ABEDA INAMDAR COLLEGE PUNE

UG Diploma Course In 3D Animation

(Faculty of Science & Technology)

3D Animation

Choice Based Credit System Syllabus

To be implemented from Academic Year 2021-2022

Title of the Course: Under Graduate Diploma Course In 3D Animation

Preamble:

In today's era where 3D is indulged in every field of entertainment as well all various different fields of career, getting a well-trained 3D artist becomes a challenge. That is why the Faculty of Science & Technology has felt the requirement to start with a UG Diploma course in 3D Animation. This course is a two-year specialization program and has been prepared while keeping both students and working professionals in mind.

Introduction:

Animation is a type of optical illusion that has computer generated artificial characters, effects and environment. With the help of softwares like 3Ds Max, Maya, Zbrush, Blender and so many game products and 3D Animation movies are produced in the today's market.Objective of this course to provide with overall knowledge of 3D Animation, that covers all aspects of 3D techniques.It will help to develop aesthetic sense in the students, and to make students capable of working in a studio environment as well as to develop his/her own studio setup.

Prerequisite:

- Students must have basic operational knowledge of computers.
- Students must understand English language.
- Students must have basic knowledge of the Internet.

Duration: The Program comprises four semesters .

Evaluation: Four semesters program with the combination of 60% Semester End Examination and 40% Continuous Evaluation per semester.

Number of seats: 60

Eligibility: 10+2 Any Stream

Semester - 1

Titles of Papers, Credit Allocation, and Scheme of Evaluation

(Total credits=30)

Paper Code	Course Type	Paper title	Credits		Evaluation		
			T	P	CE	SEE	Total
21AUUGD3D101	Core Credit Theory	Introduction to 3D Digital Art	4	-	40	60	100
21AUUGD3D102	Core Credit Theory	Introduction To Maya	4	-	40	60	100
21AUUGD3D103	Core Credit Theory	Introduction To Texturing & Lighting	4	-	40	60	100
21AUUGD3D104	Core Credit Practical	Poly Modeling and Aesthetics development	-	6	60	75	125
21AUUGD3D105	Core Credit Practical	Basic Texturing & Lighting	-	6	60	75	125
21AUUGD3D106	Core Credit Practical	Project/Portfolio	-	6	60	120	200
Total			**12**	**18**	**300**	**450**	**750**

Semester - 2

Titles of Papers, Credit Allocation, and Scheme of Evaluation

(Total credits=30)

Paper Code	Course Type	Paper title	Credits		Evaluation		
			T	P	CE	SEE	Total
21AUUGD3D201	Core Credit Theory	Introduction to Rigging Fundamentals	4	-	40	60	100
21AUUGD3D202	Core Credit Theory	Introduction to Animation Fundamentals	4	-	40	60	100
21AUUGD3D203	Core Credit Theory	Introduction to Dynamics	4	-	40	60	100
21AUUGD3D204	Core Credit Practical	Basics of Rigging & Animation	-	6	60	75	125
21AUUGD3D205	Core Credit Practical	FX & Physics Simulation	-	6	60	75	125
21AUUGD3D206	Core Credit Practical	Project/Portfolio	-	6	60	120	200
Total			**12**	**18**	**300**	**450**	**750**

Semester - 3

Titles of Papers, Credit Allocation, and Scheme of Evaluation

(Total credits=30)

Paper Code	Course Type	Paper title	Credits		Evaluation		
			T	P	CE	SEE	Total
21AUUGD3D301	Core Credit Theory	Advance Poly engineering and Sculpting	4	-	40	60	100
21AUPGD3D302	Core Credit Theory	Poly Painting Techniques	4	-	40	60	100
21AUPGD3D303	Core Credit Theory	Digital Lighting and Rendering	4	-	40	60	100
21AUPGD3D304	Core Credit Practical	Modeling and Sculpting	-	4	40	60	100
21AUPGD3D305	Core Credit Practical	Advanced shading and Texturing	-	4	40	60	100
21AUPGD3D306	Core Credit Practical	Advanced Lighting	-	4	40	60	100
21AUPGD3D307	Core Credit Practical	Rendering and Compositing	-	4	40	60	100
21AUPGD3D308	Core Credit Practical	Project/Portfolio	-	2	20	30	50
Total			**12**	**18**	**300**	**450**	**750**

Semester - 4

Titles of Papers, Credit Allocation, and Scheme of Evaluation

(Total credits=30)

