Philadelphia University	PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE	**Approval date:**
Faculty of Science		**Issue:**
Department of Math		**Credit hours: 3**
Academic year 2021/2022	**Course Syllabus**	**Bachelor**

Course information

Course#	Course title	Prerequisite
0250302	**Calculus 4**	**Calculus 3 0250202**

Course type	Class time	Room #
☐ University Requirement ☐ Faculty Requirement ☒ Major Requirement ☐ Elective ☒ Compulsory	SMTWT 11:30-12:30	2827

Instructor Information

Name	Office No.	Phone No.	Office Hours	E-mail
Feras Awad	822	2132	SMTWT 10:00–11:00	fawad@philadelphia.edu.jo

Course Delivery Method

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

Course Description

Double Integrals. Double Integrals over Nonrectangular Region. Double Integrals in Polar Coordinates. Surface Area; Parametric Surfaces. Triple Integrals. Triple Integrals in Cylindrical and Spherical Coordinates. Change of Variables in Multiple Integrals, Jacobians. Vector Fields. Line Integrals. Independence of Path; Conservative Vector Fields. Green's Theorem. Surface Integrals. Applications of Surface Integrals; Flux. The Divergence Theorem. Stokes' Theorem.

Course Learning Outcomes

Number	Outcomes	Corresponding Program outcomes *
Knowledge		
K1	Understand the basic ideas of scalar fields and vector fields.	**K_p1**
K2	Recognize that a vector field is conservative or not.	**K_p1**
K3	Understanding the line integral of a vector field and knowing how to compute the line integral over various types of paths.	**K_p1**
K4	Know how and when to use Green's and Stoke's Theorems	**K_p1**

Skills		
S1	Use computer software like GeoGebra to do calculations and graphs.	**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	• Colley S. (2012) Vector Calculus (4th Edition). Pearson.
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
	PARTIAL DERIVATIVES (Review) 13.1 Functions of Two or More Variables 13.3 Partial Derivatives 13.6 Directional Derivatives and Gradients			Chapter 13
2	**MULTIPLE INTEGRALS:** 14.1 Double Integrals 14.2 Double Integrals over Nonrectangular Regions 14.3 Double Integrals in Polar Coordinates	Lecture	Quiz	Chapter 14
3	14.4 Surface Area; Parametric Surfaces 14.5 Triple Integrals 14.6 Triple Integrals in Cylindrical and Spherical Coordinates	Lecture	Computer Task using GeoGebra	Chapter 14
4	14.7 Change of Variables in Multiple Integrals; Jacobians **TOPICS IN VECTOR CALCULUS:** 15.1 Vector Fields 15.2 Line Integrals	Lecture		Chapter 14 Chapter 15
5	15.3 Independence of Path; Conservative Vector Fields 15.4 Green's Theorem	Lecture	Quiz	Chapter 15
6	15.5 Surface Integrals 15.6 Applications of Surface Integrals; Flux	Lecture	Computer Task using GeoGebra	Chapter 15
7	15.7 The Divergence Theorem 15.8 Stokes' Theorem	Lecture		Chapter 15
8	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 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
• Recognize real life quantities that are scalar fields or vector fields such as the temperature of an object in space, the force, and the velocity

Assessment Methods and Grade Distribution

Assessment Methods	Grade Weight	Assessment Time (Week No.)	Link to Course Outcomes
Mid Term Exam	**30%**	**4**	**K1, K2, C1**
Various Assessments *	**30%**	**Continuous**	**S1, C1, C2**
Final Exam	**40%**	**8**	**K1, K2, K3, K4, 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 scalar fields and vector fields.	Lecture	**Exam**
K2	Recognize that a vector field is conservative or not.	Lecture	**Exam**
K3	Understanding the line integral of a vector field and knowing how to compute the line integral over various types of paths.	Lecture	**Exam**
K4	Know how and when to use Green's and Stoke's Theorems	Lecture	**Exam**
Skills			
S1	Use computer software like GeoGebra to do calculations and graphs.	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	**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 seven lectures (S, T, 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 4	Quiz	100% of the students get 60% 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 vector field **F** and he/she will (a) Show that **F** is a conservative vector field. (b) Find a potential function for **F**. (c) Find the work performed by the force field on a particle that moves along a curve represented by parametric equations.

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.
Conservative Field Student should proof that F is conservative.	Calculations are totally wrong.	Calculations were done with major errors.	Calculations were done with minor errors.	Calculations are complete and correct.
Potential Function Student should find the potential function for F.	Calculations are totally wrong.	Calculations were done with major errors.	Calculations were done with minor errors.	Calculations are complete and correct.
The Work Student should calculate the work performed by the force field on a particle that moves along curve.	Calculations are totally wrong.	Calculations were done with major errors.	Calculations were done with minor errors.	Calculations are complete and correct.