Yashwantrao Chavan Maharashtra Open University
School of Continuing Education

B.Sc. (Media Graphics and Animation)
Syllabus for Third Year

BMG 301: Animation Principles

(Refer: Digital Animation Bible: George Avgerakis/ McGraw Hills, 2004, ISBN 0-07-141494)

1. **What is an animator's job?**
(The passion and love of animation, your own studio, selling your talent, job of animator – small shop/midsize subcontractor/major studio, The workflow- pitching project/ contracts/ storyboard/ objects/ scene/ character/ motions/ testing/ rendering/ billing, issue of schooling, employability in animation)

2. **The tasks of animation**
(Conceptualization – storyboard/client presentation/ timing the board/ breakdown the board/ time allowance for rendering/ rendering farm, Execution – dividing the work/ script writing and approval/ element breakdown/ milestones/ design exterior scenes/ design interior. Design characters/ aquiring music sound effects voice talents/ choreography/ building render farm/ lip-sync/ test pass rendering/ recording and mixing the track,/ HD conformation to D-5, recording the results/ intermet distribution)

3. **What equipments will be necessary?**
(Equipment obsolence, Cost and ROI, burn rate, basic animation computer, choosing a computer, chosing hardware, audio creation, cabling, role of video in animation studio)

4. **How do leading animation programs like Maya and 3ds Max work?**
(Common elements: views, navigation, layers and histories, timeline, 3ds max: description, program and view navigation/ object manipulation/ object creation and editing/ obj editing/ layers/ trackbar, Maya: description, program and view navigation/ object creation and editing/ obj editing/ layers/ timeslider)

BMG 302: Introduction to Maya

(Refer: The Complete Reference Maya 8, Tata McGraw Hill 2008 ISBN 978-0-07-065954-4 and 0-07-065954-0)

1. **User interface**

(Title bar, menu bar, status line the shelf, Toolbox, Workspace, Channel Box, Layer editor, time slider, range slider, command line, script editor button, Help line, Toolbox, Navigating a scene, setting up a project, Camera, Creating and placing a geometry, Focus and shade in view editor, transforming objects, Creating hierarchy, animating objects, shading an object, adding light, rendering animation)

2. **Polygonal Modeling**

(Polygon anatomy, selecting and editing polygon component, advantages in polygon modeling Heads up display, custom polygon display, Tutorial for building a polygon model)

3. **Organic Modeling**

(Creating a custom shelf for polygon model, assigning hotkey, using polygonal marking menu, model structure, planning topology, Tutorial of modeling human head or equivalent structure, subdivision proxy, hierarchical subdivision surfaces, subdividing at render time, converting model to a subdivision proxy sculpt the geometry tool, finalize the geometry)

4. **Basic NURB Modeling**

(Components of NURB curves, component of NURB surface, surface or curve degree, curve direction, parameterization of curve and surface, surface direction, advantage and disadvantage of NURB modeling, Level of continuity, tools for achieving continuity, creating curves using curve tools, curves on surfaces, attaching and detaching curves, cutting and filleting curves, Tutorial for modeling with NURB, Revolving/extruding/ lofting/ birailing surfaces)

5. **Advanced NURB Modeling**

(Modeling with trimmed surface, Tutorial, modeling NURB patches, Tutorial)

6. Preparing Models for Animation

(Generating poly surfaces from NURB curves, Converting NURB surfaces to poly, hierarchical subdivision surfaces, Tutorial on modeling with subdivision surfaces)

7. **Deformers**

(Non linear deformers, applying and Using nonlinear deformers, Lattice deformers, cluster deformer, wire deformer, soft modification tool, blend shape deformer, wrap deformer)

8. **Joints and Skeletons**

(Creating skeletons, selecting and inserting joints, Joint tool options, orienting joints, world object and local transformation, Tutorial of creating biped skeleton)

BMG 303: Character Set up and Animation in Maya

(Refer: The Complete Reference Maya 8, Tata McGraw Hill 2008 ISBN 978-0-07-065954-4 and 0-07-065954-0)