Paper Code	Course Type	Paper title	Credits		Evaluation		
			T	P	CE	SEE	Total
21AUUGD3D401	Core Credit Theory	Advance Rigging	4	-	40	60	100
21AUUGD3D402	Core Credit Theory	Digital Animation	4	-	40	60	100
21AUUGD3D403	Core Credit Theory	Compositing for 3d	4	-	40	60	100
21AUUGD3D404	Core Credit Practical	Character setup	-	4	40	60	100
21AUUGD3D405	Core Credit Practical	Project/Portfolio	-	8	80	120	200
21AUUGD3D406	Core Credit Practical	On job training	-	6	60	90	150
Total			**12**	**18**	**300**	**450**	**750**

Abbreviation:

T: Theory

P: Practical

CE: Continuous evaluation

SEE: Semester End Examination

Semester - 1

Semester - I

Paper - I

Course Type: Core Course Theory **Course Code: 21AUUGD3D101**

Course Title :Introduction to 3D Digital Art

Teaching Scheme	No. of Credits	Examination Scheme
5 Hours / Week	4	CE : 40Marks SEE: 60Marks

Course Objectives

1. To introduce the fundamentals of visual design.
2. To develop the understanding of core concepts of modeling techniques.
3. Understanding the observation based approach for creating realism.
4. Creating photorealistic outputs using various renderers.
5. Understanding the body dynamics & principles of animation.

Course Outcomes:- On completion of this course, students will be able to :

1. Explore the various techniques & concepts of animation.
2. Develop & create effective 3D art with visualization & concept.

Course Contents

Chapter 1	**Creative Development and The Digital Process**	**5 Hour**

1.1 Storytelling
1.2 Character Design
1.3 Visual and Look Development
1.4 Production Strategies
1.5 The Digital Computer Animation
1.6 The Production Process of Computer Animation

Chapter 2	**Modeling Concept and Technique**	**15 Hour**

2.1 Space, Objects, and Structures
2.2 Moving things Around
2.3 Lines and Curves
2.4 Geometric Primitives
2.5 Free-Form Objects
2.6 Basic Modeling Utilities

Chapter 3	Shading and Surfacing Characteristics	10 Hour
3.1 Surface Shading Techniques 3.2 Surface Color, Texture & Transparency 3.3 Surface Reflectivity and Refractivity 3.4 Surface Shader & Multi-Pass 3.5 Environment Dependent Shading		
Chapter 4	**Camera, Lighting and Rendering Concepts**	**15 Hour**
4.1 Types of Cameras 4.2 Types of Camera Shots and Lens 4.3 Camera Animation 4.4 Types of Lighting Sources and Positions 4.5 Basic Components of a Light Source 4.6 Lighting Strategies and Mood 4.7 Ray Tracing 4.8 Global Illumination and Radiosity 4.9 Image Based Lighting 4.10 Photorealistic and Non-Photorealistic Rendering 4.11 Hardware Rendering		
Chapter 5	**Understanding Rigging & Animation**	**15 Hour**
5.1 The Basic Rigging & Animation Workflow 5.2 An Introduction to Skeleton 5.3 Forward & Inverse Kinematics 5.4 Forward Kinematics and Model Animation 5.5 Rigging & Animation Hierarchical Structures 5.6 Animation Cycles 5.7 Body Mechanics 5.8 Two & Three Dimensional Integration		

Reference Books:

1. The Art of 3D Computer Animation and Effects, Isaac Kerlow, Wiley Publication.
2. 3D Animation Essentials, Andy Beane, Sybex Publication.

Semester - I

Paper - II

Course Type: Core Course Theory **Course Code:21AUUGD3D102**

Course Title :Introduction To Maya

Teaching Scheme	No. of Credits	Examination Scheme
5 Hours / Week	4	CE : 40Marks SEE: 60Marks

Course Objectives:

1. Understanding the interface and mastering the use of menus and shortcuts.
2. Overview of the components, curves and surfaces of NURBS
3. Discuss the various methods of creating models in Maya and understanding their geometries.
4. Creating organic models

Course Outcomes:

1. Understand the role played by Maya in animation and its useful features.
2. Create polygon models to understand modeling using polygon.
3. Describe how to Create surfaces with the help of curves.
4. Describe the usage of multiple NURBS surfaces to create models.
5. Describe how to Make polygon models to understand poly modeling.

