1.0 Course Description

1.1 Overview of content and purpose of the course (catalog description).
Programming in C in a UNIX® operating system environment; algorithm and program
development and file manipulation using C; UNIX-like utility development.

1.2 For whom course is intended.
This course is designed primarily for individuals already possessing programming facility
in another high-level language who want to learn how to program in C in the UNIX
environment.

1.3 Prerequisites of the course (courses).
CSCI 1620 or equivalent experience with programming in a high-level language

1.4 Prerequisites of the course (topics)
1.4.1 Facility with a high-level programming language like Pascal, Modula, Java, or
C++.
1.4.2 Ability to design and implement solutions to modest problems using assignment
and flow control, procedures/subroutines/functions, scalars, arrays,
records/structures, and simple input/output.

1.5 Unusual circumstances of the course.
None

2.0 Objectives

2.1 Be able to construct syntactically correct C programs using all language features.
2.2 Be able to recognize and correct syntax errors in C programs. This includes correct
declarations and prototypes in both “K&R” C and ANSI C.
2.3 Be able to use primitive and complex data types and utilize/implement type conversion.
This includes structures, typedefs, unions, enumerations and bit fields.
2.4 Be able to effectively use the operators in C.
2.5 Be able to explain the scope, lifetime, and initialization possibilities for all variable types
in C. This includes the use of static to alter scope.
2.6 Be able to describe and the basic low-level UNIX input/output facilities, including at
least the open, close, read, write, unlink, and lseek system calls.
2.7 Be able to explain and use the malloc and free functions to create and destroy simple
dynamic data structures like variable-sized arrays and linked lists.
2.8 Be comfortable with standard Unix command line tools, make, man, nm, etc., as well as
concepts of pipes and redirection in the shell and use of the preprocessor and linker.
### 3.0 Content and Organization

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3.7.6 Recursion and storage allocation; the run-time stack
3.7.7 Typical errors

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3.8.1.2 Variable declaration
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3.9.7 Initialization of pointer variables
3.9.8 Pointer comparison
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3.12.2 The sizeof operator
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3.12.4 Dynamic allocation of arrays
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3.12.6 Pitfalls
  3.12.6.1 The dangling pointer problem
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3.14.3.1 stat
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3.15 String handling functions (string.h) 2.0
3.15.1 strcpy, strcat, strcmp, strlen
3.15.2 strchr, strrchr, strtok, strspn, strpbrk, etc.
3.15.3 memset, memcp, memcpy, memmove, memchr, etc.
3.16 Character classification functions (ctype.h) 0.5
3.17 Simple mathematical functions (math.h) 1.0
3.17.1 sqrt
3.17.2 exp, pow
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3.17.5 log, log10
3.18 Other standard library functions 1.0
3.18.1 malloc (review)
3.18.2 exit
3.18.3 qsort
3.18.4 rand/srand and random/srandom
3.18.5 atoi/atol/atof and pitfalls

4.0 Teaching Methodology

4.1 Methods to be used
This course is presented primarily through lectures, with on-line demonstrations.

4.2 Student role in the course
The student in this course will study the C programming language in depth, demonstrate understanding of the language by designing, writing and testing numerous programs, and take several quizzes and examinations.

4.3 Contact hours
Three hours per week

5.0 Evaluation

5.1 Type of student projects that will be the basis for evaluating student performance, specifying distinction between undergraduate and graduate, if applicable. For laboratory projects, specify the number of weeks spent on each project).

Students will write a significant number of C programs for the class, each of which is to be compiled and executed in a UNIX environment. All programs will use the C preprocessor, and an ANSI C-compiler (gcc is traditional); commands will be executed using a standard UNIX shell (e.g. sh, csh, ksh). Earlier programs should be completed in a week or less, while some programs later in the semester may require several weeks for completion. For some larger programs, the instructor may provide partially-complete solutions which are to be embellished or modified by the student. Each student will work independently.
5.2 Basis for determining the final grade

The major portion (typically 80 percent) of the student’s grade will be determined by their success on the programming assignments. Programming assignments will be evaluated for correctness, readability, use of required features, and structure.

A few (three or four) short quizzes and a final examination will be given, and will be the basis for the remaining portion of the student’s grade.

5.3 Grading scale and criteria

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<th>Points</th>
<th>Grade</th>
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<tr>
<td>97 – 100%</td>
<td>A+</td>
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<tr>
<td>93 – 96%</td>
<td>A</td>
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<tr>
<td>90 – 92%</td>
<td>A–</td>
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<tr>
<td>80 – 82%</td>
<td>B–</td>
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<td>77 – 79%</td>
<td>C+</td>
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<td>73 – 76%</td>
<td>C</td>
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<td>70 – 72%</td>
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<tr>
<td>60 – 62%</td>
<td>D–</td>
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<tr>
<td>0 – 59%</td>
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6.0 Resource Material

6.1 Textbooks and/or other required readings used in course

Kernighan and Ritchie, *The C Programming Language*, 2nd edition, Prentice Hall, 1988 (or a more recent text); although this is an “old” book, it is still one of the best available, especially for students who already know how to program in another high-level language (which is a prerequisite for the course).

6.2 Other suggested reading materials, if any

UNIX “man” and “info” pages for various commands, UNIX system calls, and library functions (in particular, gcc and standard C library functions); much of this material is covered in the Kernighan and Ritchie text, but students should become familiar with these resources for obtaining additional information.

6.3 Other sources of information

C is a widely-used programming language. There are numerous sites on the World Wide Web providing information on the language. A search for the literal phrase “C Programming” yielded over 300,000 hits.

6.4 Current bibliography of resource for student’s information


Loudon, *Mastering Algorithms with C*, O’Reilly, 1999


Reek, *Pointers on C*, Addison-Wesley, 1997


### 7.0 Computer Science Accreditation Board (CSAB) Category Content (class time in hours)

<table>
<thead>
<tr>
<th>CSAB Category</th>
<th>Core</th>
<th>Advanced</th>
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<tr>
<td>Data structures</td>
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<td>Computer organization and architecture</td>
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<tr>
<td>Algorithms and software design</td>
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<td>4</td>
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<tr>
<td>Concepts of programming languages</td>
<td>5</td>
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### 8.0 Oral and Written Communications

Every student is required to submit at least __0__ written reports (not including exams, tests, quizzes, or commented programs) to typically ____ pages and to make ___ oral presentations of typically ____ minutes duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.

### 9.0 Social and Ethical Issues

No coverage

### 10.0 Theoretical content

Although the course does not cover any theoretical topics in depth, it does provide some theoretical of the following topics.

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<thead>
<tr>
<th>Contact Hours</th>
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<tr>
<td>0.5</td>
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#### 10.1 Data representation (in memory and on disk)

#### 10.2 Explicit and implicit dynamic memory management
11.0 Problem analysis

Students are expected to bring with them some of the analysis skills necessary for this course. Additional skills are obtained by working through the numerous assignments.

12.0 Solution design

The focal point of the course is the design and implementation of solutions to problems, primarily in the context of the C programming language and the UNIX operating system.

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<th>Date</th>
<th>Change</th>
<th>By whom</th>
<th>Comments</th>
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<td>Cleanup, ABET-specific material</td>
<td>Wileman</td>
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<td>12/2/2008</td>
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<tr>
<td>3/5/2014</td>
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