

MATH 281 – Linear Algebra

Curricular Area	Electrical Engineering	
Type of Course	Mandatory	
Catalogue Description	Partial fractions – Binomial Theorem – Introduction to Complex Analysis – Roots of polynomial equations – Convergence of series – Determinants – Matrices – Eigen values – Eigen vectors – Block decomposition – Solution of linear system of equations – Transfer of axes – Conic sections	
Prerequisites by Courses	None	
Prerequisites by Topics	College Mathematics	
Instructors	<p>Engineer Manal K. Fattoum</p> <p>m.fattoum@bau.edu.lb</p> <p>Engineering Building – Department of General Engineering</p> <p>Office G113 (Phone Ext 3408)</p>	
Office Hours	Monday: 12:00 – 3:00; Tuesday: 2:00-3:00 , Wednesday:11:00 – 12:00, 2:00 –3:00	
Load	3 credits; 2 Lecture-sessions/week –90 min per session	
Reference book	<p>Mathematical Methods for Physicists, George Arfken, Hans Weber 4th edition, 1995 or newest version, Academic Press</p> <p>Linear Algebra with Applications, Steven Leon, 8th edition, 2010, Prentice Hall, imprint of Pearson</p> <p>Thomas’ Calculus, finney – Weir – Giordano, 10th edition, Addison Wesley</p>	
Topics	<i>Subjects covered</i>	<i>50 min. lectures</i>
	Partial fractions	4
	Binomial Theorem	6
	Introduction to Complex Analysis	6
	Roots of Polynomial Equations	6
	Convergence of series	6
	Determinants	2
	Matrices	9
	Conic Sections	3
	Transfer of Axes	3
	Total	45

Learning Outcomes	Correlation with	Program Outcomes	Program Objectives
Decompose a proper rational function into partial fractions		a	2
Expand certain forms of polynomials using binomial theorem		a	2
Develop facility with complex numbers both Cartesian and polar forms along with plotting them on the complex plane, finding the nth root of a complex number		a	2
Determine the roots of a polynomial function		a	2
Testing the convergence of a sequence and series by applying different tests		a	2
Solve linear system of equations using determinants method		a	2
Recognize matrix algebra and solving linear system of equations using Gauss Jordan elimination method		a	2
Discuss the conic sections, parabola, hyperbola and ellipses and sketching their graphs		a	2
Identify the translation of axes, rotation as well as combined translation and rotation		a	2

Learning Outcomes Assessment Tools	Exams	HW s	Lab Reports	Project	Course Survey
Decompose a proper rational function into partial fractions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
Expand certain forms of polynomials using binomial theorem	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
Develop facility with complex numbers both Cartesian and polar forms along with plotting them on the complex plane, finding the nth root of a complex number	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>
Determine the roots of a polynomial function	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>
Test the convergence of a sequence and series by applying different tests	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
Solve linear system of equations using determinants method	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>
Recognize matrix algebra and solving linear system of equations using Gauss Jordan elimination method	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
Discuss the conic sections, parabola, hyperbola and ellipses and sketching their graphs	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Identify the translation of axes, rotation as well as combined translation and rotation	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Assessment:

Assessment:	Dates	Weighing
Home works and project	Four homeworks + one project	10%
Quiz 1	7 th week	25%
Quiz 2	12 th week	25%
Final Exam	After the 16 th week	40%
		100%

Attendance:

As set by BAU regulations, and specified in Student Manual, students who miss more than one-fifth of the sessions of any course in the first ten weeks of the semester will be required to withdraw from the course with a grade of "WF".

Course Description

Week [1-2]	Chapter 1: Partial Fractions
	• Rational Fractions
	• Decomposing a fraction with non-repeated linear factors
	• Decomposing a fraction with repeated linear factor
	• Decomposing a fraction with quadratic factor
	• The Heaviside “cover-up” method for linear factors
Week [3-4]	• Decomposing a fraction using well known forms
	Chapter 2: Binomial Theorem
	• The binomial theorem with positive integral powers (Pascal’s triangle)
	• The binomial theorem with real powers
Week [5-6]	• Using the binomial theorem for large values of x
	• Coefficient of x^r
	Chapter 3: Complex Analysis
	• Complex numbers and their properties
	• Complex plane
	• Polar form of complex numbers
Week [7-8]	• De Moivre’s theorem and applications
	• Powers and roots
	• Principal n th root
	Chapter 4: Roots of Polynomial Equations
	• Remainder Theorem
	• Rational root theorem
Week [9-10]	• Polynomial equations with real coefficients
	• Horner transformation
	• Relations between coefficients and roots
	• Repeated roots
	Chapter 5: Convergence of Series
	• Sequences
	• Convergent or divergent series
• Positive term series	
Week [11]	• The comparison test
	• The ration and root tests
	• Alternating series and absolute convergence
	• Power series and interval of convergence
Week [11-14]	Chapter 6: Determinants
	• Second and third order determinants
	• General properties of determinants
	• Cramer’s rule for linear systems of two equations
Week [11-14]	• Cramer’s rule for linear systems of three equations
	Chapter 7: Matrices
	• General properties of matrices
	• Multiplication of matrices
	• The inverse of a matrix
	• Rank of a matrix
	• Using inverse matrix to solve linear system of equations
• The eigen values and eigenvectors problem	
• Matrix partitioning (block decomposition)	

Week [14]	Chapter 8: Conic sections
	<ul style="list-style-type: none">• Parabolas
	<ul style="list-style-type: none">• Ellipses• Hyperbolas
Week [15]	Chapter 9: Transfer of Axes
	<ul style="list-style-type: none">• Translation of axes• Rotation of axes
	<ul style="list-style-type: none">• Translation and rotation of axes