Course Specification

(Bachelor)

Course Title:	Discrete Mathematics
Course Code:	MH 121
Program:	CS / IT
Department:	Basic Sciences and Humanities
College:	College of Computer and Information Sciences
Institution:	Majmaah University
Version:	2023
Last Revision Date:	10/09/2023

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: 3(3,0,1)					
2. Course type					
A.	☐University	☒ College	☐Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 2)					
4. Course general Description:					
The course presents a set of mathematical facts and how to apply them for logical and mathematical thinking. Topics include Logic and set theory, Proof Strategy, Mathematical and Structural Induction, Types of relations and set partition, Partial Ordering, Integers and Algorithms, Complexity of Algorithms, Congruencies, Representation of Integers, Principles of Counting, Permutations, Combinations and Graph Theory.					
5. Pre-requirements for this course (if any)**: None**					
None					
6. Pre-requirements for this course (if any)**: None**					
None					
7. Course Main Objective(s):					

1. **Students will be able to explain and apply the basic methods of discrete (non- contiguous) mathematics in Computer Science.**
2. **Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers.**
3. **Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).**

Synthesize induction hypotheses and simple induction proofs.

5. **Prove elementary properties of modular arithmetic and explain their applications in Computer Science, for example, in cryptography and hashing algorithms.**
6. **Explain and apply the knowledge of graph theory required for the Computer Science.**
7. **Derive closed-form and asymptotic expressions from series and recurrences for growth rates of processes.**

Calculate numbers of possible outcomes of elementary combinatorial processes such as permutations and combinations. Calculate probabilities and discrete distributions for simple combinatorial processes; calculate expectations.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	% 100
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Evaluate logical expressions and perform the basic operations on sets.	CLO1	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam
1.2	Use the direct method, the contrapositive method, the contradiction	CLO2	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	method, and the mathematical induction to write a rigorous mathematical proof.			
...				
2.0	**Skills**			
2.1	Apply logical reasoning to solve a variety of problems.	CLO3	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam
2.2	Apply a wide range of principles of discrete mathematics, such as problem solving, good thinking, choice of algorithm, and mathematical proofs.	CLO4	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam
2.3	Interact with life problems using different methods of thinking and problem solving	CLO5	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam
3.0	**Values, autonomy, and responsibility**			
3.1				
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Simple and compound statements, Logical connectives, Truth tables, ,Basic logic laws, Applications of Logic	5
2.	.Operations on sets, Basic laws of set theory, Cartesian product of sets	6
3.	Proof Strategy, Direct Method, the Contrapositive Method, the ,Contradiction Method	6
4.	Mathematical Induction and Structural Induction	6
5.	Basic definitions on relations, Binary relations and their types	5

6.	Equivalence relation and set partition, Partial Ordering	5
7.	Further Applications and examples Equivalence relation and set partition, Partial Ordering	6
8.	Algorithms, Examples of Algorithms, Complexity of Algorithms, .Recursive Definitions, Recursive Algorithms	6
9.	Integers and Division, The Division Algorithm, Integers Algorithms, .The Euclidean Algorithm, Congruencies, Representation of Integers, Applications	5
10.	Principles of Counting: The Basics of Counting, The Pigeonhole Principle	5
11.	Introduction to Graphs, Representation of Graphs. Paths and Cycles, Euler and Hamilton Paths Shortest-Path, Algorithms,	5
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	Week 3, Week 8	20%
2.	Assignments/Exercises	Week 2, 7	20%
3.	Mid Term Exam	Week 6	20%
4.	Final Exam	Week 15	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Journey into Discrete Mathematics (AMS/MAA Textbooks) by Owen D. Byer (Author), Deirdre L. Smeltzer (Author), Kenneth L. Wantz (Author), American Mathematical Society, ISBN-10: 1470446960, ISBN-13: 978-1470446963, 2018
Supportive References	Discrete Mathematics and Its Applications, K. Rosen, 7th Edition McGraw-Hill, ISBN 978-0-07-338309-5, 2012.
Electronic Materials	https://ocw.vu.edu.pk/Videos.aspx?cat=Mathematics&course=MTH2 02

	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2010/video-lectures/
Other Learning Materials	Blackboard, Class notes

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (projector, smart board, software)	PC or Laptop with Windows/Linux, Smart Board, Projector
Other equipment (depending on the nature of the specialty)	Internet Connection

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Final Exam Answer Scripts Verification	Peer faculty members	Review
Course Feedback	Students	Survey
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	