**COLLEGE OF INFORMATION TECHNOLOGY**

**DEPARTMENT OF IT**

**COURSE SYLLABUS/ SPECIFICATION**

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|---|---|
| **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 students 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** | **Concepts and Theories:** Demonstrate knowledge and understanding of discrete mathematical structures such as logic, sets, functions and graphs and their useful impact in information technology and computer science. | Knowledge: theoretical understanding [Level 6] |

| B. Subject-specific Skills | | NQF Descriptor/ Level |
|---|---|---|
| **B1** | **Problem Solving:** Solve mathematical and logical problems using various discrete structure aspects such as: symbolic logic, sets, functions, combinatorial techniques and graphs. | Knowledge: Practical Application [Level 6]<br>Skills: Communication, ICT & Numeracy [Level 6] |
| **B2** | **Modeling and Design:** Model real-life problems including those arising in computing context such as algorithms using symbolic logic, sets, functions and graphs. | Knowledge: Practical Application [Level 6] |

| C. Critical-Thinking Skills | | NQF Descriptor/ Level |
|---|---|---|
| **C1** | **Analytic skills:** Analyze different kinds 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** | **Organizational and Developmental Skills:** Demonstrate ability 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 | **Logic:** 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 | **Proofs:** induction and contradiction. | Lecture/ In-Class Supervised Work | In-Class Exercises |
| 5 | 3 | - | A1, B1, B2, C1, D3 | **Sets:** operations on sets, cardinality of sets, power set, Cartesian Product. | Lecture/ In-Class Supervised Work | Quiz 2/ Assignment 1 |
| 6-7 | 6 | - | A1, B1, C1 | **Functions:** 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 | **Counting Techniques:** 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 | **Graphs:** 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 |

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| 14-15 | 6 | - | A1, B1, B2, C1 | **Trees:** 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 |

* Formative assessment

## Teaching Materials:

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| **Textbook(s):** | Rosen K. H. (2013) *Discrete Mathematics and Its Applications*, Global Edition, 7th Edition, McGraw-Hill. |
| **Handout(s):** | PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle |
| **Reference(s):** | 1. Gordon J. (2012) *Mathematics of Discrete Structures for Computer Science*, Springer.<br>*2.* Bernard Kolman, Robert Busby, and Sharon C. Ross, *Discrete Mathematical Structures,* 6th Edition, Pearson, 2008.<br>*3*. Haggard G., Schlipf J. and Whitesides S. (2005) *Discrete Mathematics for Computer Science*, Brooks Cole.<br>*4.* Crisler, N. and Froelich G. (2005) *Discrete Mathematics through Applications*, 3rd Edition, W. H. Freeman.<br>**5.** 4. More references are available in the course website in Moodle. |

## 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% |
| | Exercises will be conducted during class time to assess students | B1, B2 | |

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| In-Class Exercises | understanding of the various topics covered in the course such as symbolic logic, recurrence relations, functions, sets, etc. | | Formative |
| Tests | Student will be assessed through two theoretical tests where each will 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% |
| **Overall:** | | | **100 %** |

| **Admissions** | |
|---|---|
| **Pre-requisites** | **MATH 102** |
| **Minimum number of students** | **8** |
| **Maximum number of students** | **25** |

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