KOENIG
step forward

AUTODESK
Authorized Training Center

Character Animation
Using Autodesk 3ds Max

Target Audience

This course is designed for aspiring character animators, 3D artists, game developers, film and television animation students, and digital media professionals who want to learn the art and science of character animation using Autodesk 3ds Max. It is ideal for individuals who want to understand both the theoretical principles of animation and the hands-on technical skills required to create believable, expressive character performances — from foundational rigging and modeling to walk cycles, body mechanics, and facial animation.

Course Objective

This course aims to provide learners with a thorough understanding of character animation principles and their practical application in Autodesk 3ds Max. Starting from the fundamentals of the 3ds Max interface, modeling, and splines, learners progressively build skills in polygon modeling, character rigging, keyframe animation, and the 12 principles of animation — ultimately applying them to create professional walk cycles, body mechanics, and facial expressions for fully animated 3D characters.

Course Outcome

- **Character Animation Foundations –** Understand the history, terminology, and production pipeline of character animation in film, games, and digital media.
- **3ds Max Interface Proficiency –** Navigate Autodesk 3ds Max confidently — managing viewports, menus, the Command Panel, and scene files.
- **3D Modeling for Animation –** Create character-ready geometry using standard primitives, splines, extended splines, and polygon modeling techniques.
- **Animation Principles Mastery –** Understand and apply the 12 classic principles of animation — squash and stretch, anticipation, follow-through, timing, and more.
- **Character Rigging Skills –** Build functional character rigs using bone systems, IK solvers, constraints, and the Skin modifier with painted weights.
- **Walk Cycle Creation –** Animate a complete and convincing biped walk cycle incorporating proper weight distribution, contact poses, and timing.
- **Body Mechanics Expertise –** Animate realistic body mechanics including jumps, lifts, falls, and secondary motion for dynamic character performance.
- **Facial Animation Proficiency –** Create expressive facial animations using morph targets, blend shapes, and bone-driven facial rig controls.

Course Outline

The course comprises 40 hours of 11 chapters progressing from character animation theory and 3ds Max fundamentals through advanced body mechanics and facial expressions. Each chapter combines conceptual understanding with hands-on 3ds Max exercises to build both artistic and technical competencies in character animation.

3 MAX

Chapter 1: Introduction to Character Animation

History and Evolution of Character Animation

- Overview of character animation: from hand-drawn cells to 3D CGI
- Milestones in animation history: Disney, Pixar, and game studios
- The role of character animation in film, television, advertising, and games

The Animation Pipeline

- Understanding pre-production, production, and post-production stages
- The character animation workflow: concept, model, rig, animate, render
- Roles in a character animation team: animator, rigger, modeler, TD

Types of Animation Techniques

- Traditional (hand-drawn), stop-motion, cutout, and CGI animation
- Keyframe animation vs. motion capture: pros, cons, and use cases
- Introduction to performance-driven and procedural animation

Anatomy and Movement Basics

- Understanding human anatomy for animators: skeleton, muscles, and weight
- Principles of weight, balance, and center of gravity in character movement
- Observational studies: analyzing real-world motion as reference for animation

Chapter 2: Introduction to Autodesk 3ds Max

Overview of the 3ds Max Interface

- Understanding the workspace: viewports, menu bar, toolbars, and Command Panel
- Navigating viewports: Orbit, Pan, Zoom, Arc Rotate, and Perspective controls
- Using the Time Slider, status bar, and MAXScript listener

Scene and File Management

- Creating, opening, saving, and merging scene files
- Setting scene units, grid spacing, and system preferences
- Using Auto-backup and managing scene assets

Working with Objects

- Selecting, moving, rotating, and scaling objects in the viewport
- Using coordinate systems and transform gizmos
- Grouping, linking, and managing objects in the Scene Explorer

Customizing the Workspace

- Customizing toolbars, menus, and keyboard shortcuts
- Setting up viewport layouts for character animation workflows
- Using the Command Panel: Create, Modify, Hierarchy, Motion, Display, Utilities

Chapter 3: Primitives

Standard Primitives

- Creating Box, Sphere, Cylinder, Cone, Torus, Tube, Plane, GeoSphere, Teapot, and Pyramid
- Adjusting primitive parameters: dimensions, segments, and smoothing groups
- Using interactive vs. keyboard entry creation modes

Extended Primitives

- Creating ChamferBox, ChamferCyl, Capsule, OilTank, Spindle, L-Ext, C-Ext, Torus Knot, Hose, and Prism
- Adjusting fillet, segment, and rounding parameters on extended objects

Using Primitives for Character Blocking

- Building a character block-out using stacked and aligned primitives
- Understanding scale and proportion for humanoid characters
- Using primitives as reference guides for polygon modeling and rigging

