Lectures Outline

Lecture 1-6: Chapter # 1

Lecture 1:
  Introduction
Motivation of DM
  Applications of DM
  Logic and its applications

Lecture 2:
  Logic types
      Classical, Fuzzy
Classical Logic
  Simple Logic
      Proposition
  Compound Logic
      Logical Connectors
          AND, OR, NOT, IMPLICATION, BI-Implication
      Logical Equivalence

Lecture 3:
  Quiz
  Tautology
  Contradiction
  Logical Equivalence using Tautology
  Converse
  Inverse
  Contradiction
  Negation

Lecture 4:
  Predicate Logic
      Motivation
  Quantification
      Prefix and Quantifiers
      Proposition Function
      Types of Quantifiers
          Existential
          Universal
        Negation of quantifiers

Lecture 5:

       Translation English into Quantifiers
       Binding and Free Variables
       Nested Quantifiers

Lecture 6:

       Logical Proofs
       Types of Proof
             Direct proof
             Indirect Proof
                   Proof by Contraposition
                   Proof by Contradiction

Lecture 7-9: Chapter # 2

Lecture 7:

       Set Theory
             Set Representation
                   Set Builder Notation
                   Veinn Diagrams
                   Subset and its Derivatives
             Set Operations
             Representation of Set Concepts using Predicate Logic
             Proof of Set Properties using Set Builder Notation
             Representation of Set in Computers using Bit strings
             Set Operations using Bit strings
Self Study: Cartesian Product
         Intro to Functions
                   What is a Function
                   Domain, Range, Co-Domain and Image of a Function

Lecture 8:

       Types of Functions
             Onto functions
             One-to-one
             Bijective
       Inverse of Functions
       Composition of Functions
       Widely used functions
             Increasing, Strictly-Increasing, Decreasing, Strictly Decreasing, Ceiling, Floor
             Representation of increasing and decreasing functions using predicate logic

Sequence and Summations
        Recurrence Relations
        Base Conditions
        Expressing Summations

Lecture 9:

Class Feedback
Closed-Form Solutions vs Recurrence relations
Closed-Form Solution of Geometric Series
        Limit Shifting
        Summation Expansion

Lecture 10-12: Chapter # 5

Lecture 10:

Long Quiz
Introduction to Induction
        Sample Questions

Lecture 11:

Weak Induction
Practice Examples
Strong Induction

Lecture 12:

Weak Induction Quiz
Strong Induction
Recursion

Lecture 13:

Long Quiz Solution
Recurrence relations and Recursion

Lecture 14:

Revision of set concepts
Function Growth

Practice Questions

Chapter 1: Logic

Propositional Logic:

Exercise (starting Page 12): Q#1-12, 16-18, 31-39

Read De-Morgan's law from Page 26

Logical Equivalence

Exercise (starting Page 34): Q#1-10, 13-33

Quantification

Exercise (starting Page 53): Q# 1-18, 21, 22, 25, 28, 29

Nested Quantifiers

Exercise (starting Page 64): Q# 1-4, Q5 part (a)-(d), 25-27, 29

Proof practice Questions

Page 91: Q# 1-9, 15-17

Reading:

Rules of Inference: Page # 71-72

Proofs: Page # 81-87

Fuzzy Logic

Page 16: Q# 45-47

Chapter 2: Sequence and Summations[2.1-2.4]

Set Theory:

Basics of Set Theory

Page 125: Q# 1-44

Topic: Set operations, BitStrings, multi-sets, fuzzy-sets

V2: Page 136: Q# 1-11, 25-35, 52-65

V1: Page 136-137: Questions 1-4, 25, 26, 27, 29, 30, 31, 32, 52, 53, 63, 64 , 65

Reading:

Set Identities Page # 130

Function

Page 152: Q# 1-33, 77 (Partial Function)

Reading:

Section 2.3 starting Page 138-145

Summation

Page 167: Q#1-6(a)-(f), 7-10, 18(a), 19(a), 29-34

Reading : Page # 156-160, Page # 164-166, Theorem 1 at Page 164

Chapter 5: Induction and Recursion

Induction:

Page # 329: Q# 1-24, 31-36