**CREDIT COURSE OUTLINE**

**I. COVER PAGE**

| (1) CSCI 26 | (2) DISCRETE MATHEMATICS FOR COMPUTER SCIENCE | (3) 4 |
|---|---|---|
| Number | Title | Units |

| | | | | |
|---|---|---|---|---|
| (4) | Lecture / Lab Hours: | | | |
| | Total Course Hours | | | |
| | | Total Lec hours: | | 54.00 |
| | | Total Lab hours: | | 36.00 |
| | | Total Contact hours: | | 90.00 |
| | Lec will generate 0 hour(s) outside work. | | | |
| | Lab will generate 0 hour(s) outside work. | | | |
| (5) | Grading Basis: | Grading Scale Only | | |
| | | Pass/No Pass option | | X |
| | | Pass/No Pass only | | |
| (6) | Advisories:<br>*No defined advisories.* | | | |
| (7) | Pre-requisites(requires C grade or better):<br>CSCI 40 | | | |
| | Corequisites: | | | |

| | | |
|---|---|---|
| (8)Classification: | | |
| | Degree applicable: | X |
| | Non-degree applicable: | |
| | Basic skills: | |
| (9)RC | Fulfills AS/AA degree requirement: (area) | |
| | General education category: | |
| | Major: | COMPUTER SCIENCE |
| | Certificate of: | |
| | Certificate in: | |
| (10)CSU | Baccalaureate: | X |
| (11)Repeatable: (A course may be repeated three times) | | 0 |

(12) Catalog Description:
This course studies elements of discrete mathematics which have applications to computer science. Topics include sets, propositional and predicate logic, relations and functions, mathematical induction, graph, trees, Boolean algebra.

**II. COURSE OUTCOMES:**

***(Specify the learning skills the student demonstrates through completing the course and link critical thinking skills to specific course content and objectives.)***

Upon completion of this course, students will be able to:

I. Apply fundamental proving techniques of discrete mathematics in computer science. These techniques include proofs by mathematical induction.
II. Be proficient in dealing with the language of mathematics, such as sets, sequences, number systems, relations, and functions.
III. Acquire the knowledge of algorithms, recursive algorithms, and the analysis of algorithms.
IV. Give precise statements about the growth of functions and the complexity of algorithms using the big O, omega, and theta notations.
V. Write C++ programs to implement various algorithms.

**III. COURSE OBJECTIVES:**

***(Specify major objectives in terms of the observable knowledge and/or skills to be attained.)***

In the process of completing this course, students will:

I. Determine the truth values of propositions using truth tables.
II. Prove mathematical principles using mathematical induction method.
III. Use the language of mathematics: sets, sequences, number systems, relations, and functions.
IV. Convert numbers between decimal number system, binary number system, and hexadecimal number system.
V. Write algorithms for solutions to problems; and analyze the complexity of algorithms.
VI. Count objects using permutation and combination methods.
VII. Apply the pigeonhole principle to determine an item having a given property or not.
VIII. Understand and apply the fundamentals of graph theory.
IX. Build and traverse binary trees.

**IV. COURSE OUTLINE:**

**Lecture Content:**

A. Logic and Proofs
   1. Propositions
   2. Conditional Propositions & Logical Equivalence
   3. Proofs
   4. Mathematical Induction
B. Language of Mathematics
   1. Sets
   2. Sequences and Strings
   3. Number Systems
   4. Relations
   5. Functions
C. Algorithms: Counting Methods, Recurrence Relations
   1. Notation of Algorithms
   2. The Euclidean Algorithm and Program Implementation
   3. Recursive Algorithms and Program Implementation
   4. Complexity of Algorithms
D. Counting Methods and the Pigeonhole Principle
   1. Permutations , Combinations, and Program Implementation
   2. Binomial Coefficients and Combinatorial Identities
   3. The Pigeonhole Principle
E. Graph Theory and Trees
   1. Paths and Cycles
   2. Hamiltonian Cycles and the Traveling Salesperson Problem
   3. Representations of Graphs
F. Trees
   1. Terminology and Characterizations of Trees
   2. Binary Trees and Program Implementation
   3. Tree Traversals and Program Implementation

