Course Specification
(Bachelor)

Course Title:	Calculus 1 for Engineering
Course Code:	MTH1181
Program:	Bachelor of Engineering Programs (1*st* year/ 1*st* level)
Department:	Mathematics
College:	College of Engineering
Institution:	Umm Al Qura University
Version:	1.0
Last Revision Date:	30/01/2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (4)					
2. Course type					
A.	☐University	☐ College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: **Bachelor of Computer and Networks Engineering - (1st year/ 1st level)** **BSc in Software Engineering - (1st year/ 2nd level)**					
4. Course General Description:					
It introduces a single-variable differential calculus. Key topics of the course include precalculus, limits, continuity, derivatives, rules for finding derivatives, and integration.					
5. Pre-requirements for this course (if any)**:**					
N/A					
6. Co-requisites for this course (if any)**:**					
N/A					
7. Course Main Objective(s):					
The primary objective of the course is to introduce students to the concepts of calculus and to develop students' confidence and skills in dealing with mathematical expressions. To achieve this goal, the course will help students understand the following basic concepts: limits, continuity, derivatives, and integration involving real-valued functions of one variable (including algebraic and trigonometric functions)					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	%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**	60
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify):**	0
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods (Bachelor of Computer and Networks Engineering)

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Explain key pre-calculus concepts, including inequalities, functions, and trigonometric functions, and their importance in calculus.**	**K1**	**Lectures, Assignments**	**Exams, quizzes, Homework**
1.2	**Evaluate limits of functions using limit theorems and apply continuity principles to determine points of discontinuity.**	**K1**	**Lectures, Assignments**	**Exams, quizzes, Homework**
2.0	**Skills**			
2.1	**Apply differentiation techniques, including the chain rule, implicit differentiation, and higher-order derivatives, to solve problems involving rates of change.**	**S1**	**Lectures**	**Exams, quizzes, Homework**

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.2	Analyze real-world problems using related rates, maxima and minima, and concavity to provide solutions for optimization problems.	S1	Lectures	Exams, quizzes, Homework
2.3	Graph functions by applying derivatives to determine critical points, monotonicity, and concavity.	S2	Lectures	Exams, quizzes, Homework
2.4	Compute antiderivatives and definite integrals, using the Fundamental Theorem of Calculus to evaluate areas under curves and solve accumulation problems.	S1	Lectures	Exams, quizzes, Homework
2.4	Interpret the Mean Value Theorem for integrals and apply it to practical problems involving averages and changes over intervals.	S1	Lectures	Exams, quizzes, Homework
3.0	**Values, autonomy, and responsibility**			
3.1	Effectively manage their time to meet deadlines in both individual and group tasks.	V3	Assignments	Homework

Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods (BSc in Software Engineering)

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Explain key pre-calculus concepts, including inequalities, functions, and trigonometric functions, and their importance in calculus.	K1	Lectures, Assignments	Exams, quizzes, Homework
1.2	Evaluate limits of functions using limit theorems and apply continuity principles to determine points of discontinuity.	K3	Lectures, Assignments	Exams, quizzes, Homework
2.0	Skills			
2.1	Apply differentiation techniques, including the chain rule, implicit differentiation, and higher-order derivatives, to solve problems involving rates of change.	S1	Lectures	Exams, quizzes, Homework
2.2	Analyze real-world problems using related rates, maxima and minima, and concavity to provide solutions for optimization problems.	S2	Lectures	Exams, quizzes, Homework
2.3	Graph functions by applying derivatives to determine critical points, monotonicity, and concavity.	S3	Lectures	Exams, quizzes, Homework
2.4	Compute antiderivatives and definite integrals, using the Fundamental Theorem of Calculus to evaluate areas under curves and solve accumulation problems.	S3	Lectures	Exams, quizzes, Homework

2.5	**Interpret the Mean Value Theorem for integrals and apply it to practical problems involving averages and changes over intervals.**	**S3**	**Lectures**	**Exams, quizzes, Homework**
3.0	**Values, autonomy, and responsibility**			
3.1	**Effectively manage their time to meet deadlines in both individual and group tasks.**	**V2**	**Assignments**	**Homework**

C. Course Content

No	List of Topics	Contact Hours
1.	**Pre-Calculus:** Inequalities and Absolute Values; The Rectangular Coordinate System; functions of a single variable; 2D gemetry; Operations on Functions (Composition and Inverse of Functions, Increasing, Decreasing, Monotonic, Function Catalog); The Trigonometric Functions;	**14**
2.	**Limits and Continuity**: Introduction to Limits, Limit Theorems, Limit at Infinity and Infinite Limits, Limits Involving Trigonometric Functions, Continuity.	**10**
3.	**Differentiation:** The Tangent Line Problem; Definition of Derivative (Using Limits), Rules and Theorems for Finding Derivatives, Derivative of Trigonometric Function, Chain Rule, Higher Order Derivatives, Implicit Differentiation.	**14**
4.	**Applications of derivatives:** Related rates, Maxima and Minima, Monotonicity and concavity, Local extrema and extrema on open intervals, Graphing Functions Using Calculus; The Mean Value Theorem for Derivatives	**12**
4.	**Integration:** Antiderivatives and indefinite integrals; Introduction to Area; The Definite Integral; The First Fundamental Theorem of Calculus; The Second Fundamental Theorem of Calculus; The Mean Value Theorem.	**10**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Two Major Exams	7th or 8th 10th or 11th	%20 + %20
2.	Quizzes and Assignments	Continuous	%20
3.	Final Exam	17th or 18th	%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	Purcell, E. J., D. Varberg, and S. E. Rigdon. "Calculus (9th Editio)." (2007).
Supportive References	Thomas, George B., Maurice D. Weir, and Joel Hass. "Thomas' Calculus: Multivariable." (2010). Stewart, James, Lothar Redlin, and Saleem Watson. Precalculus: Mathematics for Precalculus 6th Edition
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Classrooms** •
Technology equipment (projector, smart board, software)	• **Data Show**
Other equipment (depending on the nature of the specialty)	• **Black board**

F. Assessment of Course Quality

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

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

Council / Committee	ACADEMIC CURRICULUM AND PLANS COMMITTEE IN COLLEGE OF ENGINEERING AND ARCHITECTURE
Reference No.	
Date	30/01/2025

