MATH 216 – APPLIED CALCULUS II (3)

Course Description: Differential calculus for functions in several variables and curves, systems of ordinary differential equations, series approximation of functions, continuous probability, exposure to use of calculus in the literature. Pre: 215 or consent.

Possible Texts:
Biocalculus: Calculus, Probability, and Statistics for the Life Sciences by J. Stewart and T. Day. Cengage Learning.
Calculus for the Life Sciences by Greenwell, Ritchey and Lial. Addison Wesley.
Calculus for Biology and Medicine by C. Neuhauser. Prentice Hall.

Format: This three credit class meets for 150 minutes of lecture (no recitation).

Topics:
(1) Review of Calculus (1 week).
(2) Multivariable calculus: graphs and level curves of functions of several variables, partial derivatives, differentiability and tangent planes, stationary points and extrema, approximation; optional: multiple integration (2.5 weeks).
(3) Linear algebra: vectors, matrix multiplication, matrix algebra, inverses, Gaussian elimination, eigenvalues and eigenvectors, application to Leslie matrices (3 weeks).
(4) Ordinary differential equations: review of separable and first-order linear DEs, Euler's method. (continued from 215). (1 week)
(5) Systems of linear and non-linear differential equations, emphasizing compartment models, population models and stability, predator-prey, competing species, etc. (3 weeks)
(6) Probability: discrete probability, conditional probability, independent events, Bayes' Theorem, applications to genetics and medicine, discrete random variables; continuous random variables, density, expectation and variance, uniform, normal, and exponential distributions. (2.5 weeks).

Student learning outcomes: Upon successful completion of Math 216, the student will be able to solve routine problems of several variable differential calculus, differential equations, matrix theory and probability theory. They will be able to apply these to the understanding of some biological processes.

Program objectives: In this introductory level course students learn the basics about calculus of several variables, the use and solution of differential equations, and the use of matrices and probability theory. The approach emphasizes computation and application over theory. The course material is fundamental for life science majors. The course is the second in a two semester sequence.