Course Contents

Chapter 1	**User Interface**	**5 Hour**

1.1 Introduction
1.2 Autodesk Maya Interface
1.2.1 The Title Bar
1.2.2 The Main Menu Bar
1.2.3 The Status Line
1.2.4 The Shelf / Shelves
1.2.5 The Toolbox
1.2.6 The Channel Box/Layer Editor
1.2.7 The Attribute Editor
1.2.8 The Tool Setting
1.2.9 Time Slider/Range Slider
1.2.10 Command Line and Script Editor Button
1.2.11 Helpline
1.2.12 The Workspace
1.3 All about Menus and Shortcuts
1.3.1 Main Menu and Menu Sets

1.4 Camera and Camera Settings
1.4.1 Navigating the Scene
1.4.2 Navigating with Default Cameras and View Cube
1.4.3 Adding a Camera
1.4.4 Camera Settings
1.4.5 Camera Attributes
1.5 Focus and Shade in View Editor
1.6 Transforming Objects
1.7 Creating and Placing a Geometry
1.8 Setting up a Project in Maya

Chapter 2	**Basic Nurbs Modeling**	**7.5 Hour**

2.1 Introduction
2.2 Understanding NURBS
2.2.1 Overview of NURBS Modeling
2.2.2 Degree of Curves and Surfaces
2.2.3 Parameterization of Curve and Surface
2.2.4 Surface Direction
2.2.5 Curve Direction
2.2.6 Level of Continuity
2.2.7 Components of NURBS Curves and Surface
2.2.8 Advantages and Disadvantages of NURBS Modeling
2.2.9 Creating Curves using Curve Tools
2.2.10 Attaching and Detaching Curves
2.2.11 Cutting and Filleting Curves
2.3 NURBS Surfaces
2.3.1 Revolving/ Extruding/ Lofting/Birailing Surfaces
2.3.2 Tutorial for Modeling with NURBS

Chapter 3	**Advanced Nurbs Modeling**	**7.5 Hour**

5.1 Introduction
5.2 Tutorial for Modeling with Trimmed Surface
5.3 Tutorial for Modeling NURB Patches
5.3.1 Modeling a small asset
5.3.2 Modeling a Game asset

Chapter 4	**Polygon Modeling**	**10 our**

4.1Polygon Anatomy
4.1.1Selecting and Editing Polygon Components
4.1.2Polygon Terminology
4.1.3 Polygon Modeling
4.1.4Polygon Normal
4.1.5Two-Manifold vs Non Manifold Geometry
4.2 Helpful Interface Elements for Polygon Modeling
4.2.1 Heads-up Display
4.2.2 Custom Polygon Display
4.3Setting up an Image Plane
4.4 Tutorial for Building a Polygon Model
4.4.1 Modeling an LCD Computer Monitor
4.4.2 Modeling a Human Ear
4.6 Advantage and Disadvantages of Polygon Modeling

Chapter 5	**Organic Modeling**	**15 Hour**

5.1 Introduction
5.2 Preparing for the Modeling Process
5.2.1 Creating a Custom Shelf for a Polygon Model
5.2.2 Assigning Hotkeys
5.2.3 Using Polygonal Marking Menu
5.3 Tutorial of Modeling a Humanoid Head or Equivalent Structure
5.3.1 Setting up image planes
5.3.2 Planning Topology
5.3.3 Model Structure (Blocking the Head)
5.3.4 Detailing the Head
5.3.5 Finalizing the Geometry
5.4 Hierarchical Subdivision Surfaces
5.5 Subdividing at Render Time
5.6 Converting Model to a Subdivision Proxy
5.7 Sculpt and Finalize with the Geometry Tool

Chapter 6	**Preparing Models for Animation**	**15 Hour**

6.1 Introduction
6.2 Converting Geometry
6.2.1 Generating Poly Surfaces from NURBS Curves
6.2.2 Converting NURBS Surfaces to Poly Surfaces
6.3 Hierarchical Subdivision Surfaces
6.4 Tutorial for Modeling a Hand with Subdivision Surfaces

Reference Books: Introduction to Maya By Nitiraj Singh Mandloi

Semester - I

Paper - III

Course Type: Core Course Theory **Course Code:21AUUGD3D103**

Course Title :Introduction To Texturing & Lighting

Teaching Scheme	No. of Credits	Examination Scheme
5 Hours / Week	4	CE : 40Marks SEE: 60Marks

Course Objectives:

1. Understand different types of texture maps.
2. Understand the fundamental physics of lighting and how lights in Maya work.
3. Discuss about different renderers that are existing in Maya.
4. Study the procedure of rendering in Maya specially for post-production.
5. Understand the use of adobe photoshop for the composting process.

Course Outcomes:

1. Explain the basics of texturing.
2. Describe the working of the UV texture Editor.
3. Elaborate about the types of lights and their settings available in Maya.
4. Discuss how to render a scene in different renderers.
5. Describe how to make various render passes.
6. Explain the process of compositing the render passes.