## V. APPROPRIATE READINGS

***Reading assignments may include but are not limited to the following:***

I. Sample Text Title:
   1. Recommended - Stein, C., Drysdale, R.,Bogart, K. *Discrete Mathematics for Computer Scientists,* Pearson, 2011,
   2. Recommended - Johnsonbaugh, R. *Discrete Mathematics,* ed. 7 Pearson, 2009,
   3. Recommended - Grimaldi, R. *Discrete and Combinatorial Mathematics,* ed. 5 Pearson, 2004,

II. Other Readings

___ Global or international materials or concepts are appropriately included in this course
___ Multicultural materials and concepts are appropriately included in this course

If either line is checked, write a paragraph indicating specifically how global/international and/or multicultural materials and concepts relate to content outline and/or readings.

## VI. METHODS TO MEASURE STUDENT ACHIEVEMENT AND DETERMINE GRADES:

Students in this course will be graded in at least one of the following four categories. Please check those appropriate. A degree applicable course must have a minimum of one response in category A, B, or C.

| | | | |
|---|---|---|---|
| **A. Writing** Check either 1 or 2 below | | | |
| X | ***1. Substantial writing assignments are required. Check the appropriate boxes below and provide a written description in the space provided.*** | | |
| | ***2. Substantial writing assignments are NOT required. If this box is checked leave this section blank. For degree applicable courses you must complete category B and/or C.*** | | |
| | a) essay exam(s) | X | d) written homework |
| | b) term or other paper(s) | | e) reading reports |
| | c) laboratory report(s) | X | f) other (specify)<br>Written computer lab programs |

***Required assignments may include but are not limited to the following:***
An example of written homework assignment:
Write a formal algorithm for searching in a binary search tree.

An example of writing assignment for computer lab programs.
Write a program to do each of the following:
1. Generate and list all combinations of C(n, r)
2. Generate and list all permutations of P(n, n)

3. Generate and list all permutations of P(n, r)
Give at least 3 test cases for each program.

| **B. Problem Solving** Computational or non-computational problem-solving demonstrations, including: | | | |
|---|---|---|---|
| X | a) exam(s) | | d) laboratory reports |
| | b) quizzes | | e) field work |
| X | c) homework problems | | f) other (specify): |

***Required assignments may include but are not limited to the following:***
Examples of problem solving for homework problems:
• A man has eight shirts, four pairs of pants, and five pairs of shoes. How many different outfits are possible?
• A club consisting of six distinct men and seven distinct women. In how many ways can we select a committee of four persons that has at most one man?

Examples of problem solving for exams:
• Build a binary tree for numbers entered in following order: 10, 9, 7, 2, 15, 8
• List the 3-permutations of a, b, c, d.

| **C. Skill** demonstrations, including: | | | |
|---|---|---|---|
| | a) class performance(s) | | c) performance exams(s) |
| | b) field work | X | d) other (specify)<br>Written computer lab programs. |

***Required assignments may include but are not limited to the following:***
Examples of computer lab programming assignments:
• Write a C++ program to implement Euclidean Algorithm.
• Write a C++ program to generate all permutations of {a, b, c, d}
• Write a C++ program to build a binary search tree and to traverse a binary search tree using (a) In-order traversal (b) pre-order traversal (c) post-order traversal

| **D. Objective** examinations including: | | | |
|---|---|---|---|
| | a) multiple choice | | d) completion |
| | b) true/false | X | e) other (specify):<br>mixed |
| | c) matching items | | |

COURSE GRADE DETERMINATION:
Description/Explanation: Based on the categories checked in A-D, it is the recommendation of the department that the instructor's grading methods fall within the following departmental guidelines; however, the final method of grading is still at the discretion of the individual instructor. The instructor's syllabus must reflect the criteria by which the student's grade has been determined. (A minimum of five (5) grades must be recorded on the final roster.)

