PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

CALCULUS III
MATH 2110

Class Hours: 4.0  Credit Hours: 4.0
Laboratory Hours: 0.0  Revised: Fall 04

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.

Prerequisites:

MATH 1920

Textbook(s) and Other Course Materials:

Textbook:

Materials:
A graphing calculator

References:


I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Three dimensional coordinate systems and vectors; 9.1-9.2</td>
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<tr>
<td>2</td>
<td>Dot product, cross product and equations of lines and planes; 9.3-9.5</td>
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<tr>
<td>3</td>
<td>Functions and surfaces; cylindrical and spherical coordinates; 9.6-9.7</td>
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<tr>
<td>4</td>
<td>Vector-valued functions: space curves, derivatives and integrals, arc length and curvature, motion in space; 10.1-10.4</td>
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<tr>
<td>5</td>
<td>Partial differentiation: functions of several variables, limits and continuity, partial</td>
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</tbody>
</table>
derivatives; 11.1-11.3
6 Tangent planes and linear approximations, the chain rule; 11.4-11.5
7 Directional derivatives and the gradient vector, maximum and minimum values, Lagrange multipliers; 11.6-11.8
8 Multiple integrals: double integrals, iterated integrals; 12.1-12.2
9 Double integrals over general regions, double integrals in polar coordinates, applications of double integrals; 12.3-12.5
10 Surface area, triple integrals; 12.6-12.7
11 Triple integrals in cylindrical and spherical coordinates, change of variables in multiple integrals; 12.8-12.9
12 Vector calculus: vector fields, line integrals, the fundamental theorem for line integrals; 13.1-13.3
13 Green's theorem, curl and divergence, surface integrals; 13.4-13.6
14 Stokes' Theorem, the divergence theorem; 13.7-13.8
15 Final Exam Period

II. Course Objectives*:

A. Become familiar with vector and solid analytic geometry. VI. 2,3,4,5,6
B. Understand the concept of vector-valued functions. VI. 2,3,4,5,6
C. Be able to calculate partial derivatives and multiple integrals. VI. 2,3,4,5,6
D. Be able to work with partial derivatives and multiple integrals in application problems. VI. 2,3,4,5,6
E. Learn how to apply vector calculus. VI. 2,3,4,5,6

*Roman numerals after course objectives reference TBR's general education goals.

III. Instructional Processes*:

Students will:

1. Use graphing calculators and/or computer software. Technological Literacy Outcome
2. Solve 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
3. Actively engage in student-led discussions and brainstorming sessions. Active Learning Strategies, Transitional Strategies
4. Investigate and justify the engineering concepts contained in statics and dynamics courses. Problem Solving and Decision Making Outcome, Numerical Literacy Outcome, Transitional Strategy

*Strategies and outcomes listed after instructional processes reference TBR's goals for strengthening general education knowledge and skills, connecting course work 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. Find 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 find the length of the curve. B
6. Differentiate and integrate vector valued functions. B
7. Find velocity, acceleration, and speed from a position vector. B
8. Find unit tangent and unit normal vectors and calculate curvature. B
9. Calculate tangential and normal components of acceleration. B
10. Find the limit of two variable functions. C
11. Determine the first and higher order partial derivatives. C
12. Use the chain rule to find partial derivatives and use partials to differentiate implicit functions. D
13. Find the gradient and directional derivative of two-variable function. D
14. Find the equations for the tangent plane and the normal line to a surface and find the extrema of the surface. D
15. Use Lagrange multipliers to find local extrema. 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 the line integral. E
24. Evaluate surface integrals and calculate flux. E
25. Use the Divergence Theorem to calculate flux. 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, homework and the comprehensive final exam. A minimum of 4 major tests is recommended.

B. Laboratory Expectations:

N/A

C. Field Work:

N/A

D. Other Evaluation Methods:

Computer applications or projects may constitute part of the final grade also.

E. Grading Scale:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<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:

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:

Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.

In addition to other possible disciplinary sanctions that may be imposed as a result of academic misconduct, the instructor has the authority to assign either (1) an F or zero for the assignment or (2) an F for the course.

C. Accommodations for disabilities:

If you need accommodation because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please inform the instructor immediately. Privately after class or in the instructor's office.

To request accommodations students must register with Services for Students with Disabilities: Goins 127 or 131, Phone: (865) 539-7153 or (865) 694-6751 Voice/TDD.

D. Other Policies:

Make-up work: Instructor discretion about make-up tests and/or assignments.

Cell phones: Cell phones are to be either turned off or put on vibration mode while in class. Instructor discretion as to penalty.