PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

BASIC CALCULUS & MODELING
MTH 1255

Class Hours: 4.0 **Credit Hours: 4.0**

Laboratory Hours: 0.0 **Date Revised: Spring 99**

Catalog Course Description:

Topics include differentiation and integration of polynomial, rational, exponential, and logarithmic functions, and methods of numerical integration. Topics from business modeling, such as economic applications and case studies, will be explored with computer simulations, computer labs, or calculators. A graphing calculator is required.

Entry Level Standards:

Students must be able to read, write, and speak at college level.

Prerequisites:

Two years of high school algebra, precalculus, and satisfactory placement scores; or MTH 1010, MTH 1020, or MTH 1021

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

Textbook:
Barnett, Raymond A. And Michael R. Ziegler. *Calculus with Technology for Business, Economics, Life and Social Sciences,* Prentice-Hall, Inc., 1997.
References:
Larson, Roland E., Robert P. Hostetler, and Bruce H. Edwards. *Brief Calculus with Applications*, Alternate 4th ed., D.C. Heath and Company, Lexington, Massachusetts, 1995.
Personal Equipment:
A graphing calculator is required.

I. Week/Unit/Topic Basis:

Week	Topic
1	Function. Linear Functions and Straight Lines. Quadratic Functions.
2	Group Activity: Mathematical Modeling in Business. Polynomial and Rational Functions. Exponential Functions. Logarithmic Functions.
3	Logarithmic Functions. Modeling Data Using Regression Techniques. Group Activity: Profit and Loss Analysis. Review.
4	Test 1. Rate of Change and Slope. Limits.
5	Limits. The Derivative. Review. Test 2.

6	Derivatives of Constants, Power Forms, and Sums. Derivatives of Products and Quotients. Chain Rule: Power Form.
7	Chain Rule: Power Form. Marginal Analysis in Business and Economics. Group Activity: Minimal Average Cost or Calculator-based laboratory activity or other group activity.
8	Test 3. Continuity and Graphs. First Derivative and Graphs. Second Derivative and Graphs.
9	Optimization: Absolute Maxima and Minima. Group Activity: Maximizing Profit. Review. Test 4.
10	The Constant e and Continuous Compound Interest. Derivatives of Logarithmic and Exponential Functions. Chain Rule: General Form.
11	Chain Rule: General Form. Group Activity: Elasticity of Demand or other group activity. Review. Test 5.
12	Antiderivatives and Indefinite Integrals. Integration by Substitution.
13	Differential Equations -- Growth and Decay. A Geometric -- Numeric Introduction to the Definite Integral.
14	Definite Integral as a Limit of a Sum; Fundamental Theorem of Calculus. Group Activity: Simpson's Rule. Area between Curves.
15	Area between Curves. Review. Test 6.
16	Review and final exam.

II. Course Objectives*:

A. Analyze behavior of functions. I, III

B. Compute derivatives of algebraic, logarithmic, and exponential functions. I, III, V

C. Calculate integrals of algebraic, logarithmic, and exponential functions. I, III, V

D. Solve problems from business, economics, social and life science. I, III

E. Interpret, communicate, and report business application problems and their solutions in a clear and concise manner. I, IV

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

III. Instructional Processes*:

Students will:

1. Work on teams to discuss and model business and economic applications by transforming data in tables into graphs and using the graphs to determine maximum profit and revenue. *Communication Outcome, Numerical Literacy Outcome, Active Learning Strategy*

2. Practice personal integrity by being punctual, dependable, and cooperative. *Personal Development Outcome*

3. Express ideas using the language and notation of mathematics. *Numerical Literacy Outcome*

4. Use critical thinking skills to: interpret and apply rules such as Simpson's Rule and the trapezoid rule to solve real-life problems such as finding the area of a pond. *Problem-Solving and Decision Making Outcome, Transitional Strategy*

5. Use calculators to optimize functions and to approximate numerical derivatives and definite integrals. *Technological 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. Calculate the limit of an algebraic function. B

2. Recognize a continuous function. A

3. Calculate the derivative of an algebraic function by the delta process. B

4. Calculate the derivative of polynomials, products, quotients, powers, and implicit functions using delta-derived rules. B

5. Use derivatives to solve application problems such as problems involving distance, velocity, and acceleration; and maximum-minimum problems. C

6. Sketch curves using information gathered from the derivatives of a function. B, C

7. Find the derivatives of exponential and logarithmic functions. B

8. Integrate polynomial, power, logarithmic, and exponential functions and use this knowledge to evaluate definite and indefinite integrals. D

9. Use derivatives to solve business/economic and life/physical sciences application problems. C

10. Use integration to solve application problems that occur in business/economic and life/physical sciences. E

11. Work with technology and applicable case studies/projects that involve real-world data to enhance the conceptual understanding and usefulness of mathematics and to provide training in an area that both business and industry are now demanding. D, F

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

V. Evaluation:

A. Testing Procedures:

Students are evaluated primarily on the basis of tests, case studies/projects, quizzes, homework, and the comprehensive final exam. A minimum of 5 major tests is recommended.

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:

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.