1. **Skinning and Advanced Deformers**

(Rigid bind process, edit membership, fexors, smooth bind process, weight normalization, Tutorial on smooth skinning a character)

2. **Connecting attributes**

(Direct connections, expressions, keyed relationships, types of constraints, using constraints)

3. **Character Controls**

(Forward kinematics, Inverse Kinematics, Tutorial on building a control rig)

4. **Animation Basics**

(Keyframe animation, in between and interpolation, setting keys, viewing and editing keyfrmaes, playback controls, Tutorial on keyframe animation, basic animation principles: squash and stretch, anticipation follow through, secondary action, case studies)

5. **Character Animation**

(Tutorial like walking and pushing a box)

6. **Animation Tools**

(File referencing; Creating references, managing references, Tutorial on creating non-linear animation, creat character set, use trax editor, retargeting workflow, Tutorial on retargeting, object interaction, constraints, using parent constraints)

BMG 304: Advanced Maya

(Refer: The Complete Reference Maya 8, Tata McGraw Hill 2008 ISBN 978-0-07-065954-4 and 0-07-065954-0)

1. **Texture Basics**

(Hypershade selections, working with hypershades, using attribute editors for editing materials, rendering nodes and their attributes, material nodes, texture nodes, placement nodes)

2. **Texturing in Practice**

(Tutorial on building shading networks, texture the stone wall material, create bronze material, create specular, diffuse and reflectivity maps, create a reflection map, use IPR to fine tune material attributes, Tutorial on UV texture mapping, creating UVs, edit UVs in the UV texture editor)

3. **Lights and Camera**

Light Nodes, types of lights, light attributes, spot light attributes, light effects shadows, Camera nodes, Tutorial on indoor lighting, Tutorial on outdoor environment lighting, setting scene, creating dome light)

4. **Rendering**

(Rendering preparation, render stetting window, select a render engine, anti-aliasing quality setting, anti-aliasing in material ray, How ray tracing works, Tutorial using ray tracing, Tutorial on using masks, Motion blur, environment fog, mental ray, Tutorial on rendering with global illumination, Tutorial on rendering caustics, Tutorial on final gather, HDR image with final gather, rendering with displacement maps, displacement shading network, the approximation editor)

5. **Particles and Fields**

(Creating particles, particle tool, emitter, particle attributes, lifespan, render attributes, per particle attributes, Applying fields, types of fields, common field attributes, Tutorial on particles and fields)

6. **Maya Hair**

(Using hair, Maya hair presets, Tutorial on creating hair from scratch)

7. **Maya Cloth**

(Loading Maya cloth, important concepts on cloth, Tutorial on making a dress)

8. **Rendering for post production**

(Camera mapping, Tutorial on camera mapping, creating a reflection map, environment ball, Tutorial on rendering, Render layer, Hard color pass, ambient color pass, soft reflection pass, soft reflection pass, hard specular pass, soft specular pass, case studies on each of these passes)

9. **Compositing for post production**

(Setting up after effects, compositing diffuse surface, compositing reflections. Compositing specular highlights, create Thruster effects, masking the edge, case studies covering all of these effects, make an initial color contrast adjustment, add a shadow, create heat ripples, create pools of light, feather the edges, color corrections, case studies on each of these)

BMG 305 Introduction to 3DS max

(Refer: How to do everything with 3ds max: a Beginner's Guide, by D J Kalwick, dream tech N Delhi, 2005, isbn 81-7722-544-8)

1 INTRODUCTION

The Views
The Tools
Manipulating Views
    Tutorial: Manipulating the Views
The Main Toolbar
The Command Panel
Quad Menus
Rollouts; Inputs, Spiners, and Flyout Menus
    Rollouts
    Inputs
    Spiners
    Flyout Menus
Summary