Course Contents

Chapter 1	**Texture Basics In Maya**	**10 Hour**

1.1 Introduction
1.2 Texturing Basics in Maya
1.2.1 Hypershade
1.3 Editing Materials Using Hypershade And Attribute Editor
1.3.1 Working with Hypershade
1.3.2 Editing Material Using Attribute Editor
1.4 Rendering Nodes and their Attributes
1.4.1 Material Nodes and their attributes
1.4.2 Texture Nodes
1.4.3 Placement Nodes.

Chapter 2	**Texturing In Practicing**	**15 Hour**

2.1 Introduction
2.2 Tutorial on building shading Networks
2.2.1 Texturing stone wall Material
2.2.2 Creating Bronze Material
2.2.3 Creating Bump & Reflectivity maps
2.3 UV Texture mapping
2.3.1 Creating Uv's
2.4 UV Texture Editor
2.4.1 Editing UVs
2.4.2 Automatic Mapping, Exporting UVs & Importing Custom Texture
2.5 Mapping Human Model

Chapter 3	**Lights and Camera**	**15 Hour**

3.1 Introduction
3.2 Light Nodes
3.2.1 Types of lights
3.2.2 Light Effects
3.2.3 Types of shadows
3.3 Camera Nodes
3.3.1 Camera Settings
3.3.2 Camera Tools
3.3.3 Camera Attributes
3.4 Outdoor Environment Lighting
3.5 Creating Dome Light

Chapter 4	**Rendering**	**10 Hour**

4.1 Introduction
4.2 Rendering in Maya
4.2.1 Types of Rendering in Maya
4.2.2 Available Renders in Maya
4.2.3 Interactive Photorealistic Rendering (IPR)
4.2.4 Render Output/File formats
4.2.5 Image Quality and Render speed
4.2.6 Object specific Render Attributes/Render stats
4.3 Understanding Mental Ray
4.3.1 Global Illumination
4.3.2 Final Gather
4.3.3 Image Based Lighting
4.3.4 Rendering an Interior with GI
4.3.5 Caustics
4.3.6 Displacement Mapping
4.3.7 High Dynamic Range Image (HDRI)

Chapter 5	**Rendering For Post - Production**	**5 Hour**

5.1Introduction
5.2 Camera Mapping
5.3 Creating A Reflection Map
5.3.1 Environment Ball
5.4 Rendering a sequence
5.4.1 Render Layers
5.4.2 Render setting Override
5.5 Rendering in a separate passes for Post-Production
5.5.1 Multi-render pass workflow
5.5.2 Batch Render

Chapter 6	**Compositing for Post Production**	**5 Hour**

6.1 Introduction
6.2 Setting up the compositing software
6.2.1 compositing various passes
6.3 Rendering passes and compositing
6.3.1 rendering layer

Reference Books: Advanced Maya By Rohan Page

Semester - I

Paper - IV

Course Type: Core Course Practical **Course Code:21AUUGD3D104**

Course Title : Poly Modeling and Aesthetics Development

Teaching Scheme	No. of Credits	Examination Scheme
4hrs 20 mins Hrs / week	6	CE : 40Marks SEE: 60Marks

Course Objectives

1. With the help of various tools & techniques of the 3D software application, one can create impressive models starting from basic to advanced, the tools allow the user to effectively manipulate the objects to get desired results.
2. 3D art looks extraordinary when it has powerful aesthetics, using various surfacing techniques one can achieve the appealing quality in the design.

Course Outcomes:-

1. On completion of this course, students will be able to :
2. To effectively use various modeling tools.
3. Using references to create models.
4. Creating organic models with proper topology.
5. Learn the importance of UV mapping.

Guidelines :

Lab Book: The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.

Submission:

The assignments are to be submitted by the student in the form of a Project folder, .ma, .mb or OBJ Format and a final render in .JPG format. Each assignment includes the Assignment Title, Date of submission, Name of Students.

Poly Modeling:

Assignments should be done individually by the student. The submission should include Clay & Wireframe render in JPG or PNG format.

Aesthetics Development:

Assignments should be done individually by the student. Students have to texture & light the model. The submission should include the final render in JPG or PNG format.

Assessment:

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of students. Each lab assignment assessment will be assigned grade/marks based on

parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance and creativity.

Operating Environment:

For Poly Modeling and Aesthetics development

Operating system: Windows 10

Software: Autodesk Maya

Suggested List of Assignments:

A) Poly Modeling:

Assignment 1.

Create a Scene with the help of Primitives and Splines

Assignment 2.

Create objects using Revolve

Assignment 3.

Create Basic Assets(Table)

Suggested List of Assignments:

B) Aesthetics Development:

Assignment 1.

Set Dressing(Small Environment)

Assignment 2.

