Discrete Mathematics

1. GENERAL

1.1 TITLE:: Discrete Mathematics

1.2 COURSE NUMBER (if known): MC.CSO204N.15

1.3 CREDITS:: 3-0-0(9 Credits)

1.4 SEMESTER-OFFERED:: 3rd

1.5 PRE-REQUISITES:: None

1.6 Course Committee Members::

2. OBJECTIVE:

This course aims to provide mathematical logic, knowledge of set theory and Boolean algebra.

3. COURSE TOPICS:

UNIT 1

Statements: Defines, notion of propositions and examples.

Connectives: Negation, disjunction, conjunction, conditional and bi-conditional.Statement formulas and truth tables. Programming on mathematical logic.

Formulas and tautologies: Well-formed formulas, tautologies, equivalence of formulas, duality laws andtautological implications, truth table.

Functionally complete sets of connectives: Functionally complete sets of connectives some other connectives, two state device and statement logic, logic GATES. ***(1+4+5+3 Lectures)***

UNIT 2

Normal forms: Disjunctive normal form, conjunctive normal form, principal disjunctive normal form,principal conjunctive normal form, ordering and uniqueness of normal forms. Different Notations: Completely parenthesized infix notation and Police notation.

Theory of inference for the statement calculus: validity using truth tables, rules of inference, consistencyof premises and indirect method of proof, automatic theorem proving. ***(3+1+6 Lectures)***

UNIT 3

Predicate calculus: Predicates, statement function, variables, and quantifiers, predicate formulas, free andbound variables, universe of discourse.

Inference theory of predicate calculus: Valid formulas and equivalences, valid formulas involvingquantifiers, special valid formulas involving quantifiers, theory of inference of predicate calculus, formulas involving more than one quantifier.

Zorn's lemma and theory of mathematical induction.***(3+3+1 Lecture)***

UNIT 4

A brief recap of Relations and ordering: Relations, binary relations, equivalence relations, partial ordering,partially ordered sets.

Lattices: Definitions and examples, Lattices as partially ordered sets, some properties of lattices, lattices asalgebraic systems, sub-lattices, direct product and homomorphism. ***(1+2 Lectures)***

UNIT 5

Boolean algebra: Definition and examples, sub-algebra, direct product and homomorphism. Boolean functions: Boolean forms, values of Boolean expressions and Boolean functions. Disjunctive andconjunctive normal forms. Boolean, expansion theorem, Representation and minimisation of Boolean functions, design examples using Boolean algebra, equivalence of finite state machines.

(2+5 Lectures)

4. READINGS

4.1 TEXTBOOK: Discrete Mathematical Structure with Application to ComputerScience.By J. P. Tramblay and R Manohar (Tata-McGraw-Hill)

4.2 *REFERENCE BOOKS:

5. OTHER SESSIONS

5.1 *TUTORIALS:	No
5.2 *LABORATORY:	No
5.3 *PROJECT::	No

6. ASSESSMENT	(indicative only)
6.1 HA:	[10%
6.2 QUIZZES-HA:	[10%
6.3 PERIODICAL EXAMS:	[40%
6.4 *PROJECT:	
6.5 FINAL EXAM:	[40%

7. OUTCOME OF THE COURSE: This one semester course in Discrete Mathematics is designed to introduce the students of mathematics and computing to mathematical logic and a brief application of logic to two state devices. In order to enable the student to read technical articles and books in computer science, the knowledge of predicate calculus is essential. The knowledge of Boolean algebra and its application to switching theory and sequential machines is a basic requirement for such students. Minimization of Boolean functions is required in the logical design of digital computer systems. Taking into consideration the large size of the contents a separate one semester course on graph theory is recommended, which is not possible to club with it.