# ABEDA INAMDAR COLLEGE PUNE

## Certificate 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: Certificate 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 certificate course in 3d animation. This course is of six month 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 software like 3ds max, Maya, Zbrush, Blunder and so many game products and 3d animation movies are produced in 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 six months.

**Evaluation:** Six-month program with the combination of 60% External Marks and 40% Internal Marks.

**Number of seats:** 60

**Eligibility:** 10+2 Any Stream

**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 |
| 21AUCC3 DA101 | Core Credit Theory | Introduction to 3D Digital Art (Th) | 4 | | 40 | 60 | 100 |
| 21AUCC3 DA102 | Core Credit Theory | Introduction to Animation Fundamentals (Th) | 4 | | 40 | 60 | 100 |
| 21AUCC3 DA103 | Core Credit Theory | Introduction to Entrepreneurship and soft skill (Th) | 4 | | 40 | 60 | 100 |
| 21AUCC3 DA104 | Core Credit Practical | Poly Modeling and Aesthetics development (Pr) | - | 4 | 40 | 60 | 100 |
| 21AUCC3 DA105 | Core Credit Practical | Character setup (Pr) | - | 4 | 40 | 60 | 100 |
| 21AUCC3 DA106 | Core Credit Practical | FX and Compositing (Pr) | - | 4 | 40 | 60 | 100 |
| 21AUCC3 DA107 | Core Credit Practical | Project/Portfolio | - | 4 | 40 | 60 | 100 |
| 21AUCC3 DA108 | Core Credit Practical | On Job Training | - | 2 | 20 | 30 | 50 |
| **Total** | | | **12** | **18** | **300** | **450** | **750** |

**Abbreviation:**

T: Theory

P: Practical

CE: Continuous evaluation

SEE: Semester End Examination

*On Job Training should be carried out in any one stream at the end of certificate course, duration of the training must be of one month minimum.

## Paper - I

**Course Type: Core Course Theory**      **Course Code:21AUCC3DA101**

**Course Title: Introduction to 3D Digital Art**

| Teaching Scheme 5 Hours / Week | No. of Credits 4 | Examination Scheme 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 Hours** |

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 Hours** |
|---|---|---|

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 Hours |
|---|---|---|

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 Hours |
|---|---|---|

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 Hours |
|---|---|---|

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.

**Course Type: Core Course Theory**          **Course Code:21AUCC3DA102**

**Course Title: Introduction to Animation Fundamentals**

| Teaching Scheme 5 Hours / Week | No. of Credits 4 | Examination Scheme 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** | **6 Hours** |
|---|---|---|

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** | **11 Hours** |
|---|---|---|

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 | 8 Hours |
|---|---|---|

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 Hours |
|---|---|---|

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 | 20 Hours |
|---|---|---|

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

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**Paper - III**

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**Course Type: Core Course Theory**     **Course Code:21AUCC3DA103**

**Course Title: Introduction to Entrepreneurship and soft skill**

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

**Course Objectives**

1. To introduce the fundamentals of entrepreneurship.
2. To develop the ability to Understand the characteristics of the various forms of business organization
3. To understand structured approach towards being a successful entrepreneur.
4. To develop plan of launching a start-up
5. To develop business -solution model around the current problems
6. To understand digital marketing as a tool for entrepreneurs.

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

1. Explore various ideas and business models around the business idea.

2. Plan the core component and elements required to start a successful start-up.

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**Course Contents**

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| Chapter 1 | **Fundamentals of Entrepreneurship** | **3   Hours** |
|---|---|---|

1.1 What is the mindset of an entrepreneur
1.2 Identifying a problem
1.3 Need Analysis
1.4 Sensing solution among the problems
1.5 Developing the seed "The Idea"
1.6 Searching market moves & trend
1.7 Understanding Creativity and Innovation
1.8 Opportunity finding and taking the right approach.

| Chapter 2 | **Develop the Plan for Startup** | **7 Hours** |
|---|---|---|

2.1 Taking first steps to develop a business model.
    Selecting the right type for registering the business.
2.2 Business Plan: concept, format.
2.3 Components: Organizational plan; Operational plan; Production plan; Financial plan; Marketing plan; Human Resource planning

| Chapter 3 | Branding & Marketing of Start-up | 10 Hours |
|---|---|---|

3.1 Developing a brand around the idea.
3.2 Branding, Logo, Tagline
3.3 Copyright, trademark and Patent for start-up
3.4 Planning a strategy for promoting the start-up
3.5 The Art of negotiation and methods
3.6 Customer Relationship Management
3.7 Vendor Management
3.8 Developing the minimum viable product
3.9 Sales and marketing plan

| Chapter 4 | Growing the Startups | 10 Hours |
|---|---|---|

4.1  Lean startup growth
4.2 Making a growth plan for the startup.
4.3 Concept of Franchising the startup
4.4 Mergers and Acquisition: Concept, reasons, types.
4.5 Reasons for failure of Mergers and Acquisitions.

