Philadelphia University	PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE	**Approval date:**
Faculty of Science		**Issue:**
Department of Math		**Credit hours: 3**
Academic year 2022/2023	**Course Syllabus**	**Bachelor**

Course information

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

Course type			Class time	Room #
☐ University Requirement	☐ Faculty Requirement		ST 11:15-12:45	21004
☒ Major Requirement	☐ Elective	☒ Compulsory	MW 12:45-14:15	21004

Instructor Information

Name	Office No.	Phone No.	Office Hours	E-mail
Feras Awad	822	2132	ST 13:00-14:00 MW 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 course is a second-year course, and it is oriented to math and engineering students. It covers the following main topics: Rectangular Coordinates in 3-Space: Spheres; Cylindrical Surfaces; Vectors; Dot Product; Projections; Cross Product; Parametric Equations of Lines; Planes in 3-Space; Quadratic Surfaces; Cylindrical and Spherical Coordinates. Vector-Valued Functions: Calculus of Vector-Valued Functions; Change of Parameter; Arc Length; Unit Tangent, Normal, and Binormal Vectors; Curvature. Functions of Two or More Variables: Limits and Continuity; Partial Derivatives; Differentiability, Differentials, and Local Linearity; The Chain Rule; Directional Derivatives and Gradients; Tangent Planes and Normal Vectors; Maxima and Minima of Functions of Two Variables; Lagrange Multipliers. Double Integrals: over Nonrectangular Regions; in Polar Coordinates; Triple Integrals; Triple Integrals in Cylindrical and Spherical Coordinates.

Course Learning Outcomes

Number	Outcomes	Corresponding Program outcomes *
Knowledge		
K1	Understand the basic ideas of vectors and their operations.	**K_p1**
K2	Know the definition of vector-valued functions, and the knowledge behind their calculus calculations.	**K_p1**
K3	Extend the main concepts and ideas of calculus of single-variable functions to multiple variables functions.	**K_p1**
K4	Understand the concepts of limits, derivatives, gradients, and the extremums of functions of two or three variables.	**K_p1**
K5	Know how to evaluate double and triple integrals and determine a suitable coordinate system to evaluate them.	**K_p1**
Skills		
S1	Use computer software like GeoGebra to do calculations.	**S_p4**
Competencies		
C1	Thinking reasonably and the ability to make decisions.	**C_p1**
C2	Work in a team to implement one of the tasks of the course.	**C_p2**

* According to learning outcomes of the faculty of pharmacy.

Learning Resources

Course textbook	• Anton H., Bivens I., Davis S. (2011) Calculus: Early Transcendentals (10th 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	Lecture		Course Syllabus Software
2	**Three-Dimensional Space; Vectors:** 11.1 Rectangular Coordinates in 3-Space; Spheres; Cylindrical Surfaces 11.2 Vectors	Lecture		Chapter 11
3	11.3 Dot Product; Projections	Lecture		Chapter 11
4	11.4 Cross Product	Lecture	Quiz	Chapter 11
5	11.5 Parametric Equations of Lines 11.6 Planes in 3-Space	Lecture		Chapter 11
6	11.7 Quadratic Surfaces 11.8 Cylindrical and Spherical Coordinates	Lecture	Quiz	Chapter 11
7	**Vector-Valued Functions:** 12.1 Introduction to Vector-Valued Functions 12.2 Calculus of Vector-Valued Functions	Lecture	Computer Task using GeoGebra	Chapter 12

8	12.4 Unit Tangent, Normal, and Binormal Vectors 12.5 Curvature	Lecture		Chapter 12
9	**Partial Derivatives:** 13.1 Functions of Two or More Variables 13.2 Limits and Continuity	Lecture		Chapter 13
10	13.3 Partial Derivatives 13.4 Differentiability, Differentials, and Local Linearity	Lecture		Chapter 13
11	13.5 The Chain Rule 13.6 Directional Derivatives and Gradients	Lecture		Chapter 13
12	13.7 Tangent Planes and Normal Vectors 13.8 Maxima and Minima of Functions of Two Variables	Lecture		Chapter 13
13	13.9 Lagrange Multipliers	Lecture	Quiz	Chapter 13
14	**Multiple Integrals:** 14.1 Double Integrals 14.2 Double Integrals over Nonrectangular Regions	Lecture		Chapter 14
15	14.3 Double Integrals in Polar Coordinates 14.5 Triple Integrals 14.6 Triple Integrals in Cylindrical and Spherical Coordinates	Lecture	Quiz	Chapter 14
16	Final Exam			

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

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%**	**11**	**K1, K2, C1**
Various Assessments *	**30%**	**Continuous**	**S1, C1, C2**
Final Exam	**40%**	**16**	**K1, K2, K3, K4, K5, 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 Method*	Assessment Method**
Knowledge			
K1	Understand the basic ideas of vectors and their operations.	Lecture	**Exam**
K2	Know the definition of vector-valued functions, and the knowledge behind their calculus calculations.	Lecture	**Exam**
K3	Extend the main concepts and ideas of calculus of single-variable functions to multiple variables functions.	Lecture	**Exam**
K4	Understand the concepts of limits, derivatives, gradients, and the extremums of functions of two or three variables.	Lecture	**Exam**
K5	Know how to evaluate double and triple integrals and determine a suitable coordinate system to evaluate them.	Lecture	**Exam**
Skills			
S1	Use computer software like GeoGebra and Google Sheets to do calculations.	Case study	**Computer project**
Competencies			
C1	Thinking reasonably and the ability to make decisions.	Discussion	**Quiz**
C2	Work in a team to implement one of the tasks of the course.	Case study	**Group 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	The student will be given a double integral problem to solve it by drawing the region of integration and according that he/she will choose the suitable technique or coordinate system to do calculations.

Assessment Rubric of the Program Learning Outcome

	Weak (1 pt.**)** Student is very confused and does not understand the topic, nor is able to clearly grasp how to apply it or when to use it.	**Not Bad (**2 pts**)** Student has a decent grasp of the process but makes some major mistakes.	**Good (**3 pts**)** Student is almost perfect in their understanding of the topic, with some minor confusion or mistakes.	**Excellent (**4 pts**)** Student understands the concept perfectly.
Drawing the Region Student should draw the region of integration.	The boundaries drawn are totally wrong.	The boundaries drawn are correct but the shaded region is wrong.	The region is graphed but with minor errors.	The region is correctly graphed.
Determine the Order of Integration Student should use correct region type or transform it to another coordinate system.	An inappropriate order of integration is used.	An appropriate order of integration is used but with major errors.	An appropriate order of integration is used but with minor errors.	An appropriate order of integration is used with correct limits of integration.
Calculations Student should calculate the double integral correctly using iterated technique.	Calculations are totally wrong.	Calculations were done with major errors.	Calculations were done with minor errors.	Calculations are complete and correct.