Course Specifications

Course Title:	Discrete Mathematics
Course Code:	30113405-3
Program:	BSc. Mathematics
Department:	Mathematical Science
College:	Applied Sciences
Institution:	Umm Al Qura University, Makkah

Table of Contents

A. Course Identification

1. Credit hours: 3 hours	

2. Course type

a.   University ☐   College ☐   Department ☑   Others ☐

b.   Required ☑   Elective ☐

3. Level/year at which this course is offered: Sixth Level / Third Year

4. Pre-requisites for this course (if any)**:**
Linear Algebra (1) 30112402-4 & Sets and Group Theory 30113403-3

5. Co-requisites for this course (if any)**:** None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	3 hours / week	100%
2	**Blended**	0	0 %
3	**E-learning**	0	0 %
4	**Correspondence**	0	0 %
5	**Other**	0	0 %

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	(3 hours) x(15 weeks)
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	45 hours
Other Learning Hours*		
1	**Study**	(1 hour)x(15 weeks)
2	**Assignments**	(1 hour)x(15 weeks)
3	**Library**	(1 hour)x(15 weeks)
4	**Projects/Research Essays/Theses**	0
5	**Others** (specify)	0
	Total	45 hours

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

Course Description: Discrete mathematics is the study of mathematical structures that are discrete, separated or distinct; in contrast with calculus which deals with continuous change. It is an important area of pure and applied mathematics, as well as providing the mathematical basis for the understanding of computers and modern computation. It is important in the sciences, where it has increasing application in many areas, an exemplar of which is the understanding of DNA sequences in molecular biology.

2. Course Main Objectives: The aim of this course is to develop logical thinking and the ability to reason and present mathematically accurate argument. During the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following:

Use mathematical logic to solve problems.

Use sets for solving applied problems, and use the properties of set operations algebraically.

Define graphs, digraphs and trees, and identify their main properties.

Evaluate combinations and permutations on sets.

Work with relations and investigate their properties.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Use direct and indirect proofs.	
1.2	Evaluate combinations and permutations on sets.	
1.3	State main properties of graphs	
1.4	Identify main properties of trees.	
1.5	Recognize Boolean functions.	
1.6	Quote some different types of discrete structures	
2	**Skills :**	
2.1	Simplify complex mathematical scenarios using logical thinking and problem-solving skill.	
2.2	Analyze basic facts of algebraic structures.	
2.3	Gain experience in using various techniques of mathematical proofs to prove simple mathematical properties.	
3	**Competence:**	
3.1	Express mathematical properties formally via the formal language of propositional logic and predicate logic.	
3.2	Use basic counting techniques to solve combinatorial problems.	
3.3	Present mathematically accurate arguments to others.	

C. Course Content

No	List of Topics	Contact Hours
1	Some revisions: Algorithms, integers, relations, matrices, induction and recursion.	6
2	Counting methods: the basic of counting, pigeonhole principle, permutation and combinations, binomial coefficients. Some generalizations. Application: Pólya-Burnside counting arguments.	6

3	Graph theory: Definition of graphs, examples and graph models, path and cycles, types of graphs, representation of a graph, graph isomorphism, connectivity.	6
4	Graph theory: Euler and Hamilton path, Planer graphs, Graph coloring	6
5	Trees: Introduction to trees, examples, tree traversal, example	6
6	Trees: Spanning and minimum spanning trees	6
7	Boolean Algebra: Boolean functions and representing Boolean functions by circuits.	9
Total		45

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:**		
1.1	Use direct and indirect proofs.	Lectures, tutorials, and exams.	Quizes, Written Assignments and Written exam.
1.2	Evaluate combinations and permutations on sets.		
1.3	State main properties of graphs		
1.4	Identify main properties of trees.		
1.5	Recognize Boolean functions.		
1.6	Quote some different types of discrete structures		
2.0	**Skills**		
2.1	Simplify complex mathematical scenarios using logical thinking and problem-solving skill.	Working together	Group tasks and projects.
2.2	Analyze basic facts of algebraic structures.		
2.3	Gain experience in using various techniques of mathematical proofs to prove simple mathematical properties.		
3.0	**Competence**		
3.1	Express mathematical properties formally via the formal language of propositional logic and predicate logic.	Working together	Group tasks and projects.
3.2	Use basic counting techniques to solve combinatorial problems.		
3.3	Present mathematically accurate arguments to others.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Continuous Assessment Evaluation (quizzez + homework)	weekly	10%
2	Midterm 1	week 7	20%
3	Midterm 2	week 13	20%
4	Final exam	End of the semester	50%

***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 :

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

2. Each group of students is assigned to a particular faculty where he or she will provide academic advising during specific academic hours. Each staff will provide at least one session/week.

3. There will be an academic advisor how will be a responsible for helping the student by doing the general supervision .

4. The people in the library will support the students during the time of the course.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	The book: Discrete Mathematics and Its Applications 4th Edition: SBN-13: 978-0072899054 by Kenneth H. Rosen. Publisher: William C Brown Pub; 4th edition (December 11, 1998)
Essential References Materials	Discrete Mathematics, 7th Edition 7th Edition: ISBN-13: 978-0131593183 by Richard Johnsonbaugh. Publisher: Pearson; 7th edition (December 29, 2007) A Discrete Introduction 3rd Edition: ISBN: 9780840065285 Author: Edward R. Scheinerman.
Electronic Materials	https://en.wikipedia.org/wiki/Discrete_mathematics. http://www.cse.iitd.ernet.in/~bagchi/courses/discrete-book/fullbook.pdf. http://mathworld.wolfram.com/DiscreteMathematics.html

Other Learning Materials	Mathematica and Matlab Magma Gap Ipe

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture classroom which can accommodate 60 students for lectures and tutorials (normal and classical classroom)
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show (projector).
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	It would be nice if the classroom has both white and black boards

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching Following completion of the prescribed course study in Pediatrics module.	Students	questionnaire
Teaching by the Program/Department Instructor	Staff	questionnaire
Verifying Standards of Student Achievement	An independent member of teaching staff either from the UQU or other universities	Compare the standards of students achievements' with standards archived elsewhere (inside KSA or students from outside the kingdom) by checking the marking of a sample of some student work tests, course work

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	Council of the mathematics Department
Reference No.	
Date	