

# Common Course Outline

CMSC 248

Numerical Methods

4 Semester Hours

## The Community College of Baltimore County

### **Description**

Covers error analysis, numerical solution of nonlinear equation, interpolation, splines, data fitting, Numerical integration, Gaussian Elimination, LU factorization, matrix inversion, and numerical Solution of ODE's.

### **Overall Course Objectives**

Upon successfully completing the course, students will be able to:

1. analyze problems to determine appropriate programming solutions.
2. use an object-oriented or structured programming language for problem solving.
3. debug logic-based programming errors.
4. develop well-written and documented programs up to a few hundred lines in length.
5. recognize common programming structures in other languages.
6. convert input from the user or files.
7. create arrays and loops to handle large files of input and output.
8. organize code into sub procedures.
9. work in teams to develop a large program.
10. continue the study of computer science and C++.

### **Major Topics**

- I. Introduction to a Structured Language
  - A. Syntax diagrams
  - B. Use of Integrated Development Environment
- II. Arithmetic Expressions
  - A. Integer storage and operators
  - B. Floating point arithmetic and storage
  - C. Math library functions
- III. Modularization
  - A. Use of value and reference parameters
  - B. Scope of variables
  - C. Function return types
- IV. Handling Text Files
  - A. Reading from a text file
  - B. Writing to a text file
- V. Control Structures
  - A. Loops: while, for, do..while
  - B. Branches: if..else, switch
- VI. Simple Data Types
  - A. Char variables

- B. Boolean variables and operators
- C. Enumerated types
- VII. Data Structures
  - A. One-Dimensional Arrays
  - B. Multi-Dimensional Arrays
  - C. Structs (Records)
- VIII. Introduction to Sorting and Searching
  - A. Bubble Sort
  - B. Insertion Sort
  - C. Selection Sort
  - D. Linear search
  - E. Binary search
- IX. Implementation of Abstract Data Types
  - A. Data members
  - B. Operations
- X. Debugging Techniques
  - A. Use of loop invariants
  - B. Use of function preconditions and postconditions
  - C. Use of stubs and drivers
  - D. Program tracing, testing, documentation and verification

### **Course Requirements**

Grading: Grading procedures will be determined by the individual faculty member, will be provided the first week of class, and will include the following:

1. Computer Projects: Students will develop at least five computer programming projects, ranging from introductory labs to complex multi-layered scientific or mathematical projects. Programming time outside of class is required to complete projects.
2. At least two Tests, Exams, and/or Quizzes: Individual faculty will notify students of the testing procedures to be used.
3. Comprehensive Final Exam: The course will include a comprehensive final exam, which may include a final project.

Final Grades: Grades will be determined by individual faculty members.

Individual faculty members may include additional course objectives, major topics, and other course requirements to the minimum expectations stated in the Common Course Outline.

The Community College of Baltimore County is committed to providing a high-quality learning experience that results in growth in knowledge, attitudes, and skills necessary to function successfully as a transfer student, in a career and as a citizen. To accomplish this goal, we maintain high academic standards and expect students to accept responsibility for their individual growth by attending classes, completing all homework and other assignments, participating in class activities and preparing for tests.

We take seriously our responsibility to maintain high-quality programs and will periodically ask you to participate in assessment activities to determine whether our students are attaining the knowledge, attitudes and skills appropriate to various courses and programs. The assessment activities may take many different forms such as surveys, standardized or faculty-developed tests, discussion groups or portfolio evaluations. We ask that you take these activities seriously so that we can obtain valid data to use for the continuous improvements of CCBC's course and programs.

### **Other Course Information**

This course is the first transfer course in the Computer Science Program at CCBC, and prepares students for CMSC 202, the second transfer course. This course is also recommended for students in these related programs who want to transfer to 4-year colleges: Computer Information Systems, Mathematics, and Engineering.