Philadelphia University	PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE	**Approval date: 20/02/2025**
Faculty of Science		**Issue:**
Department of Math		**Credit hours: 3**
Academic year 2024/2025	**Course Syllabus**	**Bachelor**

Course information

Course#	Course title	Prerequisite
0250202	**Calculus 3**	**Calculus 2 0250102**

Course type			Class time	Room #
☐ University Requirement	☐ Faculty Requirement		SSMTW 10:20-11:20	2827
☒ Major Requirement	☐ Elective	☒ Compulsory		
Degree / NQF Level	☐ Diploma degree (6)	☒ Bachelor degree (7)		

Instructor Information

Name	Office No.	Phone No.	Office Hours	E-mail
Feras Awad	822	2132	Sun. Tue. 11:30 – 12:30	fawad@philadelphia.edu.jo

Course Delivery Method

Course Delivery Method			
☒ **Physical**	☐ **Online**	☐ **Blended**	
Learning Model			
Precentage	**Synchronous**	**Asynchronous**	**Physical**
	0%	**0%**	**100%**

Course Description

This second-year course, designed for math and engineering students, covers 3D coordinate systems, vectors, parametric equations, quadratic surfaces. Topics include vector-valued functions, limits, continuity, partial derivatives, the chain rule, gradients, optimization, and double and triple integrals in various coordinate systems.

Course Learning Outcomes

Number	Outcomes	Corresponding Program outcomes *
Knowledge		
K1	Understand the concepts and operations of vectors and vector-valued functions and extend the principles of single-variable calculus to multivariable functions.	**K_p1**
K2	Recognize the methods of calculating limits, derivatives, gradients, and extremums of multivariable functions.	**K_p1**
Skills		
S1	Utilize computer software, such as GeoGebra, to perform calculations and solve mathematical problems.	**S_p4**
Competencies		
C1	Demonstrate decision-making skills while collaborating effectively in a team to complete course tasks.	**C_p1**

* According to learning outcomes of the faculty of pharmacy.

Learning Resources

Course textbook	• Anton H., Bivens I., Davis S. (2016) Calculus: Early Transcendentals (11th ed.). Wiley.
Supporting References	• Stewart J. (2015) Calculus: Early Transcendentals (8th ed.). Brooks Cole.
Supporting websites	• GeoGebra: https://www.geogebra.org/
Teaching Environment	☒**Classroom** ☐ **laboratory** ☐**Learning platform** ☐**Other**

Meetings and Subjects Timetable

Week	Topic	Learning Methods	Tasks	Learning Material
1	Explanation of the study plan for the course, and what is expected to be accomplished by the students. **Technology Preliminaries:** Moodle. Microsoft Teams. Geogebra **Three-Dimensional Space; Vectors:** 11.1 Rectangular Coordinates in 3-Space; Spheres; Cylindrical Surfaces 11.2 Vectors	Lecture		Course Syllabus Chapter 11
2	11.3 Dot Product; Projections 11.4 Cross Product	Lecture		Chapter 11
3	11.5 Parametric Equations of Lines 11.6 Planes in 3-Space	Lecture	Quiz	Chapter 11
4	11.8 Cylindrical and Spherical Coordinates **Partial Derivatives:** 13.1 Functions of Two or More Variables 13.2 Limits and Continuity	Lecture		Chapter 11 Chapter 13
5	13.3 Partial Derivatives 13.5 The Chain Rule	Lecture	Midterm	Chapter 13
6	13.6 Directional Derivatives and Gradients 13.8 Maxima and Minima of Functions of Two Variables 13.9 Lagrange Multipliers	Lecture		Chapter 13
7	**Vector-Valued Functions:** 12.1 Introduction to Vector-Valued Functions 12.2 Calculus of Vector-Valued Functions 12.3 change of Parameter; Arc Length 12.4 Unit Tangent, Normal, and Binormal Vectors	Lecture	Quiz	Chapter 12
8	**Final Exam**			

* Includes: Lecture, flipped Class, project- based learning, problem solving based learning, collaborative learning

Self-Review Exercises and Problem-solving from the Textbook

Chapter	Section	Exercises
11	1	3, 9, 12, 13, 23, 29, 30, 31, 32, 19, 20, 21, 22
	2	1, 5, 9, 11, 13, 16, 21, 23, 25, 31, 33, 37, 17, 18, 19, 20
	3	1, 2, 8, 9, 12, 14, 15, 24, 25, 28, 29, 30, 31
	4	1, 3, 5, 11, 12, 17, 19, 21, 28, 34, 37, 13, 14, 15, 16
	5	1, 3, 15, 21, 23, 29, 31, 33, 37, 11, 12, 13, 14
	6	3, 5, 7, 11, 13, 15, 17, 19, 25, 26, 27, 28, 30, 32, 33, 35, 37, 41, 43, 49, 21, 22, 23, 24
	8	1, 3, 5, 7, 9, 11, 19, 21, 23, 24, 27, 28, 29, 31, 33, 37, 39, 41, 45, 15, 16, 17
12	1	2, 3, 17, 19, 31, 32, 33, 34
	2	1, 4, 5, 9, 10, 11, 13, 15, 19, 21, 27, 29, 32, 33, 35, 38, 39, 40, 45, 47, 41, 42, 43, 44
	3	1, 3, 5, 8, 9, 11
	4	5, 7, 9, 15, 19
13	1	1, 17, 23, 25, 51, 53, 65
	2	1, 3, 7, 9, 10, 11, 13, 15, 16, 23, 25, 34
	3	3, 5, 9, 11, 25, 27, 31, 33, 43, 82, 83, 97, 99, 21, 22, 23, 24
	5	1, 3, 7, 13, 17, 21, 33, 52
	6	1, 5, 9, 11, 15, 19, 25, 26, 29, 33, 37, 41, 71, 72 ,75
	8	9, 11, 15, 31, 33
	9	5, 7, 25

