A. Protocol

Course Name: Analysis of Algorithms
Course Number: CSC360
Credits: 3
Prerequisites: CSC 328 Data Structures with C- or better

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) Explain the need to analyze algorithms before writing a computer program
2) Analyze an algorithm’s efficiency
3) Compare efficiencies of algorithms and choose the best for a particular problem
4) Discuss and implement greedy algorithms
5) Discuss and implement graph theoretic algorithms
6) Discuss and implement divide and conquer algorithms
7) Discuss distributed algorithms
8) Recognize and implement polynomial time algorithms
9) Recognize and discuss NP-Complete algorithms
10) Develop and implement approximation algorithms
11) Use standard asymptotic notations dealing with efficiencies of algorithms
12) Develop mathematical proofs by induction
13) Develop mathematical proofs by contradiction
14) Disprove false claims by counter-example
15) Solve recurrences

C. Catalog Description:
This course covers algorithm analysis theory and techniques. Students learn properties of both efficient and inefficient algorithms. The importance of analyzing algorithms before implementing them will be emphasized. This course will teach the skills necessary to determine the best algorithm for a given problem. We will investigate greedy, graph theoretic, divide and conquer, and distributed algorithms. We will cover both polynomial time algorithms and NP-completeness. Prerequisite: CSC 328 Data Structures with C- or better. Three credits.

D. Outline of the Course:
1) Introduction to Analysis of Algorithms
   a. Overview of algorithms
   b. Analyzing algorithms
   c. Designing algorithms
   d. Proofs

2) Growth of Functions and Notations
   a. Big Oh, Little Oh, Big Omega, Little Omega, and Big Theta notations
   b. NP-Complete Problems
   c. Approximation Algorithms
3) Recurrences
   a. Iteration method
   b. Recursion-tree method
   c. Master method

4) Sorting in Linear Time
   a. Lower bounds for sorting
   b. Counting sort
   c. Radix sort

5) Medians and Order Statistics
   a. Minimum and maximum
   b. Selection in expected linear time
   c. Selection in worst-case linear time

6) Greedy Algorithms
   a. Elements of the greedy strategy
   b. Huffman codes

7) Elementary Graph Algorithms
   a. Representations of graphs
   b. Breadth-first search
   c. Depth-first search
   d. Topological search
   e. Strongly connected components

8) Minimum Spanning Trees
   a. Algorithms of Kruskal and Prim

9) Single-Source Shortest Path
   a. Bellman-Ford algorithm
   b. Single-source shortest paths in directed acyclic graphs
   c. Dijkstra's algorithm

10) All-Pairs Shortest Paths

11) Maximum Flow

12) Distributed Algorithms
   a. Distributed Paradigm
   b. Consensus and Election

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:
   Quality Matters™ Statement – The online course follows the standards of the Quality Matters™ rubric. N.A.

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 N.A.

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](http://www.calu.edu/current-students/studentservices/disability/index.htm)