MATH 223 – Vector Calculus

Credits, contact hours, categorization of credits:	4 credits, 60 contact hours, Math
Instructor's or course coordinator's name:	Various instructors and sections
Textbook, title, author and year:	Multivariable Calculus; Sixth Edition by Hughes-Hallett et al. (2012) and access to the online homework system (WebAssign). These course materials are being delivered digitally via D2L through the Inclusive Access program.
Other Supplemental materials:	Graphing calculator
2021-2022 catalog description:	Math 223 Vector Calculus (4 semester credit hours) The course covers differential and integral calculus of functions of several variables. Topics include vector valued and scalar functions, partial derivatives, directional derivatives, chain rule, local optimization, double and triple integrals, the line integral, Green's theorem, Stokes' theorem and the Divergence theorem. Examinations are proctored.
Prerequisites:	MATH 129, 223 or 250A with C or better.
Co-requisites:	None
Required, Elective, or Selected Elective:	Required
Instruction Outcomes:	Upon completion of this course, students should be able to: • Perform vector operations, determine equations of lines and planes, parametrize 2D & 3D curves. • Graphically and analytically synthesize and apply multivariable and vector-valued functions and their derivatives, using correct notation and mathematical precision. • Synthesize the key concepts differential, integral and multivariate calculus. • Evaluate double integrals in Cartesian and polar coordinates; evaluate triple integrals in rectangular, cylindrical, and spherical coordinates; and calculate areas and volumes using multiple integrals.

- Use double, triple and line integrals in applications, including Green's Theorem, Stokes' Theorem, Divergence Theorem and Fundamental theorem of line integrals.

Student Outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

Topics covered:

- Recognize and sketch surfaces in three-dimensional space;
- Recognize and apply the algebraic and geometric properties of vectors and vector functions in two and three dimensions;
- Compute dot products and cross products and interpret their geometric meaning;
- Compute partial derivatives of functions of several variables and explain their meaning;
- Compute directional derivatives and gradients of scalar functions and explain their meaning;
- Compute and classify the critical points;
- Parameterize curves in 2- and 3-space;
- Set up and evaluate double and triple integrals using a variety of coordinate systems;
- Evaluate integrals through scalar or vector fields and explain some physical interpretation of these integrals;
- Recognize and apply Fundamental theorem of line integrals, Green's theorem, Divergence Theorem, and Stokes' theorem correctly.