

**UNIT - I**

<b>Chapter 1 : Cartesian Coordinate System and Vectors</b>		<b>1-1 to 1-27</b>
✓	<b>Syllabus Topic : The Cartesian XY-Plane</b> .....	1-1
1.1	The Cartesian XY-Plane.....	1-1
✓	<b>Syllabus Topic : Function Graphs</b> .....	1-2
1.2	Function Graphs .....	1-2
✓	<b>Syllabus Topic : Geometric Shapes</b> .....	1-3
1.3	Geometric Shapes.....	1-3
✓	<b>Syllabus Topic : Polygonal Shapes</b> .....	1-3
1.4	Polygonal Shapes .....	1-3
✓	<b>Syllabus Topic : Areas of Shapes</b> .....	1-4
1.5	Areas of Shapes .....	1-4
✓	<b>Syllabus Topic : Theorem of Pythagoras in 2D</b> .....	1-6
1.6	Theorem of Pythagoras in 2D .....	1-6
✓	<b>Syllabus Topic : Co-Ordinates</b> .....	1-6
1.7	3D Co-Ordinates.....	1-6
✓	<b>Syllabus Topic : Theorem of Pythagoras in 3D</b> .....	1-7
1.7.1	Theorem of Pythagoras in 3D .....	1-7
✓	<b>Syllabus Topic : 3D Polygons</b> .....	1-7
1.7.2	3D Polygons .....	1-7
✓	<b>Syllabus Topic : Euler’s Rule</b> .....	1-8
1.8	Euler’s Rule.....	1-8
1.9	Vectors.....	1-8
1.9.1	2D Vectors.....	1-9
1.9.2	Vector Notation .....	1-9
1.9.3	Graphical Representation of Vectors .....	1-9
1.9.4	Magnitude of a Vector.....	1-11
1.9.5	3D Vectors.....	1-12
✓	<b>Syllabus Topic : Vector Manipulation</b> .....	1-12
1.10	Vector Manipulation.....	1-12
✓	<b>Syllabus Topic : Multiplying a Vector by a Scalar</b> .....	1-13
1.10.1	Multiplying a Vector by a Scalar .....	1-13
✓	<b>Syllabus Topic : Vector Addition and Subtraction</b> .....	1-13
1.10.2	Vector Addition and Subtraction.....	1-13
✓	<b>Syllabus Topic : Position Vectors</b> .....	1-14
1.10.3	Position Vectors.....	1-14
✓	<b>Syllabus Topic : Unit Vectors</b> .....	1-15
1.10.4	Unit Vectors.....	1-15

✓	<b>Syllabus Topic : Cartesian Vectors</b> .....	1-16
	1.10.5 Cartesian Vectors.....	1-16
✓	<b>Syllabus Topic : Vector Multiplication</b> .....	1-17
1.11	Vector Multiplication .....	1-17
✓	<b>Syllabus Topic : Scalar Product</b> .....	1-17
	1.11.1 Scalar Product.....	1-17
✓	<b>Syllabus Topic : Example of the Dot Product</b> .....	1-19
	1.11.2 Example of the Dot Product .....	1-19
✓	<b>Syllabus Topic : The Dot Product in Lighting Calculations</b> .....	1-19
	1.11.3 The Dot Product in Lighting Calculations .....	1-19
✓	<b>Syllabus Topic : The Dot Product in Back-Face Detection</b> .....	1-20
	1.11.4 The Dot Product in Back-Face Detection.....	1-20
✓	<b>Syllabus Topic : The Vector Product</b> .....	1-21
	1.11.5 The Vector Product.....	1-21
✓	<b>Syllabus Topic : The Right-Hand Rule</b> .....	1-24
1.12	The Right-Hand Rule .....	1-24
✓	<b>Syllabus Topic : Deriving a Unit Normal Vector for a Triangle</b> .....	1-24
1.13	Deriving a Unit Normal Vector for a Triangle.....	1-24
1.14	Areas.....	1-25
✓	<b>Syllabus Topic : Calculating 2D Areas</b> .....	1-26
1.15	Calculating 2D Areas .....	1-26
	• Chapter Ends.....	1-27

<b>Chapter 2 : Transformations and Direct X</b>	<b>2-1 to 2-61</b>
---	--------------------

