BIM 284   Mathematical Methods for Biomedical Engineers   Winter 2020

Course Goals: Students will learn advanced mathematical and numerical techniques for a variety of mathematical problems of relevance to Biomedical Engineering. The course will encompass both theoretical understanding as well as numerical approaches to solving systems.

Prerequisite: Math 22B and Statistics 130A, or permission from the instructor.

Preparation: Basic knowledge in linear systems of equations, calculus, differential equations, complex numbers, probability and statistics.

Lecture Schedule: Mon/Wed, 10:00-11:50am, 110 HUNT

Instructor: Yong Duan, Department of Biomedical Engineering
                          4335 Genome and Biomedical Sciences Building
                          Email: duan@ucdavis.edu

Textbook: **1) Advanced Engineering Mathematics with Matlab**
                          Thomas L. Harman, James Dabney, Norman Richert

                          2) Numerical Methods in Biomedical Engineering
                          Stanly M. Dunn, Alkis Constantinides, and Prabhas V. Moghe,

Office: 4335 GBSF

Hours: Mon, Wed, 1:00-2:00pm

Tentative Schedule:

Week 1:   Introduction, Vectors, Linear Models of Biological Systems,

Week 2:   Matrices, Eigenvalues and Eigenvectors

Week 3:   Linear ODE, variation of constants, power series solutions

Week 4:   Fourier transform, discrete Fourier transform, fast Fourier transform

Mid-term

Weeks 5-6:   Advanced Calculus and Advanced Differential Equations

Week 7:   Vector Differential Operators and Vector Integral Calculus.

Week 8:   Introduction to Partial Differential Equations.

Week 9-10:   Diffusion Equations.

                    Final

Homework Problems: Homework problems will consist of a number of problems taken from the textbook, as well as some additional problems and programming assignments. It is suggested that the programming assignments be completed using Matlab. Assigned problems will be due approximately one week from the assignment date. Problems will be graded on a scale of 0 to 10. Quizzes will be given every one or two

weeks, depending on the schedule. It is expected that problem sets and results from the programming assignments will be neatly written and well-described. There will not be makeup quizzes. If you miss a quiz, you will receive 0.

Examinations: There will be a midterm examination given in class, and a final examination given on Thursday March 21st, 1:00-3:00pm. Both examinations will be closed book, although you are allowed to use one 8.5" x 11" sheet of paper with handwritten notes written on both sides. Calculators are allowed.

Grading: The course grade will be based on a weighted sum of the homework, quizzes, midterm, and final examination scores. The homework will account for 30% of the course grade, quizzes will account for 30% of the course grade, the midterm will account for 20%, and the final exam will account for 20%. Homework, quizzes, and exams will be graded based on logic and reasoning (50%), legibility (20%), and correctness of the answer (20%). If the class average is too low, the range of course grades will be adjusted at the instructor's discretion.