EL CAMINO COLLEGE
COURSE OUTLINE OF RECORD

I. COURSE DESCRIPTION

Course Title and Number: Computer Science 10

Descriptive Title: Computer Programming with FORTRAN

Discipline: Computer Science

Division: Mathematical Sciences

Course Length: ☒ Full Term ☐ Other (specify):

Hours Lecture: 3 Hours Laboratory: 3 Course Units: 4

Grading Method: ☒ Letter ☐ Credit/No Credit ☐ Both ☐ No Grade

Course Type: ☒ Credit, Degree Applicable ☐ Credit, Not Degree Applicable ☐ Non-Credit

Transfer CSU: ☒ Yes Effective Date Prior to 7/92 ☐ Pending ☐ No

Transfer UC: ☒ Yes Approval Date Prior to 7/92 ☐ Pending ☐ No

Conditions of Enrollment:
Specify Prerequisite Corequisite, Recommended Preparation, Enrollment Limitation or None.

Prerequisite: Mathematics 190 with a minimum grade of C, or concurrent enrollment.

Catalog Description:

This course is an introduction to elementary numerical methods using the Fortran language. Topics include algebraic equation solvers, numerical differentiation and integration, evaluation of determinants, matrix solutions of linear systems of equations, and prime number generators. Laboratory work is conducted on IBM compatible personal computers.

II. COURSE OBJECTIVES

List the major objectives of the course. These must be stated in behaviorally measurable terms.

1. Identify and make proper use of the basic data-types (INTEGER, REAL, DOUBLE PRECISION,COMPLEX, CHARACTER, LOGICAL) and the intrinsic operators (+, -, *, /, **) of the FORTRAN language.
2. Use list-directed and format-directed I/O (input/output). Make proper use of FORTRAN format descriptors, such as nAw, nIw, nFw.d, "/", "$", "\", and Tn.
3. Write efficient program code using Fortran's control structures: Logical IF, IF - THEN - END IF, IF - THEN - ELSE - END IF, IF - THEN - ELSE IF - . . . - ELSE IF - END IF, IF - THEN - ELSE IF - . . . - ELSE - END IF, and GOTO.
4. Write program code using the iteration structures: DO n - . . . - n CONTINUE, DO WHILE - END DO, DO - END DO. Conduct pre-tests and post-tests of looping structures.
5. Demonstrate knowledge of structured programming using top-down design, implementing SUBROUTINE subprograms and FUNCTION subprograms.
6. Use arrays of one and several dimensions.
7. Specifically for the CHARACTER basic datatype, use the forms of the CHARACTER string data-type and implement the operators which act on objects of that type.
8. Write program code using both formatted FORTRAN files and binary FORTRAN files.
9. Use the Fortran DATA statement, COMMON statement, the STRUCTURE statement, and use externally-storable subprogram units.

III. OUTLINE OF SUBJECT MATTER

The topics should be detailed enough to enable an instructor to determine the major areas that should be covered and so that the course may have consistency from instructor to instructor and semester to semester.

Approximate Time in Hours	Major Topics
6	The Personal Computer programming environment.
7	Basic data types and operators.
7	Simple list and format directed I/O.
13	Control structures: • Logical `IF` • **`IF - THEN - END IF`** • **`IF - THEN - ELSE - END IF`** • `IF - THEN - ELSE IF - . . . - ELSE IF - END IF` • `IF - THEN - ELSE IF - . . . - ELSE - END IF` • `GOTO` (and the possible dangers of `GOTO`)
16	Iteration structures: • `DO n - . . . - n CONTINUE` • `DO WHILE - END DO` • `DO - END DO` • General pre-test and post-test looping structures
19	Subprograms • SUBROUTINE • FUNCTION
7	String manipulation
13	Sequential files, both formatted and binary
10	Additional language structures • COMMON • SAVE • STRUCTURE
10	Externally stored subprogram libraries.

Total: 108 hours

IV . METHODS OF EVALUATION

A. CREDIT, DEGREE APPLICABLE AND CREDIT, NOT DEGREE APPLICABLE COURSES

Check the PRIMARY method of evaluation for this course.

- ☐ Substantial writing assignments
- ☒ Problem solving demonstrations (computational or non-computational)
- ☐ Skills demonstrations

A minimum of one response in the categories 1, 2, or 3 below, as applicable, is required. However, you may check all that apply.

1. Indicate the types of writing assignments used as primary or secondary methods of evaluation for this course.
   - ☐ Essay exams
   - ☐ Written homework
   - ☐ Term or other papers
   - ☐ Reading reports
   - ☐ Laboratory reports
   - ☐ Other (specify)

2. Indicate the types of problem-solving demonstrations used as primary or secondary methods of evaluation for this course.
   - ☒ Exams
   - ☒ Homework problems
   - ☒ Laboratory reports
   - ☐ Fieldwork
   - ☒ Quizzes
   - ☒ Other (specify) Develop Computer Programs

3. Indicate the types of skill demonstrations used as primary or secondary methods of evaluation for this course.
   - ☐ Class performance
   - ☐ Fieldwork
   - ☐ Performance exams
   - ☐ Other (specify)

4. If objective exams are also used, check all that apply.
   - ☐ Multiple choice
   - ☐ True/false
   - ☐ Completion
   - ☐ Other (specify)
   - ☐ Matching items

B. NON-CREDIT COURSE

Indicate the methods of evaluation that will be used to determine that stated objectives have been met.

