

42202 Numerical Computing II (3)

Knowledge

The students will know the discrete Fourier transform, its fast computation and applications, numerical methods for optimization, quadrature, and computing zeroes of a function, methods for eigenvalue computation, and methods for the solution of initial and boundary value problems for ordinary and partial differential equations.

Comprehension

Students should know what the fast Fourier transform is, be able to derive methods for optimization, root-finding, quadrature, and spectral factorization, and know how to solve initial value problems for ordinary and partial differential equations by applying suitable MATLAB functions. They also should be able to derive and use methods for the solution of boundary value problems for ordinary and partial differential equations. Students should be able to implement and apply the methods discussed in MATLAB.

Application

The methods covered in the course are applied to a variety of problems, including MP3 players, web search, and problems in control theory. Students solve these problems by writing MATLAB code.

Analysis

Students should know the mathematical background for the methods described as well as their properties.

Synthesis

The course forces students to apply and expand knowledge gained in Calculus I, Calculus II, Linear Algebra, and Introduction to Numerical Computing I.

Evaluation

Students should be able to solve problems in scientific computing by writing MATLAB code using the methods discussed in the course. Students also should know properties of these methods and how they are derived.

Class Activities

Discuss the methods, show their properties, and illustrate their performance.

Out of class Activities

Do weekly homework assignment that involves analysis, application, and implementation in MATLAB of the methods discussed