If several methods to measure student achievement are used, indicate here the approximate weight or percentage each has in determining student final grades.
75% Test
15% Computer Lab Program
15% Homework

## VII. EDUCATIONAL MATERIALS

For degree applicable courses, the adopted texts, as listed in the college bookstore, or instructor-prepared materials have been certified to contain college-level materials.

| Validation Language Level (check where applicable): | College-Level Criteria Met YES | NO |
|---|---|---|
| Textbook | X | |
| Reference materials | | X |
| Instructor-prepared materials | | X |
| Audio-visual materials | | X |

Indicate Method of evaluation:

| | |
|---|---|
| Used readability formulae (grade level 10 or higher) | |
| Text is used in a college-level course | X |
| Used grading provided by publisher | |
| Other: (please explain; relate to Skills Levels) | |

| | | |
|---|---|---|
| *Computation Level* (Eligible for MATH 101 level or higher where applicable) | X | |

| | | |
|---|---|---|
| Content | | |
| Breadth of ideas covered clearly meets college-level learning objectives of this course | X | |
| Presentation of content and/or exercises/projects: | | |
| Requires a variety of problem-solving strategies including inductive and deductive reasoning. | X | |
| Requires independent thought and study | X | |
| Applies transferring knowledge and skills appropriately and efficiently to new situations or problems. | X | |

List of Reading/Educational Materials
Recommended - Stein, C., Drysdale, R.,Bogart, K. *Discrete Mathematics for Computer Scientists,* Pearson, 2011,
Recommended - Johnsonbaugh, R. *Discrete Mathematics,* ed. 7 Pearson, 2009,
Recommended - Grimaldi, R. *Discrete and Combinatorial Mathematics,* ed. 5 Pearson, 2004,

Comments:

_____ This course requires special or additional library materials (list attached).
X This course requires special facilities:
Computer Lab

Attached Files:

BASIC SKILLS ADVISORIES PAGE The skills listed are those needed for eligibility for English 125, 126, and Math 101. These skills are listed as the outcomes from English 252, 262, and Math 250. In the right hand column, list at least three major basic skills needed at the beginning of the target course and check off the corresponding basic skills listed at the left.

Check the appropriate spaces.
_____ Eligibility for Math 101 is advisory for the target course.
_____ Eligibility for English 126 is advisory for the target course.
_____ Eligibility for English 125 is advisory for the target course.
*If the reviewers determine that an advisory or advisories in Basic Skills are all that are necessary for success in the target course, stop here, provide the required signatures, and forward this form to the department chair, the appropriate associate dean, and the curriculum committee.*

**REQUISITES**

**Subject Prerequisite -- CSCI 40 PROGRAMMING CONCEPTS AND METHODOLOGY I**

- Formulate, represent, and solve problems using a high level programming language.
- Demonstrate knowledge of high level language syntax, control structures, looping, arrays, files, and records.
- Solve application problems in science and engineering.
- Determine the truth values of propositions using truth tables.
- Use the language of mathematics: sets, sequences, number systems, relations, and functions.
- Write algorithms for solutions to problems; and analyze the complexity of algorithms.

**ESTABLISHING PREREQUISITES OR COREQUISITES**

Every prerequisite or corequisite requires content review plus justification of at least one of the seven kinds below. Prerequisite courses in communication and math outside of their disciplines require justification through statistical evidence. Kinds of justification that may establish a prerequisite are listed below.

Check one of the following that apply. Documentation may be attached.

1. _____ The prerequisite/corequisite is required by law or government regulations.
   Explain or cite regulation numbers:
2. _____ The health or safety of the students in this course requires the prerequisite.
   Justification: Indicate how this is so.
3. _____ The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of this course.
   Justification: Indicate how this is so.
4. _____ The prerequisite is required in order for the course to be accepted for transfer to the UC or CSU systems.
   Justification: Indicate how this is so.
5. _____ Significant statistical evidence indicates that the absence of the prerequisite course is related to unsatisfactory performance in the target course.
   Justification: Cite the statistical evidence from the research.
6. _____ The prerequisite course is part of a sequence of courses within or across a discipline.
7. __X__ Three CSU/UC campuses require an equivalent prerequisite or corequisite for a course equivalent to the target course:

CSUF CSCI 60 CSCI 40
UCSD CSE 20 CSE10 or CSE 11
Cal Poly CEC 141 CSC 101