2.1	Transformations.....	2-1
✓	<b>Syllabus Topic : 2D Transformation</b> .....	2-1
2.2	2D Transformations.....	2-1
	2.2.1 Translation.....	2-1
	2.2.2 Scaling .....	2-2
	2.2.3 Reflection .....	2-2
2.3	Matrices .....	2-3
	2.3.1 Systems of Notation .....	2-5
	2.3.2 The Determinant of a Matrix .....	2-6
✓	<b>Syllabus Topic : Homogeneous Coordinates</b> .....	2-6
2.4	Homogeneous Coordinates.....	2-6
	2.4.1 2D Translation.....	2-8
	2.4.2 2D Scaling .....	2-8
	2.4.3 2D Reflections.....	2-9
	2.4.4 2D Shearing.....	2-11
	2.4.5 2D Rotation .....	2-11
	2.4.6 2D Scaling .....	2-13

	2.4.7	2D Reflections.....	2-14
	2.4.8	2D Rotation about an Arbitrary Point.....	2-15
✓		<b>Syllabus Topic : 3D Transformations.....</b>	<b>2-16</b>
2.5		3D Transformations.....	2-16
	2.5.1	3D Translation.....	2-16
	2.5.2	3D Scaling.....	2-16
	2.5.3	3D Rotations.....	2-17
	2.5.4	Gimbal Lock.....	2-20
	2.5.5	Rotating about an Axis.....	2-21
	2.5.6	3D Reflections.....	2-22
✓		<b>Syllabus Topic : Change of Axes.....</b>	<b>2-23</b>
2.6		Change of Axes.....	2-23
	2.6.1	2D Change of Axes.....	2-23
✓		<b>Syllabus Topic : Direction Cosines.....</b>	<b>2-25</b>
2.7		Direction Cosines.....	2-25
	2.7.1	Positioning the Virtual Camera.....	2-26
	2.7.2	Direction Cosines.....	2-26
	2.7.3	Euler Angles.....	2-29
✓		<b>Syllabus Topic : Rotating a Point about an Arbitrary Axis.....</b>	<b>2-32</b>
2.8		Rotating a Point about an Arbitrary Axis.....	2-32
	2.8.1	Quaternions.....	2-40
	2.8.2	Adding and Subtracting Quaternion's.....	2-40
	2.8.3	Multiplying Quaternions.....	2-40
	2.8.4	The Inverse Quaternion.....	2-41
	2.8.5	Rotating Points about an Axis.....	2-41
	2.8.6	Roll, Pitch and Yaw Quaternions.....	2-44
	2.8.7	Quaternions in Matrix Form.....	2-45
	2.8.8	Frames of Reference.....	2-46
✓		<b>Syllabus Topic : Transforming Vectors.....</b>	<b>2-47</b>
2.9		Transforming Vectors.....	2-47
2.10		Determinants.....	2-48
✓		<b>Syllabus Topic : Perspective Projection, Interpolation.....</b>	<b>2-52</b>
2.11		Perspective Projection, Interpolation.....	2-52
2.12		DirectX.....	2-54
✓		<b>Syllabus Topic : Understanding GPU and GPU Architectures.....</b>	<b>2-54</b>
2.13		Understanding GPU and GPU Architectures.....	2-54
✓		<b>Syllabus Topic : How they are Different from CPU Architectures?.....</b>	<b>2-57</b>
2.14		How they are Different from CPU Architectures?.....	2-57
✓		<b>Syllabus Topic : Understanding how to Solve by GPU?.....</b>	<b>2-58</b>
2.15		Understanding how to Solve by GPU?.....	2-58
	•	Chapter Ends.....	2-61

