Program Content

Semester	2	
Course Code:	IT2106	
Course Name:	Mathematics for Computing 1	
Credit Value:	03	
Core/Optional	core	
Hourly Breakdown	Theory	Independent Learning
	45	105

Course Aim/Intended Learning Outcomes:

At the completion of this course student will be able to

- Define and give examples of basic mathematical objects such as sets, relations, functions and Boolean algebras.
- Describe basic concepts of mathematical logic and use it to analyze and establishing truths about mathematical statements
- Use basic notions of counting, such as permutations, combinations and pigeon hole principle, to enumerate well-defined sets.
- Describe basic concepts and probability theory, mean and variance to give quantitative descriptions of probabilistic events.
- Acquire the discrete mathematics skills needed to analyze, model and solve problems in Information and Communication Technology.

Course Content: (Main Topics, Sub topics)

Topic	**Theory (Hrs)**
1. Sets	07
2. Logic	12
3. Relations and Functions	07
4. Boolean Algebra	04
5. Techniques of Counting	06
6. Probability	09
Total	**45**

1. **Sets (07hrs)**

Sub Topics

1.1. Introduction to sets (including sets of numbers (N, Z, Q etc)), subsets, proper subsets, power sets, universal set, null set, equality of two sets, Venn diagrams [Ref 1: Pg 121-128]
1.2. Set operations (union, intersection, complement and relative complement) [Ref 1: Pg 133-136]
1.3. Laws of algebra of sets (The idempotent laws, the associative laws, the commutative laws, the identity laws, the complement laws (i.e.: $A \cup A^c = E$, $A \cap A^c = \emptyset$, $(A^c)^c = A$, $E^c = \emptyset$, $\emptyset^c = E$), De Morgan's laws), De Morgan's laws) proofs of the laws using labelled general Venn diagram and using the laws of algebra of sets [Ref 1: Pg 136-141]

2. **Logic (12hrs)**

Sub Topics

2.1. Propositions [Ref 1: Pg 2]
2.2. Propositional Logic
  2.2.1. Negation, conjunction, disjunction defined by truth tables [Ref 1: Pg 3-5]
  2.2.2. Truth - tables of compound propositions [Ref 1: Pg 11]
  2.2.3. Tautologies and contradictions [Ref 1: Pg 26-27]
  2.2.4. Logical equivalence [Ref 1: Pg 27-32]
  2.2.5. Algebra of propositions [Ref 1: Pg 31-32]
  2.2.6. The conditionals p => q and p <=> q and their truth - tables. The equivalence of p => q to $(\sim p) \vee q$ and the equivalence of p <=> q to $((\sim p \vee q) \wedge ((\sim q) \vee p))$ [Ref 1: pg. 6,10,27]
  2.2.7. Arguments (for example deriving r => ~p from the premises p => q, r => ~q). Also arguments involving ordinary language [Ref 1: Pg 73-79]
2.3. Predicates and Quantifiers
  2.3.1. Predicates involving one or more variables [Ref 1: Pg 40-43]
  2.3.2. The quantifiers $\forall$, $\exists$ [Ref 1: Pg 43-46]
  2.3.3. Propositions involving unmixed and simple mixed quantifiers (for example $\forall x \in Z, \exists y \in N, y>x$) [Ref 1: Pg 47-51]

3. **Relations and Function (07hrs)**

Sub Topics

3.1. Relations
  3.1.1. Ordered pairs and the Cartesian product of two sets [Ref 1: Pg 128-130]
  3.1.2. Definition of a relation, Relation from a set A to a set B, relation on a set A [Ref 1: Pg 599, 601]
  3.1.3. Relations as sets of ordered pairs [Ref 1: Pg 600]
  3.1.4. Inverse of a relation [Ref 1: Pg 609]
  3.1.5. Directed graph [Ref 1: Pg 624-626]
  3.1.6. Equivalence Relations
  3.1.6.1. Definition and examples [Ref 1: Pg 638-641]
  3.1.6.2. Equivalence classes [Ref 1: Pg 641-643]
3.2. Functions
  3.2.1. Function as a mapping from a set A to a set B [Ref 1: Pg 147-149]
  3.2.2. Range of a function; Function from a finite set A onto a set B [Ref 1: Pg 151-152]
  3.2.3. One to one functions [Ref 1: Pg 150-152]
  3.2.4. Bijections [Ref 1: Pg 152]
  3.2.5. Inverse functions [Ref 1: Pg 153-155]

3.2.6. Composite functions [Ref 1: Pg 155-156]

4. Boolean Algebra (04hrs)

Sub Topics

4.1. Introduction [Ref 1: Pg 847-850]
4.2. Basic definitions [Ref 1: Pg 853]
4.3. Duality [Ref 1: Pg 852]
4.4. Basic theorems [Ref 1: Pg 851]

5. Techniques of Counting (06hrs)

Sub Topics

5.1. Permutations
  5.1.1. Permutations [Ref 1: Pg 428-431]
  5.1.2. Permutations with repetitions [Ref 1: Pg 446]
5.2. Binomial theorem and the binomial coefficients [Ref 1: Pg 437-443]
5.3. Combinations [Ref 1: Pg 431-434]
5.4. Tree diagrams [Ref 1: Pg 415-416]
5.5. Pigeon hole principle [Ref 1: Pg 420-426]

6. Probability (09hrs)

Sub Topics

6.1. Sampling and Descriptive Statistics
  6.1.1. Measures of central tendencies
  6.1.2. Measures of dispersion
6.2. Sample space and events [Ref 1: Pg 470]
6.3. Axioms of probability and basic theorems [Ref 1: Pg 477-491]
6.4. Mutually Exclusive, Exhaustive events [Ref 1: Pg 497]
6.5. Finite probability spaces [Ref 1: Pg 470-473]
6.6. Conditional probability and the multiplication rule [Ref 1: Pg 481-482]
6.7. Tree diagrams [Ref 1: Pg 847-850]
6.8. Law of Total Probability
6.9. Bayes theorem [Ref 1: Pg 494]
6.10. Independent events [Ref 1: Pg 477,482]

Teaching /Learning Methods:

You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program. It is important to participate in learning activities given in the VLE to learn this course.

Assessment Strategy:

Continuous Assessments/Assignments:

The assignments consist of two quizzes, assignment quiz 1 (It covers the first half of the syllabus) and assignment quiz 2 (It covers the second half of the syllabus). The maximum mark for a question is 10 and the minimum mark for a question is 0 (irrespective of negative scores). Final assignment mark is calculated considering both assignments, and students will have to obtain at least 40% for each assignment. Students are advised to complete online assignments before the given deadline. It is compulsory to pass all online assignments to qualify to obtain the Level I, Diploma in IT (DIT), certificate.

In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:

The final examination of the course will be held at the end of the semester. The paper consists of 40 MCQs and candidates have to answer all the 40 questions within 2 hours.

References/ Reading Materials:

Main Reading:

Ref 1. Discrete Mathematics and Its Applications 8th Edition by Kenneth H. Rosen, McGraw-Hill Education.