| Chapter 5 | Cost, Expenses, Inventory and ROI | 10 Hours |
|---|---|---|

5.1  Unit of Sale, Unit Cost for multiple products or services
5.2 Break even Analysis for multiple products or services
5.3 Computation of Working Capital
5.4 Inventory Control and EOQ
5.5 Return on Investment (ROI) and Return on Equity (ROE)

| Chapter 6 | Resource Mobilization | 5 Hours |
|---|---|---|

6.1 Capital Market- Primary and Secondary
6.2 Stock Exchange- Concept, features, functions and importance
6.3 Securities and Exchange Board of India- History, establishment, powers
6.4 Angel Investor: Features
6.5 Venture Capital: Features, funding

| Chapter 7 | Digital Marketing as Marketing Tool | 15 Hours |
|---|---|---|

7.1 What is Digital Marketing
7.2 Growth of digital marketing
7.3 Benefits of digital marketing
7.4 Different digital marketing channels
7.5 Setting up digital marketing budgets

**Reference Books:**

1 - Udyamita (in Hindi) by Dr. MMP. Akhouri and S.P Mishra, pub. By National Institute for Entrepreneurship and Small Business Development (NIESBUD), NSIC-PATC Campus, Okhla

2-Entrepreneurship development & management (English, Paperback, V. K. Joshi) Publisher: Jagdamba Publishing Company ISBN: 9789380280462, 9380280462

3-Entrepreneurship Paperback – 1 July 2020 by Rajeev Roy Publisher: OUP India; 3rd edition (1 July 2020) Language: English Paperback: 600 pages ISBN-10: 0190125306

4- Safalta Ki 22 Chabiyaan (In Hindi) by Dr. Rishi Aacharya pub. by Notion Press Chennai ISBN-10: 1947027514

**Magazines**
- Udyamita Samachar Patra (Monthly, Hindi), Pub.  By Centre for Entrepreneurship Development, M.P. (CEDMAP), 60 Jail Road, Jhangerbad, Bhopal-462008.

- Science Tec.  Entrepreneur (A Bi Monthly Publication), Centre for Entrepreneurship Development, M.P (CEDMAP), 60 Jail Road, Jhangerbad, Bhopal -462008

**Course Type: Core Course Practical**          **CourseCode:21AUCC3DA104**

**Course Title: Practical course on 3D digital Art (Poly Modeling and Aesthetics development)**

| Teaching Scheme 4hrs 20 mins Hrs. / week | No. of Credits 4 | Examination Scheme 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. To effectively use various modeling tools.
2. Using references to create models.
3. Creating organic models with proper topology.
4. 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)
> **Assignment 4.**
>> Set Dressing (Small Environment)
> **Assignment 5.**
>> Basic Character Modeling

**B) Aesthetics Development:**

> **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
> **Assignment 5.**
>> Character Face Texturing

**Assignment 6.**
    Three Point Lighting

**Assignment 7.**
    Interior Daylight Setup

**Books: Laboratory handbook**

**Course Type: Core Course Practical**     CourseCode:21AUCC3DA105

**Course Title: Practical course on Animation Fundamentals (Character Setup)**

| Teaching Scheme 4hrs 20 mins Hrs. / week | No. of Credits 4 | Examination Scheme 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**: -

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

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 play blast 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:**
For Character Setup
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

**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**

**Course Type: Core Course Practical**          **Course Code:21AUCC3DA106**

**Course Title: FX and Compositing**

| Teaching Scheme 4hrs 20 mins Hrs. / week | No. of Credits 4 | Examination Scheme 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. 3D application provides powerful tools to achieve these complex simulations.
2. Compositing is the combination of multiple layers of images or video elements to render a final still or moving image. With the help of compositing one can enhance their results to make it look photorealistic.

**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 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 play blast or a compiled sequence render of simulation with lighting.

**Compositing:**

Assignments should be done individually by the student. The submission should include all render passes & final render in JPG, PNG or video 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 FX & Compositing
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)

**B) Compositing:**

**Assignment 1.**
Lighting Passes (Background Scene)
**Assignment 2.**
Passes Compositing (Background Passes)
**Assignment 3.**
Color Correction (Background Render)

**Books: Laboratory handbook**

**3d Animation (Certificate 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<br>Duration: 1Hr/Exam<br>Marks:40 | | | |
|---|---|---|---|
| **10 Marks<br>Academic<br>Performance** | **10 Marks<br><br>Spirit of<br>Collaboration** | **10 Marks<br><br>Quiz<br>Submission** | **10 Marks<br><br>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<br>Credits :4          Marks:40 | | | Project<br>Credits :4          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 |

iii. **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 :4 Marks :60 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 | 30 marks | 30 |