Faculty: Science	
Department: Mathematics	**Program: Bachelor's**

Course Plan

First: Course Information

Course Name	**Calculus 3**		**Course Number**	**0301201**	
Credit Hours	**3 hours**	**Theoretical**	**3 hours**	**Practical**	**0 hours**
Prerequisite	**0300102**	**Section Number: 1**		**Lecture Time:**	
Level in JNQF	**7**				
Type Of Course	☐	**Obligatory Faculty Requirement**	☐	**Elective University Requirement**	
	☐	**Obligatory University Requirement**	☐	**Faculty Requirement**	
	☐	**Course Elective Specialty Requirement**	■	**Obligatory Specialization Requirement**	
Type of Learning	■	**Face-to-Face Learning**			
	☐	**Blended Learning (2 Face-to-Face + 1 Asynchronous)**			
	☐	**Online Learning (2 Synchronous + 1 Asynchronous)**			

Third: Course Description

Vectors and analytic Geometry in the plane and in the 3D-space, Dot product and cross product, lines and planes in the 3D-space, Quadratic surfaces, Polar coordinates in the plane, cylindrical and spherical coordinates in the 3D-space, Functions of several variables, Level curves and level surfaces, limits and continuity, Partial differentiation, Chain Rule, Implicit differentiation, directional derivatives Tangent planes and normal lines, Extreme values and Lagrange multipliers, Multiple Integrals: double integral, Areas and volumes, double integrals using polar coordinates, Triple integrals.

Fourth: Course Objectives

Upon completion of this course, the student should be able to

1. Understanding the concepts of vectors, gradient, partial derivatives, double and triple integral, cylindrical and spherical coordinates.
2. Follow and to construct a formal mathematical formulas of tangent vectors and planes, and compute multi variables partial derivatives and compute multi integrals by different ways..
3. Demonstrate an understanding of the relationship of double and triple integrals to other branches of mathematics and to related fields.
4. Independently explore related topics using resources other than the text.

Fifth: Learning Source

Main Reference			**Calculus**							
Author: Anton			**Issue No.: 10th Edition**				**Publication Year:2016**			
Additional Sources & Websites			**Calculus, by Salas**							
Teaching Type	■	**Classroom**	☐	**Laboratory**	☐	**Workshop**	☐	**MSTeams**	■	**Moodle**

Sixth: Learning Outcomes

Level descriptor according to (JNQF)	**CILOs Code**	**CILOs**	**Associated PILOs Code** Choose one PILO for each CILO*	**Assessment method**** Choose at least two methods	**Scores out of 100** State the total score identified for each CILO	**Minimum acceptable Score/percentage (%)** The percentage should not be less than 50% ***
Knowledge	K1	Define and illustrate the concept of vectors, dot product, cross product	PK1	First Exam, Second Exam, Final Exam	10	5 (50%)
	K2	Comprehend basic properties of lines and planes.	PK2	First Exam, Second Exam, Final Exam, Assignment	22	11 (50%)
	K3	Comprehend the theorem of line integrals	PK2			
	K4	Comprehend basic properties of tangent vectors	PK2			
	K5	Comprehend the fundamental formulas maximum and minimum values of functions	PK2			
	K6	Comprehend the second derivative test for partial derivatives	PK2			

	K7	Define and illustrate the concept of tangent plane	PK2			
Skills	S1	Employ basic properties of vectors	PS1	First Exam, Assignment	6	3 (50%)
	S2	Employ the properties of vector valued functions	PS2	First Exam, Second Exam, Final Exam, Assignment	36	18 (50%)
	S3	Find the derivatives of vector valued functions.	PS2			
	S4	Determine whether the double integral can be solved by many techniques.	PS2			
	S5	Write the equations of lines and planes	PS2			
	S6	Discuss vector projection.	PS2			
	S7	Find the polar coordinates and the Jacobean of integration	PS2			
	S8	Solve double integral	PS2			
	S9	Solve the line integral	PS2			
	S10	Find the spherical and cylindrical coordinates	PS3	Second Exam, Final Exam	10	5 (50%)
	S11	Prove some fundamental theorems in double and triple integrals	PS3			
Competencies	C1	Working in a team to handle some advanced topics in number theory	PC3	Assignment	4	2 (50%)
	C2	Develop the personal skills and capacity to carry responsibility	PC1	Second Exam, Final Exam, Assignment	12	6 (50%)

***Refer to document ( ) and page 2 in document ( )**
**** Refer to document ( )**
****80% of the students must achieve the minimum acceptable percentage or higher for each CILO**

Seventh: Course Structure

	Intended Teaching Outcomes(ILOs)	Topics	Teaching Procedures*	Teaching Methods**	References
		Introduction to the Course	Face-to-Face	Lectures, cooperative learning and discussion	Main Reference
	K1, K2	Review of derivatives	Face-to-Face	Lectures, cooperative learning and discussion	232-300
	K1, K2, S1, S11	Vectors in 3 dimensions	Face-to-Face	Lectures, cooperative learning and discussion	185-215
	K1, K2, S1, S11	Dot Product and it's applications	Face-to-Face	Lectures, cooperative learning and discussion	767-782
	S1, S2, C1, C2	Cross Product	Face-to-Face	Lectures, cooperative learning and discussion	785-794
	K1, S2	Applications of cross product in volumes and areas	Face-to-Face	Lectures, cooperative learning and discussion	795-804
	K1, S2, S11	Parametric Equations of Lines.	Face-to-Face	Lectures, cooperative learning and discussion	795-804
	K1, S2, C1, C2	Planes in 3-Spaces,	Face-to-Face	Lectures, cooperative learning and discussion	803

