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by Stephen Kochan

Optional Reference Texts:  
GNU/Linux Application Programming by M. Tim Jones (2nd Edition)  
Linux Pocket Guide by Daniel J. Barrett (2nd Edition)

Course Description: Foundations of data structures and algorithms. These foundations include: space and time complexity analysis, the use of data structures such as linked lists and binary trees, basic sorting and searching algorithms, and foundations of software testing/verification/validation.

Prerequisite: CS 1320 with a grade of “C” or better.

Class Hours: Hybrid: Monday through Friday 9:20AM to 11:30AM in Education 318.

Office Hours: On demand via Cisco’s WebEx.

Course Outline:  
Week 1: Introduction and quick review of C language programming constructs  
Week 1: Functions for code re-use  
Week 1: Fundamental data structures: arrays, pointers and structures  
Week 2: Fundamental data structures: strings and string processing  
Week 2: C standard library: Console and File I/O  
Week 3: Exam 1  
Week 3: Fundamental data structures: linked-lists  
Week 3: Fundamental data structures: binary trees  
Week 3-4: Fundamental algorithms: sorting and searching  
Week 4: Time complexity analysis of algorithms  
Finals Day: Exam 2

Grading:  
Quizzes 30%  
Assignments 30%  
Exam 1 (June 17th) 20%  
Exam 2 (July 1st) 20%
Learning Objectives: [correlation to ACM curriculum standards in square brackets, knowledge units in bold should be covered in a pre-requisite course as well]

1. Become a proficient user of the Linux software development environment and GNU software development tool-chain [CE-SWD-2]
   a. Linux software development environment
   b. GNU software development tools – gcc, gdb, make, gprof, gcov

2. Understand C language programming constructs [CE-SWD-3]
   a. variables
   b. algebraic and logical expressions (including operator set)
   c. simple I/O
   d. decision statements
   e. iterative control statements

3. Understand and follow structured software design strategies [CE-SWD-3]
   a. programming paradigms: procedural/modular, object-oriented
   b. design for reuse using the procedural/modular paradigm
   c. utilizing standard libraries, focus on C standard library

4. Understand and utilize fundamental data structures [CE-SWD-5]
   a. arrays and structures
   b. strings and string processing
   c. pointers, linked lists, and binary trees
   d. storage allocation: static, stack and heap

5. Understand the foundations of algorithm analysis [CE-CAL-1, CE-CAL-2, CE-CAL-3]
   a. history and the role of algorithms
   b. determine time complexity of algorithms

6. Understand and utilize fundamental algorithms [CE-CAL-5]
   a. sorting algorithms: bubble sort and insertion sort
   b. searching algorithms: linear search and binary search
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