هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	Discrete Structures 2
Course Code:	**CEN2131**
Program:	Computer and Network Engineering
Department:	Computer Engineering
College:	College of Computer and Information Systems
Institution:	Umm Al-Qura University

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A. Course Identification

1. Credit hours: 4	
2. Course type	
a. University [ ] College [ ] Department [X] Others [ ]	
b. Required [X] Elective [ ]	
3. Level/year at which this course is offered:	**Leve 4 / 2nd year**
4. Pre-requisites for this course (if any)**:** Discrete Structures	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	40	100
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Advanced Discrete Structures together with Discrete Structures is one of the core components of mathematics at the undergraduate level. The main goal of the sequence is that students obtain those skills in discrete mathematics and logic that are used in the study and practice of computer science. This course introduces and studies (with an emphasis on problem solving) several of the main areas of discrete mathematics, which provide important knowledge and skills for the applied scientists, such as number theory, advance counting, graph theory, and trees to solve real world problems.

2. Course Main Objective

1. Define statements and solve problems involving divisibility, congruence, greatest common divisor, prime numbers, and Euclidean algorithm.

2. Solve counting problems by applying elementary counting techniques such as the product and sum rules, permutations, combinations, the pigeon-hole principle, and binomial expansion.
3. Describe binary relations between two sets; determine if a binary relation is reflexive, symmetric, or transitive or is an equivalence relation; combine relations using set operations and composition.
4. Represent a graph using an adjacency list and an adjacency matrix and apply graph theory to application problems such as computer networks.
5. Apply knowledge about discrete mathematics in problem solving.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Understand and use probability in practical problems	K1
1.2	Synthesize advanced proofs	K2
1.3	Apply concepts of graph theory and trees to solve real world problems	K2
2	**Skills:**	
2.1	Be able to reason mathematically to solve problems.	S1
2.2	Be able to define connections between mathematical concepts and concrete applications.	S1
2.3	Be able to discuss mathematical ideas coherently with their fellow students.	S2
2...	Be able express themselves clearly when giving a proof	S2
3	**Values:**	
	N/A	

C. Course Content

No	List of Topics	Contact Hours
1	Discrete mathematics (review)	5
2	**Number Theory**: Divisibility and Modular Arithmetic; Integer Representations and Algorithms; Primes and Greatest Common Divisors; Solving Congruences; Applications of Congruences	7
3	**Counting**: Introduction to Counting; Factorials and Permutations; Permutation Practice; Combinations; Binomial Theorem, Pascal's Triangle; Combinations with Repetition Permutations and Combinations Practice	7
4	**Relations**: Relations and Their Properties; n-ary Relations and Their Applications; Representing Relations; Closures of Relations; Equivalence Relations; Partial Orderings	7
5	*Graphs: Graphs and Graph Models; Graph Terminology and Special Types of Graphs; Representing Graphs and Graph Isomorphism; Connectivity; Euler and Hamilton Paths; Shortest-Path Problems; Planar Graphs; Graph Coloring Minimum Spanning Trees*	7
6	**Trees**: Introduction to Trees; Applications of Trees.	7
Total		40

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Understand and use probability in practical problems	Lectures	Quiz, exam, assignment.
1.2	Synthesize advanced proofs	Lectures	Quiz, exam, assignment.
1.3	Apply concepts of graph theory and trees to solve real world problems	Lectures	Quiz, exam, assignment.
2.0	**Skills**		
2.1	Be able to reason mathematically to solve problems.	Lectures	Quiz, exam, assignment.
2.2	Be able to define connections between mathematical concepts and concrete applications.	Lectures	Quiz, exam, assignment.
	Be able to discuss mathematical ideas coherently with their fellow students.	Lectures	Quiz, exam, assignment.
	be able express themselves clearly when giving proof	Lectures	Quiz, exam, assignment.
3.0	**Values**		
3.1	To work effectively and collaboratively in a teamwork setting.	Lectures	Assignments
3.2	To understand the ethical responsibility of a computer professional	Lectures	Assignments

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes	Throughout the Quarter	30%
2	Assignments	Throughout the Quarter	10%
3	Midterm	67	20%
4	Final exam	Final Weeks	40%

Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- Faculty members have at least 6 hours per week. In addition to that, appointments by email are also available.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Discrete Mathematics and Its Applications, 7th Edition, By Kenneth Rosen
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom & Laboratory
Technology Resources (AV, data show, Smart Board, software, etc.)	Mathematical S/W tools.Data show Internet access
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Course Survey	Teaching Assistant	Indirect
Instructor feedback	Course Instructor	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	

Date	