Chapter 4: Splines and Extended Splines

Drawing 2D Splines

- Creating Line, Circle, Arc, Rectangle, Ellipse, Donut, NGon, Star, Text, Helix, and Section splines
- Understanding vertex types: Corner, Smooth, Bezier, and Bezier Corner
- Setting spline rendering properties for use as 3D objects

Extended Splines

- Creating WRectangle, Channel, Angle, Tee, and Wide Flange section profiles
- Using extended splines for structural and architectural forms

Splines in Character Modeling

- Using splines as curves for character outlines, accessories, and hair
- Lathing and extruding splines to produce character prop geometry
- Using splines as motion paths and animation trajectory guides

Chapter 5: Polygon Modelling

Editable Poly Fundamentals

- Converting objects to Editable Poly for direct mesh editing
- Working with subobjects: Vertex, Edge, Border, Polygon, and Element
- Selecting, transforming, and soft-selecting subobject components

Core Polygon Editing Operations

- Extruding, beveling, chamfering, and insetting polygon faces
- Bridging edges, welding vertices, and collapsing components
- Using Cut, QuickSlice, and MSmooth for loop-based editing

Character Mesh Modeling

- Modeling a character head: establishing edge flow for clean topology
- Modeling the body: torso, limbs, and hands with animation-ready topology

- Using the Symmetry modifier for efficient bilateral character modeling
- Applying TurboSmooth and MeshSmooth for subdivision-ready geometry

Topology and Edge Flow for Animation

- Understanding edge loops around joints: knees, elbows, shoulders, and wrists
- Ensuring clean deformation-ready topology for rigging and skinning
- Checking and correcting normals, overlapping geometry, and n-gons

Chapter 6: Basics of Animation

Understanding Keyframe Animation

- Setting keyframes using Auto Key and Set Key modes
- Moving, copying, scaling, and deleting keys on the Track Bar
- Setting the animation time range and playback frame rate

The Graph Editor (Function Curves)

- Opening and navigating the Track View – Curve Editor
- Editing animation curve tangents: Bezier, Linear, Step, and Smooth
- Setting in and out infinity types: Constant, Cycle, Loop, and Ping-Pong

The Dope Sheet

- Using the Track View – Dope Sheet for key timing and spacing
- Selecting, moving, scaling, and copying key blocks
- Filtering tracks and using the Edit Time and Edit Keys modes

Animation Controllers

- Assigning Position, Rotation, and Scale controllers
- Using Bezier, TCB, Linear, and Noise controllers
- Using the Motion Panel to manage trajectories and controller assignments

Previewing Animation

- Using the RAM Player to preview rendered animation frames
- Creating Viewport Playblasts for quick motion review
- Using Ghost and Trajectory display for animation feedback

Chapter 7: Principles of Animation

The 12 Principles of Animation

- Squash and Stretch: conveying weight, mass, and flexibility
- Anticipation: preparing the audience for an upcoming action
- Staging: clear composition and visual communication
- Straight Ahead vs. Pose-to-Pose: two approaches to keyframing

Follow Through and Secondary Motion

- Follow Through and Overlapping Action: trailing motion after the primary action stops
- Secondary motion: hair, clothing, accessories, and belly jiggle
- Applying follow-through to tails, ears, and loose clothing in 3ds Max

Timing, Spacing, and Arcs

- Slow In and Slow Out (Ease In / Ease Out): natural deceleration and acceleration
- Arcs: ensuring all organic motion follows curved trajectories
- Timing: controlling the number of frames to convey speed and weight

Appeal, Exaggeration, and Solid Drawing

- Exaggeration: pushing poses and motion beyond reality for emotional impact
- Appeal: creating characters and movements audiences connect with
- Solid Drawing (Solid Posing in 3D): maintaining strong, readable silhouettes

Applying Principles in 3ds Max

- Setting up a bouncing ball exercise to apply squash/stretch, timing, and arcs
- Using Graph Editor curves to refine ease in/ease out and follow-through
- Critiquing and revising animation using the 12 principles as a checklist

Chapter 8: Rigging

Introduction to Character Rigging

- Understanding the rigging pipeline: bone system, IK, constraints, and controls
- Overview of biped vs. custom bone rigs in 3ds Max
- Planning a rig: joint placement, naming conventions, and hierarchy

Building a Bone System

- Creating and editing bone chains for the spine, arms, legs, and fingers
- Using the Bone Tools for fin display, taper, squash/stretch, and scale
- Mirroring bone chains for symmetric character rigs

