MATH 3334 Advanced Multivariable and Vector Calculus

1. *Course number and name*: MATH 3334 – Advanced Multivariable and Vector Calculus

2. *Credits and contact hours*: 3 Semester Credit Hours (3 SCH) – 3 contact hours per week

3. *Instructor's or course coordinator's name*: Gabriela Jaramillo, Assistant Professor of Mathematics

4. *Text book, title, author, and year*:
    a. "Advanced Calculus" by James J. Callahan, 2010.
    b. "Vector Calculus, Linear Algebra, and Differential Forms", by John H. Hubbard and Barbara Burke Hubbard, 2015.
    c. "Introduction to Vector Analysis", by Harry F. Davis and A. David Snider, 2016.

5. *Specific course information*
    a. *brief description of the content of the course (catalog description):* Basic theory underlying multivariable and vector calculus, with applications. Topics include topology of n-space, derivative of a multivariable function as a linear transformation and applications, multivariable Taylor theorem, the inverse and implicit function theorems; calculus of vector fields and vector differential operators, Stokes and Gauss integral theorems, physical applications.
    b. *prerequisites or co-requisites:* MATH 2318 and MATH 3333, or MATH2318 and currently enrolled in MATH 333 with approval of instructor.
    c. *indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:* N/A.

6. *Specific goals for the course*
    a. *specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic:* Upon completion of this course, the students are expected to gain an understanding of the topology of R^n; multivariable differentiation; Taylor's theorem in several variables; implicit and inverse function theorems; algebra of vectors and vector differential operators; line, surface and volume integrals, including Green's, Stokes' and Divergence theorems, and curvilinear coordinates.
    b. e*xplicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course*: This course addresses Student Outcome a.

7. *Brief list of topics to be covered*:
    - Topology of R^n: open closed sets, limits of functions and continuity, the Extreme Value Theorem on R^n.
    - Multivariable Differentiation: the derivative of a function as a linear map and implications. Taylor's Theorem in several variables, Implicit and Inverse Function Theorems.
    - Multivariable Integration: double and triple integrals, Fubini's Theorem, change of variables formula.
    - Scalar and Vector Fields: Scalar fields and gradients. Introduction to vectors; scalar and vector products.Vector fields and grad, div, curl, and Del notation in rectangular, cylindrical and spherical coordinates.
    - Line, surface and volume integrals, characterization of irrotational fields.
    - Green's Theorem, The Divergence Theorem and Stokes' Theorem in 3 dimensions and associated theorems. Applications.