Course Specifications

Course Title:	**Integral Calculus**
Course Code:	**Math 228**
Program:	**Biomedical Technology**
Department:	**Mathematics Department**
College:	**College of Sciences**
Institution:	**King Saud University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (4,0,2)**
2. Course type	
a. University ☐ College ☐ Department ☑ Others ☐	
b. Required ☑ Elective ☐	
3. Level/year at which this course is offered:	**4th Level (2nd Year)**
4. Pre-requisites for this course (if any)**:**	**Math 218**
5. Co-requisites for this course (if any)**:**	**NA**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	6	100
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	56
2	Laboratory/Studio	
3	Tutorial	28
4	Others (specify)	
	Total	84
Other Learning Hours*		
1	Study	56
2	Assignments	56
3	Library	
4	Projects/Research Essays/Theses	
5	Others (specify)	
	Total	112

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

Math 228 is a 4-credits integral calculus course that comes in continuation to Math 218, differential calculus. The course covers topics on indefinite and definite integrals, properties, applications, techniques of integration. Infinite, power, and Taylor series. Function of several variables, differentiation, double and triple integrals.

2. Course Main Objective

Upon completion of Math 228, the students will be able to solve indefinite and definite integrals using appropriate analytical and/or numerical techniques. They will be able to use integral calculus in engineering applications. They will be able to apply the concept of functions of several variables, partial derivatives, and multiple integrals in various coordinate systems and how to compute them. They will be able to represent functions by power series.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Acquire the basic knowledge with regards to the techniques of integration.	K2
2	**Skills:**	
2.1	Demonstrate the ability to think critically by setting up and solving area and volume application problems.	S2
2.2	Present solutions to problems neatly, orderly, and accurately.	S5
2.2	Appropriately use mathematics tools to solve problems and promote understanding.	S7
3	**Competence:**	

C. Course Content

No.	List of Topics	Contact Hours
1	Anti-derivatives and indefinite integrals, Table of known indefinite integrals, the definite integral and the fundamental theorem of calculus.	10
2	Area between curves, Volumes of a surface of revolution (cylindrical shell and disks methods).	6
3	Integration by substitution, Integration by parts, trigonometric integrals, integration of rational functions, improper integrals.	18
4	Functions of several variables, partial derivatives, maximum and minimum values, double integrals over rectangles, double integrals over general regions, double integrals in polar coordinates, Triple integrals, triple integrals in cylindrical coordinates, triple integrals in spherical coordinates.	24
5	Sequences and series, arithmetic sequences, geometric sequences, the Binomial theorem. Infinite series, convergence tests of positive term series (the comparison test, the integral test, the ratio and root tests), alternating series, absolute convergence.	20
6	Power series, radius of convergence, Taylor series, representations of functions by power series.	6
	Total	84

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1	**Knowledge**		
1.1	Acquire the basic knowledge with regards to the techniques of integration.	Lectures and tutorials	Quizzes, Periodicals and Final Exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2	**Skills**		
2.1	Demonstrate the ability to think critically by setting up and solving area and volume application problems.	Lectures and tutorials	Periodicals and Final Exam
2.2	Present solutions to problems neatly, orderly and accurately.	Lectures and tutorials	Assignments
2.3	Appropriately use mathematics tools to solve problems and promote understanding.	Tutorials	Not assessed
3	**Competence**		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Two (2) In-class Quizzes. Assignments/Participation/Assiduity	-	10%
2	1st Periodical Exam	7	25%
3	2nd Periodical Exam	13	25%
4	Final exam	17	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:
At least 8 office hours per week are dedicated to students (the detailed timetable and organizer for the faculty is posted on the office's door)

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	• J. Stewart, L. Redlin and S. Watson, Precalculus, Mathematics for Calculus, Cengage Learning, 7th edition, 2015. • J. Stewart, Calculus: Early Transcendentals, 8th Edition, Cengage Learning, 8th edition, 2015.
Essential References Materials	
Electronic Materials	Wolfram Mathematica Online and/or Symbolab symbolic math solver.
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, etc.)	

Item	Resources
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment.	Peer Reviewer and students	Indirect
Extent of achievement of CLOs.	Faculty	Direct and indirect
Quality of learning resources.	Program Leader	Direct and indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council/Committee	Development and Quality Committee
Reference No.	
Date	29/03/2021
BMT Department Head	Dr. Adham Aleid Signature: _____ Digitally signed by Adham Aleid DN: cn=Adham Aleid, o, ou, email=adaleid@ksu.edu.sa, c=US Date: 2021.05.26 13:09:33 +03'00' Date: 25/5/2021