3D **II Modeling & Rigging**

College of Marin, Indian Valley Campus, Fall 2015 (Credit/Noncredit)
CSU, Pathway-Career Technical Ed.

Fridays 10:10p– 3:30p; Bldg. 27, Rm. 129
August 22, 2016 - December 10, 2016; Final Exam December 16, 2016 11:10a - 2:00p
Office Hour: Fridays 9:00 - 10:00a IVC/Bldg. 27, Rm. 129
Phone: n/a

INTRODUCTION

Objectives

At the conslusion of this course, the student will have:

1. Improve analysis skills to identify and critique 3D models and animations in movies and games/simulations.
2. Design and develop outlines, concept art, and storyboards for interactive and pre-rendered 3D animation.
3. Model 3D virtual environments, props and characters.
4. Explore rigging principles and create hierarchical rigs for animating models. Bind the model to that rig.
5. Create and accurately map textures onto 3D models.
6. Add photorealistic lighting and atmospherics to existing scenes.
7. Produce renderings of 3D animations for print, online, broadcast, or interactive delivery.
8. Update existing skills on new software releases, use the current release and its new tools to produce animation projects, and bring current modeling and animation skills for use in industry

Student Learning Outcomes

1. Expand existing skills in creating and animating 3D virtual worlds, including the objects and characters that inhabit them.
2. Expand and refine modeling, texturing, and lighting techniques used to produce 3D art assets for delivery in broadcast animation or interactive games/simulations.
3. Create and implement animatiable rigs and bind them to a model.
4. Animate and output these assets as final animations or for use in simulations/games
5. Develop and enhance critical and self-evaluation skills for assessing 3D models and animation
6. Update existing knowledge of general use and production processes found in industries using 3D content
7. Achieve competency with a professional 3D production tool, i.e. Autodesk 3D Studio Max.

Class Guidelines

- You **must** be registered to attend classes, NO EXCEPTIONS.
- Adherence to ALL College of Marin Campus Policies as listed in the 2015-2016 College of Marin Catalog and otherwise as posted on the College of Marin site.
- The dates for adding, dropping, changing to credit/no credit, etc. are listed on the Academic Calendar. It is the student's responsibility to make changes before time expires -- the instructor has no discretion.

3D II Modeling & Rigging

- Be respectful and considerate of all other participants in class. During class you are expected to participate in the lecutre demos. During the lab portion, you may research examples, tutorials, content and techniques related to course materials or your projects. Phone calls, texts, etc. are to be taken or responded to **outside** the classroom.
- When in doubt, attend all sessions and always ASK questions.

Expectations for a High Grade (B or Higher)

- Attend ALL classes, and avoid being late
- Turn in MORE work then is requested for assignments
- Participate in critiques, volunteer CONSTRUCTIVE criticism to classmates
- A minimum of 3-5 hours per week is expected OUTSIDE of class time
- All assignments are due at the BEGINNING of class, unless otherwise noted
- Assignments NOT turned in at beginning of class, will be considered LATE
- Assignments will NOT be accepted after 3 class sessions past the due date
- LATE assignments will be lowered 20% for each class session late
- All work should be FINISHED, not work in progress
- This is a DESIGN class, and you will be graded based upon your creativity

Overview:

3.0 Units. Two lecture hours and three laboratory hours weekly. May be taken once for credit. This course is a full semester course that includes both lectures and hands-on computer lab sessions. The goals are threefold: (1) think like an artist working in 3D; (2) learn the basics of 3ds Max software (students may learn additional 3D software packages on their own with the instructor's permission); and (3) use these skills to create animated 3D content for use in games, film or broadcast or for design-visualization.

This sixteen-session foundation class provides a working knowledge, resources, and learning techniques for Autodesk 3DS Max software. The content presupposes no experience in 3D or with Max. However, presentations will be geared to the skill levels of the students Of all digital content creation tools, 3D software is the most rich, capable, and complex environment available because it incorporates all other art disciplines, i.e. photography, painting, sculpting, theatre, film, dance, athletics, music, game design, architectural or product design, etc. 3D software can create and simulate most objects and their behaviors. It demands the most from artists (and their hardware), and takes the longest to master. Autodesk's 3ds Max is a chosen professional tool for film, broadcast and video productions, for games, for simulations, and for architecture, engineering and product design, and for construction projects. Because it has feet in both media and entertainment (M&E) and in design-visualization (architectural, engineering & construction (AEC) and computer-aided design and manufacturing (CAD/CAM). Since it contains almost all features found in competing 3D packages, Max is well suited for our use. The computers have current versions of Autodesk's Entertainment Creation Suite, which also includes Maya, Motion Builder and Mudbox. Each is a very powerful package optimized for interoperability with Max.

