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| **Approval date:** |  | **Philadelphia University** |
| **Issue:** | **Faculty of Science** |
| **Credit hours: 3** | **Department of Math** |
| **Bachelor** | **Course Syllabus** | **Academic year 2022/2023** |

**Course information**

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| --- | --- | --- | --- | --- |
| **Prerequisite** | | **Course title** | | **Course#** |
| **Calculus 3**  **0250202** | | **Calculus 4** | | **0250302** |
| **Room #** | **Class time** | | **Course type** | |
| 21003 | SW 11:15-12:30  ST 9:45-11:00 | | University Requirement  Faculty Requirement  Major Requirement  Elective  Compulsory | |

**Instructor Information**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **E-mail** | **Office Hours** | **Phone No.** | **Office No.** | **Name** |
| [k\_hyasat@philadelphia.edu.jo](mailto:k_hyasat@philadelphia.edu.jo) | ST 11:00–12:30  SW 09:45–11:00 | 2602 | 1014 | Khaled Hyasat |

**Course Delivery Method**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Delivery Method** | | | |
| **Physical  Online  Blended** | | | |
| **Learning Model** | | | |
| **Physical** | **Asynchronous** | **Synchronous** | **Precentage** |
| **100%** | **0%** | **0%** |

**Course Description**

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| --- |
| 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**

|  |  |  |
| --- | --- | --- |
| **Corresponding Program outcomes \*** | **Outcomes** | **Number** |
| **Knowledge** | | |
| **K­p1** | Understand the basic ideas of scalar fields and vector fields. | **K1** |
| **K­p1** | Recognize that a vector field is conservative or not. | **K2** |
| **K­p1** | Understanding the line integral of a vector field and knowing how to compute the line integral over various types of paths. | **K3** |
| **K­p1** | Know how and when to use Green’s and Stoke’s Theorems | **K4** |
| **Skills** | | |
| **S­p4** | Use computer software like GeoGebra to do calculations and graphs. | **S1** |
| **Competencies** | | |
| **C­p1** | Thinking reasonably and the ability to make decisions. | **C1** |
| **C­p2** | Work in a team to implement one of the tasks of the course. | **C2** |

\* According to learning outcomes of the faculty of pharmacy.

**Learning Resources**

|  |  |
| --- | --- |
| Anton H., Bivens I., Davis S. (2011) Calculus: Early Transcendentals (10th ed.). Wiley. | **Course textbook** |
| * Colley S. (2012) Vector Calculus (4th Edition). Pearson. | **Supporting References** |
| * GeoGebra: <https://www.geogebra.org/> | **Supporting websites** |
| **Classroom**  **laboratory Learning platform Other** | **Teaching Environment** |

**Meetings and Subjects Timetable**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Learning Material** | **Tasks** | **Learning Methods** | **Topic** | **Week** |
| Course Syllabus  Software |  | Lecture | Explanation of the study plan for the course, and what is expected to be accomplished by the students.  **Technology Preliminaries:**  Moodle. Microsoft Teams. Geogebra | **1** |
| Chapter 14 |  | Lecture | **MULTIPLE INTEGRALS:**  14.1 Double Integrals | **2** |
| Chapter 14 |  | Lecture | 14.2 Double Integrals over Nonrectangular Regions | **3** |
| Chapter 14 | Quiz | Lecture | 14.3 Double Integrals in Polar Coordinates | **4** |
| Chapter 14 |  | Lecture | 14.4 Surface Area; Parametric Surfaces | **5** |
|  | Computer Task using GeoGebra |  | 14.5 Triple Integrals  14.6 Triple Integrals in Cylindrical and Spherical Coordinates | **6** |
| Chapter 14 |  | Lecture | 14.7 Change of Variables in Multiple Integrals; Jacobians | **7** |
| Chapter 14 |  |  | **TOPICS IN VECTOR CALCULUS:**  15.1 Vector Fields | **8** |
| Chapter 15 |  | Lecture | 15.2 Line Integrals | **9** |
| Chapter 15 |  | Lecture | 15.3 Independence of Path; Conservative Vector Fields | **10** |
|  | Quiz |  | 15.4 Green’s Theorem | **11** |
| Chapter 15 |  | Lecture | 15.5 Surface Integrals | **12** |
| Chapter 15 |  | Lecture | 15.6 Applications of Surface Integrals; Flux | **13** |
| Chapter 15 | Quiz | Lecture | 15.7 The Divergence Theorem | **14** |
| Chapter 15 |  | Lecture | 15.8 Stokes’ Theorem | **15** |
|  |  |  | Final Exam | **16** |

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

**Course Contributing to Learner Skill Development**

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| --- |
| **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**

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| --- | --- | --- | --- |
| **Link to Course Outcomes** | **Assessment Time**  **(Week No.)** | **Grade Weight** | **Assessment Methods** |
| **K1, K2, C1** | **4** | **30 %** | **Mid Term Exam** |
| **S1, C1, C2** | **Continuous** | **30 %** | **Various Assessments \*** |
| **K1, K2, K3, K4, C1** | **8** | **40 %** | **Final Exam** |
|  |  | **100%** | **Total** |

\* 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**

|  |  |  |  |
| --- | --- | --- | --- |
| **Assessment Method\*\*** | **Learning Method\*** | **Learning Outcomes** | **Number** |
| **Knowledge** | | | |
| **Exam** | Lecture | Understand the basic ideas of scalar fields and vector fields. | **K1** |
| **Exam** | Lecture | Recognize that a vector field is conservative or not. | **K2** |
| **Exam** | Lecture | Understanding the line integral of a vector field and knowing how to compute the line integral over various types of paths. | **K3** |
| **Exam** | Lecture | Know how and when to use Green’s and Stoke’s Theorems | **K4** |
| **Skills** | | | |
| **Computer project** | Case study | Use computer software like GeoGebra to do calculations and graphs. | **S1** |
| **Competencies** | | | |
| **Quiz** | Discussion | Thinking reasonably and the ability to make decisions. | **C1** |
| **Computer project** | Case study | Work in a team to implement one of the tasks of the course. | **C2** |

\* 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 Requirements** | **Policy** |
| The minimum passing grade for the course is (50%) and the minimum final mark recorded on transcript is (35%). | **Passing Grade** |
| * 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. | **Missing Exams** |
| 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. | **Attendance** |
| 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. | **Academic Honesty** |

**Program Learning Outcomes to be Assessed in this Course**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Target Performance level** | **Assessment Method** | **Course Title** | **Learning Outcome** | **Number** |
| 100% of the students get 60% or more on the rubric. | Quiz | Calculus 4 | The student has completed knowledge of the basic concepts, facts and theories in mathematics. | **Kp1** |

**Description of Program Learning Outcome Assessment Method**

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| --- | --- |
| **Detailed Description of Assessment** | **Number** |
| 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. | **Kp1** |

**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. |