VIRGINIA STATE UNIVERSITY
DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE
SCHOOL OF AGRICULTURE, SCIENCE AND TECHNOLOGY
MATH 301 - CALCULUS IV - 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:

Mathematics 301 is the final course of a four semester sequence of Calculus for students majoring in Mathematics and the Natural Sciences. The topics to be covered include: Vector-valued functions, Functions of several variables, Multiple integration, Introduction to vector analysis.

COURSE PREREQUISITE: MATHEMATICS 300-CALCULUS III

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 definition of Vector-Valued Functions.**
2. **know the definition of the limit and continuity of a vector-valued functions.**
3. **know the definition of the derivative of a vector-valued functions.**
4. **know the definitions of tangent vectors and normal vectors at a point on a space curve.**

5. **know how to find the tangential and normal components of acceleration.**
6. **know how to find the arc length of a space curve.**
7. **know how to use the arc length parameter to describe a plane curve or space curve.**
8. **know how to find the curvature of a curve at a point on the curve.**
9. **Have a working understanding to view functions of several variables using surface graphs, contour diagrams and tables.**
10. **know how to use computer graphics to sketch the graph of a function of two variables.**
11. **know the definition of a neighborhood in the plane.**
12. **know the definition of limit of function of two variables.**
13. **know how to extend the concept of continuity to a function of two variables.**
14. **know how to extend the concept of continuity to a function of two variables.**
15. **know the basic notations and definitions of n^{th} order partial derivatives, directional derivatives and gradient.**
16. **know the concepts of increment and differentials.**
17. **know the concept of differentiability of function of two variables.**
18. **know how to use the Chain Rules for functions of several variables.**
19. **understand the method of Lagrange Multipliers.**
20. **know how to evaluate double and triple integrals.**
21. **know the concept of vector field.**
22. **know how to evaluate divergence and curl of vector fields.**
23. **understand and use the concept of a piecewise smooth curve.**
24. **know how to evaluate line and surface integrals.**
25. **understand the Fundamental Theorem of line integrals.**
26. **understand the concept of independence of path.**
27. **know the definition of a parametric surface.**
28. **understand the Divergence Theorem.**
29. **understand the Stokes's Theorem.**

SKILLS

The Student will:

1. **read graphs and contour diagrams and think graphically.**
2. **read tables and think numerically.**
3. **understand the notion of local linearity.**
4. **use graphing calculators and computer graphics software to view surface graphs.**
5. **use differential as an approximation.**
6. **use the gradient of a function of two variables in applications.**
5. **find equations of tangent planes and normal lines to surfaces.**
6. **find the angle of inclination of a plane in space.**
7. **find absolute and relative extrema of a function of two variables.**
8. **solve optimization problems involving functions of several variables.**

9. use the method of least square.
10. use Lagrange Multipliers to solve constrained optimization problems.
11. evaluate an iterated integral and use it to find the area of a plane region.
12. evaluate a double integral as iterated integral.
13. write and evaluate double integral in polar coordinates.
14. use a double integral to find the area of a surface.
15. use a triple integral to find the volume of a solid region.
16. evaluate the divergence and curl of a vector field.
17. use Green's Theorem to evaluate a line integral.
18. write and evaluate a line integral.
19. write and evaluate a line integral of a vector field.
20. find a normal vector and a tangent plane to parametric surface.
21. evaluate a surface integral as a double integral.
22. use the Divergence Theorem.
23. use the Stokes's Theorem.

ABILITIES

The Student will:

1. be able to do both constrained and unconstrained optimization problems.
2. be able to use parametric equations to represent motion in the space.
3. be able to evaluate double, triple and line integrals.
4. able to apply the Divergence and Stokes's Theorems to physical applications.

COURSE CONTENT

Most of the sections from chapters 11, 12, 13, and 14 of the textbook will be covered.

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

1. Home Assignments - Problems will be assigned 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 component in the grade determination process,

	Points
Tests	**200**
Home Assignments	**100**
Mid-term	**100**
Final	**200**
Total	**600**

Letter Grade:

A:	**90 - 100**
B:	**80 - 89**
C:	**70 - 79**
D:	**60 - 69**
F:	**Below 60**

BIBLIOGRAPHY/ REFRENCES

Anton; Calculus, 4th Edition (1992), New York: John Wiley & Sons, Inc.

Dolciani, Mary et. al; Modern Introductory Analysis. (1967), Boston: Houghton Mifflin.

Edwards & Penney; Calculus with Analytic Geometry, 5th Edition (1998), Prentice Hall, Upper Saddle River, NJ 07458.

Gottlieb; Calculus: An Integrated Approach to Functions and their Rates of Change, Preliminary Edition, Addison Wesley Pub. Co., Boston.

Johnston and Mathews; <u>Calculus</u>, Addison Wesley Pub. Co., Boston.

Smith & Minton; <u>Multivariable Calculus</u>, 2nd Edition (2002), McGraw Hill, 1221 Ave. of the Americas, New York, NY 10020

Finney, Weir and Giordano; <u>Thomas' Calculus</u>, 10th Edition (2004), Addison Wesley Pub. Co., Boston.

Kline; <u>Mathematical Thought From Ancient to Modern Times</u>, (1972), Oxford University Press, New York.

Salas, Hille, and Etgen; <u>One and Several Variables Calculus</u>, 9th Edition (2003), John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158.

Stewart; <u>Calculus</u>, 5th Edition (2003), Thomson Brooks/Cole Publishing Co, 10 Davis Drive, Belmont, CA 94002.

Varberg, Purcell and Rigdon; <u>Calculus</u>, 8th Edition (2000), Prentice Hall, Upper Saddle River, NJ 07458.