Course Specification
— (Bachelor)

Course Title: **Advanced Integral and Differential Calculus**

Course Code: **MTHS 213**

Program: **Applied Statistics & Data Management**

Department: **Mathematics**

College: **College of Science**

Institution: **Majmaah University, Saudi Arabia**

Version: **2023**

Last Revision Date: 18/09/2023

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: 3(2+2)

2. Course type

A.	☐University	☐College	☒Department	☐Track	Others
B.	☒Required		☐Elective		

3. Level/year at which this course is offered: (4)

4. Course general Description:

Functions of several variables- Limits and continuity- Partial derivatives- Tangent planes and linear approximations- The Chain Rules-Directional derivatives and the gradient vector- Maximum and minimum Values-Lagrange Multiplier-Double integrals over rectangles- Iterated Integrals-Double integrals over general regions- Double integrals in polar coordinates-applications of double integrals. Triple Integrals-Triples in cylindrical coordinates- Triple integrals in spherical coordinates. Vector fields - Line integrals - Independence of path - Green's theorem.

5. Pre-requirements for this course (if any):

Integral calculus MTHS 131

6. Co-requisites for this course (if any):

NA

7. Course Main Objective(s):

to generalize the concepts of functions with single variable to functions with multiple variables
Identify different applications such as Domain of definitions graphing functions in two and three dimensions, limits, continuity, differentiation and multi-integrations and their applications in finding the volumes of very complicated shapes

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	42	70%
2	E-learning	18	30%
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	30
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	Knowledge of limits, continuity, and differentiation for function in more than one variable.	K.1	**Direct teaching**: Inquiry-based instruction PowerPoints and discussions **Aimed teaching**: Discovery and oral questions	• Homework • Quiz • Midterms • Final Exams • E-exam • Oral Exam
1.2	Knowledge of the properties of double and triple integration in different coordinates	K.3		
1.3	Knowledge of basic concepts of vector calculus	K.1		
2.0	**Skills**			
2.1	Identify the functions in more than one variable and their properties	S.3	**Direct teaching**: Lectures Differentiation	• Homework • Quiz • Midterms

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			Aimed teaching: Discovery and oral questions **Indirect teaching**: Peer Learning	• Final Exams
3.0	**Values, autonomy, and responsibility**			
3.1				
3.2				
…				

C. Course Content

No	List of Topics	Contact Hours
1.	Functions of several variables- Limits and continuity	12
2.	Partial derivatives- Tangent planes and linear approximations- The chain rules- Directional derivatives and the gradient vector.	12
3.	Maximum and minimum values-Lagrange Multiplier	6
4.	Double integrals over rectangles- Iterated Integrals-Double integrals over general regions- Double integrals in polar coordinates-applications of double integrals- Triple integrals.	12
5.	Triples in cylindrical coordinates- Triple integrals in spherical coordinates.	6
6.	Vector fields - Line integrals - Independence of path - Green's theorem.	12
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid-term Exam	7-14	30
2.	E- exam	10	5
3.	Homework	2,4,6,8	5
4.	Quizzes	1,3,5,7,9	15
5.	Discussion	7,8,9	5

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
6.	Final	16-17	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	Calculus: Early Transcendentals seventh edition, James Stewart, Cengage learning, 2011 (seventh edition)
Supportive References	Thomas' Calculus, George B. Thomas, Maurice D. Weir, Joel Hass, Pearson, 2009 (Twelfth edition)
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom with capacity of 8 students Library
Technology equipment (projector, smart board, software)	Blackboard
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of students assessment	Peer Reviewer	Direct
Quality of learning resources	Faculty	Direct
The extent to which CLOs have been achieved	Peer Reviewer	Direct
Effectiveness of teaching	Students	Indirect

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE

REFERENCE NO.	
DATE	