**UNIT - II**

**Chapter 3 : Introduction to DirectX 11 3-1 to 3-20**

✓ **Syllabus Topic : Introduction To DirectX 11** .....3-1

3.1 Introduction To DirectX 11 .....3-1

    3.1.1 Setting Up Project in Visual Studio 2010 .....3-1

        3.1.1.1 Linking the DirectX Libraries .....3-3

        3.1.1.2 To Link the Library File Perform the following Steps.....3-4

        3.1.1.3 Setting up the Search Paths .....3-5

        3.1.1.4 Adding the Source Code and Building the Project.....3-7

✓ **Syllabus Topic : COM** .....3-9

3.2 COM.....3-9

✓ **Syllabus Topic : Textures and Data Resource Formats** .....3-9

3.3 Textures and Data Resource Formats.....3-9

✓ **Syllabus Topic : The Swap Chain and Page Flipping**.....3-11

3.4 The Swap Chain and Page Flipping .....3-11

✓ **Syllabus Topic : Depth Buffering** .....3-12

3.5 Depth Buffering.....3-12

✓ **Syllabus Topic : Texture Resource Views** .....3-15

3.6 Texture Resource Views .....3-15

✓ **Syllabus Topic : Multisampling Theory** .....3-16

3.7 Multisampling Theory .....3-16

✓ **Syllabus Topic : Multisampling in Direct3D**.....3-18

3.8 Multisampling in Direct3D .....3-18

✓ **Syllabus Topic : Feature Levels**.....3-19

3.9 Feature Levels .....3-19

    • Chapter Ends.....3-20

**Chapter 4 : Direct 3D 11 Rendering Pipeline 4-1 to 4-63**

✓ **Syllabus Topic : Overview of The Rendering Pipeline** .....4-1

4.1 Overview of the Rendering Pipeline .....4-1

✓ **Syllabus Topic : The Input Assembler Stage**.....4-2

4.2 The Input Assembler Stage .....4-2

    4.2.1 Vertices.....4-2

    4.2.2 Primitive Topology.....4-3

        4.2.2.1 Point List .....4-4

        4.2.2.2 Line Strip.....4-4

        4.2.2.3 Line List.....4-4

        4.2.2.4 Triangle Strip.....4-5

        4.2.2.5 Triangle List .....4-5

	4.2.2.6 Primitives with Adjacency .....	4-6
	4.2.2.7 Control Point Patch List .....	4-6
	4.2.3 Indices.....	4-6
✓	<b>Syllabus Topic : The Vertex Shader Stage</b> .....	4-9
4.3	The Vertex Shader Stage.....	4-9
	4.3.1 Local Space and World Space.....	4-9
	4.3.2 View Space.....	4-12
	4.3.3 Projection and Homogeneous Clip Space .....	4-14
	4.3.3.1 Defining a Frustum.....	4-15
	4.3.3.2 Projecting Vertices .....	4-17
	4.3.3.3 Normalized Device Coordinates (NDC) .....	4-18
	4.3.3.4 Writing the Projection Equation with a Matrix.....	4-19
	4.3.3.5 Normalized Depth Value.....	4-20
	4.3.3.6 XMMatrixPerspectiveFovLH.....	4-21
✓	<b>Syllabus Topic : The Tessellation Stages (TS)</b> .....	4-22
4.4	The Tessellation Stages .....	4-22
✓	<b>Syllabus Topic : The Geometry Shader Stage (GS)</b> .....	4-23
4.5	The Geometry Shader Stage.....	4-23
✓	<b>Syllabus Topic : Clipping</b> .....	4-23
4.6	Clipping .....	4-23
4.7	The Rasterization Stage.....	4-25
	4.7.1 Viewport Transform .....	4-25
	4.7.2 Backface Culling .....	4-25
	4.7.3 Vertex Attribute Interpolation.....	4-27
✓	<b>Syllabus Topic : The Pixel Shader Stage (PS)</b> .....	4-28
4.8	The Pixel Shader Stage.....	4-28
✓	<b>Syllabus Topic : The Output Merger Stage (OM)</b> .....	4-28
4.9	The Output Merger Stage .....	4-28
✓	<b>Syllabus Topic : Understanding Meshes or Objects, Texturing, Lighting, Blending</b> .....	4-29
4.10	Understanding Meshes or Objects, Texturing, Lighting, Blending .....	4-29
	4.10.1 Understanding Meshes or Objects.....	4-29
	4.10.2 Texturing .....	4-39
	4.10.3 Texture Coordinates .....	4-40
	4.10.4 Creating and Enabling a Texture.....	4-41
✓	<b>Syllabus Topic : Lighting</b> .....	4-43
4.11	Lighting .....	4-43
	4.11.1 Light and Material Interaction.....	4-43
	4.11.2 Normal Vectors .....	4-45
	4.11.2.1 Computing Normal Vectors .....	4-45
	4.11.2.2 Transforming Normal Vectors .....	4-47
	4.11.3 Lambert’s Cosine Law .....	4-48

