COWLEY COLLEGE
& Area Vocational Technical School

COURSE PROCEDURE FOR

CALCULUS III
MTH4455 5 Credit Hours

Student Level:
This course is open to students on the college level in the sophomore year.

Prerequisite: Minimum grade of C in MATH 4440.

Controlling Purpose:
This course is designed to introduce students to two- and three- space vectors, multi variable calculus, infinite series, and other concepts appropriate for intermediate calculus.

Learner Outcomes:
Students completing this course with an A, B, or C will have solved applications involving two and three dimensional vector functions, partial derivatives, multiple integration, and vector fields.

Unit Outcomes and Criterion Based Evaluation Key for Core Content:
The following outline defines the minimum core content not including the final examination period. Instructors may add other material as time allows.

Evaluation KEY:

A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field

B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.

C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.

D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.

F = Failing, will be computed in GPA and hours attempted.

N = No instruction or training in this area.

CHAPTER 11 : VECTOR-VALUED FUNCTIONS Outcomes: The student will be able to use vector functions in the plane to solve application problems.						
A	B	C	D	F	N	Specific Competencies **Demonstrate the ability to:**
						11.1 Analyze and sketch a space curve given by a vector-valued function
						11.1 Extend the concepts of limits and continuity to vector-valued functions
						11.2 Differentiate a vector-valued function.
						11.2 Integrate a vector-valued function.
						11.3 Describe the velocity and acceleration associated with a vector-valued function.
						11.3 Use a vector-valued function to analyze projectile motion.
						11.4 Find a unit tangent vector at a point on a space curve.
						11.4 Find the tangential and normal components of acceleration
						11.5 Find the arc length of a space curve
						11.5 Use the arc length parameter to describe a plane curve of space curve.
						11.5 Find the curvature of a curve at a point on the curve.
						11.5 Use a vector-valued function to find frictional force.

CHAPTER 12: FUNCTIONS OF SEVERAL VARIABLES

Outcomes: The student will be able to analyze multi variate functions, find partial derivatives and make various applications of partial derivatives.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						12.1 Understand the notation for a function of several variables.
						12.1 Sketch the graph of a function of two variables.
						12.1 Sketch the level curves for a function of two variables.
						12.1 Sketch level surfaces for a function of three variables
						12.1 Use computer graphics to sketch the graph of a function of two variables.
						12.2 Understand the definition of a neighborhood in the plane.
						12.2 Understand the definition of the limit of a function of two variables.
						12.2 Extend the concept of continuity to a function of two variables.
						12.2 Extend the concept of continuity to a function of three variables.
						12.3 Find and use a partial derivative of a function of two and of three variables.
						12.3 Find higher order partial derivatives of a function of two or three variables.
						12.4 Understand the concepts of increments and differentials.
						12.4 Extend the concept of differentiability to a function of two variables.
						12.4 Use a differential as an approximation.
						12.5 Use the Chain Rules for functions of several variables.
						12.5 Find partial derivatives implicitly
						12.6 Find and use directional derivatives of a function of two variables.
						12.6 Find the gradient of a function of two variables.
						12.6 Use the gradient of a function of two variables in applications.

*Optional material may be covered at instructor option. REV. 8/16/2012

CHAPTER 12: FUNCTIONS OF SEVERAL VARIABLES

Outcomes: The student will be able to analyze multi variate functions, find partial derivatives and make various applications of partial derivatives.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						12.6 Find directional derivatives and gradients for functions of three variables.
						12.7 Find equations of tangent planes and normal lines to surfaces.
						12.7 Find the angle of inclination of a plane in space.
						12.7 compare the gradients $\nabla f(x, y)$ and $\nabla F(x, y, z)$.
						12.8 Find absolute and relative extrema of a function of two variables.
						12.8 Use the Second Partials Test to find relative extrema of a function of two variables.
						12.9 Solve optimization problems involving functions of several variables.
						12.9 Use the method of least squares.
						12.10 Understand the Method of Lagrange Multipliers.
						12.10 Use Lagrange Multipliers to solve constrained optimization problems.
						12.10 Use the Method of Lagrange Multipliers with two constraints.

