Math 156 - Applied Honors Calculus II - 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**: Math 156 provides students with the calculus they need for later courses in engineering, science, and math. The course emphasizes calculating skill, conceptual understanding, and critical thinking. 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.

**Organization**: The class meets four times per week (MTuWF) in fifty-minute 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 must 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 exams. The instructors use lecture notes developed in previous years. There is a close connection between lectures, homework, and exams. An interactive classroom environment is encouraged.

**Syllabus**: Math 156 covers integration, infinite series, and elementary differential equations. The course starts by recalling the definition of the definite integral as a limit of Riemann sums. The Fundamental Theorem of Calculus is derived and improper integrals are discussed. Standard applications from the AB syllabus are omitted (e.g. volume of revolution) in favor of applications the students are less likely to have 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, partial fractions, trigonometric substitution), but they're presented as they arise in specific problems (e.g. finding the arclength of a parabola). Series are discussed, including the definition of a convergent 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 (exponential growth/decay, Newton's law of cooling/heating), nonlinear equations (logistic equation), and the notion of stable and unstable equilibrium points. There is brief exposure to special topics including Bessel function, Gamma function, error function, fractal sets, Laplace transform, multipole expansion, polar coordinates, complex numbers, and Euler's formula. Students are introduced to MAPLE, a software tool for symbolic computing and graphics.

**Course website**: www.math.lsa.umich.edu/∼krasny/math156.html

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