4.11.4	Diffuse Lighting .....	4-49
4.11.5	Ambient Lighting .....	4-49
4.11.6	Specular Lighting .....	4-50
4.11.7	Specifying Materials.....	4-51
4.11.8	Parallel Lights.....	4-52
4.11.9	Point Lights .....	4-52
4.11.9.1	Attenuation .....	4-53
4.11.9.2	Range.....	4-53
4.11.10	Spotlights.....	4-53
4.11.10.1	Lighting Structures .....	4-54
✓	<b>Syllabus Topic : Blending</b> .....	4-56
4.12	Blending .....	4-56
4.12.1	The Blending Equation.....	4-56
4.12.2	Blend Operations.....	4-56
4.12.3	Blend Factors.....	4-57
4.12.4	Blend State.....	4-58
•	Chapter Ends.....	4-63

<b>Chapter 5 : Interpolation and Character Animation</b>	<b>5-1 to 5-47</b>
--	--------------------

✓	<b>Syllabus Topic : Trigonometry</b> .....	5-1
5.1	Trigonometry.....	5-1
✓	<b>Syllabus Topic : The Trigonometric Ratios</b> .....	5-2
5.1.1	The Trigonometric Ratios .....	5-2
5.1.2	Example.....	5-2
✓	<b>Syllabus Topic : Inverse Trigonometric Ratios</b> .....	5-3
5.1.3	Inverse Trigonometric Ratios.....	5-3
✓	<b>Syllabus Topic : Trigonometric Relationships</b> .....	5-3
5.1.4	Trigonometric Relationships .....	5-3
✓	<b>Syllabus Topic : The Sine Rule</b> .....	5-4
5.1.5	The Sine Rule .....	5-4
✓	<b>Syllabus Topic : The Cosine Rule</b> .....	5-4
5.1.6	The Cosine Rule .....	5-4
✓	<b>Syllabus Topic : Compound Angles</b> .....	5-4
5.1.7	Compound Angles .....	5-4
✓	<b>Syllabus Topic : Perimeter Relationships</b> .....	5-5
5.1.8	Perimeter Relationships.....	5-5
✓	<b>Syllabus Topic : Interpolation</b> .....	5-6
5.2	Interpolation .....	5-6
✓	<b>Syllabus Topic : Linear Interpolant</b> .....	5-6
5.2.1	Linear Interpolant .....	5-6

✓	<b>Syllabus Topic : Non-Linear Interpolation</b> .....	5-7
	5.2.2 Non-Linear Interpolation.....	5-7
✓	<b>Syllabus Topic : Trigonometric Interpolation</b> .....	5-8
	5.2.2.1 Trigonometric Interpolation .....	5-8
✓	<b>Syllabus Topic : Cubic Interpolation</b> .....	5-9
	5.2.2.2 Cubic Interpolation.....	5-9
✓	<b>Syllabus Topic : Interpolating Vectors</b> .....	5-13
	5.2.3 Interpolating Vectors.....	5-13
✓	<b>Syllabus Topic : Interpolating Quaternions</b> .....	5-16
	5.2.4 Interpolating Quaternions.....	5-16
✓	<b>Syllabus Topic : Curves</b> .....	5-18
5.3	Curves.....	5-18
✓	<b>Syllabus Topic : The Circle</b> .....	5-18
	5.3.1 The Circle .....	5-18
	5.3.2 The Ellipse.....	5-18
✓	<b>Syllabus Topic : Bezier Curves</b> .....	5-19
5.4	B´ezier Curves .....	5-19
	5.4.1 Bernstein Polynomials.....	5-19
	5.4.2 Quadratic B´ezier Curves .....	5-23
	5.4.3 Cubic Bernstein Polynomials .....	5-24
	5.4.4 A Recursive B´ezier Formula.....	5-26
	5.4.5 B´ezier Curves Using Matrices .....	5-27
✓	<b>Syllabus Topic : B-Splines</b> .....	5-28
5.5	B-Splines .....	5-28
	5.5.1 Uniform B-Splines .....	5-29
	5.5.2 Continuity .....	5-31
	5.5.3 Non-Uniform B-Splines .....	5-32
	5.5.4 Non-Uniform Rational B-Splines.....	5-32
✓	<b>Syllabus Topic : Analytic Geometry</b> .....	5-33
5.6	Analytic Geometry .....	5-33
✓	<b>Syllabus Topic : Review of Geometry</b> .....	5-33
	5.6.1 Review of Geometry.....	5-33
	5.6.1.1 Angles.....	5-33
	5.6.1.2 Intercept Theorems.....	5-34
	5.6.1.3 Golden Section .....	5-34
	5.6.1.4 Triangles .....	5-35
	5.6.1.5 Centre of Gravity of a Triangle.....	5-35
	5.6.1.6 Isosceles Triangle .....	5-36
	5.6.1.7 Equilateral Triangle.....	5-36
	5.6.1.8 Right Triangle.....	5-36
	5.6.1.9 Thales Theorem.....	5-37