3D applications should be the last digital art software you study. Even though this is a "fundamentals" course, it is designed to leverage any other expertise you have: if you sculpt or paint, modeling and texturing will come more easily. If you paint or are a photographer, lighting will make more sense. If you are a filmmaker or videographer, you'll quickly understand the

software is designed as a virtual film studio and you'll recognize the role of the tool in preparing elements for editing and special effects. If you are a gamer, you'll have a sense of what you'll want your models and animations to do in a real-time environment. The more you bring, the more you take away.

A working understanding of the basic iMac hardware and Windows 7 operating system are required for this course. Class time will not allocated for this, although the instructor is available during breaks for specific questions. Some background in Adobe Photoshop, and any animation tool(s) is recommended, but not required. Each class session will be a combination of lecture-demo and hands-on exercises.

Because of the length of class sessions, the morning is dedicated to lecture-demo and the afternoon for studio lab. ***Be sure to arrive on time for presentations***. The instructor is available during scheduled studio time to work one-on-one, review projects, and answer questions not discussed in lecture; students may use lab facilities anytime the lab is open on the IVC campuses.

The process begins with concept art, script and storyboarding. Then using the software, modeling and texturing, animating (if appropriate), adding lighting and cameras, and rendering or otherwise optimizing for final output.

Skills Recommended For this Course:

Although there are no prerequisites listed for this course, a good foundation in other multimedia software **is strongly advised.** Professional 3D software is the most complex and powerful toolset taught in multimedia -- the more you know going in, the more you will be able to achieve in this course. In particular, students will benefit greatly from a proficiency with Adobe Photoshop, Illustrator, Premiere Pro, and After Effects (of similar features found in competing products. For architectural, engineering or other students in design-visualization, familiarity with Autodesk Revit or AutoCAD will be helpful. Games will be developed using the Unity 3D game engine. Experience with the Unity 3D game engine and scripting in either JavaScript or C# is a plus, but not necessary.

SYLLABUS & OUTLINE

Introduction

1. Why and When 3D Content? Industries, career paths, Application and Integration
2. Context for 3DS Max -- why use 3DS Max? What else is there?
3. The 3D environment -- the "virtual film studio" and workflow basics

Working in the 3D Environment:

1. How 3D works: overview of meshes, textures, lights, animations, particles simulation tools (physics), and rendering (pre-rendered vs. real time), and the relationship of 2D to 3D.
2. The 3DS Max Interface - An Overview
3. Transforming Objects (move, rotate, scale)
4. Navigating the Scene (changing your position in relation to an object)
5. The Importance of Grids and Alligning to Grids
6. Selecting, Grouping, Linking and Arranging Objects
7. Cloning: copies, instances, references
8. **Quick Start:**
    - i. Make and Edit an Object
    - ii. Apply a Texture
    - iii. Add a Light and Camera
    - iv. Animate a Transform

Modeling:

1. 3D Geometry: polygons, patches and NURBS
2. Modeling using modifiers and the modifier stack.
3. Drawing and Modeling with Shapes (Spines) Extrude, Bevel, Lathing, Sweep, Loft, Bevel Profile)
4. Modeling with bitmaps: Displacement modifier (and discussion of displacement and normal maps)
5. Modeling with Compound Objects
6. Box and Low-polygon modeling. the Edit Poly toolset; other modifiers ; the Graphite Tools toolset, techniques and workflows.
7. Combining techniques and optimizing models
8. Discussion: Object paint, Scatter, Instancing using Particle Flow.

Textures and Texture Mapping:

1. Materials, Shaders and Maps
2. Bitmaps vs. Procedural Maps
3. The Material Editor and Its Interfaces (compact vs. slate)
4. Maps, map channels and their functions
5. Compound and Multi-Layered Materials and Maps; Texture Baking
6. Physically-based materials (how are they different)
7. Maps and UVW Mapping Coordinates
8. Unwrapping UV's
9. Discussion only: Transferring hi-res maps to lo-res models (Skinwrap)

Lighting and Cameras:

