Jordan University of Science and Technology
Faculty of Computer & Information Technology
Computer Games Design And Development Department

CG100 Elements Of Linear Algebra For Computer Gaming
First Semester 2024-2025

Course Catalog
3 Credit Hours. This course covers the basic concepts of linear equation systems, Gaussian elimination, rank solubility, matrices, matrix calculation, inverse of a matrix, determinants, trigonometry, trigonometrical identities, trigonometrical equations, vector calculation, linear dependence and independence, bases, coordinates, scalar product and vector product, straight line equation, distance, area and volume, description of rotation, reflection and orthogonal projection, linear space and interpretation of an mxn-matrix at linear mapping.
Teaching Method: On Campus

Text Book	
Title	Essential Mathematics for Games and Interactive Applications
Author(s)	James M. Van Verth Lars M. Bishop
Edition	3rd Edition
Short Name	Ref # 1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref #2	Linear Algebra and Its Applications	Gilbert Strang	4th Edition	

Instructor	
Name	**Dr. Hala Hamadeh**
Office Location	CH1 L2
Office Hours	
Email	hmhamadeh@just.edu.jo

Class Schedule & Room

Section 1:
Lecture Time: Sun, Tue, Thu : 10:30 - 11:30
Room: N4203

Prerequisites		
Line Number	**Course Name**	**Prerequisite Type**
821011	HSS101MATH Calculus I	Prerequisite / Study
901010	MATH101 Calculus I	Prerequisite / Study

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	Introduction	
Weeks 2, 3	Vectors: Geometric Vectors, Real Vector Spaces, Linear Combinations and Basis Vectors, Vector Length, Dot Product and Cross Product	From **Ref # 1**
Week 4	Points as Geometry, Lines Definition, Planes Generalized Equation	From **Ref # 1**
Weeks 5, 6, 7	Linear Transformations and Matrices: Definitions, Matrix Addition and Scalar Multiplication, Transpose, Block Matrices, Matrix Product, Identity Matrix	From **Ref # 1**
Week 8	Systems of Linear Equations : Solving Linear Systems, Gaussian Elimination	From **Ref # 1**
Week 9	Matrix Inverse	From **Ref # 1**
Weeks 9, 10	Determinant: Computing the Determinant, Determinants and Elementary Row Operations	From **Ref # 1**
Week 10	Trigonometry: Trigonometric identities, Trigonometric equations	From **Ref #2**
Weeks 11, 12	Affine Transformations: Translation, Rotation, Scaling, Reflection, Shear	From **Ref # 1**
Weeks 13, 14	Orientation Representation: Rotation Matrices, Euler Angles, Axis, Angle Representation	From **Ref # 1**
Week 15	Viewing and Projection: Normalized Device Coordinates, View Frustum, Perspective Projection, Orthographic Parallel Projection	From **Ref # 1**
Week 16	Final project presentation	

	Course Outcome Weight (Out of 100%)	**Assessment method**
Mapping of Course Outcomes to Program Outcomes		

Analyze geometric vectors and real vector spaces by calculating linear combinations, basis vectors, and vector lengths, while applying the concepts of dot and cross products in various gaming contexts.	20%	
Define and demonstrate the use of linear transformations and matrices, including matrix addition, scalar multiplication, and the matrix product, to model transformations in computer graphics effectively.	30%	
Solve systems of linear equations using Gaussian elimination and compute the matrix inverse, applying these techniques to optimize problem-solving in game development scenarios.	25%	
Evaluate determinants through computation and elementary row operations, and apply trigonometric identities and equations to manipulate affine transformations, such as translation, rotation, scaling, and reflection	25%	

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