Forward and Inverse Kinematics

- Understanding Forward Kinematics (FK): rotating joints down the chain
- Setting up Inverse Kinematics (IK): HI Solver for limbs, HD Solver for spines
- Creating IK Limb Solver for game-ready arm and leg rigs
- Switching between FK and IK using blend controllers

Applying the Skin Modifier

- Binding a character mesh to a bone system using the Skin modifier
- Adding and removing bones from the Skin modifier envelope list
- Painting and adjusting vertex skin weights for clean joint deformation
- Mirroring skin weights for symmetric character deformation

Controls and Constraints

- Creating custom control objects (curves and shapes) as animator handles
- Applying Position, Orientation, LookAt, and Parent constraints to rig controls
- Wiring parameters for driven key relationships (e.g., hand curl controls)
- Setting up a master root control for global character movement

Chapter 9: The Walk Cycle

Anatomy of a Walk Cycle

- Understanding the four key poses: Contact, Down, Passing, and Up
- Analyzing weight shift, hip movement, and shoulder counter-rotation in a walk
- Studying reference footage: differences between male, female, and stylized walks

Setting Up Key Poses

- Establishing Contact poses at frames 0 and 16 (for a 32-frame cycle)
- Creating the Down pose: lowest point of the walk with weight fully settled
- Posing the Passing position: leg passing through with full stretch
- Setting the Up pose: highest point of the stride

Refining Motion with In-Betweens

- Adding in-between keys to smooth transitions between contact poses
- Refining foot roll: heel strike, flat foot, ball, and toe-off
- Adding arm swing, spine bounce, and head bob for natural feel

Cycling and Looping the Walk

- Setting up a seamless loop using the Out-of-Range Cycle controller
- Using the Dope Sheet to shift keys for perfect cycle matching
- Offsetting upper and lower body layers for natural counter-movement

Adding Personality and Style

- Modifying timing and spacing to create confident, tired, sneaky, or happy walks
- Exaggerating hip sway and shoulder roll for stylized character personalities
- Testing the walk cycle on a path using the Path Constraint

Chapter 10: Body Mechanics

Understanding Weight and Physics

- How gravity, mass, and momentum affect character movement
- Using the Graph Editor to control acceleration and deceleration curves
- The importance of anticipation and follow-through in physical actions

Jumping and Landing

- Animating a standing jump: crouch anticipation, launch, hang, and landing
- Selling weight on impact: squash, follow-through, and secondary settle
- Adjusting timing for light vs. heavy character jumps

Lifting and Carrying

- Animating a character picking up and carrying a heavy object
- Showing effort through spine compression, leg bend, and arm tension
- Using secondary motion for object wobble and clothing pull

Falling and Getting Up

- Animating a trip, stumble, or full fall with realistic loss of balance
- Using overlapping action and staggered timing for cascading body parts
- Animating a character getting up from the ground with convincing weight shifts

Pushing, Pulling, and Throwing

- Animating a push: foot plant, lean, full-body extension, and follow-through
- Animating a pull: backward weight shift, muscle tension, and momentum
- Throwing mechanics: wind-up, release, and follow-through arc

Secondary Motion and Overlap

- Adding overlapping motion to hair, clothing, and accessories
- Using the Flex modifier and spring controllers for automatic secondary motion
- Layering secondary animation on top of primary body movement

Chapter 11: Facial Expressions

Anatomy of the Face for Animators

- Understanding facial muscles: orbicularis oris, zygomaticus, corrugator, and frontalis
- The seven universal expressions: happiness, sadness, anger, fear, disgust, surprise, and contempt
- Using photo and video reference to study facial movement and micro-expressions

Facial Rigging Techniques

- Creating bone-driven facial rigs: jaw bone, brow bones, and cheek controls
- Setting up morph target (Morpher modifier) workflow for expression shapes
- Building a blendshape library: sculpting key expression poses as morph targets
- Combining bone-driven and morph-driven approaches for a hybrid facial rig

Using the Morpher Modifier

- Adding and configuring the Morpher modifier on a character head mesh
- Creating and naming morph target channels for each expression
- Animating morph weight values over time for blended expressions
- Using Progressive Morph for smooth intermediate expression transitions

Animating Expressions

- Animating a smile-to-frown transition with proper eyelid and brow follow-through
- Animating surprise: brow raise, eye widening, and jaw drop with timing offset
- Combining expressions: anger with sadness, fear with disgust
- Using asymmetry and micro-movements to add realism and personality

Lip Sync Fundamentals

- Understanding phonemes and visemes: mapping sounds to mouth shapes
- Creating a basic viseme morph target library: open, closed, wide, round, teeth
- Animating dialogue: breaking down audio, blocking mouth shapes, and refining timing
- Syncing eye blinks, brow movement, and head turns to dialogue beats