

**VIRGINIA STATE UNIVERSITY  
DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE  
SCHOOL OF AGRICULTURE, SCIENCE AND TECHNOLOGY  
MATH 300 - CALCULUS III - 3 sem. hours  
COURSE SYLLABUS: SPRING 2004**

**Instructor's Name:** \_\_\_\_\_

**Instructor's Office Location:** \_\_\_\_\_

**Instructor's Office Phone:** \_\_\_\_\_ **Instructor's E-mail:** \_\_\_\_\_

**Departmental Fax Number: (804) 524-5746**

**Instructor's Office Hours:**

Monday	Tuesday	Wednesday	Thursday	Friday

**COURSE DESCRIPTION:**

Indeterminate forms, L'Hopital's rule, Improper integrals, Conic sections and polar coordinates, Taylor's theorem, Taylor's polynomials, Sequences and Series, Absolute and Conditional Convergence, Differentiation and Integration of Power Series, Vectors in the Plane and Space, Quadric Surfaces, Cylindrical and Spherical Coordinates.

**COURSE PREREQUISITE: MATHEMATICS 201-CALCULUS II**

**COURSE TEXT: CALCULUS by Larson, Hostetler, and Edwards, seventh edition, 2002  
Houghton Mifflin Company, Boston, Ma.**

**LEARNING OUTCOMES, ACTIVITIES AND EVALUATION STRATEGIES:**

**KNOWLEDGE**

**The Student will:**

- 1. Know the definitions of the conic sections.**
- 2. Determine the type of conic from the value of the discriminant.**
- 3. Identify symmetry in a polar equation.**
- 4. Identify a sequence, finite limit of a sequence, infinite limit of a sequence.**
- 5. Identify the several types of series.**
- 6. Define a vector geometrically and algebraically.**
- 7. Identify three-dimensional space,  $\mathbb{R}^3$ .**

8. Identify Quadric surfaces in  $\mathbb{R}^3$ .
9. Identify cylindrical and spherical coordinate systems.
10. Define vector functions in  $\mathbb{R}^2$  and in  $\mathbb{R}^3$  as well as curves in space.

## SKILLS

The Student will:

1. Translate and rotate axes of second degree equations and identify their graphs.
2. Plot points in Polar Coordinates.
3. Change from polar coordinates to rectangular coordinates and from rectangular coordinates to polar coordinates.
4. Construct graphs in polar coordinates.
5. Find areas in polar coordinates.
6. Evaluate an improper integral of type 1 and of type 2, if it converges.
7. Write a Taylor polynomial of degree  $n$  at a point  $x_0$  for a given function.
8. Approximate using Taylor polynomial approximation.
9. Find a maximum error of a Taylor polynomial approximation.
10. Determine if a given series converges or diverges using tests for convergence.
11. Differentiate and integrate power series.
12. Write a given function as a power series.
13. Calculate the magnitude of a vector.
14. Perform addition and scalar multiplication of vectors.
15. Resolve a vector into its horizontal and vertical components.
16. Find the dot product of two vectors.
17. Find the angle between two vectors.
18. Construct graphs in  $\mathbb{R}^3$ .
19. Find the sum and scalar multiple of vectors in  $\mathbb{R}^3$ .
20. Find the direction angles of a vector.
21. Write vector equations and parametric of lines in  $\mathbb{R}^3$ .
22. Write symmetric equations for lines in  $\mathbb{R}^3$ .
23. Find the cross product of two vectors.
24. Write the equation of a plane in  $\mathbb{R}^3$ .
25. Find the points of intersection of planes.
26. Change from rectangular to cylindrical coordinates and from cylindrical to rectangular coordinates.
27. Change from spherical to rectangular coordinates and from rectangular to spherical coordinates.
28. Write Cartesian equations and parametric equations of a plane curve.
29. Obtain a Cartesian equation from the parametric equations of a curve.
30. Find the equation of the tangent line to a plane curve. Identify horizontal and vertical tangents.
31. Test a parametric curve for smoothness on an interval.
32. Differentiate and integrate vector functions.
33. Calculate a unit normal vector to a curve.
34. Find the direction of the normal vector to a plane curve.

## ABILITIES

The Student will:

1. Identify the conic sections and construct their graphs, given an equation.
2. Write equations for conic sections, given their properties.
3. Identify intermediate forms.
4. Use L'Hopital's Rule to obtain a limit.
5. Distinguish between convergent and divergent improper integrals.
6. Distinguish between convergent and divergent in a sequence.
7. Distinguish between a scalar and a vector.
8. Identify two parallel vectors; two orthogonal vectors.
9. Illustrate the properties of the cross product of two or more vectors.
10. Interpret geometrically the scalar triple product of three vectors.
11. Interpret geometrically derivative of a function  $f(x)$ .
12. Identify level curves of the graph of a function.
13. Show formally that a limit exists.
14. Apply the rule for nonexistence of a limit.

## COURSE CONTENT

Chapters 7 (section 7.7 and 7.8 only), 8, 9, 10 from the textbook will be covered.

**GRADING SYSTEM:** The following components will determine the final grade.

1. Home Assignments - During each class period you will be assigned some problems from the textbook or from some other source. Sometimes the assignment will be collected and graded and other times one or two problems from the assignment will be chosen and students will be asked to do it in class. Total score from all home assignments will be 100 points.
2. Tests - Two one-hour tests. Each test will be worth 100 points. Test will be comprised of questions discussed in class, home assignments, solved examples in the text, and any other assigned problems. Tests will be announced in advance and student will have plenty of time to prepare for the tests.
3. Mid-term Examination - Mid-term examination will be conducted mid-way through the semester. It will include all the material covered upon to that time. It will be worth 100 points.
4. Final Examination - Final examination will be conducted at the end of the semester and it will be worth 200 points. It will include all the material covered during the semester.

**Numerical Scores.** The following numerical scores will be assigned to each components in the grade determination process,

	<b>Points</b>
<b>Tests</b>	<b>200</b>
<b>Home Assignments</b>	<b>100</b>
<b>Mid-term</b>	<b>100</b>
<b>Final</b>	<b><u>200</u></b>
<b>Total</b>	<b>600</b>

<b>Letter Grade:</b>	<b>A: 90 - 100</b>
	<b>B: 80 - 89</b>
	<b>C: 70 - 79</b>
	<b>D: 60 - 69</b>
	<b>F: Below 60</b>

## **BIBLIOGRAPHY**

**Anton, Howard.** Calculus, 4th edition. New York: John Wiley & Sons, Inc., 1992.

**Dolciani, Mary et.al.** Modern Introductory Analysis. Boston: Houghton Mifflin, 1967.

**Thomas/Finney.** Calculus and Analytic Geometry. New York: Addison Wesley Pub. Co.

**Kline, Morris.** Mathematical Thought From Ancient to Modern Times. New York: Oxford University Press, 1972.

**Stewart, James.** Calculus. New York: Brooks/Cole Publishing Co.

The American Mathematical Monthly, vol. 87 (1980); vol. 93 (1986).