Course Specification
(Bachelor)

Course Title:	**Applied Calculus for Environmental Science**
Course Code:	**MAT 1109**
Program:	**Bachelor of Science in Environmental Science**
Department:	**Biology**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

Table of Contents

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 2 / Year 1

4. Course general Description:

This course describes the most important ideas, results, and examples of basic precalculus, limit, differentiation, and integration. The course includes the essential fundamentals of these topics. The emphasis is on calculations and applications to environmental problems.

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 precalculus, differentiation and Integration and their applications.

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 - 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		**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	**Recall basics of Precalculus.**	**K1**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
1.2	**List basic tools of limits, differentiation, and Integration.**	**K1, K2**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
2.0	**Skills**			
2.1	**Apply techniques of problem solving.**	**S1**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
2.2	**Report mathematics clearly and precisely both orally and in writing.**	**S2, S3**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.3	**Demonstrate the connection between differentiation and its applications in areas and volumes.**	**S3, S4**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.4	**Draw graphs of functions handily and by using CAS and online solvers.**	**S1**	**Lectures, problem-solving, Classroom discussions.**	**Direct: Regular Exams, Lab Assignments, Practical exam**
3.0	**Values, autonomy, and responsibility**			
3.1	**Work individually.**	**V1**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V2	Lectures, problem-solving, Classroom discussions	Direct: Regular Exams, Lab Assignments, Practical exam

C. Course Content

No	List of Topics	Contact Hours
1	**Preliminaries:** The Real Numbers and The Cartesians Plane, Solving Linear Equations and Inequalities, Equations of Lines, Quadratic Equations and Inequalities, Special Product Formulas, Polynomials, Factoring Polynomials; Systems of Linear Equations in two variables. Sequences: Arithmetic and Geometric Sequences.	20
2	**Functions:** Domain, Range, and Graphs of Functions, Common Functions, Composition of Functions, Inverse Function; Trigonometric Functions (Sine, Cosine, and Tangent Function), Exponential and Logarithmic Functions, Laws of Exponents and Logarithms.	10
3	**Limits:** The Concept of Limit, Computation of Limits, Limits Involving Infinity.	10
4	**Differentiation:** The Derivative, Computation Of Derivatives, The Power Rule, Product and Quotient Rules, Chain Rule, Tangent Lines, Derivatives Of Trigonometric Functions, Derivatives of Exponential and Logarithmic Functions.	15
5	**Applications of Differentiation**: Indeterminate Forms and L'Hopital's Rule, Maxima and Minima Values, Increasing and Decreasing Functions, The First Derivative Test, Graphing Functions.	10
6	**Integration:** Anti-derivatives, The Definite Integral and The Fundamental Theorems of Calculus.	10
Total		**75**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homeworks, Mini projects	During the semester	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	*Calculus, Early Transcendental Functions,* Robert Smith, Roland Minton, McGraw-Hill Science Engineering, 2007. **(Main Reference)**
Supportive References	▪ *Calculus*; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994. ▪ *Calculus: Early Transcendentals*, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each classroom 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**	**Each student will complete two evaluation forms during the semester and at the end of the course.**
Effectiveness of Students' assessment	**Instructor**	**At the end of each semester, the course instructor should complete the course report, which includes a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**
Quality of learning resources	**Students**	**Each student will complete two evaluation forms during the semester and at the end of the course.**
The extent to which CLOs have been achieved	**Instructor**	**At the end of each semester, the course instructor should complete the course report, which includes 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)