

**American University of Beirut**  
**Department of Mathematics**  
**Spring 2014-2015**  
**Math 218 - Elementary Linear Algebra with Applications**

**Textbook:** Introduction to Linear Algebra with Applications, by J. DeFranza and D.Gagliardi

**Course Description:** An introduction to linear algebra at a less theoretical level than Math 219. Systems of linear equations and Gaussian elimination, vectors in  $\mathbb{R}^n$ , matrices, determinants, vector spaces, subspaces and dimension, orthogonal projection and least-squares approximation, eigenvalues, eigenvectors and selected applications. Students cannot receive credit for both Math 219 and Math 218.

**Prerequisites:** Mathematical maturity at a level equivalent to having taken Math 211. In particular, facility with sets, logic, mathematical induction and some background in basic mathematical proof.

**Course Learning Outcomes:**

Define systems of linear equations and use Gaussian elimination to solve linear systems.

Find the transpose and inverse of a matrix using elementary row operations.

Evaluate determinants using several techniques and use the properties of determinants to determine if a matrix is non singular.

Determine subspaces, spanning sets and bases of vector spaces and demonstrate linear independence or dependence of a set of vectors.

Relate linear transformations to matrices and compute their rank.

Compute the eigenvalues and eigenvectors of a matrix and learn the diagonalization of matrices.

Define inner product spaces, angles and orthogonality, orthonormal bases.

Apply Gram-Schmidt process to construct orthonormal bases.

Perform orthogonal diagonalization of a symmetric matrix.

**Exams:** The grades allocated towards the final grade are:

Exam I .....	25%
Exam II.....	25%
Final Exam.....	50%

**Exam Dates:**

Exam I: Tuesday, February 24, 2015 at 6:00 pm (location to be announced).

Exam II: Monday, March 23, 2015 at 6:00 pm (location to be announced).

### **Course Policy:**

- The grade for an unexcused missed Exam will be a zero. Students who miss an exam for a valid medical reason must provide a medical excuse from AUBMC within one week from the date of the exam.
- The university policy regarding incomplete work and other issues will be followed. Check the AUB catalogue for details.
- Students are expected to read and follow the code of conduct in the AUB Student Handbook.
- Regular attendance is expected. Students are responsible for all the material presented in class, including announcements about course procedure.
- Last day for withdrawal from courses: Thursday, April 2, 2015.

### **ASSIGNMENT SHEET**

<b>Section</b>	<b>Suggested Problems</b>
<b>1.1</b>	3, 10, 12, 18, 21, 25, 28, <b>29, 32</b> , 34, 38, <b>40</b> , 43, <b>44</b> .
<b>1.2</b>	8, <b>20</b> , 22, 24, <b>26, 28</b> , 32, 34, <b>36</b> , 40, 42, <b>46</b> , 48, 50, <b>51</b> .
<b>1.3</b>	12, 16, 18, <b>20</b> , 22, <b>24, 27</b> , 28, 29, <b>30, 32</b> , 35, <b>36</b> , 38, 40, <b>42</b> , 43, <b>44</b> .
<b>1.4</b>	6, 11, <b>12</b> , 13, 16, 18, <b>19</b> , 20, <b>24, 26</b> , 27, 28, <b>30</b> , 32, 34, 37, <b>38</b> , 40.
<b>1.5</b>	6, 12, 16, 22, <b>26</b> , 28, <b>32</b> .
<b>1.6</b>	2, 3, <b>4</b> , 18, 20, <b>23</b> , 25, <b>28, 30</b> , 32, <b>36</b> , 40, 43, <b>52, 53</b> , 54.
<b>2.1</b>	16, 21, <b>22</b> , 28, <b>30</b> , 34, 36, 38.
<b>2.2</b>	9, <b>10</b> , 12, 15, <b>16</b> , 19, <b>20</b> , 22, <b>24, 27</b> , 28, 33, 37, <b>38</b> , 39.
<b>2.3</b>	7, <b>8</b> , 9, 10, <b>13</b> , 14, 20, <b>21, 24</b> , 27, <b>28</b> , 31, 32, 37, <b>38</b> , 42.
<b>3.1</b>	3, <b>4</b> , 7, <b>8</b> , 9, <b>10</b> , 12, <b>14</b> , 15, 16, <b>17</b> , 25, 31.
<b>3.2</b>	<b>2</b> , 4, 7, <b>8</b> , 9, 11, 13, <b>14</b> , 16, <b>18, 20</b> , 23, 24, 26, <b>30</b> , 32, 36, <b>38</b> , 40, 43, <b>50</b> .
<b>3.3</b>	3, <b>4</b> , 6, <b>10</b> , 11, 12, 16, 19, <b>20, 22</b> , 24, 28, 36, 41, <b>42</b> , 44.
<b>3.4</b>	3, 4, <b>8</b> , 11, <b>16, 22</b> , 24.
<b>4.1</b>	2, 3, <b>4</b> , 5, 10, <b>11</b> , 12, <b>14</b> , 16, 18, 22, <b>26</b> , 28, 30, 32, <b>34, 36</b> , 38, 42.
<b>4.2</b>	4, <b>6</b> , 7, <b>10</b> , 12, 14, 16, <b>18</b> , 20, <b>26</b> , 28, 29, 30, <b>32</b> , 34, 40, 43.
<b>4.3</b>	<b>2, 8</b> , 10, 12, <b>16</b> , 19, 20, <b>22, 26</b> , 27, 29, 30, 31, <b>32</b> .
<b>4.4</b>	2, <b>6</b> , 10, <b>14, 16</b> , 17, <b>20</b> , 24, <b>32</b> .
<b>4.5</b>	<b>2, 4, 6, 8, 10</b> , 12, <b>16, 17, 18</b> .
<b>5.1</b>	<b>2, 4, 8, 12, 14</b> , 17, 18, <b>19, 20, 21, 23, 24, 28, 29, 32, 35</b> .
<b>5.2</b>	<b>2, 4, 6, 8, 12</b> , 16, 20, 22, <b>24, 27, 28, 30, 31, 32, 33, 34, 35, 38</b> .
<b>6.1</b>	2, 3, <b>4, 11, 12, 13, 14, 15, 16</b> , 18, 24, <b>30</b> .
<b>6.2</b>	2, <b>6, 8, 10</b> , 12, <b>18, 20, 22, 28, 30</b> .
<b>6.3</b>	4, <b>8, 12</b> , 14, <b>16</b> , 18, <b>20</b> , 24, 31, <b>34, 36</b> , 37.
<b>6.4</b>	4, <b>6, 10, 14</b> , 16, <b>18, 22</b> , 27, 29.
<b>6.5</b>	<b>2, 4, 6, 8</b> .