El Paso Community College
Syllabus
Part II
Official Course Description

SUBJECT AREA	**Mathematics**
COURSE RUBRIC AND NUMBER	**MATH 2305**
COURSE TITLE	**Discrete Mathematics**
COURSE CREDIT HOURS	**3 3 : 0** **Credits Lec Lab**

I. Catalog Description

Provides a course designed to prepare math, computer science, and engineering majors for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science. Includes topics on: logic, relations, functions, basic set theory, count ability and counting arguments, proof techniques, mathematical induction, combinatorics, discrete probability, recursion, sequence and recurrence, elementary number theory, graph theory, and mathematical proof techniques. **Prerequisite: MATH 2413 with a "C" or better. (3:0).**

II. Course Objectives

Upon satisfactory completion of the course, the student will be able to:

A. Unit I Logic

At the end of this unit you will be able to:

1. Given a statement in English, determine whether it is or is not a proposition.
2. Given two propositions, from the conjunction, the disjunction, and the exclusive or of the propositions.
3. Write the negation of a given proposition.
4. Write the truth table for a compound proposition.
5. Given two propositions, p and q, form the conditional, $p \rightarrow q$, and the bi-conditional, $p \leftrightarrow q$.
6. Given a proposition in English, write it symbolically, including propositions with quantifies.
7. Prove that two propositions or logical expressions are or are not equivalent.
8. Write the converse and the contrapositive of a given conditional proposition.
9. State and apply DeMorgan's laws.
10. Use listing notation, descriptive notation, and set builder notation to describe a set.
11. Determine if a given item is or is not a n element of a given set.
12. Find the union, intersection, set difference and Cartesian product of two sets.
13. Describe an efficient way to represent sets in a computer.
14. Find the complement of a given set.
15. Define what is mean by sequence.
16. Recognize a geometric progression and an arithmetic progression.
17. Use summation notation.

B. Unit II Algorithms

At the end of this unit you will be able to:

1. Define what is meant by "f(x) is big-o of g(x), by "f(x) is big- Omega of g(x)," by "f(x) is big -Theta of g(x)," and by "f(x) is of order g(x)."
2. Given a function f (x), choose an appropriate function, g (x) and prove that f(x) is big-O of g(x) and/or that f(x) is of order g(x).
3. Define the term "algorithm".
4. Describe the finiteness, definiteness, input, output, effectiveness, and generality properties of an algorithm.
5. Given a description of a task, write an algorithm pseudo-code to accomplish the task.
6. Find the time complexity of an algorithm, including the best case and worst case time complexities.
7. Write the linear search and binary search algorithms.

8. Describe and use hashing functions and pseudo-random numbers.
9. Determine whether two integers are or are not congruent modulo m where m is a given positive integers.
10. Write the Euclidean Algorithm and use it to find the greatest common divisor of two positive integers.
11. Convert decimal numerals to and from other bases.
12. Add and multiply binary, octal, and hexadecimal numerals.

C. Unit III Counting

At the end of this unit you will be able to:

1. Use the Sum Rule, the Product Rule, and the Inclusion-Exclusion Principle to count the number of possible outcomes of the number of successful outcomes of an experiment.
2. Use permutations and combinations where repetition is or is not allowed to count the number of possible or successful outcomes of an experiment.
3. Calculate the probability of an event where the sample space is finite.
4. Calculate the expected value of a random variable.

D. Unit IV Graphs and Trees

At the end of this unit you will be able to:

1. Write the definition of and recognize a simple graph, a multi-graph, a pseudo-graph, adirected graph, a directed multi-graph, a vertex, and edge , parallel edges, and loops.
2. Write the definition of the terms adjacency, incidence, degree of a vertex, adjacency forma vertex, adjacency to a vertex, in-degree and out-degree of a vertex.
3. Write the definition of a sub-graph of a graph.
4. Given a graph, write its adjacency matrix, and, given an adjacency matrix, draw its graph.
5. Write the definition of a path, a simple path, a circuit, a simple circuit, and what it means for a graph to be connected.
6. Use the adjacency matrix of graph to count the number of paths of a given length between two vertices.
7. Simplify a Boolean expression.
8. Simplify a Boolean expression using a Karnaugh Map
9. Design a logic circuit to implement a logic expression.

III. THECB Learning Outcomes (ACGM)

Upon successful completion of this course, students will:

1. Construct mathematical arguments using logical connectives and quantifiers.
2. Verify the correctness of an argument using propositional and predicate logic and truth tables.
3. Demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
4. Solve problems involving recurrence relations and generating functions.
5. Use graphs and trees as tools to visualize and simplify situations.
6. Perform operations on discrete structures such as sets, functions, relations, and sequences.
7. Construct proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases, and mathematical induction.
8. Apply algorithms and use definitions to solve problems to prove statements in elementary number theory.

IV. Evaluation

A. There will be at least three in class exams (100 points each) and one required in class comprehensive final exam to evaluate student learning for the course.

B. Homework quizzes or other assignments may contribute to the final grade at the instructor's discretion,. Refer to the instructor's course requirements for details.

C. Grades will be assigned according to the following scale:

A	90-100
B	80-89
C	70-79
D	60-69
F	below 60 or for cheating

Note I and **W** grades will be assigned whenever the appropriate assignments and deadlines have been met. To receive an I, the students must have completed at least 80% of the course with at least a 75 average. The proper forms must also be signed by both the student, and the instructor before being submitted to the registrar.

V. Disability Statement (American with/Disabilities Act [ADA])

EPCC offers a variety of services to persons with documented sensory, mental, physical, or temporary disabling conditions to promote success in classes. If you have a disability and believe you may need services, you are encouraged to contact the Center for Students with Disabilities to discuss your needs with a counselor. All discussions and documentation are kept confidential. Offices located: VV Rm C-112 (831-2426); TM Rm 1400 (831-5808); RG Rm B-201 (831-4198); NWC Rm M-54 (831-8815); and MDP Rm A-125 (831-7024).

VI. 6 Drop Rule

Students who began attending Texas public institutions of higher education for the first time during the Fall 2007 semester or later are subject to a 6-Drop limit for all undergraduate classes. Developmental, ESL, Dual Credit and Early College High School classes are exempt from this rule. All students should consult with their instructor before dropping a class. Academic assistance is available. Students are encouraged to see Counseling Services if dropping because exemptions may apply. Refer to the EPCC catalog and website for additional information.