



Course Specifications

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



Table of Contents

A. Course Identification	3
6. Mode of Instruction (mark all that apply)	3
B. Course Objectives and Learning Outcomes	3
1. Course Description	3
2. Course Main Objective	3
3. Course Learning Outcomes	4
C. Course Content	4
D. Teaching and Assessment	5
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods	5
2. Assessment Tasks for Students.....	6
E. Student Academic Counseling and Support	6
F. Learning Resources and Facilities	6
1. Learning Resources	6
2. Facilities Required	7
G. Course Quality Evaluation	7
H. Specification Approval Data	7



A. Course Identification

1. Credit hours:
2. Course type
a. University <input type="checkbox"/> College <input checked="" type="checkbox"/> Department <input type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: Level 2
4. Pre-requisites for this course (if any): None
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	44	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	33
2	Laboratory/Studio	
3	Tutorial	11
4	Others (specify)	
	Total	

B. Course Objectives and Learning Outcomes

1. Course 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.
2. Course Main Objective
<ol style="list-style-type: none"> Students will be able to explain and apply the basic methods of discrete (non-contiguous) mathematics in Computer Science. Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers. 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.
8. 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.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1		
1.2		
1...		
.		
2	Skills :	
2.1	CLO 1: Evaluate logical expressions and perform the basic operations on sets.	S5
2.2	CLO 2: Use the direct method, the contrapositive method, the contradiction method, and the mathematical induction to write a rigorous mathematical proof.	S5
2.3	CLO 3: Apply logical reasoning to solve a variety of problems.	S5
2.4	CLO 4: Apply a wide range of principles of discrete mathematics, such as problem solving, good thinking, choice of algorithm, and mathematical proofs.	S5
2.5	CLO 5: Interact with life problems using different methods of thinking and problem solving	S5
3	Values:	
3.1		
3.2		
3...		

C. Course Content

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



7	Further Applications and examples Equivalence relation and set partition, Partial Ordering	3+1
8	Algorithms, Examples of Algorithms, Complexity of Algorithms, .Recursive Definitions, Recursive Algorithms	3+1
9	Integers and Division, The Division Algorithm, Integers Algorithms, .The Euclidean Algorithm, Congruencies, Representation of Integers, Applications	3+1
10	Principles of Counting: The Basics of Counting, The Pigeonhole Principle	3+1
11	Introduction to Graphs, Representation of Graphs. Paths and Cycles, Euler and Hamilton Paths Shortest-Path Algorithms,	3+1
Total		44

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			
1.2			
1..			
2.0	Skills		
2.1	CLO 1: Evaluate logical expressions and perform the basic operations on sets.	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam
2.2	CLO 2: Use the direct method, the contrapositive method, the contradiction method, and the mathematical induction to write a rigorous mathematical proof.	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam
2.3	CLO 3: Apply logical reasoning to solve a variety of problems.	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam
2.4	CLO 4: Apply a wide range of principles of discrete mathematics, such as problem solving, good thinking, choice of algorithm, and mathematical proofs.	Classroom Teaching	Quiz, Home assignment, Mid-Exam, Final Exam
2.5	CLO 5: Interact with life problems using different methods of thinking and problem solving	Classroom Teaching	Quiz, Home assignment, Mid - Exam, Final Exam
3.0	Values		
3.1			

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.2			
3...			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Attendance and Class participation	Week 1 to 15	5%
2	Quizzes	Week 4, Week 12	15%
3	Assignments/Exercises	Week 4, 8, 12, 15	20%
4	Mid Term Exam	Week 8	20%
5	Final Exam	Week 16	40%
6			
7			
8			

*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 :

- Each student is allotted to an academic advisor for guidance and counseling.
- Available for a minimum of 2 hours per week/course, as communicated to the students.
- The student also contacts through social networking websites / Blackboard/ Email for advice and consultations

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Discrete Mathematics and Its Applications, K. Rosen, 7th Edition McGraw-Hill, ISBN 978-0-07-338309-5, 2012.
Essential References Materials	Journey into Discrete Mathematics (AMS/MAA Textbooks) by Owen D. Byer (Author), Deirdre L. Smeltzer (Author), Kenneth L. Wanz (Author), American Mathematical Society, ISBN-10: 1470446960, ISBN-13: 978-1470446963, 2018
Electronic Materials	https://ocw.vu.edu.pk/Videos.aspx?cat=Mathematics&course=MTH202 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. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	PC or Laptop with Windows/Linux, Smart Board, Projector
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Internet Connection

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Final Exam Answer Scripts Verification	Peer faculty members	Review
Course Feedback	Students	Survey

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	



Course Specifications

Course Title:	Calculus-II
Course Code:	MH 132
Program:	Basic Science
Department:	Basic Science
College:	College of Computer and Information Sciences
Institution:	Majmaah University



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A. Course Identification

1. Credit hours: 3(4,0,1)
2. Course type
a. University <input type="checkbox"/> College <input checked="" type="checkbox"/> Department <input type="checkbox"/> Others <input type="checkbox"/>
b. Required <input type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: Level 4
4. Pre-requisites for this course (if any): MATH 112: Calculus 1
5. Co-requisites for this course (if any): None