V. COURSEWORK

A. TYPICAL ASSIGNMENT

Provide an example of a typical assignment. This assignment must correspond to the PRIMARY method of evaluation indicated in Section IV, Methods of Evaluation. That is, it must be a writing assignment or, if more appropriate, an assignment involving problem solving or skill demonstration.

The intent in this assignment is to use Newton's method to calculate a zero of a function, given *an approximation of* that zero. Develop a subroutine subprogram taking six arguments. The first argument will be an input argument that represents a `REAL`-valued function that takes a `REAL`-valued argument. The second argument will be an input argument representing a `REAL`-valued function that takes a `REAL`-valued argument. This second function is the derivative of the first function. Remember that you will have to make use of the `EXTERNAL` facility of FORTRAN at this point, in order to pass functions as arguments. The third argument will be an input argument containing a `REAL`-valued approximation to a zero of the function. The fourth argument will be an input argument of type `REAL` representing the acceptable tolerance value. The fifth argument will be an output argument of type `LOGICAL` that lets the user know if the process was successful. The sixth argument will be an output argument of type `REAL` representing the zero of the function, accurate to the specified tolerance.

B. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS

Cite two specific assignments that demonstrate college-level critical thinking. (Required for degree applicable courses only.)

1. Develop a computer program to use numerical integration to evaluate the integral of an arbitrary continuous function, given the limits of integration and the number of subintervals. Develop an algorithm to be used internally to determine if the number of subintervals specified is consistent with the range of values of the function on the interval of integration, and the data type of the function.

2. Develop a computer program to solve a system of n linear equations in n unknowns. As part of the solution to this problem, develop a recursive function to generate the determinant of an n by n square matrix.

C. WORK OUTSIDE OF CLASS

Two hours work outside of class are required for each hour of lecture or equivalent. Each student in this course will be required to participate in the following work outside of class time. Check all that apply.

- ☒ Study
- ☐ Answer questions
- ☐ Skill practice
- ☒ Required reading
- ☒ Problem solving activity
- ☐ Written work (such as essay/composition/report/analysis/research)
- ☐ Journal (done on a continuing basis throughout the semester)
- ☐ Observation of or participation in an activity related to course content (such as theatre event, museum, concert, debate, meeting)
- ☐ Course is lab only - minimum required hours satisfied by scheduled lab time
- ☒ Other (specify) Computer laboratory work and developing computer programs.

VI. INSTRUCTIONAL METHODOLOGY

A. Check all planned instructional activities that apply:

☒ Lecture	☐ Group Activities
☒ Lab	☐ Role play/simulation
☐ Discussion	☐ Guest Speakers
☐ Multimedia presentations	☐ Field trips
☐ Demonstration	☐ Other (specify)

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instructional delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VII. TEXTS AND MATERIALS

If multiple selections are offered, only representative texts need be listed. An up-to-date list of required and recommended materials is maintained in the division office.

A. REQUIRED TEXTS (title, author, publisher, year)

FORTRAN 77 for Engineers and Scientists with an Introduction to FORTRAN 90, 4th Edition, Larry Nyhoff and Sanford Leestma, Prentice Hall, 1996
(This is a standard, classical textbook. No other options are suitable for this course.)

B. REQUIRED SUPPLEMENTARY READINGS

C. OTHER REQUIRED MATERIALS

VIII. CONDITIONS OF ENROLLMENT

If this course has a Prerequisite or Corequisite, complete section A. If this course has an Enrollment Limitation complete section B.

A. PREREQUISITE AND/OR COREQUISITE

1. Indicate if this course has a prerequisite or corequisite or both.
   ☒ Prerequisite ☐ Corequisite ☐ Both

2. Indicate Type. Check all that apply.

☐Sequential ☒Computational/Communication Skills
☐Health and Safety ☐Non-Course
☐Standard (If this is a Standard prerequisite or corequisite, attach CCC Form D.)

3. Entrance Skills/Knowledge
List the required skills and/or knowledge without which a student would be highly unlikely to receive a grade of A, B, C, or Credit (or for Health and Safety, would endanger self or others) in this course.
a. Manipulate algebraic expressions at the Precalculus level.
b. Solve application problems at the Precalculus level.
c. Evaluate and perform operations on functions at the Precalculus level.
d. Estimate derivatives numerically.

B. ENROLLMENT LIMITATION

1. Indicate the category which describes the Enrollment Limitation for this course.
☐Band/Orchestra
☐Theater
☐Speech
☐Chorus
☐Journalism
☐Dance
☐Intercollegiate Athletics
☐Honors Course
☐Blocks of Courses
☐Other (specify)
2. List Degree and/or Certificate requirements that are met by this course.

3. List all El Camino College courses that also satisfy the requirements listed above in Section B.2.

Originator: David Akins Submittal Date: March 1984

BOARD APPROVAL DATE: _____

Reviewed and/or Revised by:

Geoff Jones Date: October 1987

Geoff Jones Date: October 1999

Ralph Taylor Date: September 2007

REQUIRED SIGNATURES FOR NON-CREDIT COURSE

College Curriculum Committee Chair

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Vice-President - Academic Affairs

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