

SOUTHEAST MISSOURI STATE UNIVERSITY

DEPARTMENT OF Computer Science

COURSE NO. CS180

TITLE OF COURSE Scientific Computing I

REVISION 2/2000

- I. CATALOG DESCRIPTION AND CREDIT HOURS OF COURSE: An introduction to scientific computing. Topics include scientific information systems, productivity tools, introduction to programming. Two hours lecture, two hours lab per week. Prerequisites: MA139 or MA140 with a minimum grade of "C". (3)
- II. PREREQUISITE(S): MA139 Applied Calculus or MA140 Analytic Geometry and Calculus I with a minimum grade of "C".
- III. PURPOSE OR OBJECTIVE OF THE COURSE: Students will:
  - A. use a variety of productivity tools to analyze scientific and engineering problems.
  - B. evaluate the capabilities of productivity tools for problem solving.
  - C. be introduced to computer programming.
- IV. EXPECTATION OF STUDENTS:
  - A. Regular access to computer resources for assigned activities
  - B. Diligent and timely attention to the sequence of topics
  - C. Active engagement in solution of exercises
  - D. Active participation in class discussion.
- V. COURSE CONTENT OR OUTLINE (Lecture/Lab): Because of the nature of the course material, the main topics will be interleaved. The following outline gives the approximate number of class periods devoted to the main categories and topics in the course. In addition considerable out of class lab time will be required.
  - A. Introduction (4/2)
    1. Access to computer resources
    2. The use of the computer's operating system
    3. Use of course bulletin boards and discussion forums
    4. Use of FTP to make files available during discussion.

- B. Spreadsheet Analysis and Modeling (7/6)
  - 1. Orientation to a Worksheet
  - 2. Basic Operations – Formulae and Addresses
  - 3. Copying Formulae
  - 4. Use of Mathematical Functions
  - 5. Decisions – IF constructions
  - 6. Decisions – 1D and 2D tables
  - 7. Graphs
  - 8. Fitting Curves to Functional Forms
  - 9. Reduction of Experimental Data
  - 10. Modeling
  - 11. User-defined Functions -- Macros
  
- C. Introduction to Programming (7/6)
  - 1. Orientation to the User Interface
  - 2. Scalars, Vectors, and Matrices – Variables and Data Types
  - 3. Mathematical and Statistical Functions
  - 4. Random Number Generation and Stochastic Models
  - 5. Control Structures – if...then...else
  - 6. Control Structures -- loops
  - 7. Matrix Computations – Transpose, Inverse, Multiplication
  - 8. Symbolic Mathematics
  - 9. Numerical Techniques – Interpolation and Curve Fitting
  
- D. Tests and Examinations (2)

## VI. TEXTBOOK(S) AND OTHER REQUIRED MATERIALS OR EQUIPMENT

- A. Student textbooks:
  - 1. Delores M. Etter and David Kuncicky, *Introduction to MATLAB*, Prentice-Hall, 1999
  - 2. Bernard V. Liengme, *A Guide to Microsoft Excel for Scientists and Engineers*, Wiley, 1997
  
- B. Reference textbooks and periodicals: Microsoft Excel Reference manuals can be purchased from many book stores, by mail order, or online. MATLAB Reference manuals are installed with the MATLAB software. A printed reference manual is included in the student version.
  
- C. Equipment: Microcomputer laboratories: Computer Science labs have both Excel and MATLAB. Open laboratories on campus have only Excel. MATLAB's availability is limited by the license that the Computer Science Department has.
  
- D. The Student Version of MATLAB is available in the campus bookstore or can be purchased directly from the MathWorks, Inc.

VII. BASIS OF STUDENT EVALUATION:

- A. Projects and programming assignments (10 – 30%)
- B. Tests and/or Quizzes (20 – 50%)
- C. A Final Examination (20 – 40%)
- D. Library assignments (10 – 20%)
- E. Class Participation (10 – 20%)