	5.6.1.10 Theorem of Pythagoras .....	5-37
	5.6.1.11 Quadrilaterals .....	5-37
	5.6.1.12 Trapezoid.....	5-37
	5.6.1.13 Parallelogram.....	5-37
	5.6.1.14 Rhombus.....	5-38
	5.6.1.15 Regular Polygon (n-gon).....	5-38
	5.6.1.16 Circle .....	5-38
✓	<b>Syllabus Topic : 2D Analytical Geometry</b> .....	5-39
5.7	2D Analytical Geometry .....	5-39
	5.7.1 Equation of a Straight Line .....	5-39
	5.7.2 The Hessian Normal Form .....	5-39
	5.7.3 Space Partitioning.....	5-40
	5.7.4 The Hessian Normal Form (HNF) from Two Points .....	5-41
✓	<b>Syllabus Topic : Intersection Points</b> .....	5-42
5.8	Intersection Points .....	5-42
	5.8.1 Intersection Point of Two Straight Lines .....	5-42
	5.8.2 Intersection Point of Two Line Segments .....	5-42
✓	<b>Syllabus Topic : Points inside a Triangle</b> .....	5-43
5.9	Points inside a Triangle .....	5-43
	5.9.1 Area of a Triangle.....	5-43
	5.9.2 Hessian Normal Form .....	5-44
✓	<b>Syllabus Topic : Intersection of a Circle with a Straight Line</b> .....	5-46
5.10	Intersection of a Circle with a Straight Line .....	5-46
	• Chapter Ends.....	5-47

**UNIT - III**

<b>Chapter 6 : Introduction to Rendering Engines</b>		<b>6-1 to 6-20</b>
✓	<b>Syllabus Topic : Understanding the Current Market Rendering Engines</b> .....	6-1
6.1	Understanding the Current Market Rendering Engines .....	6-1
✓	<b>Syllabus Topic : Understanding AR, VR and MR</b> .....	6-7
6.2	Understanding AR, VR and MR .....	6-7
	6.2.1 Augmented Reality .....	6-7
	6.2.1.1 Applications of AR.....	6-7
	6.2.2 Virtual Reality .....	6-9
	6.2.2.1 Applications of VR.....	6-10
	6.2.3 Mixed Reality .....	6-11
	6.2.3.1 Applications of MR .....	6-12
✓	<b>Syllabus Topic : Mobile Phones</b> .....	6-13
6.3	Mobile Phones .....	6-13



✓	<b>Syllabus Topic : Smart Glasses</b> .....	6-16
6.4	Smart Glasses .....	6-16
	6.4.1 Applications of small glasses .....	6-17
	6.4.2 Disadvantages of smart glasses .....	6-18
✓	<b>Syllabus Topic : HMD's</b> .....	6-18
6.5	HMD's.....	6-18
	• Chapter Ends.....	6-20

<b>Chapter 7 : Unity Engine: Multi-platform Publishing VR + AR</b>	<b>7-1 to 7-81</b>
--	--------------------

