CS 357 (MATH 357) - Numerical Methods I

Instructors:

Many different professors have taught this course in past semesters, including Prof. Heath, Shaffer, Hirani, Gambill, and Yershova.

Prerequisites:

The course has some prerequisites. These are a 100-level computer science course (e.g. CS 101, CS 125, or ECE 190); MATH 225 (Matrix Theory) or MATH 415 (Applied Linear Algebra); and MATH 241 (Calculus III). As the prerequisites suggest, this is more of a Mathematics course than a Programming course.

When to Take It:

CS 357 is offered during Fall and Spring semesters. It is relatively important to have a good mathematical background, so it is recommended to be done with the Calculus series before taking this course. Students with earned credit in CS 450 (Numerical Analysis) may not receive credit for CS 357. Although programming is not an essential part of the course, it is useful to have some Python experience. It is very useful to have taken MATH 415 before, as many concepts are shared between the courses, and some other concepts build up from those of MATH 415.

Class Content:

The course is an introduction to numerical methods, studied from a purely mathematical point of view. Students will learn the theoretical foundations of numerical methods used to solve complex mathematical problems. The course starts with a review of fundamental concepts, such as Taylor series, approximation of numbers, and binary to decimal conversion. The main part of the course includes floating-point computation, characteristics of square matrices, and systems of linear equations. The final part covers approximation of functions and integrals, nonlinear equations, interpolation, numerical solutions of ordinary differential equations, and eigenvalues and eigenvectors. The amount of coding required for this class is insignificant and, in most semesters, non-existent. In some semesters, there are a few programming exercises which require students to implement the numerical methods studied during the course, usually using Numpy and Matplotlib in Python.

Work:

The workload is fairly light compared to the average CS/ECE course. There are no labs on this course, and the format of the class is the classic lecture. There are weekly homework assignments, which should not take a long time to solve if you have access to the course materials (either class-notes and/or textbook). It is helpful to have some experience with Python, because it will allow you to solve homework problems faster. In case you don't, professors usually offer a Python tutorial by the beginning of the semester. There are two midterm exams and one final, all in the DCL Testing Center, which make up most of the grade. These exams are closed book, closed notes, and no calculator is allowed. You are supposed to demonstrate knowledge of the fundamental methods studied, but there are no hard computations - most, if not all, of the questions on the tests are multiple-choice.

Life After:

This course is an overview of numerical methods to solve complex mathematical problems. This is particularly useful to solve many kinds of problems in engineering, and it is a suggested non-ECE tech elective for those students interested in areas so diverse as Power or Microelectronics, as well as Computing Systems. Many students will be involved in numerical computing to some extent, regardless of which area one is focused on. This course is also a prerequisite for CS 457 (Numerical Methods II).