

King Abdulaziz University  
Department of Mathematics



1<sup>st</sup> Semester 1439-1440  
Faculty of Sciences -Version

## Math 241 “Students Syllabus”

Textbook: Elementary Linear Algebra, Sixth Edition

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		Lectures			
Chapter Title	Section Title	Subtitle	Examples	Exercises	HW
<b>Chapter 1</b> <b>Systems of Linear Equations</b>	<b>1.1</b> Introduction to Systems of Linear Equations	<ul style="list-style-type: none"> <li>• Linear Equations in <math>n</math> Variables.</li> <li>• Systems of Linear Equations.</li> <li>• Solving a System of Linear Equations.</li> </ul>	<b>1-5</b>	<b>1-6</b>	<b>16, 69, 70</b>
	<b>1.2</b> Gaussian Elimination and Gauss-Jordan Elimination	<ul style="list-style-type: none"> <li>• Elementary Row Operations.</li> <li>• Gauss –Jordan Elimination.</li> <li>• Homogeneous Systems of Linear Equations.</li> </ul>	<b>1-9</b>		<b>4, 7, 20, 21, 27, 44, 47, 48, 49, 57, 61, 62</b>

<b>Chapter 2</b> <b>Matrices</b>	<b>2.1</b> <b>Operations with Matrices</b>	<ul style="list-style-type: none"> <li>• <b>Matrix Addition.</b></li> <li>• <b>Scalar Multiplication.</b></li> <li>• <b>Matrix Multiplication.</b></li> <li>• <b>Systems of Linear Equations.</b></li> </ul>	<b>1-6</b>		<b>1-3, 7-10, 12-15, 21-28, 37, 38, 40, 41, 44, 49, 51-53</b>
	<b>2.2</b> <b>Properties of Matrix Operations</b>	<ul style="list-style-type: none"> <li>• <b>Properties of Matrix Multiplication.</b></li> <li>• <b>The Transpose of a Matrix.</b></li> </ul>	<b>1-10</b>		<b>1, 5, 7, 13, 14, 16, 17, 19-22, 29, 30, 32, 39, 55, 57- 59, 61, 65</b>
	<b>2.3</b> <b>The Inverse of a Matrix</b>	<ul style="list-style-type: none"> <li>• <b>Properties of Inverses.</b></li> <li>• <b>Systems of Equations.</b></li> </ul>	<b>1, 3-8</b>	<b>48</b>	<b>2, 4, 5, 9, 25-27, 33, 38, 39, 41, 42, 49, 52, 56- 58</b>
<b>Chapter 3</b> <b>Determinants</b>	<b>3.1</b> <b>The Determinant of a Matrix</b>	<ul style="list-style-type: none"> <li>• <b>Triangular Matrices.</b></li> </ul>	<b>1-4, 6</b>		<b>13, 15, 19, 33, 41- 45, 49, 51-54, 67- 72,74</b>
	<b>3.2</b> <b>Evaluation of a Determinant Using Elementary Operations</b>	<ul style="list-style-type: none"> <li>• <b>Determinants and Elementary Column Operations</b></li> </ul>	<b>2-6</b>		<b>15-20, 31-33, 48</b>
	<b>3.3</b> <b>Properties of Determinants</b>	<ul style="list-style-type: none"> <li>• <b>Determinants and the Inverse of a Matrix.</b></li> <li>• <b>Determinants and the Transpose of a Matrix</b></li> </ul>	<b>1-6</b>		<b>3,4, 7-9, 12, 15, 23, 25, 45, 47, 49, 50, 64, 65, 67, 69, 72, 73</b>
	<b>3.5</b> <b>Applications of Determinants</b>	<ul style="list-style-type: none"> <li>• <b>The Adjoint of a Matrix, Cramer's rule</b></li> </ul>	<b>1-4</b>		<b>2-4, 11, 15, 25-27, 29, 43</b>