2 THE 3DS MAX PRODUCTION PIPELINE

Project Planning
Assessing the Problem
Bidding and Billing
    Bidding Fixed Price
    Time and Materials
    Determining the Billing Process
Signing Copyright, Non-Disclosure, and Non-Compete Agreements
Getting Approvals
Creating Storyboards
    Model Sheets
Creating Mock-ups and Animatics
    Animatics
Starting Full-Scale Production
Delivering Preliminary Contents
Delivering Final Content
Billing the Client
Ending the Contract
Giving Recognition
The Production Pipeline
Summary

3 STARTING SIMPLE; CREATING SHAPES AND PRIMITIVES

Creating Shapes
    Tutorial: Creating Basic Shapes
    Building a Line
    Tutorial: Building a Line
    Creating Primitives
    Tutorial: Creating a Sphere
Tutorial Review
    Tutorial: Creating a Box
Tutorial Review
    Building Cylinders, Cones and Tubes

Tutorial: Creating a Cylinder, Cone and Tube
Segments and Sides
Tutorial: Editing the Segments and Size Parameters
Editing Primitives and Shapes Parameters
The Modify Panel
Summary

4 MANAGING AND MANIPULATING 3 D SPACE
Transform Axis
Transformation Tools
The Pivot Point
Transform Gizmos
Positional Transforms
Tutorial: Transforming with the Select and Move Tool
Transform Type-In Dialog Box
Tutorial: Using the Transform Type-In Dialog Box
Using the Quad Menu
Tutorial: Using the Transform Type-In Dialog Box
Rotational Transforms
Using the Rotate Transform Gizmo
Scale Transforms
Coordinate Systems Overview
Summary

5 BUILDING WITH SUB-OBJECTS
Sub-Objects
Tutorial: Adding an EditMesh Modifier
Tutorial: Transforming Sub-Objects
Building the Mailbox Body
Tutorial: Building the Mailbox Body
Tutorial: Creating the Door Using an Editable Poly Object
Summary

6 BUILDING THE WATER TOWER
Tutorial: Building the Tower Cap
Tutorial: Building the Tower Body
Tutorial: Creating the Cross Beams
Tutorial: Creating the Vertical Support Beams
Tutorial: Creating the Tank Floor
Building Bottom Cross Beams
Accessories
Summary

7 BUILDING THE ELASTIC-POWERED ATMOSPHERIC TRANSPORTER
Overview
Tutorial: Building the Fuselage
Tutorial: Building the Wing
Tutorial: Creating the Stabilizer
Tutorial: Creating the Rudder
Tutorial: Creating the Propeller

Tutorial: The Linkage and Power Band
Summary

8 COMPLEX MODELING: CREATING A SKULL

Get to Know Your Subject
Where to Start
Tutorial: The Virtual Studio
Applying a Material
Tutorial: Modeling within the Virtual Studio
Tutorial: Refining the Skull
Tutorial: Refining the Nasal Cavity
Tutorial: Creating More Skull Detail
Tutorial: Creating an Eye Socket
Tutorial: Adding the Nasal Bridge
Further Refinement
Tutorial: Refining the Eye Socket
Tutorial: Building the Horn
Tutorial: The Final Revision …Almost
Summary

BMG 306 Advanced 3ds max

(Refer: How to do everything with 3ds max: a Beginner's Guide, by D J Kalwick, dream tech N Delhi, 2005, isbn 81-7722-544-8)

1 BUILDING A CHARACTER

Building from a Box- Again
- Tutorial: Creating the Side of the Fish
- Tutorial: Building the Fish Head
- Tutorial: Adding the Tail
- Tutorial: Adding the Cheeks and Nose
- Tutorial: Creating the Eye Socket
- Tutorial: Adding Fins
- Tutorial: Creating a Pectoral Fin
- Tutorial: Building the Mouth

Summary

2 BASIC HIERARCHIES AND PARAMETRIC ANIMATION

Basic Animation
- Creating Key Frames
- Auto Key versus Set Key Mode
- Tutorial: Animating Parameters
- Tutorial: Wiring Parameters