Course Contributing to Learner Skill Development

Using Technology
• Use GeoGebra to draw vectors, curves, and surfaces in space.
Communication Skills
• Making a GeoGebra applet that do calculations of any main topic of the course and represents it to the students in class.
Application of Concepts Learnt
• Choose a physical model of any main topic of the course and briefly solve it.

Assessment Methods and Grade Distribution

Assessment Methods	Grade Weight	Assessment Time (Week No.)	Link to Course Outcomes
Mid Term Exam	**30%**	**5**	**K1, C1**
Various Assessments *	**30%**	**Continuous**	**S1, C1**
Final Exam	**40%**	**8**	**K1, K2, C1**
Total	**100%**		

* Includes: quiz, in class and out of class assignment, presentations, reports, videotaped assignment, group or individual projects.

Alignment of Course Outcomes with Learning and Assessment Methods

Number	Learning Outcomes	Learning Methods*	Assessment Method
	Knowledge		
K1	Understand the concepts and operations of vectors and vector-valued functions and extend the principles of single-variable calculus to multivariable functions.	Lecture	**Exam**
K2	Recognize the methods of calculating limits, derivatives, gradients, and extremums of multivariable functions.	Lecture	**Exam**

Skills			
S1	Utilize computer software, such as GeoGebra, to perform calculations and solve mathematical problems	Case study	**Computer project**
Competencies			
C1	Demonstrate critical decision-making skills while collaborating effectively in a team to complete course tasks.	Case study	**Computer project**

* Includes: Lecture, flipped Class, project- based learning, problem solving based learning, collaborative learning
** Includes: quiz, in class and out of class assignment, presentations, reports, videotaped assignment, group or individual projects.

Course Polices

Policy	Policy Requirements
Passing Grade	The minimum passing grade for the course is (50%) and the minimum final mark recorded on transcript is (35%).
Missing Exams	• Missing an exam without a valid excuse will result in a zero grade to be assigned to the exam or assessment. • A Student who misses an exam or scheduled assessment, for a legitimate reason, must submit an official written excuse within a week from an exam or assessment due date. • A student who has an excuse for missing a final exam should submit the excuse to the dean within three days of the missed exam date.
Attendance	The student is not allowed to be absent more than (15%) of the total hours prescribed for the course, which equates to six lectures days (M, W) and six lectures (S, T). If the student misses more than (15%) of the total hours prescribed for the course without a satisfactory excuse accepted by the dean of the faculty, s/he will be prohibited from taking the final exam and the grade in that course is considered (zero), but if the absence is due to illness or a compulsive excuse accepted by the dean of the college, then withdrawal grade will be recorded.
Academic Honesty	Philadelphia University pays special attention to the issue of academic integrity, and the penalties stipulated in the university's instructions are applied to those who are proven to have committed an act that violates academic integrity, such as: cheating, plagiarism (academic theft), collusion, and violating intellectual property rights.

Program Learning Outcomes to be Assessed in this Course

Number	Learning Outcome	Course Title	Assessment Method	Target Performance level
K_p1	The student has completed knowledge of the basic concepts, facts and theories in mathematics.	Calculus 3	Quiz	100% of the students get 75% or more on the rubric.

Description of Program Learning Outcome Assessment Method

Number	Detailed Description of Assessment
K_p1	Students will be tasked with finding partial derivatives of a given function. They must first analyze the function's graph or contour plot to understand its behavior. Based on this visual representation, they will determine the appropriate differentiation technique and the variables with respect to which they should compute the derivatives.

Assessment Rubric of the Program Learning Outcome

	4 Points (Excellent)	3 Points (Good)	2 Points (Satisfactory)	1 Point (Needs Improvement)
Understanding of Partial Derivatives	Clearly identifies the concept and purpose of partial derivatives.	Demonstrates understanding but lacks minor details.	Shows partial understanding with some misconceptions.	Lacks understanding or has major misconceptions.
Use of Visual Representation	Clearly explains the role of graphs or contour plots in differentiation.	Mentions visual representation but lacks depth.	Briefly refers to visuals but with little connection to differentiation.	Does not mention or misinterprets visual representation.
Application of Differentiation Techniques	Accurately describes the selection of differentiation techniques.	Identifies techniques but with minor errors.	Attempts to describe techniques but lacks clarity.	Fails to identify or describe differentiation techniques.
Clarity and Organization	Well-structured and logically flows with precise language.	Mostly clear, with minor wording or organization issues.	Somewhat unclear or disorganized, making comprehension difficult.	Lacks clarity and organization, making it hard to understand.