



Course Specification

— (Bachelor)

Course Title: **Calculus 1**

Course Code: **MTHS 121**

Program: **Applied Statistics & Data Management**

Department: **Mathematics**

College: **College of Science**

Institution: **Majmaah University, Saudi Arabia**

Version: **2023**

Last Revision Date: **20/09/2023**



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A. General information about the course:

1. Course Identification

1. Credit hours: (4 (3+1))

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (2nd level /2th year)

4. Course general Description:

Limit of a function – Calculating limits using the limit laws -the precise definition of limits- Limits techniques – Continuity – Properties of Continuity- limits at infinity; horizontal asymptotes- The nth derivatives- Derivatives and rates of change- Differentiation by definition– The Relationship between Differentiation and Continuity – Differentiation Laws – Derivative of Trigonometric and Inverse Trigonometric Functions – Derivative of Hyperbolic and Inverse Hyperbolic Functions –Logarithmic and Exponential Functions– Using the first derivative to studying an increasing and decreasing functions – Chain Rule's Implicit Differentiation – L'Hospital's Rule - Rolle's Theorem and the Mean Value Theorems - Using Differentiation to studying concavity of functions and studying some applications of Differentiation such as sketching the graph of Polynomial, rational and logarithmic functions - Relative and absolute extrema values -Tangent and normal equations - Related rates. Studying applications of derivatives to physics, chemistry and biology.

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

Pre-Calculus: PMTH112

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

7. Course Main Objective(s):

- 1- Have knowledge of how to find the limit of the function and study its Continuity.
- 2- Have the skills of different limits techniques and apply them to solve different limits.



3- From this course the student can find the derivative of the function and study the relationship between Differentiation and Continuity.

4- Have knowledge of finding the tangent of the curve and the maximum and minimum values of the function.

5- Have a knowledge of how the function increased and decreased and draw its shape of the curve.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	50%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	30	50%
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	
4.	Tutorial	
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	Reproduce fundamentals and concepts of the concepts of limits,	K1	Direct teaching: Lectures Aimed teaching: Discovery and oral questions	<ul style="list-style-type: none"> · Homework · Quiz · Midterms · Final Exams



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	continuous and derivatives.		Indirect teaching: Cooperative Learning.	
1.2	Reproduce fundamentals and concepts of the concepts of limits, continuous and derivatives.	K1	Direct teaching: Lectures Aimed teaching: Discovery and oral questions Indirect teaching: Cooperative Learning. Student centered learning. Create some activities based on the critical thinking and problem solving. Authentic assessment. Providing some tutorials on the basic concepts.	<ul style="list-style-type: none"> · Homework · Quiz · Midterms · Final Exams
1.3	Construct mathematical arguments and proofs and apply the underlying structures of differentiation rules of some functions.	K3	Direct teaching: Lectures Aimed teaching: Discovery and oral questions Indirect teaching: Cooperative Learning. Student centered learning. Create some activities based on the critical thinking and problem solving. Authentic assessment. Providing some tutorials on the basic concepts.	<ul style="list-style-type: none"> · Homework · Quiz · Midterms · Final Exams
2.0	Skills			
2.1	Identify appropriate calculus concepts and techniques to provide mathematical models of real-world situations	S1	Direct teaching: Lectures Aimed teaching: Discovery and oral questions	<ul style="list-style-type: none"> · Homework · Quiz · Midterms · Final Exams





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	and determine solutions to applied problems		Indirect teaching: Cooperative Learning. Student centered learning. Create some activities based on the critical thinking and problem solving. Authentic assessment. Providing some tutorials on the basic concepts.	
2.2	Identify appropriate calculus concepts and techniques to provide mathematical models of scientific fields such as biology, physics and chemistry and determine solutions to applied problems		Direct teaching: Lectures Aimed teaching: Discovery and oral questions Indirect teaching: Cooperative Learning. Student centered learning. Create some activities based on the critical thinking and problem solving. Authentic assessment. Providing some tutorials on the basic concepts.	<ul style="list-style-type: none"> · Homework · Quiz · Midterms · Final Exams
2.3				
3.0	Values, autonomy, and responsibility			
3.1	Students are expected to develop certain team work activities regarding the theoretical part.		Part of some lectures will be specified for group discussions. At least students will be distributed into groups once monthly for discussing certain issues in the theoretical part.	Observe students during their interactions and discuss with them their point of view regarding the issues under discussion. Evaluating students interactions in the



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				lab as well as in the classroom

C. Course Content

No	List of Topics	Contact Hours
1	Limit of a function – Calculating limits using the limit laws -the precise definition of limits- Limits techniques	12
2	Continuity – Properties of Continuity-limits at infinity; horizontal and vertical asymptotes	6
3.	Derivatives and rates of change- Differentiation by definition– The Relationship between Differentiation and Continuity – Differentiation Laws – Derivative of Trigonometric and Inverse Trigonometric Functions – Derivative of Hyperbolic and Inverse Hyperbolic Functions –Logarithmic and Exponential Functions. Determining the nth derivatives.	18
4.	Using the first derivative to study an increasing and decreasing functions – Chain Rule's Implicit Differentiation	6
5.	L'Hospital's Rule - Rolle's Theorem and the Mean Value Theorems	6
6.	Using Differentiation to study concavity of functions and studying some applications of Differentiation-Relative and absolute extrema values-Tangent and normal equations-Related rates. Sketching the graphs of polynomial, rational and logarithmic functions.	12
7.		
8.		
9.		
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	Week 4 and Week 8	10%
2.	Assignments/Exercises	Every Week	10%
3.	Mid Term Exam 1	Week 6	15%
4.	Mid Term Exam 2	Week 12	15%





No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
5.	Final Exam	After Week 15	40%
6.	E-exam-Lab	Week 13	10%

*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	George B. Thomas, Maurice D. Weir, Joel Hass, Thomas' Calculus, Pearson, 2009 (Twelfth edition)
Supportive References	1-James Stewart, Calculus: Early Transcendentals seventh edition, Cengage learning, 2011 (Seventh edition) 2- Cole and Required Text(s): Thomas, G. B. and Finney, R. L., " Calculus and Analytic Geometry", Addison Wesley, (11th edition)
Electronic Materials	1-University website-Blackboard 2-Saudi Digital Library (SDL) 3-MIT Open Courses 4-Khanacadmy
Other Learning Materials	i) The software package Matlab ii) The software package Maple iii) The software package Mathematica

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> The size of the room should be proportional to the number of students Provide enough seats for students. The number of students do not exceed on 30 in the classroom Strong lights
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> Mathematics Lab is equipped with a computer. Provide overhead projectors and related items i.e smart Board, Wi-Fi, AV. Updated Math Software i. e Mathematica, Matlab, Maple. Etc Smart boards Overhead projector



Items	Resources
Other equipment (depending on the nature of the specialty)	NA

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
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	

