

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE  
MASTER SYLLABUS

**CALCULUS III**  
**MTH 2410**

**Class Hours: 4.0**

**Credit Hours: 4.0**

**Laboratory Hours:**  
**0.0**

**Date Revised: Fall 1998**

**Catalog Course Description:**

Calculus of functions in two or more dimensions. Topics include solid analytic geometry, partial differentiation, multiple integration, and selected topics in vector calculus.

**Entry Level Standards:**

A thorough knowledge of algebraic, trigonometric, and beginning and intermediate calculus functions is necessary for entrance to this course.

**Prerequisite:** MTH 1420

**Textbook(s) and Other Reference Materials Basic to the Course:**

Textbook:

James Stewart. *Multivariable Calculus Concepts and Contexts*, Brooks/Cole Pub., 1998

Materials:

A graphing calculator

References:

Earl Swokowski. *Calculus with Analytic Geometry*, 6th Edition. PWS-Kent Pub. Co., 1994.

C. Henry Edwards & David Penney. *Multivariable Calculus with Analytic Geometry*, 5th Edition. Prentice-Hall, Inc., 1998.

Arnold Ostebee & Paul Zorn. *Multivariable Calculus*. Saunders College Pub., 1997.

William McCallum, Deborah Hughes-Hallett & Andrew Gleason. *Multivariable Calculus*. John Wiley & Sons, Inc., 1997.

**I. Week/Unit/Topic Basis:**

<b>Week</b>	<b>Topic</b>
1	Three dimensional coordinate systems and vectors; 9.1-9.2
2	Dot product, cross product and equations of lines and planes; 9.3-9.5
3	Functions and surfaces; cylindrical and spherical coordinates; 9.6-9.7
4	Vector-valued functions: space curves, derivatives and integrals, arc length and curvature; 10.1-10.3
5	Motion in space, parametric surfaces; 10.4-10.5

- 6 Partial differentiation: functions of several variables, limits and continuity, partial derivatives; 11.1-11.3
- 7 Tangent planes and linear approximations, the chain rule; 11.4-11.5
- 8 Directional derivatives and the gradient vector, maximum and minimum values, Lagrange multipliers; 11.6-11.8
- 9 Multiple integrals: double integrals, iterated integrals; 12.1-12.2
- 10 Double integrals over general regions, double integrals in polar coordinates, applications of double integrals; 12.3-12.5
- 11 Surface area, triple integrals; 12.6-12.7
- 12 Triple integrals in cylindrical and spherical coordinates, change of variables in multiple integrals; 12.8-12.9
- 13 Vector calculus: vector fields, line integrals, the fundamental theorem for line integrals; 13.1-13.3
- 14 Green's theorem, curl and divergence, surface integrals; 13.4-13.6
- 15 Stokes' Theorem, the divergence theorem; 13.7-13.8
- 16 Final Exam

## II. Course Objectives\*:

- A. Demonstrate familiarity with vector and solid analytic geometry. I, III, IV
- B. Apply the concepts of vector-valued functions to suitable mathematical models. II, III
- C. Calculate partial derivatives and multiple integrals. III
- D. Employ the use of vector calculus in 3-space application problems. II, III, V

\*Roman numerals after course objectives reference goals of the Math department.

## III. Instructional Processes\*:

Students will:

1. Employ graphing calculators and/or computer software as tools for the field of study. *Technological Literacy Outcome*
2. Advance their skills in analysis, synthesis, symbol manipulation, graphical conceptualization and technical writing skills using the work and/or projects assigned. *Problem Solving and Decision Making Outcome, Numerical Literacy Outcome, Communication Outcome*
3. Analyze real life problems such as using tangential and normal components of acceleration to justify banking curved roads, analyze the forces placed on beams, poles, etc. used in engineering constructions, calculate flux through semi-permeable membranes. *Problem Solving and Decision Making Outcome, Numerical Literacy Outcome, Transitional Strategy*
4. Actively engage in student-led discussions and brainstorming sessions about the mathematical/physics based models inherent to the course. *Active Learning Strategies,*

*Transitional Strategies*

5. Investigate and justify the engineering concepts contained in fields of statics and dynamics.  
*Problem Solving and Decision Making Outcome, Numerical Literacy Outcome*

\*Strategies and outcomes listed after instructional processes reference Pellissippi State's goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

**IV. Expectations for Student Performance\*:**

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

1. Sketch vectors, use vector operations, find the magnitude of a vector, and find a unit vector in two-space and three space. A
2. Determine whether two vectors are orthogonal; determine the angle between two vectors. A
3. Define the equations of lines and planes in three-space. A
4. Sketch the graph of rectangular, cylindrical, or spherical equations in three-space. A
5. Sketch the graph of vector valued functions and calculate the length of the curve. B
6. Differentiate and integrate vector valued functions. B
7. Calculate velocity, acceleration, and speed for a position vector. B
8. Compute unit tangent and unit normal vectors and calculate curvature. B
9. Calculate tangential and normal components of acceleration. B
10. Determine the limit of multivariable variable functions. C
11. Establish the first and higher order partial derivatives of multivariable variable functions. C
12. Utilize partials to differentiate implicit functions. D
13. Calculate the gradient and directional derivative of a multivariable function. D
14. Originate the equations for the tangent plane and the normal line to a. D
15. Locate extrema for both constrained (Lagrange multipliers) and unconstrained multivariable functions. D
16. Evaluate iterated integrals. C
17. Calculate areas, surface areas, and volumes using double integrals. D
18. Calculate volumes using triple integrals. D
19. Find mass, moments, center of mass and moments of inertia. D
20. Find the divergence and curl of vector fields. E
21. Evaluate line integrals. E

22. Determine if a line integral is independent of path and find a potential function for the vector function. E
23. Use Green's Theorem to evaluate a closed line integral. E
24. Evaluate surface integrals and calculate flux through an open surface. E
25. Use the Divergence Theorem to calculate flux through a closed surface. E

\*Letters after performance expectations reference the course objectives listed above.

## **V. Evaluation:**

### A. Testing Procedures:

Students are evaluated primarily on the basis of tests, quizzes, and homework. A minimum of 4 major tests is recommended. Computer applications or projects may constitute part of the final grade also.

### B. Laboratory Expectations: None

### C. Field Work: None

### D. Other Evaluation Methods: None

### E. Grading Scale:

93% - 100%	A
88 - 92	B+
83 - 87	B
78 - 82	C+
70 - 77	C
60 - 69	D
Below 60	F

## **VI. Policies:**

### A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent.

### B. Academic Dishonesty:

Individual instructors must distribute their policy on academic dishonesty during the first week of class.