EMBRY-RIDDLE AERONAUTICAL UNIVERSITY
Department of Computing and Mathematics
COURSE OUTLINE FOR

Course No.: CS223 **Title: Scientific Programming in C**
Cr Hrs: 3

Lecture Hours: 3 **Laboratory Hours: 0**

COURSE DESCRIPTION:

This is an introductory course in C programming for scientists and engineers. Using a problem solving approach for developing algorithms, the algorithms are implemented in C and include the following topics: data types, and related operations, input/output, control structures, functions, arrays, files, and strings. Prerequiste: MA112 or MA241 or permission of the instructor

GOALS:

Upon successful completion of this course the student should be able to analyze various scientific and engineering problems and design and develop algorithmic solutions to these problems. Furthermore, the student should be able to implement these algorithms in C. This course is not intended to make a professional programmer out of the student but rather make the student knowledgeable about scientific programming.

PERFORMANCE OBJECTIVES:

1. Describe the functional units of a computer (ALU, control unit, main memory, peripheral devices, secondary memory).

2. Create, edit, compile, and execute a C program from an operating system environment.

3. Design solutions to problems requiring elementary processing concepts of arithmetic, basic data types and operations, in algorithmic form and translate them to C programs.

4. Design solutions to problems requiring the basic control structures of sequence, selection, and repetition in algorithmic format and implement them in C.

5. Design solutions to problems requiring the use of files, I/O with files in algorithmic format, and translate them to ‘C programs.’

6. Design solutions to problems requiring array structures, apply them to the topics of linear search and sorting; implementing the algorithmic solution in C.

7. Apply a top-down design methodology to problems of intermediate complexity, using functions.

8. Solve problems of intermediate complexity requiring the use of non-numerical data such as characters, strings and the use of the additional numerical data of double-precision and complex numbers.

Department of Computing and Mathematics
COURSE OUTLINE FOR CS223, Continued

TEXTBOOK:

Prata, Stephen, C Primer Plus (SAMS Publishing, 1999, Third edition)

SUGGESTED SUPPLEMENTAL MATERIALS:

Davies, Paul, *The Indispensible Guide to C with Engineering Applications* (Addison - Wesley 1995 Reprinted 1998)

PREREQUISITE KNOWLEDGE BY TOPIC:

A competency in the basic mathematical topics of arithmetic, algebra, elementary functions, summation, basic differentiation and integration as covered in the prerequisite course.

	TOPIC	CLASS HOURS	COURSE OBJECTIVES
1.	Introduction to Computers and Programming	3	a. History b. Components of a Computer c. Programming Languages d. Using a Computer
2.	Problem Solving with C	6	a. Applying the Software Development Method b. Overview of C c. Variable Declarations d. Executable Statement e. Data Types f. Expressions g. Input and Output Processing
3.	Top-Down Design with Functions	3	a. The Art and Science of Problem Solving b. Functions c. Programming using Building Blocks d. Code Reuse
4.	Control Structures in Algorithm Design	9	a. Sequence Structure b. Decision Structure c. Repetition Structure d. Nested Control Structure
5.	Modular Programming	6	a. Functions that return a single value b. Void Functions c. Formal and Actual arguments d. Introduction to Scope of Names
	Con't	**Class**	

	Topics	Hours	Course Objectives
6.	Array Structures	6	a. One Dimensional Array Processing b. Using Arrays as Arguments c. Multi-Dimensional Array Processing
7.	Strings	2	a. String Basics b. String Assignment and Substrings c. Concatenation d. String-to-Number and Number-to-string
8.	File Input and Output	3	a. Data File Concepts b. Text Files

LABORATORY:

There will be 7-9 laboratory assignments, mainly programs. Examples of these assignments are as follows:

1. Rocket trajectory: Computation of a simulated rocket trajectory for height as a function of time.
2. Softlanding for a retrorocket: Computation of the distance, velocity, and acceleration as a function of time, using a polynomial of degree 4 for the distance above the ground.
3. Rocket motor thrust based on wind tunnel data: Computation of the thrust for a rocket motor simulation based on wind tunnel data using linear interpolation.

COMPUTER USAGE:

The chief resource is a laboratory of NT workstations with an integrated C development environment. In addition, the classroom used for the course must have access to a computer running the laboratory software, and be equipped with an appropriate classroom display.

GRADING SYSTEM:

The final assessment will be based on performance on homework assignments and class evaluations. Homework assignments consist of both programming assignments in C and written assignments. The written assignments will include the development of pseudocode algorithms. Class evaluation will include quizzes, full-period tests, and a two-hour comprehensive final exam. The items are prorated as follows: Tests 70% Homework 20% Quiz 10%

ESTIMATED CONTENT:

Skills: 50%
Content: 50%