

## Math 156 Course Description

Math 156 (Applied Honors Calculus II) is designed for engineering and science students who received a score of 4 or 5 on the Advanced Placement Calculus exam (AB or BC). Math 156 is an alternative to Math 116 (Calculus II).

**Goals:** A key goal of Math 156 is to provide students with the calculus background they need for later courses in engineering, science, and math. Math 156 strikes a balance between theory and applications. Theorems are stated carefully and some proofs are sketched, but technical details are omitted. Examples are given to illustrate the theory. There is a close connection between lectures, homework, and exams. The course emphasizes calculating skill, conceptual understanding, and critical thinking.

**Organization:** The class meets four times per week (MTuWF) in fifty-minute class sessions. There are weekly homework assignments with problems from the text as well as customized problems. Students are encouraged to work together on homework, but each student is required to write up and submit their own solutions. There are two midterm exams and a final exam. Review sheets with sample problems are distributed to help students prepare for the exams.

**Syllabus:** Math 156 covers integration, infinite series, and elementary differential equations. The course starts by reviewing the definition of the integral as a limit of Riemann sums. Next the fundamental theorem of calculus is derived and improper integrals are discussed. Standard applications from the AB syllabus are omitted (e.g. volumes of revolution) in favor of applications that many of the students haven't seen before (e.g. work, center of mass, arclength, surface area, probability density functions). The standard methods of integration are discussed (e.g. integration by parts, method of partial fractions, trigonometric substitution), but they are presented as they arise in concrete problems (e.g. finding the arclength of a parabola). Series are discussed in depth, including the definition of convergent and divergent series, geometric series, alternating series, power series, Taylor series, and binomial series. First order differential equations are discussed as an application of integration; topics include linear equations (e.g. Newton's law of cooling/heating), nonlinear equations (e.g. logistic equation), and the notion of stable and unstable equilibrium points. There is brief exposure to advanced topics such as the Bessel function, Gamma function, error function, fractal sets, Laplace transform, multipole expansion, polar coordinates, complex numbers, and Euler's formula. Students are introduced to the MAPLE software package for symbolic computing and graphics.

**Course website:** <http://www.math.lsa.umich.edu/~zieve/math156.html>