



COLLEGE OF INFORMATION TECHNOLOGY  
DEPARTMENT OF IT  
COURSE SYLLABUS/ SPECIFICATION

**Course Code & Title:** ITCS 209 – Discrete Structures  
**Weight:** (3-0-3)  
**Prerequisite:** MATH 102  
**NQF Level Allocated:** 6

**NQF Notional Hours / Credits:** 120 notional hours/ 12 NQF credit

**Description:** The course covers the fundamental concepts of discrete mathematics that are widely used in information technology and engineering. The covered topics are logic and mathematical reasoning, sets, functions, counting and combinatorial techniques, graphs and trees.

**Objective:**

1. To provide understanding of basic concepts and ideas in discrete mathematics.
2. To enable learners to gain an insight into the use of basic mathematical ideas useful in various fields of study including computer science, information technology, physical sciences and engineering.
3. To explain with examples the basic terminology of functions, relations, and sets as well as perform operations associated with them.

**Semester:**

**Instructor (s):**

**Office Telephone:**

**Email (s):**

## Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	<b>Concepts and Theories:</b> Demonstrate <i>detailed</i> knowledge and understanding of discrete mathematical structures	Knowledge: theoretical understanding [Level 6]

B. Subject-specific Skills		NQF Descriptor/ Level
B1	<b>Problem Solving:</b> Use <i>basic skills</i> to solve mathematical and logical problems using various discrete structure aspects	Knowledge: Practical Application [Level 6] Skills: Communication, ICT & Numeracy [Level 6]
B2	<b>Modeling and Design:</b> Adapt <i>practices</i> to model <i>real-life problems</i> including those arising in computing context	Knowledge: Practical Application [Level 6]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	<b>Analytic skills:</b> Evaluate <i>different areas</i> of problems to determine the underlying logic, structure or recurrence relations.	Generic Problem Solving & Analytical skills [Level 6]

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D3	<b>Organizational and Developmental Skills:</b> Operate with <i>accountability</i> to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 6]

## Course Structure (Outline)

Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lec.	Lab				
1	3		A1	Introduction	Lecture	
2	3	-	A1, B1, C1	<b>Logic:</b> propositions, truth tables, logical connectives.	Lecture/ In-Class Supervised Work	In-Class Exercises
3	3	-	A1, B1, B2, C1	Tautologies, contradictions, logical equivalences, predicates and quantifiers.	Lecture/ In-Class Supervised Work	Quiz 1
4	3	-	A1, B1, C1	<b>Proofs:</b> induction and contradiction.	Lecture/ In-Class Supervised Work	In-Class Exercises
5	3	-	A1, B1, B2, C1, D3	<b>Sets:</b> operations on sets, cardinality of sets, power set, Cartesian Product.	Lecture/ In-Class Supervised Work	Quiz 2/ Assignment 1
6-7	6	-	A1, B1, B2, C1	<b>Functions:</b> 1-1, onto, bijection, graph of function, inverse and composition functions.	Lecture/ In-Class Supervised Work	In-Class Exercises/ Test 1 (week 7)
8-9	6	-	A1, B1, C1	<b>Counting Techniques:</b> Sum and Product Rules, Permutations and Combinations, Pigeonhole Principle, Binomial Coefficients.	Lecture/ In- Class Supervised Work	Quiz 3 (week9)/ In-Class Exercises
10-11	6	-	A1, B1, C1	Sequences, Summations, Applications of Recurrence Relations, Solving Recurrences.	Lecture/ In-Class Supervised Work	Quiz 4 (week 11)/ In-Class Exercises
12-13	6	-	A1, B1, B2, C1, D3	<b>Graphs:</b> types of graphs, special graphs, paths and connectivity, isomorphism, Euler and Hamilton paths and circuits, Chromatic number, planar graphs.	Lecture/ In-Class Supervised Work	Quiz 5 (week 13)/ In-Class Exercises/ Assignment 2

14-15	6	-	A1, B1, B2, C1	<b>Trees:</b> Tree Traversal, applications of trees.	Lecture/ In-Class Supervised Work	Test 2 (week 14)/ In-Class Exercises
16	2	-	A1, B1, B2, C1	All Topics		Final Exam

### Teaching Materials:

<b>Textbook(s):</b>	Rosen K. H. (2019) <i>Discrete Mathematics and Its Applications</i> , Global Edition, 8 <sup>th</sup> Edition, McGraw-Hill.
<b>Handout(s):</b>	PowerPoint slides available on Moodle i.e. <a href="http://www.ahlia.edu.bh/moodle">http://www.ahlia.edu.bh/moodle</a>
<b>Reference(s):</b>	<ol style="list-style-type: none"> <li>Gordon J. (2012) <i>Mathematics of Discrete Structures for Computer Science</i>, Springer.</li> <li>Bernard Kolman, Robert Busby, and Sharon C. Ross, (2006), <i>Discrete Mathematical Structures</i>, 6th Edition, Pearson.</li> <li>Haggard G., Schlipf J. and Whitesides S. (2005) <i>Discrete Mathematics for Computer Science</i>, Brooks Cole.</li> <li>Crisler, N. and Froelich G. (2005) <i>Discrete Mathematics through Applications</i>, 3<sup>rd</sup> Edition, W. H. Freeman.</li> <li>More references are available in the course website in Moodle.</li> </ol>

### Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Quizzes	Five, in class, written quizzes will be conducted and the average of best four quizzes will be considered. Quizzes' questions will mainly assess knowledge and understanding of set theory, symbolic logic, functions and graph theory; as well as evaluate problem solving.	A1, B1	10%
Assignments	Two assignments to be given to students and their average will be considered. Assignment questions will cover different course concepts and skills.	B1, B2, C1, D3	10%
In-Class Exercises	Exercises will be conducted during class time to assess students understanding of the various topics covered in the course such as symbolic logic, recurrence relations, functions, sets, etc.	B1, B2	Formative
	Student will be assessed through two theoretical tests where each will		

Tests	take one hour of class time. Each test worth 20 marks and their total will be considered at the end. Test 1 will cover all topics from week 1 to 6 whereas Test 2 will cover all the topics from week 8 to 14.	A1, B1, B2, C1	40%
Final Exam	Final exam will be for two hours and including all types of question: MCQs, short answers questions and problem solving.	A1, B1, B2, C1	40%
<b>Overall:</b>			<b>100 %</b>

<b>Admissions</b>	
<b>Pre-requisites</b>	<b>MATH 102</b>
<b>Minimum number of students</b>	<b>8</b>
<b>Maximum number of students</b>	<b>25</b>

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