

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 154**

Course Title: **Honors Calculus II**

Credit Hours: **4**

Textbook: Varies by instructor and semester.

Prerequisites: MTH 153 with recommended grade of C or higher, or MTH 141 with B+ or higher.
MTH 121 is usually not adequate preparation for MTH 154.

Notes: A more theoretically oriented version of College Calculus II. Differentiation and integration of transcendental functions; infinite sequences; series and power series; integration methods. Topics enhance those of MTH 142 and concepts are often developed with proofs. This is designed to be a challenging course for bright students, including students who might be interested in graduate work in the sciences, engineering, and mathematics. Note: Credit for MTH 154 may be given in addition to AP Calculus credit for MTH 142. Credit will not be given for both MTH 154 and MTH 122/142.

Week	Sections	Topics
1	6.1, 6.2	Areas between curves. Volumes.
2	6.3, 6.4, 6.5	Volumes by cylindrical shells. <i>Work (option)</i> . Average value of a function.
3	7.1, 7.2	Integration by parts. Trigonometric integrals.
4	7.3, 7.4	Trigonometric substitution. Integration of rational functions by partial fractions (<i>omit Case IV</i>).
5	7.5, 7.6	Strategy for integration. Integration using tables and computer algebra systems. Midterm Exam I
6	7.7, 7.8	Approximate integration. Improper integrals.
7	8.1, 8.2, 8.3, 8.4	Arc length. Area of a surface of revolution. <i>Applications to physics and engineering (option)</i> . <i>Applications to economics and biology (option)</i> .
8	8.5, 10.1, 10.2	Probability. Curves defined by parametric equations. Calculus with parametric curves.
9	10.3, 10.4	Polar coordinates. Areas and lengths in polar coordinates.
10	10.5, 10.6	<i>Conic sections (option)</i> . <i>Conic sections in polar coordinates (option)</i> . Midterm Exam 2
11	11.1-11.4	Sequences. Series. The integral test and estimates of sums. The comparison tests.
12	11.5-11.8	Alternating series. Absolute convergence and the ratio and root tests. Strategy for testing series. Power series.
13	11.9-11.11	Representations of functions as power series. Taylor and Maclaurin Series. Applications of Taylor polynomials (<i>omit applications to physics</i>).

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: extensively	Analytical Skills: little or not at all	Practical Problem Solving: moderately	Research Skills: little or not at all	Communication Skills: little or not at all
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Student Learning Outcomes for MTH 154 Honors Calculus II

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

At the end of this course a student will be able to:	Assessment
<ul style="list-style-type: none"> - interpret the area enclosed between curves as a definite integral and compute its value - express the area of a surface of revolution as a Riemann sum of rings, convert it to a definite integral form and compute its value. 	HW #1, 2 Midterm 1 Final Exam
<ul style="list-style-type: none"> - compute indefinite and definite integrals using integration by parts, by substitution (including trigonometric substitutions) and using decomposition of rational expressions into partial fractions 	HW #3,4, Midterm 1, Final Exam
<ul style="list-style-type: none"> - determine convergence of improper integrals with discontinuities in their domain or with infinite limits of integration and compute their values 	HW #6, Midterm 2 Final Exam
approximate values of definite integrals numerically using the midpoint rule, the trapezoidal rule, and Simpson's rule; compute error bounds for these approximations	HW #6, Midterm 2 Final Exam
<ul style="list-style-type: none"> - compute the length of a curve segment from its parametric representation - describe curves and regions of the xy-plane in polar coordinates and use this description to compute lengths and areas 	HW #7, 8, 9 Midterm 2 Final Exam
<ul style="list-style-type: none"> - use the concept of the limit at infinity to determine whether a sequence of real numbers is bounded and whether it converges or diverges - interpret the concept of a series as the sum of a sequence, and use the sequence of partial sums to determine convergence of a series - distinguish between conditional convergence and absolute convergence of infinite series and be aware of the consequences of reordering terms of a conditionally converging infinite series 	HW #11, 12 Final Exam
<ul style="list-style-type: none"> - decide whether and to what value an infinite geometric series converges - use comparison, root, ratio, and integral test to investigate whether a given infinite series is convergent - decide whether an alternating series converges from the limit and monotonic decrease of the sequence of absolute values of its terms 	HW #11, 12 Final Exam
<ul style="list-style-type: none"> - interpret a converging power series as a function - compute the derivatives and antiderivatives of a functions represented by power series - determine the Taylor series of the n^{th} order and determine an upper bound on its remainder. - manipulate Taylor series by substitution and (anti-)differentiation to obtain expansions for other functions 	Final Exam
<ul style="list-style-type: none"> - 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