power functions, understand their basic properties and know how to evaluate them</li> <li>- compute zeros of quadratic functions</li> </ul>	HW #1 Exam 1 Final Exam
<ul style="list-style-type: none"> <li>- compute limits of algebraic functions graphically, numerically, and algebraically</li> <li>- interpret the derivative graphically as the slope of the tangent to the graph of a function and algebraically as the limit of difference quotients</li> <li>- compute derivatives of basic algebraic functions</li> </ul>	HW #2, 3 Exam 1 Final Exam
<ul style="list-style-type: none"> <li>- use limits and derivatives to construct, analyze, and interpret the graph of a function</li> <li>- use derivatives to analyze and solve applied optimization problems</li> </ul>	HW #4, 5 Exam 1 Final Exam
<ul style="list-style-type: none"> <li>- compute the first and higher order derivatives using derivative rules, including the chain rule and implicit differentiation</li> </ul>	HW #6 Exam 2 Final Exam
<ul style="list-style-type: none"> <li>- simplify algebraic expressions involving exponents and logarithms</li> <li>- compute derivatives of exponential and logarithm functions</li> <li>- use exponential functions and logarithms in problems involving compound interest rates, and exponential growth and decay</li> </ul>	HW #7, 8, 9 Exam 2 Final Exam
<ul style="list-style-type: none"> <li>- compute indefinite and definite integrals of basic functions using anti-derivative rules and the fundamental theorem of calculus</li> <li>- represent area as a definite integral and interpret the result in applications</li> </ul>	HW #10 Final Exam
<ul style="list-style-type: none"> <li>- Choose appropriate methods or models for a given problem, using information from observation or knowledge of the system being studied.</li> <li>- Employ quantitative methods, mathematical models, statistics, and/or logic to solve real-world problems beyond the level of basic algebra.</li> <li>- Identify common mistakes and/or limitations in a) empirical and/or deductive reasoning, and b) mathematical, quantitative, and/or logical problem solving.</li> <li>- Interpret mathematical models, formulas, graphs, and/or tables, to draw inferences from them, and explain these inferences.</li> </ul>	HW #1-10 Exam 1 Exam 2 Final Exam

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## Course Schedule

Week	Sections	Topics	Exams
1	0.1-0.5	Functions. Some important functions. Algebra of functions. Zeros - the quadratic formula and factoring. Exponents and power Functions.	
2	1.1-1.5	Slope of a straight line. Slope of a curve at a point. Limits and the derivative. Differentiability and continuity.	
3	1.6-1.8	Some rules for differentiation. More about derivatives. The derivative as a rate of change.	
4	2.1-2.3	Describing graphs of functions. First and second derivative rules. Curve sketching (introduction).	
5	2.4-2.6	Curve sketching (conclusion). Optimization problems.	
6	2.7	Applications of calculus to business and economics.	Exam 1
7	3.1-3.3	Product and quotient rules. Chain and general power rules. Implicit differentiation and related rates.	
8	4.1-4.3	Exponential functions. The exponential function $e^x$ . Differentiation of exponential functions	
9	4.4-4.6	The natural logarithm. The derivative of $\ln x$ . Properties of the natural logarithm function.	
10	5.1-5.3	Applications of the natural exponential and natural logarithm functions.	
11	5.4	Further applications in business and economics.	Exam 2
12	6.1-6.2	Antidifferentiation. The definite integral and net change of a function.	

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Week	Sections	Topics	Exams
13	6.3-6.4	The definite integral and area under a graph. Areas in the xy-plane.	
14	6.5	Applications of the definite integral.	
15		Cumulative final exam during final exams week	Final Exam

## Exam Schedule

Date	Subject
Week 6	Exam 1
Week 11	Exam 2
Week 15	Final Exam