PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

BASIC CALCULUS AND MODELING
MATH 1830 (formerly MTH 1255)

Class Hours: 4.0  Credit Hours: 4.0
Laboratory Hours: 0.0  Date Revised: Spring 03

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:

High school algebra I, algebra II, precalculus and ACT of at least 23; or MATH 1130 or 1730 or 1731.

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

Textbook:

References:

Personal Equipment:
A graphing calculator is required.

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Linear Functions and Average Rate of Change. Quadratic Functions and Average Rate of Change. Operations on Functions. Rational, Radical, and Power Functions.</td>
</tr>
<tr>
<td>2</td>
<td>Modeling Data with Functions. Limits. Limits and Asymptotes.</td>
</tr>
<tr>
<td>3</td>
<td>Problem Solving: Rates of Change. The Derivative. Section Project.</td>
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<tr>
<td>5</td>
<td>Derivatives of Products and Quotients. Continuity and Nondifferentiability.</td>
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</tbody>
</table>
Marginal Analysis. Section Project. Review. Test 2.

The Chain Rule. Derivatives of Logarithmic Functions.

Section Project. Derivatives of Exponential Functions. Review. Test 3.

First Derivatives and Graphs. Second Derivatives and Graphs.

Graphical Analysis and Curve Sketching. Optimizing Functions on a Closed Interval.


The Indefinite Integral. Trapezoidal and Simpson’s Rule. Fundamental Theorem of Calculus.

Section Project. Problem Solving: Integral Calculus and Total Accumulation. Integration by $u$-substitution.

Integrals That Yield Logarithmic and Exponential Functions. Average Value of a Function and The Definite Integral in Finance.

Area between Curves and Applications. Review. Test 5

Review. Final Exam.

II. Course Objectives*:

A. Use derivatives to analyze behavior of functions. VI.1,3

B. Compute derivatives of algebraic, logarithmic, and exponential functions. VI. 1,3,4

C. Calculate integrals of algebraic, logarithmic, and exponential functions. VI.1,3,5

D. Use differentiation and/or integration to solve applications from business, economics, social and life science. VI.1,3

E. Use calculus concepts to interpret, communicate, and report business application problems and their solutions in a clear and concise manner. VI.1, 4

*Roman numerals after course objectives reference goals of the university parallel program.

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 using strategies learned in calculus. 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.  B, D
6. Sketch curves using information obtained from the derivatives of a function.  B
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.  C, D
9. Use derivatives to solve business/economic and life/physical sciences application problems.  D, E
10. Use integration to solve application problems that occur in business/economic and life/physical sciences.  D, E
11. Work with technology and applicable case studies/projects that involve real-world data to enhance the conceptual understanding and usefulness of calculus and to provide training in an area that both business and industry are now demanding.  D, 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, 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:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>93 - 100</td>
<td>A</td>
</tr>
<tr>
<td>88 - 92</td>
<td>B+</td>
</tr>
<tr>
<td>83 - 87</td>
<td>B</td>
</tr>
<tr>
<td>78 - 82</td>
<td>C+</td>
</tr>
<tr>
<td>70 - 77</td>
<td>C</td>
</tr>
<tr>
<td>60 - 69</td>
<td>D</td>
</tr>
<tr>
<td>Below 60</td>
<td>F</td>
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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.