1. SM221 Calculus III with Vector Fields.

2. 4 credit hours, 4 recitation hours

3. Course coordinator: Prof. Anastasios Liakos

4. Textbook: Calculus, Early Transcendentals, 8e, 2016, by James Stewart

   a. Other supplemental materials: None

5. Specific course information

   a. Differential and integral calculus of several real variables; vector analysis including integral theorems.

   b. Prerequisite: SM122

   c. Required course

6. Specific goals for the course

   a. At the end of this course students should be able to:

      - describe basic curves, space motion using vector functions including their derivatives, and integrals; describe basic surfaces using rectangular, cylindrical, and spherical coordinates; describe basic surfaces using parameterizations,
      - find partial derivatives, directional derivatives, and gradient vectors; demonstrate proficiency in relating these to the changes in a function; demonstrate intuitive understanding of the curl, divergence, and the main theorems in vector calculus,
      - solve extreme value problems by classification of critical points; minimize or maximize a function given constraint(s),
      - demonstrate proficiency in evaluating double and triple integrals in various coordinate systems; establish connections between density and mass, center of mass; demonstrate proficiency in evaluating line integrals and surface integrals of vector fields and interpreting the results in connection to work, potential, or flux for the field,
      - write well-organized, coherent solutions to application problems,
      - use power, Taylor, and Maclaurin Series to approximate functions, integrals, and limits of functions.

b. This course introduces the following Student Outcome:

(a) an ability to apply knowledge of mathematics, science, and engineering

7. Topics covered:

- Geometry of lines and surfaces in 3 dimensions
- partial derivatives
- directional derivatives and the gradient
- double and triple integrals (including in cylindrical and spherical coordinate systems)
- vector fields
- line integrals
- surface integrals
- vector calculus (Green's, Stokes's and Gauss's Theorems)
- power and Taylor series