Basic Character Modeling

Books: Laboratory handbook

Semester - I

Paper - V

Course Type: Core Course Practical **Course Code:21AUUGD3D105**

Course Title : Basic Texturing & Lighting

Teaching Scheme	No. of Credits	Examination Scheme
4hrs 20 mins Hrs / week	6	CE : 40Marks SEE: 60Marks

Course Objectives

1.With the help of various tools & techniques of the 3D software application, one can create impressive models starting from basic to advanced, the tools allow the user to effectively manipulate the objects to get desired results.

2.3D art looks extraordinary when it has powerful aesthetics, using various surfacing techniques one can achieve the appealing quality in the design.

Course Outcomes:-

On completion of this course, students will be able to :

1. Creating real-world simulations effects.
2. Creating realistic looking fluids & rigid body simulations.
3. Recognize the importance of render passes.
4. Creating photorealistic outputs with compositing.

Guidelines :

Lab Book: The lab book is to be used as a hands-on resource, reference, and record of assignment submission and completion by the student. The lab book contains the set of assignments that the student must complete as a part of this course.

Submission:

The assignments are to be submitted by the student in the form of a Project folder, .ma, .mb, or FBX Format, Compositing file, and videos. Each assignment includes the Assignment Title, Date of submission, Name of Students.

Texturing & Lighting

Assignments should be done individually by the student. The submission should include either the playblast or a compiled sequence render of simulation with lighting.

Assessment:

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of students. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, and creativity.

Operating Environment:

For Texturing/Lighting

Operating system: Windows 10

Software: Autodesk Maya

Suggested List of Assignments:

A) Basic Texturing:

Assignment 1.
Texture the Tea Table Scene(Basic Texturing)
Assignment 2.
Reflective & Refractive Objects(Basic Shading)
Assignment 3.
Basic MatchBox Unwrapping & Texturing
Assignment 4.
Background Unwrapping & Texturing

Suggested List of Assignments:

B) Basic Lighting:

Assignment 1.
Character Face Texturing
Assignment 2.
Three Point Lighting
Assignment 3.
Interior Daylight Setup

Books: Laboratory handbook

3d Animation (UG Diploma Question Paper Pattern)

a. **Evaluation Criteria :** The evaluation of students will be based on three parameters:-

- Continuous Internal Evaluation (CIE).
- Practical / Project Examination
- Semester End Examination.

i. **For Continuous Internal Evaluation (CIE):** Internal assessment will be as follows:

Theory Examination

Credits :4 Duration : 1Hr/Exam Marks:40			
10 Marks Academic Performance	**10 Marks Spirit of Collaboration**	**10 Marks Quiz Submission**	**10 Marks Class Test**
Attendance	Active participation in class activities.	Submission of end module quizzes on regular basis	Minimum 40% marks required to get marks for class test.

ii. For Practical/Project Examination: Internal assessment will be as follows:

Practical Credits :4 Marks:40			**Project Credits :6 Marks:60**		
10 marks	**20 Marks**	**10 Marks**	**20 marks**	**20 Marks**	**20 Marks**
Attendance	Assignment submission on time	Lab Course Book / Journal	Idea and Originality	**accuracy** and reliability	Presentation

For Semester End Examination: The Duration of the SEE will be as follows:

For Theory Examination

Credits: 4		**Marks : 60**
Duration : 2.5 hrs		
Q1	**Q2**	**Q3**
10 marks	**20 marks**	**30 marks**
Short answers **(any 5)** Each carry 4 marks)	Descriptive **(any 2)** Each carry 10 marks	Multi choice questions **(any 15**) Each carry 2 marks

For Practical/Project Examination

Practical **Credits : 4 Marks:60** **Duration : 3.5 Hours**						**Project** **Credits :6 Marks :90** **Duration : 3.5 Hours**	
Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Portfolio**	**Project Presentation And Design**
10 marks	10 marks	10 marks	10 marks	10 marks	10 marks	45 marks	45

Semester - 2

Semester - II

Paper - I

Course Type: Core Course Theory **Course Code:21AUUGD3D201**

Course Title : Introduction to Rigging Fundamentals

Teaching Scheme	No. of Credits	Examination Scheme
5 Hours / Week	4	CE : 40Marks SEE: 60Marks

Course Objectives

1. Learning the use of deformers for manipulations of geometry with the help of deformers.
2. Understand the concept of skeleton using Maya
3. Learn about connection attributes.
4. Understand the concept of skinning.