✓	<b>Syllabus Topic : Introduction and Working in Unity</b> .....	7-1
7.1	Introduction and working in Unity .....	7-1
	7.1.1 Steps for Unity Installation.....	7-1
✓	<b>Syllabus Topic : 2D</b> .....	7-4
7.2	2D .....	7-4
✓	<b>Syllabus Topic : Graphics</b> .....	7-6
7.3	Graphics.....	7-6
✓	<b>Syllabus Topic : Physics</b> .....	7-9
7.4	Physics .....	7-9
✓	<b>Syllabus Topic : Scripting</b> .....	7-12
7.5	Scripting .....	7-12
	7.5.1 MonoBehaviour .....	7-13
✓	<b>Syllabus Topic : Animation</b> .....	7-14
7.6	Animation .....	7-14
	7.6.1 Animation workflow .....	7-15
	7.6.2 Using the Animation View .....	7-19
	7.6.3 The Animated Properties List.....	7-19
	7.6.4 The Animation Timeline .....	7-20
	7.6.4.1 Dopesheet Timeline Mode .....	7-21
	7.6.4.2 Curves Timeline Mode .....	7-21
	7.6.4.3 Fitting Your Selection to the Window .....	7-22
	7.6.5 Playback and frame navigation controls .....	7-23
	7.6.5.1 Locking the Window .....	7-24
	7.6.6 Creating a New Animation Clip .....	7-24
	7.6.6.1 Adding Another Animation Clip .....	7-25
	7.6.6.2 How it Fits Together.....	7-25
	7.6.7 Animating a GameObject.....	7-27
	7.6.8 Recording Keyframes.....	7-27
7.7	Timeline.....	7-29
	7.7.1 Creating Keyframes in Preview Mode .....	7-29

	7.7.2	Manually Creating Keyframes .....	7-30
✓		<b>Syllabus Topic : Timeline .....</b>	<b>7-31</b>
7.8		Timeline.....	7-31
	7.8.1	Timeline Asset.....	7-31
	7.8.2	Timeline Instance .....	7-32
	7.8.3	Reusing Timeline Assets .....	7-32
	7.8.4	Difference between the Animation window and the Timeline Window .....	7-33
	7.8.4.1	The Timeline Window.....	7-33
	7.8.4.2	The Animation window .....	7-34
	7.8.5	Creating a Timeline Asset and Timeline instance.....	7-34
	7.8.5.1	Recording Basic Animation with an Infinite Clip.....	7-35
✓		<b>Syllabus Topic : Multiplayer and Networking.....</b>	<b>7-39</b>
7.9		Multiplayer and Networking .....	7-39
	7.9.1	Multiplayer Overview .....	7-39
	7.9.1.1	High Level Scripting API.....	7-39
	7.9.1.2	Engine and Editor Integration .....	7-39
	7.9.1.3	Internet Service.....	7-39
	7.9.1.4	NetworkTransport real-time Transport Layer .....	7-40
	7.9.1.5	Setting up a Multiplayer Project.....	7-40
	7.9.2	The Network Manager.....	7-40
	7.9.2.1	Networked Player GameObjects .....	7-41
	7.9.2.2	Multiplayer-aware Scripts .....	7-42
	7.9.2.3	Using the Network Manager .....	7-42
	7.9.2.4	Getting Started with the Network Manager .....	7-42
	7.9.3	Game State Management.....	7-43
	7.9.4	Spawn Management .....	7-44
	7.9.5	Customizing Player Instantiation .....	7-44
	7.9.6	Start Positions.....	7-44
	7.9.7	Scene Management.....	7-45
	7.9.8	Customization.....	7-45
✓		<b>Syllabus Topic : UI .....</b>	<b>7-49</b>
7.10		UI.....	7-49
	7.10.1	Canvas .....	7-49
	7.10.1.1	Draw Order of Elements.....	7-49
	7.10.1.2	Render Modes.....	7-49
	7.10.1.3	Basic Layout.....	7-51
	7.10.1.4	Visual Components .....	7-56
	7.10.2	Interaction Components .....	7-57