Creating a Hierarchy
- Tutorial: Using a Dummy Object

Summary

3 RIGGING AND ANIMATING

Setting up the Character for Animating
- Tutorial: Creating the Eyes and Eyelids

Creating the Eyelids
- Tutorial: Finishing the Eyelids
- Tutorial: Controlling the Eyes with LookAt
- Tutorial: Rigging the Body
- Tutorial: Creating a Hierarchy
- Tutorial: Creating a Working Tail
- Tutorial: Skinning a Fish
- Tutorial: Animating the Rig

Summary

4 MATERIAL BASICS

The Material Editor-the Key to Creation
- Material Editor Overview
- Tutorial: Selecting a Shader

Specular Controls

Maps

Mapping
- Mapping Problems and Solutions
- Bump Maps and Other Material Attributes
- General Map Options

Summary

5 MATERIALS UNWRAPPED

Tutorial: Creating and Applying the Materials for the Mailbox
Tutorial: Mapping with unwrap UVW
Tutorial: Aging the Mailbox
Tutorial: Aging the Flag
Summary

6 LIGHTING AND ATMOSPHERICS

Before the Lighting Begins
Interior Lighting (Inside the Puddle)
Tutorial: Adding Lights to a Scene
Tutorial: Customized Lighting
Projection Maps and Advanced Effects
Tutorial: Additional Light Sources
Tutorial: Adding Depth to Water
Tutorial: Creating Streaks of Light Through the Water
Summary

7 RENDERING- GETTING TO PIXELS

What is Rendering?
Tutorial: Creating a Camera
Tutorial: Rendering Output to Frames
Tutorial: Setting Up a Render Farm
Tutorial: Using Network Rendering
The Queue Monitor
Editing Job Output
Controlling Rendering Servers
The Split Scanline Option
Summary

8 PARTICLE FLOW FOR MODELING AND EFFECTS

What is Particle Flow?
Tutorial: The PF Source
Tutorial: Applying Materials to Particles
Tutorial: Events, Tests, and Branching
Summary

BMG 307 Character Animations

(Refer: Character Animation an overview, PHI 2004, ISBN-81-203-2434)

1. **Basics**
(Workflow in 3d animation, principles of animation related to action/overall animation, human anatomy, 3ds max features including bones constraints, modifiers, expression controllers, maxscript, IK solver)

2. **Character Modeling**
(Modeling methods, Creating torso, arms, legs, neck, body, face)

3. **Preparation for modeling**
(Creating skeleton with two/four legs, skinning a model, assigning weights to vertices, skinning two legged model)

4. **Animation of biped (two legs) character**
(Two leg walk, animating two leg walk- various poses/cycles)

5. **Animation of quadruped (four legged) character**
(Four leg walk, animation of walk- toot node/ legs/ spine/ tail/ ears, Complete walk cycle)

6. **Animation of expressions**
(Body/face expressions, morphing face expressions, animating eyes, lip sync)

7. **Preparing biped with character studio**
(Character Studio basics, creating biped, skinning – assigning Physique modifier/editing envelop/ creating bulges, applying tendons, using Physique files)

8. **Animating using character studio**
(Methods of animating a Biped, animating a Biped, libraries of biped animation)

BMG 308 CG Film making

(Refer: 3ds max animation, by Barrett Fox, TMH N Delhi, 0-07-058715-9)

1. STORY IDEAS

(Two types of Story Concepts: Type 1: Your Stories/ Type 2: Someone Else's Stories; Filtering: Is the Idea Ripe to Be Animated? Why Are You Making This Film? Avoiding Pitfalls and Perils: Clichés / Not Having a Story / Gratuitous Photo realism/ Biting Off More Than You Can Chew , Feasibility: Your Experience Level / Time Resources / Scope / Two Final Filters , The Example Film's Story)

