

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mathematics II		Module Delivery
Module Type	Support or related learning activity		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	UOMU0202024		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester of Delivery	
Administering Department	CET	College	UOMUS
Module Leader	Anmar Fouad Kadhim	e-mail	anmar.fouad.kadhim@uomus.edu.iq
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	UOMU022014	Semester	1
Co-requisites module	None	Semester	

<b>Module Aims, Learning Outcomes and Indicative Contents</b> <b>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</b>	
<b>Module Aims</b> <b>أهداف المادة الدراسية</b>	<ol style="list-style-type: none"> <li>1. To Understand concepts of vectors and vector operations.</li> <li>2. To Understand concepts of linear algebra.</li> <li>3. To get a grasp of various methods to solve systems of linear equations.</li> <li>4. To Compute linear transformations.</li> <li>5. To be able to determine Eigenvalues and Eigenvectors.</li> <li>6. To perform matrix diagonalization.</li> </ol>
<b>Module Learning Outcomes</b> <b>مخرجات التعلم للمادة الدراسية</b>	<ol style="list-style-type: none"> <li>1. Recognize Vectors concepts, notation and Operations.</li> <li>2. Discuss dot product, cross product, Orthogonal and orthonormal vectors.</li> <li>3. Discuss the terms Diagonal, Triangular, Symmetric, Square Matrix, Transpose of a Matrix.</li> <li>4. Describe the matrix operations {addition, subtraction, scalar multiplication, multiplication}.</li> <li>5. Identify Determinant and Inverse for Nonsingular matrices.</li> <li>6. Discuss aspects about System of Linear Equations (Linear Equations, Linear Equations Solution, Matrix equations.).</li> <li>7. Identify Row operations, row-echelon form "triangular", Rank of a Matrix, reduced row-echelon form, Augmented Matrix.</li> <li>8. Discuss Gaussian elimination.</li> <li>9. Explain Gauss–Jordan elimination and Solving Systems with Inverses.</li> <li>10. Explain Cramer's Rule.</li> <li>11. Explain Linear Combinations of Vector, span.</li> <li>12. Explain Linear Dependence and Independence, Basis and Dimension, Rank of a Matrix.</li> <li>13. Recognize Linear Transformations.</li> <li>14. Discuss Polynomials of Matrices, Characteristic Polynomial, Cayley–Hamilton Theorem.</li> <li>15. Discuss Eigenvalues and Eigenvectors, Diagonalizing Matrices.</li> </ol>
<b>Indicative Contents</b> <b>المحتويات الإرشادية</b>	<p><u>Part A - Vectors.</u>  This part includes Vectors definition, notation {Ordered set, Matrix, Unit vector}, Magnitude, Unit, Zero, negative, Direction, Operations on vectors {addition, subtraction, scalar multiplication}. In addition to Operations on vectors {dot product, cross product}, Orthogonal, orthonormal vectors. <b>[6 hrs]</b> + Revision problem classes in weekly tutorials <b>[2 hrs]</b></p> <p><u>Part B – Matrices.</u>  This part will take in details Matrices (Matrix, Diagonal, Triangular, Symmetric, Square Matrix, Transpose of a Matrix.), in addition to operations {addition, subtraction, scalar multiplication, multiplication}. Furthermore, Determinant, Inverse (Nonsingular). <b>[10 hrs]</b> + Revision problem classes in weekly tutorials <b>[3 hrs]</b></p>

	<p><b>Part C – System of Linear Equations.</b></p> <p>This part discusses System of Linear Equations (Linear Equations, Linear Equations Solution, Matrix equations.), in addition to Row operations, row-echelon form “triangular”, Rank of a Matrix, reduced row-echelon form, Augmented Matrix. Furthermore, Gaussian elimination, Gauss–Jordan elimination, Solving Systems with Inverses, Cramer's Rule is described. <b>[14 hrs]</b> + Revision problem classes in weekly tutorials <b>[4 hrs]</b></p>
	<p><b>Part D – Vector Spaces and Diagonalization.</b></p> <p>This part discusses Vector Spaces (Linear Combinations of Vector, span, Linear Dependence and Independence, Basis and Dimension, Rank of a Matrix, Linear Transformations. Furthermore, Diagonalization (Polynomials of Matrices, Characteristic Polynomial, Cayley–Hamilton Theorem, Eigenvalues and Eigenvectors, Diagonalizing Matrices.) <b>[15 hrs]</b> + Revision problem classes in weekly tutorials <b>[5 hrs]</b></p>

