Course Specification
— (Bachelor)

Course Title: Differential Calculus
Course Code: MATH1102
Program: General Course
Department: Mathematics
College: Faculty of Science
Institution: University of Tabuk
Version: 4
Last Revision Date: 10 September 2023

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:

3 Credit hours (3 h Theoretical)

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

3. Level/year at which this course is offered: (level 2/ Year 1)

4. Course general Description:

This course covers topics of calculus of single variable functions including limits and continuity, derivatives and antiderivative. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics, taking into account student's majors. Use program packages such as Mathematica, MATLAB or Maple in some scheduled topics if possible

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

MATH1101

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

NA

7. Course Main Objective(s):

Upon successful completion of this course, students will be able to:
- Compute limits, derivatives, and antiderivative.
- Analyze functions using limits, derivative, and anti-derivative.
- Recognize the appropriate tools of calculus to provide and solve applied problems.

A Mathematical software tool to implement that graphs functions and performs many standard calculus operations

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		45

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	Define the different types of functions, properties and forms and use it to express some natural phenomena	ILO 1	● Traditional lectures. ● Group discussions. ● Cooperative learning. ● Self-learning through the website. .	● Exams. ● Activities Class. ● Quizzes. ● Assignments.
1.2	Recognize the basic concepts of limits, continuity, differentiation and anti-differentiation, and the relationship between them	ILO 1		
1.3	Recognize the basic rules and theories of differentiation	ILO 1		
1.4	Define calculus concepts and techniques to provide mathematical models of real-world situations	ILO 1 + 5		
2.0	**Skills**			
2.1	Determine continuity at a point or on intervals and distinguish between	ILO 1	● Traditional lectures. ● Group discussions.	● Exams. ● Assignments. ● Quizzes.

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	the types of discontinuities at a point		● Cooperative learning. ● Self-learning through the website.	
2.2	Compute limits, derivatives, antiderivatives for a various types of functions	ILO 1		
2.3	Analyze functions and their graphs as informed by limits and derivatives	ILO 1		
2.4	Use differentiation to solve real world problems such as rate of change and optimization	ILO 1 + 3		
3.0	**Values, autonomy, and responsibility**			
3.1	Realize the importance of the computational principles of calculus to the solutions of various mathematical problems.	ILO 5	● Group discussions. ● Cooperative learning. ● Projects.	● Assignments. ● Class Activities. Oral exams.
3.2	Present mathematics clearly and precisely to an audience of peers and faculty.	ILO 3		

C. Course Content

No	List of Topics	Contact Hours
1.	The Limits of a Function.	3 hrs
2.	Calculating Limits Using the Limits Laws .	3 hrs
3.	Continuity, Limits at Infinity.	3 hrs
4.	Derivatives as a Function.	3 hrs
5.	Derivatives of Polynomials and Exponential Functions.	3 hrs
6.	The Product and Quotient Rules.	3 hrs
7.	Derivatives of Trigonometric Functions.	3 hrs
8.	The Chain Rule, Implicit Differentiation.	3 hrs
9.	Derivatives of Logarithmic and Inverse Trigonometric Functions	3 hrs
10.	Higher Derivatives , L'H'opital Rule .	3 hrs

11.	Maximum and Minimum Values.	3 hrs
12.	Mean Value Theorem ,The Derivative Test.	3 hrs
13.	Indeterminate Forms and Optimization Problems.	3 hrs
14.	Anti-derivatives.	3 hrs
15.	Anti-derivatives.	3 hrs
Total		**45** hrs

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Activities	Weekly basis	5%
2.	Homework	Weekly basis	5%
3.	Quizzes	Weekly basis	10%
4.	Mid Exam1	6th week	20%
5.	Mid Exam2	11th week	20%
6.	Final Exam	At end of the Semester	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, by James Stewart Published by Brooks Cole 9th Edition 2019
Supportive References	● Calculus Early Transcendentals, by H. Anton, I. Bivens and S. Davis Published by WILEY 10th Edition 2012 ● Thomas' Calculus, by Joel R. Hass, Christopher E. Heil Maurice D. Weir, 14th edition 2018
Electronic Materials	موقع د. جيمس ستيوارت (موقع مساند للمرجع الرئيسي) https://stewartcalculus.com/ موقع البروفيسور ليونارد لتعليم الرياضيات https://www.patreon.com/ProfessorLeonard دورات معهد ماساتشوستس للتكنولوجيا المفتوحة https://ocw.mit.edu/courses/mathematics/18-01sc-single-variable-calculus-fall-2010/ المكتبة الرقمية السعودية https://www.sdl.edu.sa/
Other Learning Materials	--

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	- Lecture room with capacity of 30 students and equipped with and internet connection. - Library
Technology equipment (projector, smart board, software)	- White board - Smart board - Data Show - Sound system - Computer lab equipped with supporting software
Other equipment (depending on the nature of the specialty)	Mathematical software

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct/Indirect
	Department/Faculty	Direct/Indirect
	External committees	Indirect
Effectiveness of Students assessment	Students	Direct/Indirect
	Department/Faculty	Direct/Indirect
	External committees	Indirect
Quality of learning resources	Students	Direct/Indirect
	Department/Faculty	Direct/Indirect
	External committees	Indirect
The extent to which CLOs have been achieved	Students	Direct/Indirect
	Department/Faculty	Direct/Indirect
	External committees	Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**Approval by the Department Council**
REFERENCE NO.	Department Council No (7)
DATE	14/09/2023