1. Similarities and Differences from Lighting in the Real World
2. Lighting Types: Direct, Ambient, Accent, Global Illumination, Caustics, HDRI
3. Lighting Setups: 3 Point; Zone: Projectors, Animated Lights
4. 3DS Max Lights: Standard vs. Photometric; Skylights, Daylight System
5. Cameras in Pre-Rendered vs. Real Time 3D; Virtual Cinematography
6. 3DS Max Cameras, Animating Cameras, Virtual Tripods and Cranes
7. Renderer-spcific lights

Introduction to Rigging and Animation:

1. Types of Animation (motion graphics vs animation)
2. Overview and history
3. Keyframe Animation and the Keyframing toolset (Autokey, Set Key, Keyframe editors):
4. Procedural Animation (expressions wiring, scripts, constraints, and controllers) and their tools
5. Deformational Animation (animating with modifiers)
6. Hierarchical Animation (introduction to rigging, animating poses and gestures)
7. Discussion: Biped, CAT, Motion Builder animation systems
8. Related Technologies: Motion Capture (including using Kinect), Performance Capture
9. Lights, Lighting, Cameras and Render Effects.

Rendering:

1. Pre-Rendered Content: Analogy to Photography & Film
2. Realtime/Interactive Rendering: Video Games, Simulations
3. The "Render Setup" Dialog
4. The Renderer: Scanline, ART, Mental Ray, IRay, Quicksilver and 3rd Party (Arnold, V-Ray, Maxwell Render, Final Render, Octane, game-engine renderers such as Unity, Unreal, Stingray, etc.)
5. Renderer-Specific Materials, Lights and Cameras
6. Breaking Up Renderings for Post-Production (**not for interactive content**):
   - Compositing Overview
   - Rendering Layers
   - Render Passes: "Render Elements"
   - Compositing Environments: Autodesk Toxik, Adobe After Effects
   - State Sets

Building Virtual Worlds:

1. Environments - Modeling, Texturing, Lighting
2. Instancing Objects and Props
3. Particle Systems
4. Admospheres, Fogs and Special Effects
5. Camera Animation

To Begin:

First, start by **sending an email to the instructor** using the Student Portal (MyCOM Student Portal)* for MMST 151. Type "MMST 151" in the subject heading, and in the body of the email

type your name (as registered) and provide a preference of how you would like to be addressed (nickname, etc.). This will be used to contact you regarding projects updates, due dates, class sessions as well as general class and school announcements. *If you do not have a login/password for the MyCOM Student Portal THIS is your homework—gain the necessary info and use the MyCOM Portal.

Second, **gather all materials** required for class.
1. Most of the courseware is available at Lynda.com. If you are a resident of Marin County, you have a free subscription available through the Marin County Library. You'll need to obtain a library card. This will provide free access to Lynda.com through Marin.net. Although Marin.net can be accessed free through the COM library, Lynda.com is not part of that subscription. If neither alternative works for you, you will need to purchase a subscription at Lynda.com on a monthly or annual Plan.
2. Download and install 3ds Max 2017 and 3ds Max 2017 Service Pack 2. Optionally, install the most recent version of the Autodesk Entertainment Suite. Autodesk offers its entire line of software **free to students** on a 3 year license at: http://www.autodesk.com/education/free-software/all. 3ds Max 2017 Service Pack 2 can be found at https://knowledge.autodesk.com/support/3ds-max/downloads/caas/downloads/content/3ds-max-2017-service-pack-2.html As an added option, the Adobe Creative Cloud is available at a student-discounted subscription through the Foundation for Community Colleges portal at: http://www.journeyed.com/go/index/fccc

Attendence, class procedures and recommendations:
- Consistent class attendance and communication with the instructor has proved to be important to students' success in this course.
- Your focused attention during class on the presentations and content is critical to your success. This applies regardless of your skill level or whether you understand what is being presented. Because the class contains beginning and intermediate students, it's expected you may be either bored or lost at times. On those occasions, accept the content as either a review of what you should know or as something that can be done which you will appreciate later.
- The most successful experience results from open sharing and cooperation -- make an effort to find solutions for yourself and for your classmates. This is because most concepts, materials and assignments are provided during lecture, and this content varies with the experience and skill of the class. Usually there are multiple solutions for any task. It works both ways: the sources and works in progress students bring often become an important part of class content, in part because it is current and relevent, and in part because it usually means something and that speeds learning. 3D art and animation generally is a collaborative art form, and the class experience builds these skills.
- Lecture-demos are performed twice -- first for a quick overview of technique and rhythm, and a second time for everyone to perform the task. Although you'll be tempted to jump in on the first pass, don't. Just watch. Then ask questions. Then on the second pass, try it for yourself.
- We will be using **3ds Max**. For your projects you may choose different software, subject to two restrictions: (1) the package must contain the capabilities found in 3ds Max covered in class, and (2) you are responsible for learning the concepts presented in class and for translating it to that package. With very few exceptions, experience shows that beginning students who opt to do classwork and projects in another package achieved less than if they had worked in Max. This is because the extra effort required to translate between two software packages reduced their available time to learn techniques. The

exception is where a student had prior working knowledge of the other software - for them finding comparable features in their package required less effort.