2. PRODUCTION: 3DS MAX AND THE ANIMATION PIPELINE

(Wearing the Producer's Hat, Preparing to Prepare, Scope of Work, R&D and Learning Feasibility Revisited , Planning, Defining the Max Animation Pipeline, Identifying granular Tasks, Organizational Methods, Scheduling: Putting a Gun to the Head of invention, Production Documents, Factors That Affect Scheduling, Planning the Example Film, Top-level Considerations, Scope of Work, Example Film's Toolset, Feasibility, What Got Cut, Key Methodology Decisions)

3. SCRIPTWRITING: STORY AND CHARACTER THROUGH DIALOGUE

(Studying a Little Eugene O'Neill, Preparation, Background Reference, Outlining the plot, Creating a Back Story, Knowing What Your Character Would Do, Sample biography, Scriptwriting: What Does a Given Phrase Make You Animate?, Character Acting Starts With the Script, Writing Dialogue, Internal Dialogue: Writing Action, Revisions, Writing the Example Film's Script, Fine-Tuning the Dialogue)

4. ART DIRECTION: DESIGNING THE ANIMATION

(Art Direction: Establishing and Aesthetic, Reference Creating Concept Art: Approach: Communicating an Idea. Character Design. Facial Design, Male Facial design Female Body/Costume Design, Male Body/Costume Design, Character's Design drawings, Set Design, Tying Your Aesthetic Elements Together, The Visual Identity)

5. STORYBOARDING: CINEMATIC PLANNING

(The Cinematographer's job Storyboarding: Blocking and Story Progression Character Choreography and Placement Action Dram and Expressions Camera composition and Camera Moves Animators Edit at the Beginning Storyboards Are the Ultimate Planning Tool Drawing the Storyboards Previsualization: Beyond storyboards Animatic Color Script Previsualization Animations Balancing Good planning Without Sacrificing Serendipity Example Storyboards)

6. SOUND: YOUR FILM'S SONIC IDENTITY

(General Notes on Sound: Sound as a Storytelling Tool General Equipment and process Audio Advice From Industry Expert Alan Stuart Character Dialogue: Voice Casting Directing a Dialogue-Recording Session Characters' Recording Session
Alan Stuart on Dialogue Recording, Sound Effects: Basic Sound Effect Techniques Sound Effects for "The Game to Save the World" Music: Working with a Composer or Songwriter, Setting the Tone. Alan Stuart on Sound Effects: Using Existing Music Audio Workflow for Your Animation)

7. LAYOUT: PREPARING THE SCENE

(Back to the Producer's Job: Scene Breakdown and File Creation Organizing with selection Sets and Filters Blocking Movement Previsualization Revisited)

8. FACIAL ANIMATION: KEYFRAMING EXPRESSIONS

(Rigging the Face with Morph Targets: Defining a Set of Morph Targets Modeling Setting Up the Morpher Modifier Facial Animation: Animating the Eyes Animating Facial Expressions Lip-synching Another Approach to Morphing: Muscles)

9. BRINGING THE BACKGROUND TO LIFE

(Secondary animation: 3-D Effects Animation Scatter Compound Objects, Orbiting particle Systems Secondary Animation with the Flex Modifier Final Linking, aming, and Merging Effect: Orbiting Light Trails: Creating Random Oscillations The Appearance of Light Effect: A Flame Made of Bubbling Glass)

10. LIGHTING AND RENDERING: CRAFTING AN ATMOSPHERE

(Choosing a Renderer . The Importance of Lighting in CG: Character Lighting: Three-Point Setup. Character Lighting Within a Scene: Integrating Character and environmental Lighting. Adding Global Illumination and High Dynamic Range Images. How the HDRI Image for Cloud 10 Was Created, Rendering: Environment and Video effects. Effects in the Example Film. Final Rendering Letting Your Computer Work for You.)

11. COMPOSITING AND VIDEO EDITING: FINISHING TOUCHES

(Compositing with Combustion 3: Creating a Videogame Interface Video Editing: simple Editing with Adobe Premiere Video Compression Codecs Getting Your Films Out to the World)

BMG 308 Project
Show reels
Presentation
Project report