<b>Chapter 4</b> <b>Vector Spaces</b>	<b>4.1</b> <b>Vectors in <math>R^n</math></b>	<ul style="list-style-type: none"> <li>• <b>Vectors in <math>R^n</math></b></li> </ul>	<b>4-6</b>	<b>13, 15, 23, 27, 28, 47-49</b>
	<b>4.2</b> <b>Vector Spaces</b>		<b>2-4, 6-8</b>	<b>1, 3, 4, 6, 19-24, 29(a,b), 33, 34</b>
	<b>4.3</b> <b>Subspaces of Vector Spaces</b>	<ul style="list-style-type: none"> <li>• <b>Subspaces of <math>R^n</math></b></li> </ul>	<b>1-4, 6, 8</b>	<b>1, 4, 7, 9, 29, 31-35, 41, 44, 45</b>
	<b>4.4</b> <b>Spanning Sets and Linear Independence</b>	<ul style="list-style-type: none"> <li>• <b>Spanning Sets.</b></li> <li>• <b>Linear Dependence and Linear Independence.</b></li> </ul>	<b>1-13</b>	<b>2, 7, 9, 13, 15, 18, 19, 21, 27, 31, 32, 39, 49, 59, 65</b>
	<b>4.5</b> <b>Basis and Dimension</b>	<ul style="list-style-type: none"> <li>• <b>The Dimension of a Vector Space</b></li> </ul>	<b>1-12</b>	<b>8-9, 11, 16, 17, 21, 25, 35, 41, 43, 45, 49, 63, 67, 70, 73, 79</b>
	<b>4.6</b> <b>Rank of a Matrix and Systems of Linear Equations</b>	<ul style="list-style-type: none"> <li>• <b>The Null Space of a Matrix.</b></li> <li>• <b>Systems of Linear Equations with Square Coefficient Matrices.</b></li> </ul>	<b>1-7</b>	<b>2, 3, 7, 9, 13, 15, 21, 23, 27, 29, 35, 66</b>

<b>Chapter 6</b> Linear Transformations	<b>6.1</b> <b>Introduction to Linear Transformations</b>		1, 2, 4-6, 9		2, 3, 9, 10, 15, 17, 20, 22, 23, 32, 33, 39, 53, 68, 69, 73
	<b>6.2</b> <b>The Kernel and Range of a Linear Transformation</b>	<ul style="list-style-type: none"> <li>• <b>The Range of a Linear Transformation.</b></li> <li>• <b>One-to-One and Onto Linear Transformations.</b></li> </ul>	1, 2, 4-11		1, 3, 5, 9, 11, 13, 17, 22, 31, 33, 49, 51, 56
<b>Chapter 7</b> Eigenvalues and Eigenvectors	<b>7.1</b> <b>Eigenvalues and Eigenvectors</b>	<ul style="list-style-type: none"> <li>• <b>Eigenspaces</b></li> </ul>	1, 2, 4, 5, 7		2, 7, 11(a,b), 13(a,b), 15, 17, 19, 23, 25, 63, 65

## Lists of Theorems:

Chapters	Theorems with proofs	Theorems without proofs
<b>1</b>	–	1.1
<b>2</b>	2.7 – 2.8 – 2.9 – 2.10 – 2.11	2.1 – 2.2 – 2.3 – 2.4 – 2.5 – 2.6
<b>3</b>	3.8	3.1 – 3.2 – 3.3 – 3.4 – 3.5 – 3.6 – 3.7 – 3.9 – 3.10 – 3.11
<b>4</b>	4.5 – 4.6 – 4.7 – 4.8 – 4.9	4.2 – 4.3 – 4.4 – 4.10 – 4.11 – 4.12 – 4.13 – 4.14 – 4.15 – 4.16 – 4.17
<b>6</b>	6.2 – 6.3 – 6.6	6.1 – 6.4 – 6.5 – 6.7 – 6.8
<b>7</b>	–	7.1 – 7.2 – 7.3

**Remarks:**

1. Any student who misses 25% of the class will receive **DN**.
2. Students should solve all problems in HW column.
3. If one of the students is absent from one of the exams due to an acceptable excuse by the instructor, and then the mark will be calculated as a percentage from the total of the other exams.
4. The requirements to get an **IC grade** due to being absent from the final exam are: an attendance of at least 80% of the total lectures, attendance of the first and second exams and an acceptable excuse by the Educational Affairs.

**Marks distribution:**

	First Exam	Second Exam	Section & HW	Final Exam	Total
Time; marks	90 min; 25 marks	90 min; 25 marks	10 marks	120 min; 40 marks	100
Date			weekly	-----	
Curriculum	Ch(1) to Ch(3)	Ch(4)	/	<b><u>ALL</u></b>	