Grading:

GRADING PERCENTAGE of FINAL GRADE						
Order 1	Order 2	Order 3	Order 4	Order 5	Order 6	Participation
15%	15%	15%	10%	10%	20%	15%

LETTER GRADES										
F	D	D+	C	C+	B-	B	B+	A-	A
0-62	63-65	66-72	73-75	76-79	80-82	83-85	86-89	90-94	95+

Class Guidelines
- You **must** be registered to attend classes, NO EXCEPTIONS.
- Adherence to ALL College of Marin Campus Policies as listed in the current
  Schedule of Classes and 2016-2017 College of Marin Catalog
- Be respectful and considerate of all other participants in class
- When in doubt, attend all sessions and always ASK questions

Expectations for a High Grade (B or Higher)

- Complete all Job Orders on time
- Attend ALL classes, and avoid being late
- Participate in critiques/discussions, volunteer CONSTRUCTIVE criticism to classmates
- A minimum of 5-10 hours per week is expected OUTSIDE of class time. All assignments are due at the BEGINNING of class, unless otherwise noted
- Assignments NOT turned in at beginning of class, will be considered LATE
- LATE assignments will be lowered for each class session late
- All work should be FINISHED, not work in progress
- This is both a DESIGN and a PROJECT class -- you will be graded based upon (1) timely completion of the job orders and production of a functioning game, and (2) the creativity brought to the design.

Required Materials

1. Access to a computer outside of class time with 3ds Max (or equivalent) and related software installed.
2. Internet Access for viewing online training materials, communicating and sharing files.
3. Lynda.com free subscription available to residents of Marin County with a library card; if not, monthly standard subscription.
4. A portable hard drive (recommended) or USB Thumb drive (Windows compatible).

Recommended Textbooks & Materials

In-class presentations will follow many presentations in the videos below. This allows you to re-visit the techniques and files out of class as often as needed to practice and replicate techniques shown in class.

Online Courses through Lynda.com (http://www.lynda.com)

3ds Max 2017 New Features with Aaron F. Ross
3ds Max 2017 Essential Training with Aaron F. Ross
3ds Max for Design Visualization with Scott Onstott
Rendering for Composites inside 3ds Max with Joel Bradley
Up and Running with mental ray in 3ds Max with Brian Bradley
Mastering UVW Mapping in 3ds Max with Joel Bradley
Modeling a Character in 3ds Max with Ryan Kittleson
Character Rigging in 3ds Max with George Maestri
Getting Started with CAT Rigging Tools in 3ds Max with Joel Bradley
Character Animation Fundamentals in 3ds Max with George Maestri
Many Texture and Rendering Courses by Adam Crespi

3ds Max Learning Channel: https://www.youtube.com/user/3dsMaxHowTos

Courses are arranged into playlists and range from two to 40+ videos. Each playlist includes the exercise files. These are published by the Autodesk 3ds Max team and are of excellent quality.

JOB ORDERS		
Job Order 1	Model furniture using primitives and modifiers	DUE: 09/09/16
Job Order 2a	Spline Modeling - scene objects from splines. Lathe, Sweep, Lofting	DUE: 09/16/16
Job Order 2b	Polygonal Modeling - model a vehicle	DUE: 10/07/16
Job Order 3	Polygonal Modeling - model a character	DUE: 10/21/16
Job Order 4a	Prepare and apply textures to models from Jobs 1, 2a	DUE: 11/04/16
Job Order 4b	Prepare and apply textures to model from Job 3, 2b. Build a first-draft rig and bind it to the character created in Job Order 3 using either a pre-made animation system or custom rig of your creation	DUE: 11/18/16
Job Order 5	Refine and finalize the rigging from Job 4b. Set up lights, cameras and render an interior scene populated with objects from Jobs 4a, 4b	DUE: 12/05/16
Final Project Job Order 6	Animate objects and/or character, lights, and/or cameras moving in the scene created in Job 5.	DUE: 12/16/16

Projects:

In addition to the Job Orders, Students are responsible for two projects during the term, the mid-term and the final. All projects are due on or before the Due Date below. Ifyou are unable to present or turn in your projects on these dates, you may turn it in earlier. No extensions or incompletes will be given. Projects and Job Orders are the primary consideration for your grade. If a grade is borderline, Attendance and class participation will be determinative. You are responsible to make sure your project is delivered in a format and on media compatible with the equipment in the lecture hall. (a portable or flash drive is the common means, or file delivery via Dropbox.)

