Subject Description Form

Subject Code	COMP210
Subject Title	Discrete Structures
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite/Co-requisite: Nil Exclusion: COMP207
Objectives	• To introduce students to the concepts and applications of discrete mathematical structures. • To 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: *Professional/academic knowledge and skills* (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; *Attributes for all-roundedness* (d) acquire mathematical knowledge and skills required to further study other more advanced computing-related subjects; (e) relate learned mathematical knowledge to other computing subjects. **Alignment of Programme Outcomes:** Programme Outcome 1: This subject contributes to having students practice their writing skills with assignment and/or report writing. Programme Outcome 2: This subject contributes to having students practice their programming skills solve practical engineering problems with mathematical knowledge. Programme Outcome 4: This subject contributes to developing student critical thinking through tutorial and lecture exercises on solving problems. They will also practice more in written assignments and/or programming exercises.

<table>
<tr><td></td><td>Programme Outcome 5: This subject contributes to problem solving with programming skills through tutorials and programming exercises with proper design and implementation.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>
<table>
<tr><th>Topic</th><th>Duration of Lectures</th></tr>
<tr><td>1. Set, relations and functions
Sets, relations and functions, equivalence, cardinality, order relations.</td><td>5</td></tr>
<tr><td>2. Propositional and predicate logic
Logical expressions; truth tables; tautologies; formal reasoning; predicates; quantifiers; proof system; soundness and completeness.</td><td>7.5</td></tr>
<tr><td>3. Mathematical skills
Mathematical induction; counting techniques; inclusion-exclusion principle; pigeonhole principle.</td><td>5</td></tr>
<tr><td>4. Graphs and trees
Graph, digraph, isomorphism; connectivity; Euler and Hamilton path; shortest path problems; planar graphs; graph coloring; trees and tree traversal; spanning trees and minimum spanning trees; decision tree and isomorphism of tree.</td><td>7.5</td></tr>
<tr><td>5. Basic network problems
Network flows; maximal-flow minimum-cut problem; minimal-cost flow problem; applications, e.g., network design, transportation problem.</td><td>5</td></tr>
<tr><td>6. Boolean algebras and combinatorial circuits
Combinatorial circuits and its properties, Boolean algebras, Boolean functions and synthesis of circuits.</td><td>2.5</td></tr>
<tr><td>7. Analysis of the complexity of algorithms
Algorithms, rate of growth of functions, Complexity of Algorithms, Big O notation and representation.</td><td>2.5</td></tr>
<tr><td>Total</td><td>35</td></tr>
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</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>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.</td></tr>
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Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
1. Assignments	60%		✓		✓		
2. Exercises		✓	✓	✓		✓	
3. Quizzes			✓		✓		
5. Examination	40%		✓		✓		
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous assessments consist of assignments, class exercises and quizzes, which are designed to facilitate students to achieve intended learning outcomes. The quizzes are designed to drive students to review how comprehensively and correctly they have understood the knowledge concepts, principles, and theories taught in the subject. The assignment is designed to enhance students' ability to acquire the understanding and applying discrete structures knowledge and skills to solve real world problems. Examination assessment is designed to evaluate student's understanding and use of discrete structures knowledge, e.g. theories, concepts, rules and inference.

Student Study Effort Required

Class contact:	
▪ Lecture	35 Hrs.
▪ Tutorial	14 Hrs.
Other student study effort:	
▪ Assignments	18 Hrs.
▪ Preparation and review	52 Hrs.
Total student study effort	119 Hrs.

Reading List and References

Textbooks:

1. Johnsonbaugh, R., Discrete Mathematics, Fifth Edition, Prentice Hall, Seventh Edition, 2009.
2. Rosen, K.H. Discrete Mathematics And Its Applications, Sixth Edition, McGraw Hill, 2007.
3. Dossey, J.A., Discrete Mathematics, Fourth Edition, Pearson Addison Wesley, Fifth Edition 2006.

Reference Books:

1. Kolman, B., Busby, R.C. and Ross, S.C., Discrete Mathematical Structures, Fourth Edition, Prentice Hall, Sixth Edition, 2009.
2. Ralph P.G., Discrete and Combinatorial Mathematics: An Applied Introduction, Fifth Edition, Pearson Addison Wesley, 2004.

	3. Truss, J.K., Discrete Mathematics for Computer Scientists, Pearson Addison-Welsey, 2011.