CHAPTER 13: MULTIPLE INTEGRATION

Outcomes: The student will be able to work application problems by setting up and solving double and triple integrals.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						13.1 Evaluate an iterated integral.
						13.1 Use an iterated integral to find the area of a plane region.
						13.2 Use a double integral to represent the volume of a solid region.
						13.2 Use properties of double integrals.
						13.2 Evaluate a double integral as a iterated integral.
						13.3 Write and evaluate double integrals in polar coordinates.
						13.4 Find the mass of a plantar lamina using a double integral.
						13.4 Find the center of mass of a planar lamina using double integrals.
						13.4 Find moments of inertia using double integrals.
						13.5 Use a double integral to find the area of a surface.
						13.6 Use a triple integral to find the volume of a solid region.
						13.6 Find the center of mass and moments of inertia of a solid region.
						13.7 Write and evaluate a triple integral in cylindrical coordinates.
						13.7 Write and evaluate a triple integral in spherical coordinates.
						13.8 Understand the concept of a Jacobian.
						13.8 Use a Jacobian to change variables in a double integral.

CHAPTER 14: VECTOR ANALYSIS

Outcomes: The student will be able to solve elementary problems requiring the calculus of vector fields.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						14.1 Understand the concept of a vector field.
						14.1 Determine whether a vector field is conservative.
						14.1 Find the curl of a vector field.
						14.2 Understand and use the concept of a piecewise smooth curve.
						14.2 Write and evaluate a line integral.
						14.2 Write and evaluate a line integral of a vector field.
						14.2 Write and evaluate a line integral in differential form.
						14.3 Understand and use the Fundamental Theorem of Line Integrals.
						14.3 Understand the concept of independence of path and conservation of energy.
						14.4 Use Green's Theorem to evaluate a line integral.
						14.4 Use alternative forms of Green's Theorem.
						*14.5 Understand the definition of a parametric surface.
						*14.5 Find a set of parametric equations to represent a surface.
						*14.5 Find a normal vector and a tangent plane to a parametric surface.
						*14.5 Find the area of a parametric surface.
						*14.6 Evaluate a surface integral as a double integral.
						*14.6 Evaluate a surface integral for a parametric surface.
						*14.6 Determine the orientation of a surface.
						*14.6 Understand the concept of a flux integral.

CHAPTER 14: VECTOR ANALYSIS Outcomes: The student will be able to solve elementary problems requiring the calculus of vector fields.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						*14.7 Understand and use the Divergence Theorem.
						*14.7 Use the Divergence theorem to calculate flux.
						*14.8 Understand and use Stoke's Theorem.
						*14.8 Use curl to analyze the motion of a rotating liquid.

Projects Required:
Projects may or may not be required. Any projects will be announced in class.

Text Book:
Contact the Bookstore for current textbook.

Major Equipment Required:
Graphics Calculator, TI-83 or TI-83 Plus.

Attendance Policy:
Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

Grading Policy:
The grading policy will be outlined by the instructor in the course syllabus.

Maximum class size:
Based on classroom occupancy

Course Time Frame:
The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time, The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

Catalog Description:

MTH4455 - CALCULUS III (5 hrs)
This course includes two- and three-space vectors, indeterminate forms, improper/integrals, multivariable calculus, analytic geometry, and some theorem proofs. Applications are mostly in the physical sciences. This course requires that the students furnish their TI-83 or TI-84 series-graphing calculator. Prerequisite: Minimum grade of C in MTH4440 Calculus II.

Refer to the following policies:

402.00 Academic Code of Conduct
263.00 Student Appeal of Course Grades
403.00 Student Code of Conduct

Disability Services Program:
Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.