	7.10.3	Animation Integration .....	7-59
	7.10.4	Auto Layout.....	7-62
	7.10.4.1	Understanding Layout Elements .....	7-62
	7.10.4.2	Layout Element Component.....	7-63
	7.10.4.3	Understanding Layout Controllers .....	7-63
	7.10.4.4	Content Size Fitter.....	7-63
	7.10.4.5	Layout Groups .....	7-64
	7.10.4.6	Driven Rect Transform properties.....	7-64
	7.10.5	Rich Text .....	7-64
✓	<b>Syllabus Topic :</b>	Navigation and Path Finding .....	7-66
7.11		Navigation and Path Finding.....	7-66
	7.11.1	NavMesh Building Components .....	7-68
	7.11.2	NavMesh Modifier .....	7-72
	7.11.3	NavMesh Modifier Volume .....	7-72
	7.11.4	NavMesh Link.....	7-73
	7.11.5	Creating a NavMesh Agent .....	7-74
	7.11.6	Creating the Character.....	7-75
	7.11.7	Creating an Off-mesh Link.....	7-77
	7.11.8	Navigation Areas and Costs .....	7-77
✓	<b>Syllabus Topic :</b>	Publishing .....	7-77
7.12		Publishing.....	7-77
	•	Chapter Ends.....	7-81

<b>Chapter 8 : Scripting</b>	<b>8-1 to 8-64</b>
------------------------------	--------------------

✓	<b>Syllabus Topic :</b>	Scripting Overview .....	8-1
8.1		Scripting Overview.....	8-1
	8.1.1	Creating and Using Scripts.....	8-1
	8.1.2	Creating Scripts .....	8-2
	8.1.3	Anatomy of a Script file .....	8-2
	8.1.4	Variables and the Inspector .....	8-4
	8.1.5	Controlling GameObjects using Components.....	8-5
	8.1.5.1	Accessing Components .....	8-5
	8.1.5.2	Accessing Other Objects .....	8-6
	8.1.6	Linking GameObjects with Variables .....	8-6
	8.1.7	Event Functions .....	8-9
	8.1.8	Physics Events.....	8-10
8.2		Time and Frame Rate Management .....	8-11
8.3		Fixed Timestep .....	8-12
	8.3.1	Maximum Allowed Timestep.....	8-13
	8.3.2	Time Scale .....	8-13
	8.3.3	Capture Framerate .....	8-14

8.4	Creating and Destroying GameObjects .....	8-16
8.4.1	Coroutines.....	8-16
8.4.2	Namespaces .....	8-19
8.4.3	Attributes .....	8-20
8.5	Execution Order of Event Functions .....	8-21
8.5.1	First Scene Load .....	8-21
8.5.2	When the Object is Destroyed.....	8-23
8.5.3	Understanding Automatic Memory Management.....	8-24
8.5.4	Value and Reference Types.....	8-24
8.5.5	Allocation and Garbage Collection .....	8-25
8.5.6	Optimization .....	8-25
8.5.7	Requesting a Collection.....	8-29
8.5.7.1	Small Heap with Fast and Frequent Garbage Collection .....	8-30
8.5.7.2	Large Heap with Slow but Infrequent Garbage Collection.....	8-30
8.5.8	Reusable Object Pools.....	8-31
8.5.8.1	Platform Dependent Compilation.....	8-31
8.5.9	Platform #define Directives.....	8-31
8.5.10	Platform custom #defines .....	8-35
8.5.11	Global custom #defines .....	8-36
8.5.11.1	Special Folders and Script Compilation Order.....	8-36
8.5.11.2	Script Compilation and Assembly Definition Files About .....	8-37
8.5.12	How to Use Assembly Definition Files.....	8-38
8.5.12.1	Multiple Assembly Definition Files Inside a Folder Hierarchy .....	8-39
8.5.12.2	Assembly Definition Files are Not Build System Files .....	8-39
8.5.12.3	Backwards Compatibility and Implicit Dependencies .....	8-39
8.6	API.....	8-40
8.6.1	File Format .....	8-40
8.6.2	.NET Profile Support.....	8-41
8.6.2.1	Legacy Scripting Runtime.....	8-41
8.6.2.2	Stable Scripting Runtime.....	8-42
8.6.2.3	Cross-Platform Compatibility .....	8-42
8.6.2.4	Managed Plugins .....	8-42
8.6.2.5	Referencing Additional Class Library Assemblies .....	8-42
8.6.3	.NET Standard 2.0 Profile .....	8-43
8.6.4	.NET 4.x Profile .....	8-43
8.6.5	Switching between Profiles .....	8-43
8.6.5.1	Stable Scripting Runtime : Known Limitations .....	8-44
8.6.5.2	Generic Functions.....	8-44
8.6.6	Scripting Restrictions .....	8-45
8.6.6.1	.NET 4.x Equivalent Scripting Runtime .....	8-45
8.6.6.2	.NET 3.5 Equivalent Scripting Runtime .....	8-46

