Credits and contact hours: Credit hours: 3, Contact Hours: 44 (1 contact hour = 50 minutes)

Instructor: Dr. Chungsim Han


Specific course information
a. Catalog description: This course introduces basic concepts in discrete processes, their underlying theory, and how those concepts apply in computing. Topics include logic, functions, graphs, sets, induction proof, recursion and computational efficiency.
b. Prerequisites: Students are required to have passed the BW mathematics placement test or have scored at least a 22 on the quantitative part of the ACT (or a 520 on the SAT).
c. Required/Elective:
   i. Computer Science-- required
   ii. Software Engineering- required

Specific goals for the course
a. Specific outcomes of instruction
   i. The student will be able to work with symbolic logic and simplify Boolean expressions.
   ii. The student will be able to use mathematical definitions, in particular, even/odd, prime/composite, divisibility, div/mod, floor and ceiling, and to provide proofs and disproofs for statements using these definitions.
   iii. The student will be able to work with the defining properties of sets, set operations, and Cartesian product of sets.
   iv. The student will be able to work with binary relations and their directed graphs and be able to determine reflexive, symmetric, and transitive properties.
   v. The student will be able to use first order recurrence relations of sequences to find formulas, and be able to provide induction proofs.
   vi. The student will be able to work with functions and their arrow diagrams and be able to determine one-to-one and onto properties.
   vii. The student will be able to compute compositions of functions.
   viii. The student will be able to draw graphs and trees with specific conditions.
   ix. The student will be able to compute the heights of trees with specific conditions.
   x. The student will be able to traverse rooted trees using preorder, postorder, and inorder traversal algorithms.
xi. The student will be able to find minimum spanning trees using Kruskal’s and Prim’s algorithms.

xii. The student will be able to determine the orders of a polynomial functions and logarithmic functions.

b. CAC Criterion 3 outcomes addressed by the course:
   (a) An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline

c. EAC Criterion 3 outcomes addressed by the course:
   (a) an ability to apply knowledge of mathematics, science, and engineering

Brief list of topics to be covered
a. Statements, Logical Equivalences, Arguments
b. Digital Logic Circuits
c. Binary and Hexadecimal Representations of Integers
d. Quantified Statements
e. Definitions of Even, Odd, Prime, Composite, Divisibility, Div and Mod, Floor and Ceiling
f. Sets, Set Operations, Cartesian Products
g. Binary Relations, Reflexive, Symmetric, and Transitive Properties
h. Recursion and Mathematical Induction
i. Functions, One-to-One and Onto, Inverse Functions
j. Composition of Functions
k. Introduction to Graphs
l. Trees
m. Rooted Trees, Tree Traversals, Spanning Trees
n. Big Oh and Big Theta Notations, Polynomial Orders and Logarithmic Orders