



University of Bahrain
Quality Assurance
& Accreditation Center



Course Syllabus Form	
1. College	Science
2. Department	Mathematics
3. Program	B.Sc. in mathematics
4. Course Code	MATHS 211
5. Course Title	Linear Algebra
6. Course Credits	3
7. Pre-requisites	MATHS 121 or MATHS 101
8. Course webpage	http://www.abdullaaid.net/teaching/Fall2018/MATHS211.html
9. Course Coordinator	Dr. Abdulla Eid
10. Academic Year	2018/2019
11. Semester	First
<p>12. Course Description: Fields, Vector spaces, Linear dependence and independence, Bases, Dimensions, Subspaces, Quotient spaces, Linear transformations, Connection with matrices, Change of bases, Eigen-values, Characteristic polynomial, Minimal polynomial, Canonical forms in simple cases, Real and complex, inner-product spaces, Orthonormal bases, Orthogonal and complex unitary matrices and their eigen-values, Orthogonal and unitary reduction of real symmetric and complex Hermitian matrices.</p>	
<p>13. Textbook:</p> <ul style="list-style-type: none"> • H. Anton, <i>Elementary Linear Algebra</i>, 2013, 11th Edition, Wiley, ISBN-13: 978-1118473504 	
<p>14. References:</p> <ol style="list-style-type: none"> 1. G. Strang, <i>Introduction to Linear Algebra</i>, 2016, 5th Edition, Wellesley-Cambridge Press, ISBN-13: 978-0980232776 2. D. Lay, S. Lay, J. Macdonald, <i>Linear Algebra and Its Applications</i>, 2015, 5th Edition, Pearson, ISBN-13: 978-0321982384 3. D. Cherney, T. Denton, R. Thomas and A. Waldron, <i>Linear Algebra</i>, 2013, online textbook. 	
<p>15. Other Resources: The instructor's lecture notes and slides that will be given in the class.</p>	

16. Course Intended Learning Outcomes (CILOs):											
Students who successfully complete this course should be able to:											
	Mapping to PILOs										
CILOs	a	b	c	d	e	f	g	h	i	j	k
1. Manipulate matrix operations, perform row reduction for a matrix and finding the inverse of a matrix.	✓	✓									
2. Compute the determinant of a square matrix using cofactor expansion and row reduction methods	✓	✓									
3. Solve systems of linear equations using Gaussian elimination, invertible matrices, and Cramer's rule	✓	✓									
4. Verify the vector space and subspace axioms	✓	✓									
5. Prove that a given set of vectors are linearly independent, forms a spanning set or a basis for a given vector space	✓	✓	✓								
6. Find a basis for the row, column, and null space of a matrix and determine the nullity and rank of the matrix	✓	✓									
7. Find a transition matrix from an old basis to a new basis	✓	✓									
8. Find the Eigenvalues and basis for the Eigenspaces for a given matrix	✓	✓									
9. Determine whether a given matrix is diagonalizable and write its diagonalization	✓	✓	✓								
10. Verify whether a transformation is a linear or not and find the transformation from the image of a basis vectors	✓	✓	✓								
11. Compute the kernel, image, rank, and nullity of a linear transformation and explore their properties	✓	✓	✓								
12. Determine whether a linear transformation is an isomorphism	✓	✓	✓								
13. Compute the inner product and find the length, angle and distances between vectors	✓	✓	✓								
14. Find an orthonormal basis of a given vector space using Gram-Schmidt algorithm	✓	✓	✓								
15. Recognize the properties of special types of matrices such as elementary, hermitian, unitary, and normal matrices	✓	✓									
16. Apply linear algebra techniques in wide range of real life problems	✓	✓									

17. Course Assessment:			
Assessment Type	Number	CILOs	Weight
Tests	2	Test 1: CILOs 1,2,3,4,5 Test 2: CILOS 5,6,7,8	50%
Quizzes/ Homework		All CILOs	10%
Final Exam	1	All CILOs	40%

18. Assessments Details:						
No	Assessment	Weight	Time	Date	Place	Material
1	Test 1	25%	TBA	TBA	TBA	TBA
2	Test 2	25%	TBA	TBA	TBA	TBA
3	Quizzes / Homework	25%	See the homework rules	See the homework rules	See the homework rules	All Sections
4	Final Exam	40%	11:30 AM – 1:30 PM	13.1.2019	TBA	All sections

19. Course Instructor:		
Section(s)	Instructor	Office
6	Dr. Abdulla Eid	S41-2098

20. Attendance Policy:
<p>Extracts from the University Bulletin regarding withdrawal and enforced withdrawal (Article 31):</p> <p>A student's absence from lectures or classes in excess of 25% of the total assigned session will result in an automatic withdrawal of the student from the course, regardless of the causes for his/her absence.</p> <p>(a) A grade of (W) is given to a student who misses 25% or more of the total sessions assigned to the course if he/she presents a valid excuse for his/her absence.</p> <p>(b) A grade of (WF) is given to a student who misses 25% or more, but with no valid excuse.</p> <p>The classroom environment should be conducive to learning by all. This means, among other things, coming to class on time and prepared. Please no chit-chat talks during the class. Cell phones, graphical calculators and all electronic devices should be turned off and put away during the class and in the exams.</p>

