SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: MATH 355 Department: Mathematics

Course Title: Calculus III Semester: Fall Year: 1998

Objectives/Competencies

Course Objective	Competencies
1. Polar Coordinate system	1. Convert points and equations from the rectangular system to polar and vice versa. 2. Given r-f(0), sketch the graph and discuss symmetry. 3. Given r-f(0)), find arc length or a<0<b. 4. Given the intersection of two curves, find area. 5. Given r-f(0), x-r cos9, and y-r sin0, find dy/dx.
2. Lines, planes and vectors in 3-D space	1. Calculate distance between two points. 2. Divide a given line segment between two given ratios. 3. Find the angle between two given lines. 4. Decide whether two given lines are parallel or perpendicular. 5. Find the parametric and symmetric form of the equations of a given line. 6. Find the equation of a plane passing through a given point and perpendicular to a given line. 7. Find the distance of a point from a given plane. 8. Describe the graphs of quadric and cylindrical surfaces.

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	9. Define: vector; scalar product; vector product; linear independence; position, velocity, and acceleration vectors. 10. Given 2 vectors u and v, compute: c1 u + c2v where c1 and c2 are constants; u .v; u x v; projection of u along v; angle between u and v. 11. Given vectors, u, v, w, find: u x (v x w) and u(v x w). 12. Find the distance between two lines or two parallel lines. 13. Find the equation of the place through three points. 14. Find the equation of the intersection line of 2 given planes. 15. Find the equation of a line through a point and normal to and intersecting a given line.
3. Functions in higher dimensions: Partial differentiation: Applications of partial derivatives.	1. Define the following: a. f(x,y) is continuous at (a,b) b. partial derivatives c. directional derivatives d. gradient of f(x,y,z) e. total differential f. relative extrema of f(x,y) 2. Compute each of the following: a. List partial derivatives of f(x,y,z) b. higher order derivatives of f(x,y,z) c. partial or total derivative of a composite function using the chain rule. d. Gradient and directional derivatives of f(x,y,z) e. equations of a tangent place and a normal line to a

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	given surface at a given point.
4. Double and triple integration: Cylindrical and spherical coordinates	1. Define: f(x,y) is integrable over a plane region R. 2. Define: f(x,y,z) is integrable over a space region Q. 3. Evaluate double integrals by computing the integrated integrals. 4. Evaluate double integrals by using polar coordinates. 5. Change the order of integration in a given double integral. 6. Evaluate triple integrals or iterated integrals in rectangular, cylindrical, and spherical coordinates. 7. Change the coordinate system and the order if integration given in an iterated integral.
5. Applications	1. Find each of the following using multiple integrals. a. Area between curves b. Volume of a given solid c. Mass of a given solid with a given density d. Center of mass of a given solid mass distribution of a given density. 2. Compute the work done by a moving particle along a given path in a given force field.
6. Line integrals	1. Define and evaluate line integrals in 2 and 3 dimensions. 2. State the properties of a line integral. 3. State and use Green's Theorem to compute line integrals. 4. State conditions for line integrals to be independent of path.

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	Time Permitting: 1. Compute integrals over a given surface. 2. State the Divergence Theorem and verify it for a given region. 3. State and use Stokes' theorem to evaluate line integrals.