<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	This module will primarily focus on encouraging students to participate in the activities, as well as refining and developing their critical thinking skills. This will be achieved through lectures, tutorials, discussions, and grading activities.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	48	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	3.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	5.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	125		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	20%	5,10	LO #1 - 4, LO # 6-9
	<b>Assignments</b>	2	15%	5,10	LO # 1 - 14, LO # 6-9
	<b>Projects / Lab.</b>	N/A			
	<b>Report</b>	5	5%	Cont.	LO # 1-15
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	5	LO # 1-7
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	<b>Material Covered</b>
<b>Week 1</b>	<b>Vectors</b> (Definition, notation {Ordered set, Matrix, Unit vector}, Magnitude, Unit, Zero, negative, Direction, Operations on vectors {addition, subtraction, scalar multiplication}.)
<b>Week 2</b>	<b>Vectors</b> (Operations on vectors {dot product, cross product}, Orthogonal, orthonormal vectors.)
<b>Week 3</b>	<b>Matrices</b> (Matrix, Diagonal, Triangular, Symmetric, Square Matrix, Transpose of a Matrix.)
<b>Week 4</b>	<b>Matrices</b> (operations {addition, subtraction, scalar multiplication, multiplication}). <b>Matrices</b> (Determinant, Inverse (Nonsingular))
<b>Week 5</b>	<b>Midterm Exam</b>
<b>Week 6</b>	<b>System of Linear Equations</b> (Linear Equations, Linear Equations Solution, Matrix equations.)
<b>Week 7</b>	<b>System of Linear Equations</b> (Row operations, row-echelon form “triangular”, Rank of a Matrix, reduced row-echelon form, Augmented Matrix.)
<b>Week 8</b>	<b>System of Linear Equations (Gaussian elimination.), System of Linear Equations (Gauss–Jordan elimination, Solving Systems with Inverses.)</b>
<b>Week 9</b>	<b>System of Linear Equations (Cramer's Rule.)</b>
<b>Week 10</b>	<b>Midterm Exam</b>
<b>Week 11</b>	<b>Vector Spaces</b> (Linear Combinations of Vector, span.). <b>Vector Spaces</b> (Linear Transformations.)
<b>Week 12</b>	<b>Midterm Exam</b>
<b>Week 13</b>	<b>Vector Spaces</b> (Linear Dependence and Independence, Basis and Dimension, Rank of a Matrix.)
<b>Week 14</b>	<b>Diagonalization</b> (Polynomials of Matrices, Characteristic Polynomial, Cayley–Hamilton Theorem.)
<b>Week 15</b>	<b>Diagonalization</b> (Eigenvalues and Eigenvectors, Diagonalizing Matrices.)
<b>Week 16</b>	<b>Preparatory week before the final Exam</b>

**Delivery Plan (Weekly Tutorial)**

## المنهاج الاسبوعي الاضافي

**Material Covered**

Each week, a question sheet related to the material presented in the theoretical lecture will be solved and debated.

**Learning and Teaching Resources**

## مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	David C. Lay, Judi J. McDonald, Steven R. Lay, "Linear Algebra and Its Applications", Pearson Education, 6th edition (July 10th 2020), ISBN-13: 978- 0136880929.	Yes
<b>Recommended Texts</b>	Gilbert Strang, " Linear Algebra and Its Applications", Cengage Learning, 4th edition, (January 1, 2006), ISBN-13: 978-0030105678.	No
<b>Websites</b>	<a href="https://www.udemy.com/course/linear-algebra-with-applications/">https://www.udemy.com/course/linear-algebra-with-applications/</a>	

**Grading Scheme**

## مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	راسب	(0-44)	Considerable amount of work required

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.