

Catalog Description:

Introduction to uses of computers to solve problems arising in the physical and biological sciences, and in engineering and finance.

Prerequisite:

{C- or better in 2255, 2415, or 5520H; and C- or better in 2568 or 5520H}; or:
{credit for 255, 415.xx, or 521H; and credit for 568, 571, or 520H}.

Purpose:

Math 3607 is a course which has three main goals: it introduces students to MATLAB (or improves their knowledge of MATLAB); it uses MATLAB to solve practical problems from various areas of mathematics, physics, engineering, business, and finance; and it presents the numerical analysis needed to use MATLAB effectively. The principle underlying this course is that the way to learn MATLAB and numerical analysis is by doing it, not by reading about it. This course is taught in a computer lab and MATLAB will be used to some extent every class.

Textbook:

Learning MATLAB, Problem Solving, and Numerical Analysis through Examples, by Ed Overman (downloadable e-book).

Topics List:

1. MATLAB as a scalar calculator, round-off errors, debugging.
2. Arrays in MATLAB, probability theory, Markov processes.
3. Graphics in MATLAB, applications of probability theory, histograms.
4. Programming in MATLAB, more probability theory, mathematical biology.
5. Function m-files in MATLAB, more Markov processes, chaos.
6. More about functions, randomness.
7. Solving linear systems of equations.
8. Interpolation and approximation.
9. The solution of nonlinear equations and unconstrained optimization.
10. Numerical differentiation and integration
11. Time-evolution ordinary differential equations, boundary-value ordinary differential equations, stochastic differential equations, examples from many disciplines.
12. Eigenvalues, Fourier series.