21. Academic Plagiarism:
<p>All students are expected to follow the specific rules of academic honesty and plagiarism as per the regulation of professional conduct violations for University of Bahrain students, decision number 4/2006. Please refer the UoB website-Deanship of Students Affairs-Guidance Office.</p> <p>Cheating is strictly prohibited and will result in serious consequences. In particular, cheating may result in an "F" for the course and be reported to deanship of students affairs. Using of any outside materials, looking at another student's exam or using cell phones might be considered as a cheating (whether or not you get benefit from it). For more information, refer to the student handbook (Article 75).</p>

22. Important Dates:

- Sept 16, 2018: First day of the semester (Instruction begins).
- Sept 27, 2018: Last day to drop courses without a 'W' grade.
- Nov 4 – Nov 8, 2018: Mid semester break.
- Dec 6, 2018: Last day to withdraw with a 'W' grade.
- Jan 3, 2019: Last day of instruction.
- Jan 13, 2019: Final exam.

23. Weekly Breakdown:

Week	Date	Topics Covered	CILOs	Teaching Method	Assessment
1	16.09.2018	Matrices and Matrix Operations	1	Lecture and problem-solving	Test 1, Final Exam
2	23.09.2018	Inverses, Gaussian Elimination and a method for finding A^{-1}	1	Lecture and problem-solving	Test 1, Final Exam
3	30.09.2018	Determinant by cofactor expansion and row reduction Properties of the determinant	2,3	Lecture and problem-solving	Test 1, Final Exam
4	07.10.2018	System of Linear Equations	2,3	Lecture and problem-solving	Test 1, Final Exam
5	14.10.2018	Real vector spaces and subspaces	4	Lecture and problem-solving	Test 1, Final Exam
6	21.10.2018	Linear independence, spanning sets and basis of a vector space	5	Lecture and problem-solving	Test 1, Final Exam
7	28.10.2018	Dimension, row space, column space, and null space	6	Lecture and problem-solving	Test 1, Final Exam
8	04.11.2018	Rank, nullity, and change of a basis	6,7	Lecture and problem-solving	Test 2, Final Exam
	11.11.2018	Mid semester break.			
9	18.11.2018	Eigenvectors and Eigenvalues	8	Lecture and problem-solving	Test 2, Final Exam
10	25.11.2018	Diagonalization General linear transformation	9	Lecture and problem-solving	Test 2, Final Exam
11	02.12.2018	General linear transformation	10,11	Lecture and problem-solving	Test 2, Final Exam

23. Weekly Breakdown:					
Week	Date	Topics Covered	CILOs	Teaching Method	Assessment
12	09.12.2018	Isomorphisms and matrix for linear transformation	10,11,12	Lecture and problem-solving	Test 2, Final Exam
13	16.12.2018	General inner product Angle orthogonality	13	Lecture and problem-solving	Test 2, Final Exam
14	23.12.2018	Orthonormal basis and Gram-Schmidt process	14	Lecture and problem-solving	Test 2, Final Exam
15	30.12.2018	Orthogonal matrices and quadratic forms	15	Lecture and problem-solving	Test 2, Final Exam
16	06.01.2019	Application of linear algebra	16	Lecture and problem-solving	Quiz

24. Course Weekly Examples and Problems:				
Week	Date	Section	Topics Covered	Problems
1	16.09.2018	1.3 1.4	Matrices and Matrix operations Inverse of a matrix	
2	23.09.2018	1.2 1.5 2.1	Gaussian Elimination Finding A^{-1} Determinant	
3	30.09.2018	2.2 1.6 2.3	Determinant by row operations solving linear system by using the inverse Cramer's rule	
4	07.10.2018	1.1	Solving linear system by using the Gauss-Jordan elimination, inverse of a matrix, and Cramer's rule	
5	14.10.2018	4.1 4.2	Real vector spaces Subspaces	
6	21.10.2018	4.3 4.4	Linear independence Basis	
7	28.10.2018	4.5 4.7	Dimension row, columns, null spaces	
8	04.11.2018	4.7 4.6	Rank and nullity Change of basis	
	11.11.2018		Mid semester break.	
9	18.11.2018	5.1	Eigenvalues and Eigenvectors	
10	25.11.2018	5.2 8.1	Diagonalization Linear Transformation	
11	02.12.2018	8.1	Linear transformation	

24. Course Weekly Examples and Problems:				
Week	Date	Section	Topics Covered	Problems
12	09.12.2018	8.2 8.4	Isomorphisms Matrices for linear transformation	
13	16.12.2018	6.1 6.2	Inner product Angle and orthogonality	
14	23.12.2018	6.3	Othonormal basis and Gram-Schmidt process	
15	30.12.2018	7.1 7.2 7.3	Orthogonal matrices orthogonal diagonalization Quadratic forms	
16	06.01.2019	Chapter 10	Selected applications of linear algebra	

25. Grades		
Letter Grade	Percentage Equivalent	Grade Point Value
A	90 – 100	4.00
A-	87 – 89	3.67
B+	84 – 86	3.33
B	80 – 83	3.00
B-	77 – 79	2.67
C+	74 – 76	2.33
C	70 – 73	2.00
C-	67 – 69	1.67
D+	64 – 66	1.33
D	60 – 63	1.00
F	Below 60	0.00