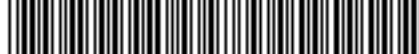
6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	55	100%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	44
2	Laboratory/Studio	
3	Tutorial	11
4	Others (specify)	
	Total	55
Other Learning Hours*		
1	Study	
2	Assignments	
3	Library	
4	Projects/Research Essays/Theses	
5	Others (specify)	
	Total	

* 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

1. Course Description

Catalog Description: This course includes the following topics:

- 1) Integration Techniques: Review of Integration by Substitution and Integration by Parts, Integration of Rational Functions Using Partial Fractions, Trigonometric Techniques of Integration, and Integrals involving logarithmic, exponential, and hyperbolic functions, Improper Integrals.
- 2) Infinite series: Sequences and limit of a sequence. Infinite series of constant terms, convergence tests, alternating series and absolute convergence. Power series, the ratio test, and radius of convergence; Taylor and McLaurin series.
- 3) Vectors and Geometry of Space: Vectors in Space, Dot Product, Cross Product, Lines and Planes in Space, Cylindrical and Spherical Coordinates.
- 4) Parametric Equations and Polar Coordinates: Plane Curves and Parametric Equations, Calculus and Parametric Equations, Polar Coordinates, Calculus and Polar Coordinates.
- 5) Functions of several variables and Partial Differentiation: Functions of several variables, Partial derivatives, Total derivative, and Chain rule.
- 6) Multiple Integrals: Double and Triple Integrals in Cartesian Coordinates; Areas and Volumes, Double Integrals in Polar Coordinates; Triple Integrals in Cylindrical and Spherical Coordinates.

2. Course Main Objective

This course aims at giving student knowledge in fields:

1. Manipulate the integration of complicated functions and evaluate double and triple integrals.
2. Use various tests to determine series convergence and successfully solve problems involving infinite series.
3. Use polar coordinates and their applications in the parametric equations.
4. Differentiate functions of two and three variables.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge:	
2	Skills :	
3	Competence:	
3.1	CLO (1) Manipulate the integration of complicated functions and evaluate double and triple integrals	C2
3.2	CLO (2) Use various tests to determine series convergence and successfully solve problems involving infinite series.	C2
3.3	CLO (3) Use polar coordinates and their applications in the parametric equations.	C2
3.4	CLO (4) Differentiate functions of two and three variables.	C2

C. Course Content

No	List of Topics	Contact Hours
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1	Review of Integration by Substitution and Integration by Parts, Integration of Rational Functions Using Partial Fractions,	4
2	Trigonometric Techniques of Integration, Integrals involving logarithmic, exponential, and hyperbolic functions, Improper Integrals.	4
3	Sequences and limit of a sequence. Infinite series of constant terms, convergence tests, alternating series and absolute convergence.	4
4	Power series, the ratio test, and radius of convergence; Taylor and MacLaurin series.	4
5	Vectors in Space, Dot Product, Cross Product,	4
6	Lines and Planes in Space Cylindrical and Spherical Coordinates.	4
7	Plane Curves and Parametric Equations, Calculus and Parametric Equations	4
8	Polar ordinates, Calculus and Polar Coordinates.	4
9	Functions of several variables, Partial derivatives, Total derivative, Chain rule.	4
10	Double and Triple Integrals in Cartesian Coordinates; Areas and Volumes, Double Integrals in Polar Coordinates;	4
11	Triple Integrals in Cylindrical and Spherical Coordinates.	4
Total		44

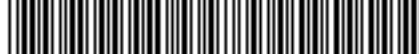
D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge		
2.0	Skills		
3.0	Competence		
3.1	CLO (1) Manipulate the integration of complicated functions and evaluate double and triple integrals	Classroom Teaching	Quiz, Mid- Exam, Final Exam
3.2	CLO (2) Use various tests to determine series convergence and successfully solve problems involving infinite series.	Classroom Teaching	Quiz, Mid- Exam, Final Exam
3.3	CLO (3) Use polar coordinates and their applications in the parametric equations.	Classroom Teaching	Quiz, Mid- Exam, Final Exam
3.4	CLO (4) Differentiate functions of two and three variables.	Classroom Teaching	Quiz, Mid- Exam, Final Exam

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1	Week 3	10%
2	Assignment 1	Week 3	10%
3	Midterm	Week 6	20%



#	Assessment task*	Week Due	Percentage of Total Assessment Score
4	Assignment 2	Week 7	10%
5	Quiz 2	Week 9	10%
	Final Exam	Week 12	%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 :

Each student is allotted to an academic advisor for guidance and counselling

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Robert Smith, Roland Minton "Calculus, Early Transcendental Functions" McGraw-Hill, 4 edition (2012). ISBN 978-0-07-338311-8
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	PC or Laptop with Windows/Linux, Smart Board, Projector
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Internet Connection



G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Final Exam Answer Scripts Verification	Peer faculty members	Review
Course Feedback	Students	Survey

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	