Course Outcomes

1. Understand how deformers function in Maya.
2. Understand skeleton hierarchy.
3. Create a biped skeleton for understanding of the process of creating human rigs.
4. Understand the process of building a control rig

Course Contents

Chapter 1	**Deformers**	**6 Hour**

1.1 Introduction
1.2 Non-linear Deformers
1.2.1 Applying and Using Nonlinear Deformers
1.2.2 Bend
1.2.3 Flare
1.2.4 Sine
1.2.5 Squash
1.2.6 Twist
1.2.7 Wave
1.2.8 Nodes, History and the Deformation Order
1.3 Specialized Deformers
1.3.1 Lattice Deformers
1.3.2 Cluster Deformer
1.3.3 Wire Deformer
1.3.4 Soft Modification Tool
1.3.5 Blend Shape Deformer
1.3.6 Wrap Deformer

Chapter 2	Joints And Skeletons	11 Hour

2.1 Introduction
2.2 Creating Skeletons
 2.2.1 Skeleton Components
 2.2.2 Skeleton Hierarchy
 2.2.3 Building Skeletons
2.3 Joints
 2.3.1 Joint Tool Options
 2.3.2 Setting up Joints for Posing and Animation
 2.3.3 Selecting, Creating, Mirroring and Connecting Joints
 2.3.4 World Objects and Local Transformation
2.4 Tutorial for Creating Biped Skeleton
 2.4.1 Selecting and Inserting joints
 2.4.2 Orienting Joint

Chapter 3	Basics Of Skinning	8 Hour

3.1 Introduction
3.2 Introduction to Skinning
 3.2.1 Methods of Skinning
 3.2.2 Changing a skinned Object's deformation order
 3.2.3 Point tweaking skinned objects
 3.2.4 Editing node behaviour to improve performance
 3.2.5 Workflow summary
3.3 Tutorial on Smooth Skinning a Character
 3.3.1 Understanding Smooth Skinning
 3.3.2 Binding Smooth Skin
 3.3.3 Editing smooth skin
 3.3.4 Using Smooth Skin Influence Objects
3.3.5 Instances

Chapter 4	Connection Tools	15 Hour

4.1 Introduction
4.2 Dependency Graph
4.2.1 Nodes
4.2.2 Attributes
4.2.3 Connections
4.2.4 Types of Connections
4.2.5 Keyed Relationships
4.3 Understanding Constraints
4.3.1 Constraint Node Behavior
4.3.2 Enabling and Disabling Constraint Nodes
4.3.3 Workflow Summary
4.3.4 Using Point Constraints
4.3.5 Using Geometry Constraints

Chapter 5	Character Controls	20 Hour

5.1 Introduction
5.2 Building Skeletons
5.2.1 Understanding Skeleton Construction
5.2.2 Creating Joint Chains and Limbs
5.2.3 Editing Joints
5.3 Posing Skeletons
5.3.1 Forward Kinematics
5.3.2 Inverse Kinematics
5.3.3 Handles and Chains of Inverse Kinematics
5.4 Building a Control Rig
5.4.1 Control Objects
5.4.2 Rig Controls
5.4.3 IK or FK
5.4.4 Setup Theory
5.4.5 The Hips
5.4.6 The Legs and Feet
5.4.7 Automatic Foot Roll
5.4.8 Arms and Wrist
5.4.9 Shoulder Blades
5.4.10 Chain Up Vectors: The Third Dimension
5.4.11 Controlling the Head Using a Position and Orientation Constraint
5.4.12 Invert the Constraints
5.4.13 Fine-Tuning and Parenting the Rig
5.4.14 Creating a Model Space

Reference Books:

1. Advanced Maya By Rohan Page
2. Character Setup And Animation In Maya By Rohan Page

Semester - II

Paper - II

Course Type: Core Course Theory **Course Code:21AUUGD3D202**

Course Title : Introduction to Animation Fundamentals

Teaching Scheme	No. of Credits	Examination Scheme
5 Hours / Week	4	CE : 40Marks SEE: 60Marks

Course Objectives

1. Understanding the history & evolution of Animation.
2. Recognize the significance of storytelling.
3. Learn the importance of storyboarding & editorial.
4. Observe & recognize different walk & run styles.
5. Understanding the techniques of computer animation.

Course Outcomes:- On completion of this course, students will be able to :

1. Analyze different types of animation.
2. Develop impressive 3D animation with application of animation principles

Course Contents

Chapter 1	**Animation Overview**	**5 Hour**

1.1 Defining Animation
1.2 Exploring the Animation Industry
1.3 The History of 2D and 3D Animation
1.4 The Dawn of Computer Animation
1.5 The Foundation of Modern Computing

Chapter 2	**Exploring Animation, Story and Pre-visualization**	**10 Hour**

2.1 Building a Good Story
2.2 Using Principles & Traditional Animation
2.3 Using a Script to Animate an object
2.4 Character Animation
2.5 Character, Goal & Conflict
2.6 Pre-visualization Techniques in Animation

