Course Specification
(Bachelor)

Course Title:	Calculus (2)
Course Code:	MAT 1105
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
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, theoretical results, and examples of integration technics, infinite series, and parametric equations. 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 1104					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• To understand the meaning of definite integral as a limit of Riemann sum. • To learn different techniques of integration. • To understand the applications of definite integrals to physics and Engineering. • To develop the basics of the calculus of infinite series, 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		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 different techniques of integration and improper integrals.**	**K1**	**3 lecture hours\week**	**Direct: Regular Exams**
1.2	**List theorems and tests of convergence of sequences and series.**	**K3**	• **2 tutorial hours\week** • **Self-study**	**Direct: Short Quizzes**
2.0	**Skills**			
2.1	**Use the concepts of definite integrals to solve problems involving area, volume, work, and other physical applications.**	**S3**	• **Self-study** • **Real-life problems**	**Direct:** • **Participations** • **Short Quizzes**
2.2	**Apply the concepts of limits, convergence, and divergence to evaluate some classes of infinite series and/or improper integrals.**	**S3**	**Self-study**	**Direct: Participations**
2.3	**Illustrate the revolution of a solid region using CAS and online solvers.**	**S3**	**Real-life problems**	**Direct: Short Quizzes**
2.4	**State clearly and precisely both orally and in writing, Taylor or Mac Laurin series.**	**S3**	**Self-study**	**Direct: Participations**
3.0	**Values, autonomy, and responsibility**			
3.1	**Shows self-reliance when working independently.**	**V2**	**Personal questions**	**Direct: Participation**
3.2	**Develop constructive and supportive relationships with classmates.**	**V2**	**Teamwork and class discussions.**	**Direct: Homework and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Integration:** Anti-derivatives, Indefinite Integral and its properties, Sums and Sigma Notation, Partitions and Riemann sums, Area under curves and The Definite Integral, First and Second Fundamental Theorems of Calculus.	15
2.	**Integration Techniques:** Integration by Substitution, Integration by Parts, Integration of Rational Functions Using Partial Fractions, Trigonometric Techniques of Integration, Integrals involving logarithmic, exponential, and hyperbolic functions, Improper Integrals.	20

3.	**Applications of Definite Integrals:** Area between curves, Volumes by slicing, Volumes using Cylindrical Shells, Arc Length and Surface Area.	10
4.	**Infinite Series:** Sequences of Real Numbers, Convergence and Divergence of Infinite Sequences, Formal definition of a convergent sequence, Infinite Series, Basic Infinite Series (geometric series, p-series, alternating series, telescoping series), Convergence Tests for Positive Series (ratio test, root test, comparison and limit comparison test, integral test), Alternating Series, Absolute and Conditional Convergence, Power Series, Differentiation ad Integration of power series, Taylor and Maclaurin Series, Convergence of Taylor series, Applications of Taylor and Maclaurin Series.	20
5	**Parametric equations:** Plane Curves and Parametric Equations, Calculus and Parametric Equations, Arc Length and Surface in Parametric Equations.	10
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 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	***Calculus***, 4th Edition, R. T. Smith, R. B. Minton, McGraw-Hill, 2012. **(Main Reference)**
Supportive References	1. ***Calculus***; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994. 2. ***Calculus: Early Transcendentals***, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008. 3. ***Essential Calculus with Application***; Richard A. Silverman, Dover Publications, 1989. 4. ***Schaum's Outline of Calculus***, 6th Edition; Frank Ayres, Elliott Mendelson, McGraw-Hill, 2013.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities	▪ **Each classroom should be equipped with a whiteboard and a projector.**

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **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.	**8/1446**
Date	**05/04/1446 (08/10/2024)**