



University/Academy: Arab Academy for Science and Technology & Maritime Transport
Faculty/Institute: College of Computing and Information Technology
Program: Computer Science / Information Systems / Software Engineering

Form No. (12)
Course Specification

1- Course Data

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| Course Code: BA 204 | Course Title: Linear Algebra | Academic Year/Level: Year 2 / Semester 4 |
| Specialization: Basic & applied Science | No. of Instructional Units: 2 hrs lecture 2 hrs lab | Lecture: |

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| 2- Course Aim | This course illustrates the nature of mathematics as a blend of technique, theory, and applications. The important problem of solving systems of linear equations leads to the algebra of matrices, determinants, vector spaces, bases and dimension, linear transformations, and Eigen values. |
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3- Intended Learning Outcome:

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| a- Knowledge and Understanding | <p>Students will be able to demonstrate knowledge of:</p> <p>K14.Management and economics principles relevant to computing and information disciplines.</p> <p>(Equivalent to K12 in the IS dept & K13 in the SE dept)</p> <p>Define what is meant by Matrix</p> <ul style="list-style-type: none">• Describe types of matrices and its Algebraic operations• Define The transpose of Matrix• Define The Matrix Determinants• Describe Matrix Inverse• Define Equivalent Matrices• Define Matrix Rank• Define General form of System of linear equations• Discuss the solution of linear system• Identify consistency of the linear system• Define Vector• Discuss Vectors Algebraic Operations• Define Eigen values and Eigen vectors of a given matrix• Define Vector space• Describe The characteristics of a Vector Space• Define The Subspace of a Vector Space |
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| | <ul style="list-style-type: none"> • Define linear independence ; Span • Describe linear independence vectors , Spanning sets • Define basis and dimension of a vector space • Define Orthonormal basis (A.5) • Describe Gram-Schmidt process • Define linear mapping • Describe Matrix diagonalization |
| b- Intellectual Skills | <p><u>By the end of the course, the student acquires high skills and an ability to understand:</u></p> <p>I2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.</p> <ul style="list-style-type: none"> • Examine and Evaluate Algebraic operations of Matrices • Extract Determinants with different order • Evaluate Matrix Inverse • Solve square linear system with unique solution using matrix inverse • Examine Equivalent Matrices • Evaluate Matrix Rank • Solve linear system of linear equations • Examine the consistency of the linear system and find its solution • Solve Algebraic operations about vector addition, scalar multiplication, inner products, projections, norms, orthogonal vectors • Determine the Eigen values and Eigen vectors of a given matrix • Examine the characteristics of a Vector Space on different problems • Examine the Subspace of given problems • • Solve algebraic problems about linear independence, spanning sets • Determine basis and dimension of abstract vector spaces • Apply Gram-Schmidt process to orthogonalize vectors • Examine linear maps • • Apply diagonalization process |
| c- Professional Skills | <p><u>By the end of the course the student will have the ability to:</u></p> <p>P8. Handle a mass of diverse data, assess risk and draw conclusions.</p> <ul style="list-style-type: none"> • Apply the Eigen values and Eigen vectors in applications such as graph Laplacian • Build a matlab computer program to calculate Gram-Schmidt • Evaluate numerical stability |
| d- General Skills | <p><u>Students will be able to:</u></p> <p>G1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.</p> <p>G3. Show the use of information-retrieval.</p> <p>G5. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.</p> |

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| | <ul style="list-style-type: none"> • Communicate scientific findings in vector space • Enlist researchable problems in the field of linear algebra |
| 4- Course Content | <p>Vector Spaces Linear Transformations and Matrices Canonical Forms Inner Product Spaces Elementary Matrix Operations and Systems of Linear Equations Determinants Diagonalization</p> |
| 5- Teaching and Learning Methods | Lectures, Labs, Projects, Individual study & self-learning. |
| 6- Teaching and Learning Methods for Students with Special Needs | <ul style="list-style-type: none"> • Students with special needs are requested to contact the college representative for special needs (currently Dr Hoda Mamdouh in room C504) • Consulting with lecturer during office hours. • Consulting with teaching assistant during office hours. • Private Sessions for redelivering the lecture contents. • For handicapped accessibility, please refer to program specification. |
| 7- Student Assessment: | |
| a- Procedures used: | Exams and coursework |
| b- Schedule: | <p>Week 7 exam Week 12 exam Week 16 Final exam</p> |
| c- Weighing of Assessment: | <p>7th week exam 30% 12th exam 20% Course work 10% Final exam 40%</p> |
| 8- List of References: | |
| a- Course Notes | From the Moodle on www.aast.edu |
| b- Required Books (Textbooks) | Lay, David C, <i>Linear Algebra and Its Applications with CD-ROM</i> , Update, 3rd ed., Addison Wesley, 2006. |
| c- Recommended Books | |

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| d- Periodicals, Web Sites, ..., etc. | |
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Course Instructor: Dr Nehad Nashaat

Head of Department: Dr Samah Senbel

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