



Course Specification

(Bachelor)

Course Title: **Calculus (1)**

Course Code: **MAT 1101**

Program: **Bachelor of Science in Chemical Laboratories**

Department: **Chemistry**

College: **Science**

Institution: **Imam Mohammad Ibn Saud Islamic University**

Version: **2024 – V1**

Last Revision Date: **None**

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A. General information about the course:

1. Course Identification

1. Credit hours:

4 (3 Lectures, 0 Lab, 2 Tutorial)

2. Course type

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

3. Level/year at which this course is offered: Level 1 / Year 1

4. Course general Description:

This course describes the most important ideas, theoretical results, and examples of limit, continuity, differentiation and its applications for functions with one variable. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned.

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

None.

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

None.

7. Course Main Objective(s):

Understanding basics of differentiation and integration and their applications which are essential to proceed to next courses in all programs.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning	0	0%
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 	0	0%
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	30
5.	Others (specify)	0
Total		75



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	Identify various types of limits of functions of one variable (graphically, numerically and algebraically)	K1, K3	4 lecture hours\week	Direct: Regular Exams
1.2	Describe different techniques of differentiation and its applications.	K1, K3	<ul style="list-style-type: none"> • 2 tutorial hours\week • Self-study 	Direct: Short Quizzes
2.0	Skills			
2.1	Use differentiation to solve real world problems such as rate of change, optimization.	S3	<ul style="list-style-type: none"> • Self-study • Real-life problems 	Direct: <ul style="list-style-type: none"> • Participations • Short Quizzes
2.2	Draw graphs of functions handily and by using CAS and online solvers.	S3	Real-life problems	Direct: Short Quizzes
2.3	State, clearly and precisely both orally and in writing, differentials and their applications.	S3	Self-study	Direct: Participations
3.0	Values, autonomy, and responsibility			
3.1	Work individually.	V1, V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	Preliminaries: Solving Linear Equations and Inequalities, Absolute value, Solving Inequalities Containing an Absolute Value, Equations of lines, Quadratic Equations and Inequalities, Special Product Formulas, Polynomials, Factoring Polynomials; Functions: Domain, Range, and graphs of functions, Common Functions, Composition of functions, Inverse function; Trigonometry: Unit Circle, Angles and their Measurements, Solving Equations Involving Sines and Cosines, Important Trigonometric Identities, Trigonometric Functions (Sine, Cosine, and Tangent Function), Inverses Trigonometric Functions, Exponential and Logarithmic Functions, Laws of Exponents and Logarithms.	21



2.	Limits and Continuity: The Concept of Limit, Formal definition of limit, Limit Theorems, Limits Involving Infinity, Asymptotes, The natural number e as a limit, Continuity of functions, Operations on continuous functions, Intermediate value theorem, The Bisection Method, Formal definition of the limit.	16
3.	Differentiation: Tangent Lines and Velocity, The Derivative, Computation of Derivatives: The Power Rule, Higher Order Derivatives, The Product and Quotient Rules, The Chain rule, Derivatives of Trigonometric Functions and their inverses, Derivatives of Exponential and Logarithmic Functions, Implicit Differentiation, The Rule Theorem, The Mean Value Theorem.	19
4.	Applications of Differentiation: Indeterminate Forms and L'Hopital's Rule, Maxima and minima values, Monotonic functions and the first derivative test, Concavity and the second derivative test, Graphing functions.	19
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 5-6	25%
3.	Second Midterm	Week 10-11	25%
4.	Final Exam	Week 15	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	<i>Calculus</i> , 4 th Edition, R. T. Smith, R. B. Minton, McGraw-Hill, 2012. (Main Reference)
Supportive References	<ol style="list-style-type: none"> 1. <i>Calculus</i>; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994. 2. <i>Calculus: Early Transcendentals</i>, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008. 3. <i>Essential Calculus with Application</i>; Richard A. Silverman, Dover Publications, 1989. 4. <i>Schaum's Outline of Calculus</i>, 6th Edition; Frank Ayres, Elliott Mendelson, McGraw-Hill, 2013.
Electronic Materials	None
Other Learning Materials	None



2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> Each class room should be equipped with a whiteboard and a projector. Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and Smart Board.
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	During the semester and at the end of the course each student will complete two evaluation forms.
Effectiveness of Students assessment	Instructor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.
Quality of learning resources	Students	During the semester and at the end of the course each student will complete two evaluation forms.
The extent to which CLOs have been achieved	Instructor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.
Other	None	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL
REFERENCE NO.	4/1446
DATE	06/03/1446 (09/09/2024)