Chapter 3	**Principles of Animation**	**12 Hour**

3.1 The Craft of Animation
3.2 The Twelve Principles
3.3 Few More Principles
3.4 Character Development
3.5 Storyboarding & Editorial

Chapter 4	**Human Walks and Run Animation**	**15 Hour**

4.1 Walk Cycles
4.2 Walk Cycles displaying Different Moods
4.3 Pose to Pose
4.4 Two People Walk Cycle Together
4.5 Run Cycles
4.6 Changing the pace and mood in Run Cycles

Chapter 5	**Computer Animation Techniques**	**18 Hour**

5.1 Keyframe Interpolation and Parameter Curves
5.2 Creating a Full Skeleton
5.3 Binding the Skin to the Skeleton
5.4 Blend Shapes & Expressions
5.5 Hierarchical Character Animation
5.6 Lighting and Camera Animation
5.7 Procedural Animation
5.8 Facial Animation
5.9 Crowd Animation
5.10 Interactive Animation
5.11 Animation with A Motion Path

Reference Books:

1. 3D Animation for the Raw Beginner, Roger King, CRC Press Publication
2. Character Animation in 3D, Steve Roberts, Focal Press Publication

Semester - II

Paper - III

Course Type: Core Course Theory **Course Code:21AUUGD3D203**

Course Title :Introduction to Dynamics

Teaching Scheme	No. of Credits	Examination Scheme
5 Hours / Week	4	CE : 40Marks SEE: 60Marks

Course Objectives:

1. Learn to create cloth in Maya.
2. Learn out about the particle system in Maya and its various attributes.
3. Using a dynamic hair system to model realistic hairstyles and hair behaviour.
4. Learning Maya Fluids to simulate gaseous effects such as clouds, smoke, flames, explosions, and so on.

Course Outcomes:

1. Explain the system of particles and fields.
2. Explain the method of creating Hair in Maya.
3. Describe How to make different types of cloth objects.
4. Use fluid containers.
5. Render fluid containers

Course Contents

Chapter 1	**Particles and Fields**	**10 Hour**

1.1 Introduction
1.2 Introduction to Particles
1.2.1 Particle Tool
1.2.2 Emitter
1.3 Particle Attributes
1.3.1 Lifespan
1.3.2 Render Attributes
1.3.3 Per Particle Attributes
1.4 Fields
1.4.1 Applying Fields
1.4.2 Types of Fields
1.4.3 Common Field Attributes

Chapter 2	**Maya Hair**	**12 Hour**

2.1 Introduction
2.2 Using Hair in Maya
2.2.1 Creating Hairs
2.2.2 Hair Presets
2.3 Maya Hair
2.3.1 Understanding XGen
2.3.2 Creating XGen Description
2.3.3 Dynamic Curve with IK Spline

Chapter 3	**Maya Cloth**	**8 Hour**

3.1 Introduction
3.2 Loading Cloth with Maya
3.3 Creating A Table cloth using Maya classic cloth
3.3.1 Creating a dress

Chapter 4	**Maya Fluids**	**15 Hour**

4.1Introduction
4.2Using Fluid Containers
4.2.1Using 2D Containers
4.2.2Using Fields with Fluids
4.2.1Using 3D Containers
4.3Fluid Interactions
4.3.1 Emitting Fluids from a Surface
4.3.2Making Flames
4.3.3Igniting the Fuel
4.4Rendering Fluid
Containers
4.5Create Fluids and nParticle Interactions
4.5.1Emitting Fluids from nParticles

Chapter 5	**Dynamic Effects**	**15 Hour**

5.1Introduction
5.2Creating nCloth Objects
5.2.1Making a Polygon Mesh Dynamic
5.2.2Applying nCloth Presets
5.3Creating nCloth and nParticle Interactions
5.3.1Creating an nParticle Goal
5.3.2Controlling Collision Events
5.4Rigid Body Dynamics
5.4.1Creating an Exploding Tower
5.4.2Tuning the Rigid Body Simulation
5.4.3Baking the Simulation

Reference Books:

1. Advanced Maya By Rohan Page
2. Mastering Autodesk Maya By Todd Palamar, Sybex Publication

Semester - II

Paper - IV

Course Type: Core Course Practical **Course Code:21AUUGD3D204**

Course Title : Basics of Rigging & Animation

Teaching Scheme	No. of Credits	Examination Scheme
4hrs 20 mins Hrs / week	6	CE : 40Marks SEE: 60Marks

Course Objectives:

1. For creating an impressive animation, one should first need to create an efficient Rig setup, which can be done using the various tools available inside the 3D application.
2. Understanding the various techniques for animation provides the opportunity to develop powerful animation

Course Outcomes:

1. Recognize various tools of rigging.
2. Creating mechanical & organic rigging.
3. Recognizing the importance of poses.
4. Creating different animations.

