A. Protocol

Course Name: Numerical Analysis  
Course Number: CSC424  
Credits: 3  
Prerequisites: CSC 328 Data Structures with a C- or better, MAT 282 Calculus II, and MAT 341 Linear Algebra I

Maximum Class Size (face-to-face): 35  
Maximum Class Size (online): N.A.

B. Objectives of the Course:
Upon completion of this course the student will be able to:

1) Investigate the source, measure, and propagation of errors inherent in the computer.  
2) Use the power series to perform the calculation of functions.  
3) Compare various iterative methods for obtaining the roots of equations.  
4) Discuss and identify methods for dealing with nonlinear simultaneous equations.  
5) Discuss and perform numeric problems in linear algebra such as matrix manipulation, evaluation of determinants, and the solution of simultaneous linear equations.  
6) Discuss and identify methods of numerical integration and solutions to ordinary differential equations.  
7) Discuss and identify interpolation and curve-fitting.

C. Catalog Description:
In this course, various mathematical algorithms and applications relating to the numerical computation are investigated. Topics include: roundoff errors and computer arithmetic; numerical instability; error analysis and estimation; approximation; Gaussian elimination and pivoting strategies for linear systems; numerical integration and numerical solution of differential equations; curve fitting, polynomial approximation; and regression. Prerequisite: CSC 328 Data Structures with C- or better, MAT 282 Calculus II, and MAT 341 Linear Algebra I. Three credits.

D. Outline of the Course:
1) Principles of computer operations  
   a. Floating point formats  
   b. Round-off and truncation errors  
   c. Absolute, relative and percentage errors  
   d. Propagation of errors through computation  
2) Taylor and Maclaurin power series and their remainder; telescoping a series with Chebyshev polynomials.  
3) Roots of equations  
   a. Simple iteration  
   b. Newton-Raphson method  
   c. Method of false position  
   d. Bisection method  
4) Matrices, determinants, and linear simultaneous equations  
   a. Gaussian elimination method  
   b. Gauss-Siedel iterative method  
5) Numerical integration  
   a. Trapezoidal method
b. Simpson's method
c. Other Newton-Cotes methods
d. Romberg's method
e. Gauss quadrature method
6) Solutions to ordinary differential equations
   a. Euler's method and variations
   b. Milne's method
c. Runge-Kutta methods
7) Interpolation and curve-fitting
8) Lagrange and Aiken's interpolating polynomial
   a. Difference calculus
   b. Newton's forward-difference and backward-difference formulas
   c. Legendre Poynomials
d. Least-square curve fitting

E. Teaching Methodology:

1) Traditional Classroom Methodology:
   This course will be taught using the lecture/discussion method and cooperative group
   method during appropriate sections of the course.

2) Online Methodology:
   This course will not be taught online.

F. Text:

G. Assessment Activities:

1) Traditional Classroom Assessment
   The final grade will be determined as a percentage from the following evaluation methods
   with varying weights at the discretion of the instructor:

   a. Examinations
   b. Quizzes
   c. Assignments
   d. Programs
   e. Attendance
   f. Performance

2) Online Assessment
   No online assessments will be given.

H. Accommodations for Students with Disabilities:

Accommodations for Students with Disabilities

Students with disabilities:
- Reserve the right to decide when to self-identify and when to request accommodations.
- Will register with the Office for Students with Disabilities (OSD) each semester to receive
  accommodations.
- Might be required to communicate with faculty for accommodations, which specifically involve the
  faculty.
- Will present the OSD Accommodation Approval Notice to faculty when requesting
  accommodations that involve the faculty.

Requests for approval for reasonable accommodations should be directed to the Office for Students with
Disabilities (OSD). Approved accommodations will be recorded on the OSD Accommodation Approval
notice and provided to the student. Students are expected to adhere to OSD procedures for self-identifying, providing documentation and requesting accommodations in a timely manner.

Contact Information:
- Location: Azorsky Hall – Room 105
- Phone: (724) 938-5781
- Fax: (724) 938-4599
- Email: osdmail@calu.edu
- Web Site: http://www.calu.edu/current-students/studentservices/disability/index.htm