February 1, 2010

METROPOLITAN STATE COLLEGE *of* DENVER
Office of Academic Affairs

DETAILED COURSE CONTENT

Required Reading and Other Materials will be equivalent to:
Fortran 95/2003 for Scientists and Engineers, Steven J. Chapman, McGraw-Hill, 2007.

Detailed Outline of Course Content:

I. Introduction to Computers and the Fortran Language
   A. The Computer
   B. Data Representation in a Computer
   C. Computer Languages
   D. The history of Fortran Language
   E. The Evolution of Fortran

II. Basic Elements of Fortran
   A. The Fortran Character Set
   B. The Structure of a Fortran Statement
   C. The Structure of a Fortran Program
   D. Constants and Variables
   E. Assignment Statements and Arithmetic Calculations.
   F. Assignment Statements and Logical Calculations
   G. Assignment Statements and Character Variables
   H. Intrinsic Functions
   I. List-Directed Input and Output Statements
   J. Initialization of Variables.
   K. The IMPLICIT NONE Statement
   L. Debugging Fortran Programs.

III. Control Structures and Program Design
   A. Introduction to Top-Down Design Techniques.
   B. Use of Pseudocode and Flowcharts.
   C. Control Constructs: Branches.
   D. Control Constructs: Loops
   E. More on Debugging Fortran Programs.

IV. Basic I/O Concepts
   A. Formats and Formatted WRITE Statements.
   B. Output Devices.
   C. Format Descriptors.
   D. Formatted READ Statements.
   E. An Introduction to Files and File Processing

V. Arrays
   A. Declaring Arrays.
   B. Using Array Elements in Fortran Statements.
   C. Using Whole Arrays and Array Subsets in Fortran Statements.
   D. Input and Output.
   E. Two-Dimensional or Rank-2 Arrays.
   F. Multidimensional or Rank-*n* Arrays.
   G. Using Fortran Intrinsic Functions with Arrays.
   H. Allocatable Arrays.
   I. When Should You Use an Array?

VI. Procedures and Structured Programming
- A. Subroutines
- B. The SAVE Attribute and Statement
- C. Automatic Arrays.
- D. Sharing Data Using Modules
- E. Module Procedures.
- F. Fortran Functions
- G. Passing Procedures as Arguments to Other Procedures.

VII. More about Character Variables
- A. Character Comparison Operations.
- B. Intrinsic Character Functions.
- C. Passing Character Variables to Subroutines and Functions.
- D. Variable Length Character Functions.
- E. Internal Files

VIII. Additional Data Types
- A. Alternative Lengths of the REAL Data Type.
- B. Alternative Lengths of the INTEGER Data Type.
- C. The COMPLEX Data Type.
- D. Derived Data Types

IX. Advanced Features of Procedures and Modules
- A. Internal Procedures.
- B. Recursive Procedures.
- C. Keyword Arguments and Optional Arguments.
- D. Generic Procedures

X. Advanced I/O Concepts
- A. Additional Format Descriptors.
- B. Defaulting Values in List-Directed Input.
- C. Detailed Description of Fortran I/O Statements.
- D. Namelist I/O.
- E. Unformatted Files.
- F. Direct Access Files

XI. Fortran Libraries
- A. Types of Fortran Libraries.
- B. Using Fortran Libraries.

Evaluation of Student Performance:

As determined by the instructor:
1. Quizzes
2. Exams
3. Homework
4. Projects

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Course Committee Chair **Date**