



Course Specification

(Bachelor)

Course Title: **Calculus (1)**

Course Code: **MAT 1115**

Program: **Bachelor of Science in Engineering**

Department: **Mathematics and Statistics**

College: **Science**

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

Version: **2024 – V1**

Last Revision Date: **08/10/2024**



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A. General information about the course:

1. Course Identification

1. Credit hours:

3 (3 Lectures, 0 Lab, 2 Tutorial)

2. Course type

A. ☐ University ☒ College ☐ Program ☐ 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, theoretical results, and examples of limit, continuity, differentiation and integration 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):

Mat 1122

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

None.

7. Course Main Objective(s):

The main purpose of this course is to provide the student with the basic understanding of differentiation, Integration, and its applications that is 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	Recall the definitions of limits and continuity, and the processes for computing derivatives.	K1	Tutorials and guided problem-solving sessions	Multiple-choice exams and problem sets
1.2	To acquire basics of limits, continuity, differentiation and its applications.	K2	Tutorials and guided problem-solving sessions	Multiple-choice exams and problem sets
1.3	To introduce integration.	K3	Tutorials and guided problem-solving sessions	Multiple-choice exams and problem sets
2.0	Skills			
2.1	1. Utilize appropriate integration techniques, including substitution and integration by parts, to effectively solve complex problems involving definite and improper integrals.	S1	Problem-based learning, workshops, tutorials, and hands-on practice.	Problem sets in assignments
2.2	2. Construct graphical representations of functions and curves described by parametric equations, accurately determining arc lengths and surface areas using calculus methods.	S2	Hands-on workshops with graphing software, tutorials, and guided practice.	Assignments; and Class participation and feedback.
2.3	3. Evaluate the convergence of infinite series by applying various convergence tests and effectively communicate the results through written explanations and presentations.	S3, S4	Lectures on convergence tests, group discussions, tutorials, and presentations.	Exams and class participation
3.0	Values, autonomy, and responsibility			
3.1	1. Demonstrate ethical responsibility by collaborating effectively with peers, fostering a respectful and inclusive learning environment during group activities and projects.	V1	Group activities, peer review sessions, tutorials, and collaborative projects.	Direct: Group evaluations; Indirect: Reflection on group dynamics and peer feedback.
3.2	2. Cultivate self-directed learning by engaging in independent study and reflection, recognizing the importance of personal responsibility in mastering calculus concepts.	V2	Independent study assignments, self-directed projects, tutorials, and reflective journaling.	Direct: Individual assignments; Indirect: Reflective journals and self-assessment.



C. Course Content

No	List of Topics	Contact Hours
1.	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.	15
2.	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.	20
3.	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, Linear approximation, Newton's method, Optimization, Related Rates.	20
4.	Integration: Anti-derivatives, Indefinite Integral, Sum and Sigma notation, Area, The Definite Integral, The Fundamental Theorem of Calculus, Area between curves, Integration by Substitution, Integration by Parts, Numerical Integration.	20
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homeworks, Quizzes, participation	During the term	10%
2.	First Midterm	Week 5-6	25%
3.	Second Midterm	Week 10-11	25%
4.	Final Exam	Week 15-16	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"> <i>Calculus</i>; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994. <i>Calculus: Early Transcendentals</i>, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008. <i>Essential Calculus with Application</i>; Richard A. Silverman, Dover Publications, 1989. <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"> Classrooms: Equipped with whiteboards, projectors, and Smart Boards for interactive lessons and group discussions. Laboratories: Feature computers with internet access, enabling hands-on activities and exploration of algebraic and trigonometric concepts. Exhibition Rooms: Spaces for showcasing projects and presentations to encourage collaborative learning.
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> Data Show Projectors: For clear presentations in classrooms and labs. Smart Boards: To enhance interactivity during lessons. Mathematical Software: Essential for graphing and analysis.
Other equipment (depending on the nature of the specialty)	<ul style="list-style-type: none"> Computers: For mini-project and homework and practical applications in laboratories. Advanced Calculators: For computations and problem-solving and supporting the study of limits, continuity, and differentiation. Whiteboards and Markers: To facilitate brainstorming and collaboration.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student and teaching staff	Surveys and Questionnaires
Effectiveness of Students assessment	Course Coordinator	Peer Reviews
Quality of learning resources	Students and teaching staff	Classroom Observations
The extent to which CLOs have been achieved	Student Representatives	Student Performance Evaluations (exams, projects) CLOs Excel sheet.
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.	8/1446
DATE	05/04/1446 (08/10/2024)

