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| **Approval date:** |  | **Philadelphia University** |
| **Issue:** | **Faculty: Science** |
| **Credit hours:3 Credit Hours** | **Department:Basic Science and Mathematic** |
| **Bachelor** | **Course Syllabus** | **Academic year:2022/2023** |

**Course information**

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| **Prerequisite** | | **Course title** | | **Course#** |
| **250241** | | **Matrix Analysis** | | **0250444** |
| **Room #** | **Class time** | | **Course type** | |
|  | **Mon. and Wedenesday 11:15-12:45** | | University Requirement  Faculty Requirement  Major Requirement  Elective  Compulsory | |

**Instructor Information**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **E-mail** | **Office Hours** | **Phone No.** | **Office No.** | **Name** |
| **ralseidi@philadelphia.edu.jo** | **Sun. to Wed.**  **10:00-11:00** | **009626479900/2340** | **1015** | **Dr. Rola Alseidi** |

**Course Delivery Method**

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

**Course Description**

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| This course deals with the following main topics: review of main concepts of linear algebra such as determinants, rank and nullity, eigenvalues and eigenvectors. Also, it includes the study of Characteristic polynomial, minimal polynomial, spectral theorem, Cayley-Hamilton theorem, Jordan form, companion matrices, spectral radius and Investigate some types of matrices. |

**Course Learning Outcomes**

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| **Corresponding Program outcomes** | **Outcomes** | **Number** |
| **Knowledge** | | |
| **Kp1** | Understanding the concepts of linear algebra e.g., Determinants, rank, nullity eigenvalues and eigenvectors. | **K1** |
| **Kp1** | Identify special classes of matrices and their properties. | **K2** |
| **Kp1** | Understanding the concept of spectral radius, Characterstic polynomial, minimal polynomial. | **K3** |
| **Skills** | | |
| **Sp1** | Prove some Theorems on spectral properties of various types of matrices. | **S1** |
| **Competencies** | | |
| **Cp1** | Develop a mathematical vocabulary by expressing mathematical ideas orally and in writing | **C3** |

**Learning Resources**

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| Lecture Notes | Course textbook |
| Linear algebra, A Modren Introduction, Third Editionm David Poole.  Linear Algebra by L.W. Jhonson & R.D. Riess & J.T. Arnold- Addisson Wesely 2007. | Supporting References |
| http://videolectures.net/mit1806s05\_linear\_algebra/ | Supporting websites |
| Classroom  laboratory Learning platform Other | Teaching Environment |

**Meetings and subjects timetable**

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| --- | --- | --- | --- | --- |
| **Learning Material** | **Tasks** | **Learning Methods** | **Topic** | **Week** |
|  |  | Lecture | Determinants  Linear Independence | **1** |
| **Work Sheet (1)** |  | Lecture | Rank, Nullity, Basis. | **2** |
|  |  | Lecture | Eigenvalues and Eigenvectors  Similarity and Diagonalization | **3** |
| **Work Sheet (2)** | **Quiz (1)**  **21/11/2022** | Lecture | Iterative Methods for computing Eigenvalues | **4** |
|  |  | Lecture | Applications and the Perron-Frobenius Theorem | **5** |
| **Work Sheet (3)** |  | Lecture | The Gram-Schmidt Process and the QR Factoriztion | **6** |
|  |  | Lecture | Spectral Mapping Theorem  Minimal Polynomial and Similar matrices. | **7** |
| **Work Sheet (4)** | **Quiz (2)**  **19/12/2022** | Lecture | Jordan Canonical Form | **8** |
|  |  | Lecture | Vectors and Matrices with Complex Entries | **9** |
| **Work Sheet (5)** |  | Lecture | Hermitian Matrices | **10** |
|  |  | Lecture | Unitary Matrices | **11** |
| **Work Sheet (6)** | **Ass.**  **16/1/2023** | Lecture | Normal Matrices | **12** |
|  |  | Lecture | Norms and Distance Functions | **13** |
| **Work Sheet (7)** |  | Lecture | Discussion and practice week | **14** |
|  |  | Lecture | Singular Value Decoposition | **15** |
|  |  | Lecture | Final Exam and Review | **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 |
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| Communication skills |
| Improve the communication skills of the student by giving oral quizzes and discuss the assignments at the class |
| Application of concepts learnt |
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**Assessment Methods and Grade Distribution**

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| **Link to Course Outcomes** | **Assessment Time**  **(Week No.)** | **Grade Weight** | **Assessment Methods** |
| **K1, K2** | **Week 11** | **30 %** | **Mid Term Exam** |
| **C2, C3** | **Continued** | **30 %** | **Various Assessments \*** |
| **K1, K2 K3, K4** | **Week 16** | **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**

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| **Assessment Method\*\*** | **Learning Method\*** | **Learning Outcomes** | **Number** |
| **Knowledge** | | | |
| **Quiz** | Lecture | Understanding of the concepts of vectorspace and subspace. | **K1** |
| **Assignment** | Lecture | Understanding of the concepts of Rank and nullity. | **K2** |
| **Assignment** | Lecture | Understanding the concepts of eigenvalues, eigenvectors. | **K3** |
| **Quiz** | Lecture | Understanding the concept of general linear transformation. | **K4** |
| **Skills** | | | |
| **Midterm** | Lecture | Prove some properties of matrix transformation. | **S1** |
| **Assignment** | Lecture | Apply the matrix method to analyze the behavior of physical systems that evolve over time. | **S2** |
| **Competencies** | | | |
| **Final Exan** | Lecture | Solve system of linear equations in different ways | **C1** |
| **Final Exan** | Lecture | Recognize different types of matrices and their properties and find the determinant of a square matrix in different ways. | **C2** |
| **Final Exan** | Lecture | Recognize how a set of matrices, a set of vectors with appropriate operations can be considered as vector space | **C3** |

\* 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**

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| **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 the 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,R). 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**

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| **Target Performance level** | **Assessment Method** | **Course Title** | **Learning Outcome** | **Number** |
| 75% have a degree above 8 | Quizzes | Matrix Analysis | Understanding the main concepts | Kp1 |
| 75% have a degree above 8 | Assignment | Matrix Analysis | Using Technology in many mathematical fields. | Sp4 |

**Description of Program Learning Outcome Assessment Method**

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| **Detailed Description of Assessment** | **Number** |
| Short quizzes mainly (2) with 10 points each | Kp1 |
| Assignment to solve system of linear equations with 10 points | Sp4 |

**Assessment Rubric of the Program Learning Outcome**

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| **Construct during the course.** |