	K3, S2, S11	Relation between planes	Face-to-Face	Lectures, cooperative learning and discussion	805-812
	K3, S2, S11, C1, C2	Quadratic Surfaces 1	Face-to-Face	Lectures, cooperative learning and discussion	805-812
	K1, S2	Quadratic Surfaces 2	Face-to-Face	Lectures, cooperative learning and discussion	813-820
	K1, S2, , C1, C2	Functions of two variables.	Face-to-Face	Lectures, cooperative learning and discussion	813-820
	First Exam				
	S3, S11, C1	Functions of three variables	Face-to-Face	Lectures, cooperative learning and discussion	821-830
	K1, K4, S4	Examples and exercises	Face-to-Face	Lectures, cooperative learning and discussion	831-840
	K5, S5	Properties of functions of several variables	Face-to-Face	Lectures, cooperative learning and discussion	841-847
	K4, K5, S4, S5, C2	Limits and Continuity	Face-to-Face	Lectures, cooperative learning and discussion	841-847
	K1, K4, S4	Partial derivatives	Face-to-Face	Lectures, cooperative learning and discussion	848-852
	K4, K5, S4, S5, C2	Partial derivatives	Face-to-Face	Lectures, cooperative learning and discussion	848-857
	K1, K4, S4	Applications on derivatives	Face-to-Face	Lectures, cooperative learning and discussion	848-857
	K1, S7	Tangent Planes and Normal Vectors 2	Face-to-Face	Lectures, cooperative learning and discussion	927-935
	K1, S7	Maximum and minimum	Face-to-Face	Lectures, cooperative learning and discussion	927-935
	K1, S7, C1, C2	Lagrange Multiplier 1	Face-to-Face	Lectures, cooperative learning and discussion	950-958
	K1, K6, S6	Lagrange Multiplier 2	Face-to-Face	Lectures, cooperative learning and discussion	960-977
	K1, K6, S6, S7	Polar Coordinates	Face-to-Face	Lectures, cooperative learning and discussion	960-977
	K1, S6, S7, C1, C2	Double Integral on rectangular region	Face-to-Face	Lectures, cooperative learning and discussion	977-988
	S6, S8, S9, S11	Double Integral on non-rectangular region	Face-to-Face	Lectures, cooperative learning and discussion	977-988
	S6, S8, S9, S11	Double Integral on non-rectangular region	Face-to-Face	Lectures, cooperative learning and discussion	989-999
	S8, S9, S11, C1, C2	Examples and applications	Face-to-Face	Lectures, cooperative learning and discussion	1000-1010
	K1, S7, S10, S11	Volumes	Face-to-Face	Lectures, cooperative learning and discussion	1011-120
	S7, S10, S11	Triple integrals 1	Face-to-Face	Lectures, cooperative learning and discussion	1011-1020
	Second Exam				
	S7, S10, S11,K1	Applications on integrals	Face-to-Face	Lectures, cooperative learning and discussion	1015-1025

	S7, S10, S11, K1	Spherical & Cylindrical coordinates	Face-to-Face	Lectures, cooperative learning and discussion	1035-1040
	S7, S10, K1,S11	Changing the variables of integration & Triple integrals	Face-to-Face	Lectures, cooperative learning and discussion	1035-1040
	S7, S10, S11, K1	Changing the variables of integration & Triple integrals	Face-to-Face	Lectures, cooperative learning and discussion	1041-1050
	S7, S10, S11, K1	Examples and applications	Face-to-Face	Lectures, cooperative learning and discussion	1050-1060
	S7, S10, S11, K1	Quadratic surfaces in spherical coordinates	Face-to-Face	Lectures, cooperative learning and discussion	1060-1070
	S7, S10, S11, K1	Applications on transforming to different coordinates	Face-to-Face	Lectures, cooperative learning and discussion	Main reference
	S7, S10, S11, K1	Examples and discussion	Face-to-Face	Lectures, cooperative learning and discussion	Main reference
	S7, S10, S11, K1	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	Main reference
Final Exam					

Eighth: Assessment methods

Methods	Direct Teaching	Specific Course Output to be measured *State the score identified for each CILO for each method of assessment out of 100 **If any CILO will not be assessed in the course, mark NA.																		
		K1	K2	K3	K4	K5	K6	K7	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	C1	C2
First Exam	20	2	1	1					4	3	2			2	2	2		1			
Second Exam	20	2			1	1	1	1		1	1	1	1	1	1	1	1	1	1		4
Final Exam	50	6	8			4	4			6	2		2			3	2	7			6
Assignment	10								2					2						4	2
Total	100	10	22						6	36								10		4	12

ninth: Course Policies

- All course policies are applied on all teaching patterns (online, blended, and face-to-face Learning) as follows:
  a. Punctuality.
  b. Participation and interaction.
  c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).