	8.6.7	Ahead-of-Time Compile .....	8-47
	8.6.8	Generic Virtual Methods .....	8-47
✓	<b>Syllabus Topic :</b>	Scripting Tools and Event Overview .....	8-50
8.7		Scripting Tools and Event Overview .....	8-50
	8.7.1	Obsolete API Warnings and Automatic Updates .....	8-51
	8.7.2	Adjusting the Line Count .....	8-51
	8.7.3	Stack Trace Logging .....	8-52
	8.7.4	Universal Windows Platform .....	8-53
	8.7.4.1	WebGL .....	8-54
	8.7.5	Defining A Custom Messages .....	8-56
	8.7.5.1	Input Modules.....	8-57
	8.7.5.2	Supported Events.....	8-57
	8.7.5.3	Raycasters.....	8-58
	8.7.6	Event System Manager.....	8-59
	8.7.7	Graphic Raycaster .....	8-59
	8.7.8	Physics Raycaster .....	8-60
	8.7.9	Physics 2D Raycaster .....	8-60
	8.7.10	Standalone Input Module .....	8-60
	8.7.11	Touch Input Module .....	8-62
	8.7.12	Event Trigger.....	8-63
	•	Chapter Ends.....	8-64

<b>Chapter 9 : XR</b>	<b>9-1 to 9-23</b>
-----------------------	--------------------

✓	<b>Syllabus Topic :</b>	XR : VR, AR, MR, Conceptual Differences, SDK, Devices.....	9-1
9.1		XR Differences, SDK and Devices .....	9-1
	9.1.1	Google VR.....	9-1
	9.1.1.1	Daydream vs. Cardboard.....	9-2
	9.1.2	Hardware and Software Requirements for Google VR.....	9-2
	9.1.2.1	Recommended Hardware and Software Requirements.....	9-3
	9.1.2.2	Supported APIs and SDKs .....	9-3
	9.1.3	Google VR Controllers and Input Devices.....	9-3
	9.1.3.1	Supported Feature Sets .....	9-4
9.2		Vuforia.....	9-4
	9.2.1	Marker-Based Tracking.....	9-4
	9.2.2	Hardware and Software Requirements for Vuforia.....	9-6
	9.2.3	Windows Mixed Reality .....	9-7
	9.2.3.1	HoloLens .....	9-7
	9.2.3.2	Differences between Holographic and Immersive Devices .....	9-8
	9.2.3.3	Differences between HoloLens and Immersive Devices.....	9-9
	9.2.3.4	WMR Hardware and Software Requirements.....	9-10

9.3	Working on WMR.....	9-11
9.3.1	Installation of Tools.....	9-11
9.3.2	Project Set Up.....	9-11
9.3.3	Camera Settings.....	9-11
9.3.3.1	Camera Settings for HoloLens .....	9-12
9.3.4	Performance Settings.....	9-12
9.3.5	Publishing Settings .....	9-12
9.3.6	Exporting a Visual Studio Solution.....	9-14
9.3.7	WMR Input and Interaction Concepts.....	9-19
9.4	VR Devices.....	9-19
9.4.1	VR Device Information .....	9-19
9.5	Oculus.....	9-19
9.5.1	Getting Started (Windows).....	9-19
9.5.1.1	Getting Started (Gear VR).....	9-19
9.5.1.2	Getting Started (OpenVR).....	9-20
9.5.2	Input for Oculus.....	9-20
9.5.3	Naming Convention and Detection .....	9-20
9.6	OpenVR.....	9-21
9.6.1	Input for OpenVR Controllers.....	9-21
9.6.2	Naming Convention and Detection .....	9-21
9.7	Unity Input.....	9-22
9.7.1	HTC Vive Controllers .....	9-22
9.7.2	Upgrading a Project that Contains the SteamVR Package.....	9-23
	• Chapter Ends.....	9-23
➤	<b>Model Question Paper.....</b>	<b>M-1 to M-2</b>
➤	<b>Appendix-A .....</b>	<b>A-1 to A-14</b>
➤	<b>University Question Paper .....</b>	<b>Q-1 to Q-3</b>