هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	**Calculus 3**
Course Code:	**313 Math**
Program:	**B. Sc. In Mathematics**
Department:	**Mathematics**
College:	**Science**
Institution:	**Jazan University**
Version:	**V2023**
Last Revision Date:	2/2023

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:	

2. Course type					
A.	University ☐	College ☐	Department ☒	Track☐	Others☐
B.	Required ☒		Elective☐		

3. Level/year at which this course is offered:	**Level 7/Year 3**
4. Course general Description	

- **Functions of several variables**: Functions of two variables, examples of functions of two variables, definition of functions of two variables, domain and range, sketch the domain. Graphs of functions of two variables: Definition Functions of three variables.
- **Limits and Continuity**: Definition of limits of functions of two variables, limits a long path, when the limit does not exist, how to prove the limit exists, limit of functions of three variables, continuity.
- **Partial Derivatives**: Definitions, notations, rule for finding partial derivatives
- z=f(x,y), interpretation of partial derivatives. Functions of more than two variables, higher derivatives. Claiuraut's theorem. Chain rule case1, chain rule case 2, chain rule general version, implicit differentiation,
- **Directional derivatives and Tangent planes**. Directional derivative and the gradient vector, tangent planes to level surfaces, normal lines, Equation of tangent plane, symmetric and parametric equations of normal lines, Maximum and Minimum: Definition, theorem of critical points, second derivative test
- **Multiple integrals**: Double integrals over rectangles: review of the definite integral, volume and double integrals, properties of double integrals. Iterated integrals: Fubini's theorem**,** Double integral, over general regions: Type I and type II regions Double integrals in Polar Coordinates, Triple integrals**.**
- **Line integrals**: Fundamental theorem for line integrals, independence of path, Green's Theorem, Surface integrals, Stokes' Theorem and divergence Theorem.

5. Pre-requirements for this course (if any): Math 212

6. Co- requirements for this course (if any): none

7. Course Main Objective(s)

- After finishing the course, the student is expected to be familiar with the following:
- Functions of several variables
- Limits and continuity
- Partial derivatives and its application
- Multiple integration (double integrals-Triple integrals
- Line and surface integrals.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	33

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	Distinguish mathematical concepts relevant to domain and range, limits, continuity, partial derivatives, directional derivatives, tangent planes, max. and mini, multiple integrals , line integrals..	K1	Lectures, Web based work, Classroom discussions .	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
1.2	Identify structures and features of Mathematics problems in limits, continuity, partial derivatives, directional derivatives, tangent planes, max. and mini.., multiple integrals , line integrals	K2	Lectures, Web based work, Classroom discussions .	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
1.3	Explain notations and concepts required for the solution of Mathematical problem in limits, continuity, partial derivatives, directional derivatives, tangent planes, max. and mini. multiple integrals, line integrals	K3	Lectures, Web based work, Classroom discussions .	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	Skills			
2.1	Apply theoretical, computational or practical aspect relevant to limits, continuity, partial derivatives, directional derivatives, tangent planes, max. and mini., multiple integrals , line integrals	S1	Lectures, Web based work, Classroom discussions	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.2	Compute numerical quantities for various parameters to approximate the solution of limits, continuity, partial derivatives, directional derivatives, tangent planes, max. and mini., multiple integrals , line integrals.	S2	Lectures, Web based work, Classroom discussions	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.3	Apply various mathematical rules, techniques and theorems in Application on limits, continuity, partial derivatives, directional derivatives, tangent planes, max. and mini., multiple integrals , line integrals	S3	Lectures, Web based work, Classroom discussions	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.4	Solve mathematical problem using critical thinking in limits, continuity, partial derivatives, directional derivatives, tangent planes, max. and mini., multiple integrals , line integrals	S4	Lectures, Web based work, Classroom discussions	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
3.0	Values, autonomy, and responsibility			
3.1	Cultivate a mathematical attitude and nurture the interest.	V1	Group work, problem solving, web based work	Assignments Discussion
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	V2	Group work, problem solving, web based work	Assignments, Discussion
3.3	Inculcating values and ethics in thought, expression and deed.	V3	Group work, problem solving, web based work	Assignments, Discussion

C. Course Content

No	List of Topics	Contact Hours
1.	Functions of several variables	3
2.	Limits and continuity	3

3.	Partial derivatives and its application	10
4.	Multiple integration: double integrals-Triple integrals	10
5.	Line and surface integrals	7
Total		33

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework and Quiz	3	5%
2.	First exam.	5	20%
3.	Second exam.	10	20%
4.	Homework and Quiz	11	5%
5.	Final exam.	12	50%

*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, J. Stewart, 6thEdition, Brooks/ Cle Publishing Company**
Supportive References	**Calculus, H. Anton, 8thEdition, John Wiley and Sons, (2005).**
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom, Computer lab
Technology equipment (projector, smart board, software)	Data show; Smart Board, Mathematics software
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect(Course Evaluation Survey)-Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
Quality of learning resources	Instructor	Direct/Indirect
The extent to which CLOs have been achieved	Students, Faculty members	Indirect
Other	Students, Program assessment committee	Direct/ Indirect

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	**Board Of Mathematics Department**
REFERENCE NO.	**2306**
DATE	**07/09/1444 A. H.; 29/03/2023 A. D.**