Guidelines :

Lab Book: The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.

Submission:

The assignments are to be submitted by the student in the form of a Project folder, .ma, .mb or FBX Format and videos. Each assignment includes the Assignment Title, Date of submission, Name of Students.

Rigging:

Assignments should be done individually by the student. The submission should include the screen recording of the setup and video format should be either MP4 or AVI.

Animation:

Assignments should be done individually by the student. The submission should include either the playblast or a compiled sequence render of animation.

Assessment:

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of students. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance and creativity.

Operating Environment:

Basics of Rigging & Animation

Operating system: Windows 10

Software: Autodesk Maya

Suggested List of Assignments:

A) Rigging:

Assignment 1.
Basic Rigging(Pendulum)
Assignment 2.
Mechanical Rigging(Toy Train)
Assignment 3.
Bone Leg Setup(Separately)
Assignment 4.
Bone Hand Setup(Separately)
Assignment 5.
Basic of Skinning

Suggested List of Assignments:

B) 3D Animation:

Assignment 1.
Bouncing Ball Animation
Assignment 2.
Pose to Pose Animation
Assignment 3.
Creating Strong Poses
Assignment 4.
Character Animation(Walk Cycle)

Books: Laboratory handbook

Semester - II

Paper - V

Course Type: Core Course Practical **Course Code:21AUUGD3D205**

Course Title : FX & Physics Simulation

Teaching Scheme	No. of Credits	Examination Scheme
4hrs 20 mins Hrs / week	6	CE : 40Marks SEE: 60Marks

Course Objectives:

1. Dynamics are a complex physics engine inside your 3D application; dynamics describes how objects move using rules of physics to simulate real-world forces.
2. 3D application provides powerful tools to achieve these complex simulations.

Course Outcomes:

1. Creating real-world simulations effects.
2. Creating realistic looking fluids & rigid body simulations

Guidelines :

Lab Book: The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.

Submission:

The assignments are to be submitted by the student in the form of a Project folder, .ma, .mb, or FBX Format, Compositing file and videos. Each assignment includes the Assignment Title, Date of submission, Name of Students.

FX:

Assignments should be done individually by the student. The submission should include either the playblast or a compiled sequence render of simulation with lighting

Assessment:

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of students. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance and creativity.

Operating Environment:

For FX & Physics Simulation

Operating system: Windows 10

Software: Autodesk Maya

Suggested List of Assignments:

A) FX:

Assignment 1.
nParticles Simulation(Smoke)
Assignment 2.
Fluids Simulation(Fire)
Assignment 3.
Create nHair on Character Face
Assignment 4.
Active and Passive Rigid Body(Break a Wall)

Books: Laboratory handbook

3d Animation (UG Diploma Question Paper Pattern)

b. **Evaluation Criteria :** The evaluation of students will be based on three parameters:-

- Continuous Internal Evaluation (CIE).
- Practical / Project Examination
- Semester End Examination.

iii. For Continuous Internal Evaluation (CIE): Internal assessment will be as follows:

Theory Examination

Credits :4 **Duration : 1Hr/Exam** **Marks:40**			
10 Marks **Academic Performance**	**10 Marks** **Spirit of Collaboration**	**10 Marks** **Quiz Submission**	**10 Marks** **Class Test**
Attendance	Active participation in class activities.	Submission of end module quizzes on regular basis	Minimum 40% marks required to get marks for class test.

iv. For Practical/Project Examination: Internal assessment will be as follows:

Practical Credits :4 Marks:40			Project Credits :6 Marks:60		
10 marks	**20 Marks**	**10 Marks**	**20 marks**	**20 Marks**	**20 Marks**
Attendance	Assignment submission on time	Lab Course Book / Journal	Idea and Originality	**accuracy** and reliability	Presentation

For Semester End Examination: The Duration of the SEE will be as follows:

For Theory Examination

Credits: 4 **Marks : 60** **Duration : 2.5 hrs**		
Q1	**Q2**	**Q3**
10 marks	**20 marks**	**30 marks**
Short answers **(any 5)** Each carry 4 marks)	Descriptive **(any 2)** Each carry 10 marks	Multi choice questions **(any 15**) Each carry 2 marks

For Practical/Project Examination

Practical **Credits : 4 Marks:60** **Duration : 3.5 Hours**						**Project** **Credits :6 Marks :90** **Duration : 3.5 Hours**	
Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Portfolio**	**Project Presentation And Design**
10 marks	10 marks	10 marks	10 marks	10 marks	10 marks	45 marks	45