I. CATALOG DESCRIPTION AND CREDIT HOURS OF COURSE:
CS245. DISCRETE STRUCTURES I. An introduction to discrete structures as used in computer science. Topics include proof techniques, fundamental structures, induction, recursion, basic algorithm analysis. Prerequisite(s): CS155 with a C or better (3)

II. PREREQUISITE(S): CS155 Computer Science I with a C or better.

III. PURPOSE OR OBJECTIVE OF THE COURSE:

The Student will learn:

A. the fundamentals of discrete structures from the computer science viewpoint
B. the rudiments of algorithm analysis
C. several useful algorithms
D. the rudiments of functional programming

Upon completion of the course, student should demonstrate the ability to

A. use mathematical induction.
B. analyze simple algorithms.
C. solve a simple recurrence equation.
D. implement and analyze simple recursive algorithms
E. implement some simple algorithms in a functional language.

IV. EXPECTATIONS OF STUDENTS:

Students are expected to:

A. Attend class and participate in lecture discussions and classroom activities.
B. Apply themselves in approximately 9 hours of work per week outside of class on activities such as reading, assignments, and project work.
C. Perform satisfactorily on assignments and examinations.

V. COURSE CONTENT OR OUTLINE (include number of periods on each topic):

A. Basic logic
   1. Proofs and algorithms
   2. Induction
3. Boolean algebra  
4. Predicate logic

B. Functions, relations and sets  
1. Basics of functions and sets  
2. Equivalence and order relations  
3. Recursive definitions and algorithms  
4. Functional programming (in Scheme)

C. Integers and Integer Algorithms  
1. Basics  
2. Counting  
3. Modular arithmetic  
4. Greatest common divisor, prime numbers  
5. Probability

D. Introduction to Algorithm Analysis  
1. Introduction to Order of functions - $O(f)$, $\Omega(f)$, $\Theta(f)$, $o(f)$, $\omega(f)$  
2. Elementary Recurrence relations  
3. Analysis of several simple algorithms

E. Topics: one or more of the following:  
1. Introduction to Graphs and Trees  
2. Introduction to Matrices  
3. Introduction to Program correctness  
4. Regular expressions  
5. Relational algebra and elementary SQL  
6. Boolean Algebra and circuits

F. Testing  

VI. TEXTBOOK(S) AND OTHER REQUIRED MATERIALS OR EQUIPMENT

A. Class textbook: 
   Mathematical Structures for Computer Science, 5th ed. by Judith L. Gersting,  
   W.H. Freeman and Company, 2001

B. Other references: (suggested reference)  
   Discrete mathematics and Its Applications, by Kenneth Rosen, 5th Edition,  
   McGraw-Hill, 2001
VII. BASIS OF STUDENT EVALUATION (may vary):

A. Assignments, projects 35%
B. Midterm(s) and tests. 20%
C. Participation 5%
D. Final Examination 40%