MAT 169 Calculus III

2004-2005 USM Bulletin Description: 3 hrs. Prereauisite: MAT 168. Sequences, series including Taylor series and power series, parametric equations and polar coordinates in calculus, vectors and the geometry of space.

Text: Calculus, 2nd Ed., Robert T. Smith and Roland B. Minton, McGraw-Hill, 2002

Calculus is perhaps the most important mathematics course for undergraduate students. The instructor strongly hopes that the students attend the class regularly and consistently, do their homework problems, ask questions in and outside classroom, and use the instructor's office hours. The students should go over the text and the class notes after each class before they do the assigned homework problems. The instructor will try his best to make the students understand the material and enjoy the study of calculus.

Instructor: Dr. Jiu Ding, Southern Hall Room 312; Office: 266-4291 (Department: 266-4289); Email: Jiu.Ding@usm.edu.

Office Hours: One hour each week day; and by appointment

Course Goals: To provide basic methods in the study of series for both the convergence analysis and the computation of the sum of power series, representation of plane or space curves and surfaces in space by parametric equations and polar coordinates, vector operations in three dimensional analytic geometry and their applications in the development of equations for lines and planes in space, and a solid foundation for the future study of calculus of several variables. The emphasis is also upon teaching students how to prove important theorems based on definitions, observations of facts, properties of the related mathematics terms, and mathematical reasoning.

Tests: Four tests with 100 points each and one 200 points final exam. The date for each test will be announced in the class.

Grades: The class grade is based on the student's performance on the tests and the final exam. The class grade is assigned based on

- 90-100: A
- 80-90: B
- 70-80: C
- 60-70: D

- 0-60: F

Grades which fall on a grade boundary are decided at the discretion of the instructor based on the participation of the students in class.

Course Overview: The intent is to cover Chapter 8 through Chapter 10 of the text. Topics of the course include:

1. Sequences and infinite series.
2. Convergence tests for positive series.
3. Alternating series. Absolute convergence and the ratio test.
4. Power series and Taylor series.
5. Parametric equations and polar coordinates. Arc length and surface area in parametric equations. Conic sections in polar coordinates.
6. Vectors and geometry of space. Vector operations. The dot product and cross product. Lines and planes in space. Surfaces in Space.

Assessment: The course is taught in a manner which combines the presentation of basic theory behind the methods and the practical application of such methods to interesting real world problems. Students learn fundamental knowledge of the basic integration theory and methods through the class instruction and the homework assignments in which the art of proofs is taught and appreciated so that they can use the learned knowledge to investigate mathematical conjectures arising from observations and apply a variety of appropriate strategies to solve such problems. The department's computational laboratory installed with Maples and other symbolic computational softwares will be stressed as an additional tool to help strengthen the understanding of the class material.

After finishing the course, the students can demonstrate a conceptual understanding of basic concepts of integration and can use such concepts and methods to solve real world problems from mathematical modeling in physical, social, and mathematical sciences. They can apply concepts of college algebra, trigonometry, two and three dimensional analytic geometry, and the parametric representation of curves and surfaces to solve problmes in calculus. They can also use techonogical tools and symbolic computation sofrware to further explore fundamental concepts of calculus for the study of the calculus sequence.

The instructor will also present the historical development of algebraic representation of curves and surfaces from antient mathematicians in different countries to reflect the contribution of various cultures and peoples in the formation of modern mathematics.

The course asssessment is based on the extensive homework assisgments and four in-class tests plus the comprehensive final exam.

Attendance: Class attendance is a necessity in order to complete the course successfully. Please do not miss any classes unnecessarily.

Assignments: There will be homework assignments at each class. The homework may involve material not covered in the lectures. Students are encouraged to finish the homework independently and can seek the help from the instructor during office hours or via email.

Exams: The in-class exams and the final exam will be closed book exams, taken without notes of any kind. The student will be expected to know the fundamental concepts, basic facts, properties, and methods, and to understand the definitions, theorems, proofs, and techniques emphasized by the instructor.

ADA: If a student has a disability that qualifies under the Americans with Disabilities Act and requires accommodations, he/she should contact the Office of Student Services for information on appropriate policies and procedures.

Policies: No make-up tests will be given. Class attendance and preparation affect the grade directly as well as indirectly. After coverage of each section, the students are required to do the corresponding homework assignments. If the student must miss class it is the student's responsibility to consult a classmate for notes, assignments, and announcements prior to the next class meeting. Recall that missed tests may not be made up.

Academic dishonesty (as defined in the handbook) will not be tolerated. The penalty for such conduct is an F in the course for all parties involved. The students are asked to discuss with the instructor any activity of this nature that the stuents observe with the assurance that their identity will be held in confidence.

Resources: Mathematics tutors who are graduate students of mathematics are available in the Mathematics Learning Center (MLC) in Southern Hall 309. A schedule will be distributed as soon as available.

Detailed Coverage of the Course

Section 8.1. p. 622, Sequences of Real Numbers.
Section 8.2, p. 636, Infinite Series.
Section 8.3, p. 647, The Integral Test and Comparison Test.
Section 8.4, p. 658. Alternating
Section 8.5, p. 666, Absolute Convergence and the Ratio Test.

Test on Sections 8.1-8.5

Section 8.6. p. 674, Power Series.
Section 8.7. p. 682, Taylor Series.
Section 8.8, p. 695, Applications of Taylor Series.
Section 9.1, p. 722, Plane Curves and Parametric Equations.
Section 9.2, p. 732, Calculus and Parametric Equations.

Test on Sections 8.6-8.8 and 9.1-9.2

Section 9.3, p. 739, Arc Length and Surface Area in Parametric Equations.
Section 9.4, p. 746, Polar Coordinates.
Section 9.5. p. 760. Calculus and Polar Coordinates.
Section 9.6. p. 769, Conic Sections.
Section 9.7, p. Conic Sections in Polar Coordinates.

Test on Sections 9.3-9.7

Section 10.1, p. 788, Vectors in Planes.
Section 10.2, p. 798, Vectors in Space.
Section 10.3, p. 805, The Dot Product.
Section 10.4, p. 814, The Cross Product.
Section 10.5. p. 827, Lines and Planes in Space.
Section 10.6. p. 836, Surfaces in Space.

Test on Chapter 10

Comprehensive Final Exam