NORTHERN ARIZONA UNIVERSITY
College of Engineering, Forestry & Natural Sciences

Department of Mathematics & Statistics
Adel Mathematics Building
PO Box 5717
Flagstaff, AZ 86011-5717
928-523-3481
928-523-5847 fax
www.nau.edu

MAT 137 CALCULUS II
MASTER SYLLABUS

CATALOG DESCRIPTION

MAT 137 Calculus II (4). Concepts, techniques, and applications of integration, differential equations, Taylor polynomials, infinite series. Letter grade only. Course fee required.
Prerequisite: MAT 136 or MAT 136H with a grade greater than or equal to C

LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Integrate a function, including transcendental functions, using parts or other appropriate techniques.
2. Use a definite integral of a region to obtain the area enclosed between curves and compute its value.
3. Apply basic anti-differentiation techniques to selected problems arising in various fields such as physical modeling, economics and population dynamics.
4. Use a definite integral to obtain the volume of revolution of a region around a given axis and compute its value.
5. Express the length of a curve as a definite integral and compute its value.
6. Determine convergence of improper integrals with discontinuities in their domain or infinite limits of integration.
7. Solve first order differential equations using separation of variables and estimate the solution using Euler's method. Apply the ideas of differential equations to model real world scenarios such as population growth or falling bodies.
8. Determine whether a sequence of real numbers converges or diverges.
9. Express understanding of the concept of a series and use the sequence of partial sums to determine convergence of a series.
10. Decide if and to what value an infinite geometric series converges.
11. Determine if a series converges or diverges by applying an appropriate test including tests for p-series, comparison test, alternating series test, ratio test, and root test.
12. Distinguish between absolute and conditional convergence of a series.
13. Interpret a converging power series as a function.
14. Determine and apply the Taylor series for a function.
15. Perform vector arithmetic including dot and cross products and apply these products to geometric and simple physics situations.
16. Find equations of lines and the equation of a plane.

COURSE CONTENT

1. Review of integrals (2-3 days)
2. Techniques of Integration (8-10 days)
   Integration by parts, integrals involving transcendental functions, integral tables, improper integrals, approximation of definite integrals.
3. Applications of Integrals (12-14 days)
   Average function value, area between curves, volumes of solids, work, arc length, hydrostatic pressure.
4. Introduction to parametric equations and curves (1-2 days)
5. Differential equations (4-6 days)
   Separable equations, first order modeling, Euler's method.
6. Sequences and series (14-17 days)
   Sequences, geometric series, integral test, comparison test, alternating series test, absolute convergence, ratio test, power series, Taylor's series, applications.
7. Vectors (6-8 days)
   Vector arithmetic, dot product and projections, cross product, 3D coordinates, equations of lines, equations of planes.

If time permits other topics include: Trigonometric substitutions, partial fraction decomposition, surface area, center of mass of an object, probability applications, direction fields of differential equations, or binomial series.

STRUCTURE AND APPROACH

The course will use any or all of: lecture, discussion, student presentations, in-class work, or group work. In addition students may use technology (e.g. Mathematica, or graphing calculators).

ASSESSMENT

The assessment procedures include: at least three, preferably four mid-term exams; a comprehensive final exam (minimum 20%); and some selection of (a) homework assignments (WebWork or other), (b) in-class work, and (c) quizzes.

CURRENT AND RECENT TEXTS

1. Whitman Online Text: http://www.whitman.edu/mathematics/multivariable/
2. Paul's Online Math Notes: http://tutorial.math.lamar.edu/Classes/CalcII/CalcII.aspx
3. Stewart: *Calculus – Concepts and Contexts*