B.Sc. (Data Science)
Discipline Specific Elective (DSE)
Semester II
BSDB31203T: Introduction to Logic

Total Marks: 100
External Marks: 70
Internal Marks: 30
Credits: 4
Pass Percentage: 40%

Objective: This course will enable students to understand the fundamentals of logic. Students will be able to infer the concept Logic and inference.

INSTRUCTIONS FOR THE PAPER SETTER/EXAMINER

1. The syllabus prescribed should be strictly adhered to.
2. The question paper will consist of three sections: A, B, and C. Sections A and B will have four questions from the respective sections of the syllabus and will carry 10 marks each. The candidates will attempt two questions from each section.
3. Section C will have fifteen short answer questions covering the entire syllabus. Each question will carry 3 marks. Candidates will attempt any ten questions from this section.
4. The examiner shall give a clear instruction to the candidates to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.
5. The duration of each paper will be three hours.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt any two questions each from the sections A and B of the question paper and any ten short questions from Section C. They have to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.

Section A

Unit- I: Definition, Nature and Significance of Logic; Nature of Implication; Truth and Validity; Laws of Thought, Nature of Proposition; Traditional classification of Propositions; Quality, Quantity and Distribution of Terms.

Unit-II: Immediate Inferences: Conversion, Obversion & Contraposition; Square of Opposition; Mediate Inferences; Categorical Syllogism: Rules, Fallacies & Validity through Venn-Diagrams.

Unit-III: Truth-functional Logic: Truth-functional compound statements; Negation, Conjunction, Disjunction and Implication. Validity & Invalidity through Truth-table Method; Statement Forms: Tautology, Contradictory and Contingent.

Unit IV: Propositional Logic: Syntax of Propositional Logic, Logical Connectives: Truth Tables, Validity, Consistency, Logical Equivalence. Conjunctive and Disjunctive Normal Forms

Section B

Unit V: **Predicate Logic:** Quantifiers, Translating simple syllogistic sentences to Predicate logic, Semantics of Predicate Logic, Conversion to Clausal form Resolution, Unification, Truth, satisfiability, validity in Predicate Logic.

Unit VI: **Fuzzy Logic**: Basic concepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relations – Fuzzy relational equations – operations on fuzzy relations – fuzzy systems,

Unit VII: **Prolog:** Introduction, Variables and atoms, Facts and predicates, data types, goal finding, Clauses, Central Idea of Prolog, Execution of Prolog Programs, backtracking, simple object, compound objects,

Unit VIII: Arithmetic Operators, Program Termination, Use of cut and fail predicates, Satisfiability: Use Unification, recursion, lists, simple input/output, dynamic database.

Suggested Readings

1. Cohen & Nagal : Introduction to Logic and Scientific Method, Macmillan Publishing Company, London, 1934 Copi, Cohen, Jetli : Introduction to Logic, Pearson Education, 12th Edition, 2013
2. Timothy J.Ross, Fuzzy logic with Engineering Applications, 3ʳᵈ Ed. McGraw Hill, 2011
3. Ivan Bratko, PROLOG Programming For Artificial Intelligence, Addison Wesley, 2011