COURSE OUTLINE

Department & Faculty: **Department of Mathematics, Faculty of Science**	Page : **1 of 5**
Code and Subject: **SSH 2673 – Discrete Mathematics** Total Lecture Hours: **42 hours**	Semester: **1** Academic Session: **2010/11**

Lecturer	:	Associate Professor Dr. Jamalludin Talib
Room No.	:	C22 438, Mathematics Department
Tel. No	:	07-5534270
e mail	:	jt@mel.fs.utm.my
Synopsis	:	**Pre-requites: None**
		This course introduces the applications of discrete mathematics in the field of computer science. It covers sets, logic, proving techniques, combinatorics, functions, relations, graph theory and algebraic structures. These basic concepts of sets, logic functions and graph theory are applied to Boolean Algebra and logic networks, while the advanced concepts of functions and algebraic structures are applied to finite state machines and coding theory.

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Learning Outcomes

At the end of the course, students should be able to:

No.	Course Learning Outcomes	Programme Learning Outcome(s) Addressed	Assessment Methods
CO1	Apply Euclidean Algorithm in finding GCD for two integers.	PO1(C2, P2, A1), PO2(C3, P2, A2)	Assignment 1 (Individual), Test1
CO2	Attempt the approach of mathematical induction as demonstrated by the lecturer to prove mathematical statements.	PO1(C2, P2, A1), PO2(C3, P3, A2)	Assignment 1 (Individual), Test1
CO3	Establish the decisive properties of relations in order to compute inverses of functions.	PO1(C2, P2, A1), PO2(C3, P2, A2)	Assignment 1 (Individual), Test1
CO4	Differentiate and select either the direct method or the contradiction method in order to prove a mathematical statement effectively.	PO1(C2, P2, A1) PO2 (C3, P3, A2)	Assignment 2 (Individual), Test2
CO5	Discriminate between an Eulerian graph from a Hamiltonian graph for use in solving mathematical problems.	PO1(C2, P2, A1), PO2(C3, P3, A2)	Assignment 2 (Individual), Test2
CO6	Recognize the use of Karnaugh map to construct and minimize the canonical sum of products of Boolean expressions and transform it into an equivalent Boolean expression.	PO1(C2, P2, A1), PO2(C5, P3, A2)	Assignment 3 (Individual), Presentation, Test2, Final
CO7	Discriminate, identify and prove the properties of groups and subgroups.	PO1(C2, P2, A1) PO2(C3, P3, A2)	Assignment 3 (Individual), Final
CO8	Work in a group to construct finite state-machine and to design quotient machine by using homomorphism theory aptly.	PO1(C2, P2, A1), PO2(C5, P3, A2), PO6(TS1, TS2, TS3)	Assignment 4 (Group), Presentation, Final
CO9	Perceive, construct and decode group codes based on the maximum likelihood method appropriately.	PO(C2, P2, A1)1, PO2(C5, P3, A2),	Assignment 5 (Individual), Final

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Student Learning Time

Teaching and Learning Activities			Student Learning Time
1	**Face-to face Learning**		
	a.	Lecture-Centered Learning	
		Lecture (2.5 hrs lecture) x 14	35
	b.	Student-Centered Learning	
		In-class exercises (0.5 hr) x 14	7
2	**Self-Directed Learning**		
	a.	Assignments	24
	b.	Revision (preparation for lectures, tutorials and assignments)	39
	c.	Preparations for Assessment	9
3	**Formal Assessment**		
	a.	Continuous Assessment (2 tests)	3
	b.	Final Examination (3 hrs)	3
	Total SLT		120

Teaching Methods

i) Lecture and Discussion
ii) Problem Solving
iii) Independent Study

Weekly Schedule

Week	Topics
Week 1	**Set, Logic, Proving Techniques and Combinatorics:** Sets**:** set**,** union of sets, intersection of sets and complimentary set. Set of numbers – integers, positive integers, nonnegative integers, rational numbers, irrational numbers, real numbers
Week 2	**Set, Logic, Proving Techniques and Combinatorics:** Greatest common divisor(GCD),least comon multiple(LCM), Euclidean algorithm. **Logic:**Proposition and statements, negation of statements, compound statement using connectives OR and AND, truth tables and truth values of conditional and biconditional statements.
Week 3	**Set, Logic, Proving Techniques and Combinatorics:** **Proving Techniques:** Proving by direct method, proving by contradiction, and principle of mathematical induction. **Combinatorics:** Permutation of n elements, permutation of r out of n elements, combination of r out of n elements.

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Week 4	**Relations:** Binary Relations, relation matrix, reflexive, symmetric, anti symmetric and transitive relations on a finite set.
Week 5	**Relations:** Equivalence relation and partial order relation. **Functions:** one to one function, onto function, floor function, ceiling function, and inverse function.
Week 6	**Introduction to graph theory:** Definitions of edge, vertex, path, loop, cycle, Eulerian path and cycle, problem of Konigsberg bridge, Hamiltonian path and cycle.
Week 7	**Algebraic Structures:** Binary operation, commutative and associative laws, identity element, inverse element, semigroup, monoid and group.
Week 8	**Algebraic Subgroup:** Coset, normal subgroup and quotient group.
Week 9	**Boolean Algebra and Logic Network:** AND, OR and NOT logic gates and their operations. Boolean expressions and logic network diagrams, Boolean algebra and properties.
Week 10	**Boolean Algebra and Logic Network:** Canonical sum of product form Boolean expression, Minimization, Karnaugh Map, Minimization Procedure.
Week 11	**Finite State Machines :** Mathematical structure and finite state machines, state table, state graph, homomorphism of finite state machine.
Week 12	**Finite State Machines:** Quotient machine, machines equivalence and sequential machine.
Week 13	**Introduction to Coding Theory:** Binary information and coding, parity check code, Hamming distance and minimum distance.
Week 14	**Introduction to Coding Theory:** Group Code, generation of group code and decoding of code using maximum likelihood method.
Week 15	**Final Examination**
Week 16-17	

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References

1. Talib, J. (2006) *Struktur Matematik Diskret Untuk Sains Komputer*, Penerbit UTM. (QA76.9.M35J352006a).
2. Kolman, B. and Busby, R.,C. (1999), *Discrete Mathematical Structures*, Prentice Hall. (QA76.9.M35K642000).
3. Epp, S. S. (1990), *Discrete Mathematics with Applications*, Belmont, California. (QA39.2E661990).
4. Lipshutz, S. (1976), Schaum's Outline Series, *Theory and Problems in Discrete Mathematics*, McGraw Hill Book Company. (QA162L561977)
5. Grimaldi, R.P. (1985) *Discrete and Combinatorial Mathematics*, Addison-Wesley. (QA39.2G771985)

Assessment

No.	Type of Assessment	Number	% each	% total	Date
1	Test 1	1	15	15	Week 6
2	Test 2	1	15	15	Week 12
3	Assignment (Individual)	4	4	16	Week 3, 5, 7, 9
4	Assignment (Group)	1	4	4	Week 13
5	Final Examination	1	50	50	Week 16 - 18

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