Request for changes to recently approved course CIS 180

Justification: To align the course with the existing courses at Skyline College COMP 262 and CANADA College CIS 262

Requested changes:

1- **COURSE ID**: CIS 262

2- TITLE: Discrete Mathematics for Computer Science

3- **Catalog Description:**
Covers the fundamental mathematical elements of computer science including proof, well ordering principle, logical formulas, mathematical data types, induction, state machines, number theory, graphs, communication networks, counting, probability, Markov Chain, and recurrences.

1. **COURSE CONTENT:**
Lecture Content:
    1. What is a Proof?
        A. Propositions
        B. Predicates
        C. The Axiomatic Method
        D. Proving an "If and Only If"
        E. Proof by Cases
        F. Proof by Contradiction
    2. The Well Ordering Principle
        A. Well Ordering Proofs
        B. Factoring into Primes
        C. Factoring into Primes
    3. Logical Formulas
        A. Propositions from Propositions
        B. Propositional Logic in Computer Programs
        C. Equivalence and Validity
        D. The Algebra of Propositions
        E. Predicate logic
    4. Mathematical Data Types
        A. Sets
        B. Sequences
        C. Functions
        D. Binary Relations
        E. Finite Cardinality
    5. Induction
        A. Ordinary Induction
        B. Strong Induction

    C. Strong Induction vs. Induction vs. Well Ordering
6. State Machines
    A. States and Transitions
    B. The Invariant Principle
    C. Partial Correctness & Termination
7. Recursive Data Types
    A. Recursive Definitions and Structural Induction
    B. Strings of Matched Brackets
    C. Recursive Functions on Nonnegative Integers
    D. Search Trees
8. Infinite Sets
    A. Infinite Cardinality
    B. The Logic of Sets
9. Number theory
    A. Divisibility
    B. Greatest common divisor
    C. Fundamental theorem of arithmetic
    D. Modular Arithmetic
    E. Remainder Arithmetic
    F. Multiplicative Inverses and Cancelling
    G. Euler's Theorem
    H. RSA Public Key Encryption
10. Graphs and trees
    A. Types of graphs
    B. Examples of graphs
    C. Paths and connectivity
    D. Cycles
    E. Proofs about graphs
    F. Trees
    G. Spanning trees/forests
    H. Traversal strategies
11. Counting
    A. Sums of Powers
    B. Approximating Sums
    C. Products
    D. Asymptotic Notation
    E. Counting One Thing by Counting Another
    F. Counting Sequences
    G. The Generalized Product Rule
    H. The Division Rule
    I. Counting Subsets
    J. Sequences with Repetitions
    K. The Pigeonhole Principle
    L. Inclusion-exclusion principle
    M. Infinite Series
    N. Counting with Generating Functions
    O. Partial Fractions

P. Solving Linear Recurrences
Q. Formal Power Series

12. Probability
    A. Events and Probability Spaces
    B. Set Theory and Probability
    C. Conditional Probability
    D. The Law of Total Probability
    E. Independence
    F. Mutual Independence
    G. Probability versus Confidence
13. Random Variables
    A. Distribution Functions
    B. Linearity of Expectation
    C. Markov's Theorem
    D. Chebyshev's Theorem
    E. Properties of Variance
    F. Estimation by Random Sampling
    G. Sums of Random Variables
14. Recurrences
    A. The Towers of Hanoi
    B. Linear Recurrences
    C. Divide-and-Conquer Recurrences
15. Communication Networks
    A. Routing
    B. Routing Measures
    C. Network Designs

Note: Per email from Lale Yurtseven 11/11/18