Subject Description Form

Subject Code	COMP2012
Subject Title	Discrete Mathematics
Credit Value	3
Level	2
Pre-requisite / Co-requisite / Exclusion	
Objectives	The objectives of this subject are to: 1. introduce students to the concepts and applications of discrete mathematical structures; and 2. help students attain the fundamental mathematical knowledge and reasoning skills they need to be successful in upper-level computing subjects.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) apply discrete structures knowledge and skills to solve real world problems using computers; (b) understand the major mathematical knowledge in computer systems; (c) apply the computer programming techniques to solve practical engineering problems; (d) acquire mathematical knowledge and skills required to further study other more advanced computing-related subjects; and (e) relate learned mathematical knowledge to other computing subjects.
Subject Synopsis/ Indicative Syllabus	**Topic** **1. Set, Relations and Functions** Sets, relations and functions, equivalence, cardinality, order relations. **2. Propositional and Predicate Logic** Logical expressions; truth tables; tautologies; formal reasoning; predicates; quantifiers; proof system; soundness and completeness. **3. Discrete Mathematical Skills** Mathematical induction; counting techniques; inclusion-exclusion principle; pigeonhole principle.

4. Graphs and Trees

Graph, digraph, isomorphism; connectivity; Euler and Hamilton path; shortest path problems; planar graphs; graph colouring; trees and tree traversal; spanning trees and minimum spanning trees; decision tree and isomorphism of tree.

5. Basic Network Problems

Network flows; maximal-flow minimum-cut problem; minimal-cost flow problem; applications, e.g., network design, transportation problem.

6. Boolean Algebras and Combinatorial Circuits

Combinatorial circuits and its properties, Boolean algebras, Boolean functions and synthesis of circuits.

Teaching/ Learning Methodology

A mix of lectures and tutorial sessions is used to deliver the various topics in this subject. Lectures are conducted to initiate students with the discrete structures concepts and knowledge that are reinforced by in-class exercises and quizzes. Tutorial sessions are used to provide more opportunity to understand solutions to the mathematical problems and to gain hands-on experience on solving real world problems by applying learned mathematical knowledge and computing skills.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
Continuous Assessment	**60%**					
1. Assignments			✓		✓	
2. Exercises		✓	✓	✓		✓
3. Quizzes			✓		✓	
Examination	**40%**		✓		✓	
Total	100%					

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Assignments, Quizzes, Projects, Self-study	66 Hrs.
Total student study effort	105 Hrs.

Reading List and References	**Textbook:** 1. Johnsonbaugh, R., *Discrete Mathematics*, 8th Edition, Prentice Hall, 2017. 2. Rosen, K.H., *Discrete Mathematics and Its Applications*, 8th Edition, McGraw Hill, 2019. 3. Dossey, J.A., *Discrete Mathematics*, 5th Edition, Pearson Addison Wesley, 2006. **Reference Books:** 1. Truss, J.K., *Discrete Mathematics for Computer Scientists*, Pearson Addison-Welsey, 2011. 2. Kolman, B., Busby, R.C. and Ross, S.C., *Discrete Mathematical Structures*, 6th Edition, Prentice Hall, 2009. 3. Ralph P.G., *Discrete and Combinatorial Mathematics: An Applied Introduction*, 5th Edition, Pearson Addison Wesley, 2004.