Project Content & Due Dates		
No.	Due Date:	Description:
1	October 21, 2016 (Midterm)	Midterm: Archived MAX project file and completed, rendered scene with final lighting and camera.
2	December 16, 2016 5 (Final)	Completed, rendered scene with final animation, lighting and camera.

Final Project:

1. You may choose your content for the midterm and final projects, so long as they make use of the techniques covered in the presentations and delivery meets the requirements listed below.
2. Project renders shall be as a single-frame sequence at either 1280 x 1024(SD) or 1280 x 720 (HD, preferred) pixels. In addition, the 3ds Max working files shall be submitted as a 3ds Max Archive.

3. All required working, archived project and rendered files are to be turned in on a <u>Portable or Flash Drive, Dropbox or other Pre-Approved Delivery Medium:</u>
   a. All paper documents, artwork etc., shall be scanned to PDF files and included with the submission. Do not submit original documents or images on paper.
4. <u>Documentation:</u> <u>Digital scans of</u> all 6 signed Job Orders, storyboards, drawings, design/tech docs, bug reports and homework assignments are to be handed in inside a labeled folder with your name. In the readme.txt, <u>provide written per</u>mission for instructor to show your work to others. Instructor may then show you work and/or display online.
   If you work in a team, each person is **required to hand in** one digital copy containing all work by the team. <u>This is NOT just one submission for the whole team.</u> The instructor with keep the submissions.

Note: The F<u>i**nal pres**</u>**entation wi**ll start promptly at 11:10a, December 16, 2016. All digital conten<u>t and folders are to be placed on instructor's desk </u>at the start of class. **Arrival during the presentations will constitute a late project** and lower the final project grad<u>e</u>. **Projects will NOT be accepted after presentations are completed** on December 16, 2016, and will receive 0 (zero) credit for the final project – **no exceptions!**

MMST 151 CLASS SCHEDULE		
Week 1 **Aug 26**		Overview of class objective, expectations, and procedures. Background, Tools and Training Materials recommended for this course Discussion: Role of 3D generally, 3ds Max in particular Introduction to 3ds Max interface, first scene.
Week 2 **Sept 2**		Delving deeper into the 3ds Max interface, settings, etc. Modeling with primitives and modifiers. 3ds Max 2016 MCG and its future
Week 3 **Sept 9**		**Job Order No. 1 due.** Modeling with primitives and Modifiers, cont. Review splines and spline modeling. Lathing, Sweeps, Lofts.
Week 4 **Sept 16**		**Job Order No. 2a due.** Review Box Modeling. First look at the Ribbon and Graphite Toolset.
Week 5 **Sept 23**		Introduction to Low Poly modeling.
Week 6 **Sept 30**		Low Poly modeling (con't.), the Graphite Toolset.
Week 7 **Oct 7**		**Job Order No. 2b due.** Low Poly modeling (con't.), the Graphite Toolset.
Week 8 **Oct 14**		Low Poly modeling (con't.), the Graphite Toolset. Introduction: Shaders, Materials, Maps
Week 9 **Oct 21**		MIDTERM PROJECTS DUE Critique and Review
Week 10 **Oct 28**		**Job Order No. 3 due.** Shaders, Materials, Maps
Week 11 **Nov 4**		**Job Order No. 4a due.** Introduction UVW Mapping issues and techniques.
Week 12 **Nov 11**		**HOLIDAY - CAMPUS CLOSED**
Week 13 **Nov 18**		**Job Order No. 4b due** Introduction Lights, Cameras, Rendering
Week 14 **Nov 25**		**HOLIDAY - CAMPUS CLOSED**
Week 15 **Dec 2**		**Job Order No. 5 due** Introduction: Animation tools and techniques
Week 16 **Dec 9**		Animation tools and techniques (con't)
Week 17 **Dec 16**		**FINAL DUE: Friday, December 11th at 11:10 am—sharp!** **Job Order No. 6b due**. Final project presentation and critique. Present and turn in FINISHED project. Any project received after class begins will be considered late. **No projects accepted after 2:00 pm.**