

# COURSE OUTLINE

## MATH 186

### Introductory Numerical Analysis

3 Semester Hours

## HOWARD COMMUNITY COLLEGE

### Description

In this course, students will develop skills necessary to design and implement algorithms to solve problems using digital computers. The FORTRAN or an equivalent language will be used to program solutions to these problems. Techniques will include data input and storage, selection of relevant numerical and non-numerical methods for problem solution, and the efficient ordering of data for meaningful output presentation. Some problems will be fundamental to engineering design, but non-engineers interested in numerical analysis methods along with the construction and description of effective procedures to solve the problem should gain knowledge which can be used in their respective fields of interest. Prerequisite: MATH 140 (3 hours weekly)

### Overall Course Objectives

Upon completion of this course, the student will be able to:

1. Apply numerical methods to approximate roots of  $f(x) = 0$ .
2. Apply numerical methods to solve systems of equations.
3. Apply numerical methods to do polynomial interpolation.
4. Apply numerical methods to curve fitting.
5. Apply numerical methods to numerical differentiation and integration.
6. Apply numerical methods to solve ordinary differential equations.
7. Apply efficient algorithms for digital computer solutions of problems requiring numerical analysis techniques.
8. Write structured and well-documented programs in the FORTRAN language to implement algorithms.
9. Compare and appraise the different numerical algorithms used to solve problems requiring numerical analysis techniques.
10. Discuss computer number systems, error types and sources, and other concerns with using computers to implement the algorithms used in numerical work.

### Major Topics

- I. Preparation for Using Computers for Algorithm Implementation
- II. Approximation of Roots of  $f(x) = 0$
- III. Solving Linear Systems of Equations

- IV. Polynomial Interpolation
- V. Curve Fitting
- VI. Numerical Differentiation and Integration
- VII. Numerical Solution of Ordinary Differential Equations

### **Course Requirements**

Grading/exams: Policy is to be decided by the individual instructor, but must include a comprehensive final exam and projects coded in a higher level language.

### **Other Course Information**

This course is a Math core course. This course is an Arts & Science and Math elective.