I. CATALOG DESCRIPTION AND CREDIT HOURS OF COURSE:
CS345. DISCRETE STRUCTURES II. A continuation of the study of discrete structures in computer science. Topics may include graph theory, computational models, proof of correctness and algorithm analysis. Prerequisite(s): CS265, MA138 or CS245, and MA140 with all courses passed with a C or better (3)

II. PREREQUISITE(S): CS265 Computer Science II, MA138 Discrete Mathematics I or CS 245 Discrete Structures I, and MA140 Analytic Geometry and Calculus I with all courses passed with a C or better.

III. PURPOSE OR OBJECTIVE OF THE COURSE:
The Student will study:
A. additional fundamental techniques of algorithm analysis.
B. the basic methods used to prove program correctness.
C. to apply graph theory to computer science.
D. computing models used in computer science.

Upon completion of the course, student should demonstrate the ability to:
A. prove the correctness of simple programs.
B. understand algorithm analyses and analyze simple algorithms.
C. use graph algorithms to solve problems.
D. understand and use finite state machines.
E. understand and use Turing machines
F. understand and use grammars for programming languages.

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. Review 6
   1. Logic
   2. Induction
   3. Proofs
   4. Other topics as necessary

B. Analysis of Algorithms 12
   1. Order of functions - $O(f)$, $\Omega(f)$, $\Theta(f)$, $o(f)$, $\omega(f)$
   2. Recurrence relations
   3. Analysis of several algorithms

C. Program correctness 4

D. Graph Algorithms 5
   1. Several graph algorithms will be considered
   2. Applications

E. Theory of Computing 15
   1. Formal Language Theory
      a. Regular expressions
      b. Finite automata
      c. Context Free Languages
   2. Turing machines
   3. Undecidability
   4. Computational Complexity

F. Testing 3

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

A. Class textbooks:

B. Other references:
VII. BASIS OF STUDENT EVALUATION (may vary):

A. Assignments, projects 35%

C. Midterm(s) and tests. 20%

D. Participation 5%

D. Final Examination 40%