MTH 812: Applied Engineering Mathematics (3-0)

Objective:

This course covers advanced mathematics from a biomedical engineering perspective. Linear and nonlinear systems, partial differential equations, optimization and inverse problems will be discussed. Advanced mathematical techniques are increasingly needed in today's biomedical engineering. For example, one needs a nonlinear system to describe a model or problem in neural engineering. Finite element has been a powerful numerical method to deal with many problems in biomechanics and biomaterials where partial differential equations are involved. This course is geared towards the applications of the advanced mathematical techniques to various biomedical engineering problems.

Textbooks:

"Numerical Analysis" by Richard L. Burden (Author) and J. Douglas Faires

"Linear Algebra: A Modern Introduction" by David Poole

"Advanced Engineering Mathematics" by Erwin Kreyszig

"Applied Mathematics", 3rd Edition by J. David Logan

Course Outline:

Topics	Periods
Aims to provide an overview and to enhance students' analytical skills in dealing with a variety of engineering design issues. The module reviews the fundamentals of engineering principles and develops problem-solving skills using analytical and computational methods, Numerical method and algorithm Linear Algebra (Matrix solutions), Basic knowledge of Numerical Analysis including, Numerical integration and differentiation, Numerical solutions of equations in one variable, Numerical solutions of systems of linear equations, Interpolation and polynomial approximation, Numerical solution of ordinary differential equations, Optimization methods. Fourier Series and Transforms.	45

Course outcomes: The basic concept of the course is to understand and apply advanced mathematical techniques to various biomedical engineering problems. At the end of the course students should be enable to solves the mathematical problems related to the biomedical systems.