University at Buffalo
The State University of New York
Department of Mathematics
Office of Undergraduate Studies
233 Mathematics Building
E-mail: math-undergrad@buffalo.edu
Ph: (716) 645-8785

SAMPLE SYLLABUS
This document is published as an indication of the core content of the course. Instructors have responsibility of deciding on additional topics to be included, and the emphasis, ordering, and pacing of presentation.

Course Number: **MTH 153**

Course Title: **Honors Calculus I**

Credit Hours: **4 credits (includes one hour of recitation per week)**

Textbook: **Thomas, *Calculus, Early Transcendentals,* 14th ed.**

Prerequisites: A grade of C or better in ULC 148, MTH 115, or any UB Calculus course, or a score of 76 or better on the ALEKS placement test is required to register. For Honors, it is recommended to have a grade of B+ or better.

Notes: This is the first part of a 3-semester honors sequence for intended math majors or for others with suitable preparation. Emphasizes proofs and concepts of calculus. Note: Credit will not be given for both MTH 153 and MTH 121/131/141. Credit for MTH 153 may be given in addition to AP Calculus credit for MTH 141.

This schedule is written for 13 weeks of instruction. In a typical semester there are 14 teaching weeks. Thus some flexibility is built in.

Week	Sections	Topics
1	2.1-2.3	The tangent and velocity problems. Limit of a function. Calculating limits using limit laws.
2	2.4-2.5	The precise definition of a limit. Continuity.
3	2.6-2.7	Limits at infinity; horizontal asymptotes. Derivatives and rates of change.
4	2.8, 3.1a, 1.4	The derivative as a function. Derivatives of polynomials. Exponential functions.
5	1.5	Inverse functions and logarithms. Inverse trigonometric functions. **Midterm Exam 1**
6	3.1b, 3.2	Derivatives of exponential functions. The product and quotient rules.
7	3.3-3.5	Derivatives of trigonometric functions. The chain rule. Implicit differentiation. Derivatives of inverse trigonometric functions.
8	3.6, 3.8, *3.9*, 3.10, *3.11*	Derivatives of logarithmic functions. Exponential growth and decay. *Related rates (option)*. Linear approximation and differentials. . *Hyperbolic functions (option)*.
9	4.1-4.3	Maximum and minimum values. The mean value theorem. Derivatives and the shape of a graph.
10	4.4-4.5	Indeterminate forms and L'Hospital's rule. Summary of curve sketching. **Midterm Exam 2**
11	4.7, *4.8*, 4.9	Optimization problems. *Newton's method (option)*. Antiderivatives.
12	5.1-5.3	Areas and distances. The definite integral. The fundamental theorem of calculus.
13	5.4-5.5	Indefinite integrals and the Net Change Theorem. The substitution rule.

Student Learning Outcomes for
MTH 153 Honors Calculus I

Assessment measures: weekly homework assignments, 2 midterm exams, final exam.

At the end of this course a student will be able to:	Assessment
– define the limit of a function at a point – evaluate limits using the definition and using algebraic properties of limits – evaluate limits of functions at infinity and interpret them as horizontal asymptotes – define continuity and determine whether or not a function is continuous at a point and on an interval	HW #1, 2, 3 Midterm 1 Final Exam
– recognize exponential, logarithmic, and inverse trigonometric functions, sketch their graph and use their basic properties in computations	HW #4, 5 Midterm 1 Final Exam
– define derivative and interpret it as the slope of a tangent to the graph of a function – compute derivatives of polynomial, exponential, logarithmic, trigonometric, and inverse trigonometric functions – compute derivatives using derivative rules, including the chain rule and implicit differentiation	HW #4, 6, 7, 8 Midterm 2 Final Exam
– use derivatives to compute linear approximations of functions – find critical points, minima and maxima of a function using its first and second derivatives – use derivatives to solve optimization problems – use derivatives to sketch graphs of functions – state the mean value theorem and apply it in computations – apply L'Hospital's rule to compute limits of functions – use derivatives to solve practical problems involving rectilinear motion.	HW #8, 9, 10, 11 Midterm 2 Final Exam
– find the area of a region bounded by a curve and the x-axis using rectangles and limits. – find the area of a region bounded by a curve and the x-axis using indefinite integrals and the fundamental theorem of calculus – use integrals to solve practical problems involving rectilinear motion.	HW #11, 12 Final Exam
– Choose appropriate methods or models for a given problem, using information from observation or knowledge of the system being studied. – Employ quantitative methods, mathematical models, statistics, and/or logic to solve real-world problems beyond the level of basic algebra. – Identify common mistakes and/or limitations in a) empirical and/or deductive reasoning, and b) mathematical, quantitative, and/or logical problem solving. – Interpret mathematical models, formulas, graphs, and/or tables, to draw inferences from them, and explain these inferences.	HW #1-10, Midterm 1 Midterm 2 Final Exam

The table below indicates to what extent this course reflects each of the learning objectives of the undergraduate mathematics program. A description of learning objectives is available online at http://www.buffalo.edu/cas/math/ug/undergraduate-programs.html.

Computational Skills:	Analytical Skills:	Practical Problem Solving:	Research Skills:	Communication Skills:
extensively	little or not at all	moderately	little or not at all	little or not at all