COLEMAN UNIVERSITY

San Diego, CA

COURSE SYLLABUS

DSN 433 MEL SCRIPTING IN MAYA

COURSE DESCRIPTION

This course covers MEL scripting with a character rigging focus. Intended for the intermediate 3D artist who is interested in enhancing the 3D production process in Maya. The course will cover each major rigging task in the Maya interface, and covers how to efficiently code the same task using MEL. In the process, the course focuses on creation of a character to rig, creating skeletons and icons, parent's nodes into a hierarchy, connect constraint channels, and deform a skin model.

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GENERAL COURSE INFORMATION

Number of Credits/Units	4
Course Length in Weeks	10
# Hours Lecture/ Laboratory/ Homework	30/20/60
Prerequisites	None
Course Developer(s)	T.Vasquez
Date Approved: Curriculum Development	June 2011 / December 2012

LEARNING OBJECTIVES

Upon completion of this course, you should be able to:

- Understand the process to create proper character modeling and Rigs
- Understand Scripting in MEL
- Basic IK biped rigs
- Understand the advance Rig Controls
- Scripting an advance Character GUI

INSTRUCTIONAL METHODS EMPLOYED IN THIS COURSE

A number of instructional/learning methods are employed in this course, including the following:

- Lecture
- Reading
- Exercises
- Labs
- Projects

INFORMATION RESOURCES FOR THIS COURSE

Textbook

Maraffi, Chris (2009). *MEL Scripting a Character Rig in Maya.* New Riders, ISBN-13: 978-0321383532

Other Materials

Autodesk 3DS Max
Adobe Photoshop
Adobe Illustrator

Web Site Readings

POLYEXTRUDE http://www.polyextrude.com/tutorials/MelScripting/index.html
CG SOCIETY http://forums.cgsociety.org/forumdisplay.php?f=89
AREA http://area.autodesk.com/
SIMPLY MAYA http://simplymaya.com

WEEK	***TOPIC***	***READING***	***WORK ASSIGNED***
1	User Interface Introduction		**Project:** Structure Model, 4 hours **Evaluation:** 5 points **Final Project:** Adv. Character Rig 20 hours **Evaluation:** graded, 20 points

2	Mechanical Modeling		**Project:** Mechanical/Tex Model, 5 hours **Evaluation:** 5 points
3	Character Modeling	Chapter 1	**Read:** MEL CH 1 38 pages 3.8 hours **CH1 Exercise:** 2 Hours **Evaluation:** 5 points **Project:** Char Modeling, 7 hours **Evaluation:** 5 points
4	Rig a Character	Chapter 2	**Read:** MEL CH 2 69 pages 6.9 hours **CH 2 Exercise:** 2.5 Hours **Evaluation:** 5 points **Project:** Basic FK rig, 5 hours **Evaluation:** 5 points
5	Scripting in MEL	Chapter 3	**Read:** MEL CH 3 40 pages 4 hours **CH 3 Exercise:** 3 Hours **Evaluation:** 5 points **Project:** Biped Rig, 6 hours **Evaluation:** 5 points

6	Basic Script for IK Rig	Chapter 4	**Read:** MEL CH 4 42 pages 4.2 hours **CH 4 Exercise :** 2 Hours **Evaluation:** 5 points **Project:** Scripting Basic IK, 8 hours **Evaluation:** 5 points
7	Advance Rig Control	Chapter 5	**Read:** MEL CH 5 25 pages 2.5 hours **CH 5 Exercise:** 2 Hours **Evaluation:** 5 points **Project:** Adv. Limb Script, 6 hours **Evaluation:** 5 points
8	Finish the IK Rig	Chapter 6	**Read:** MEL CH 6 20 pages 2 hours **Project:** Skin Deformation, 5 hours **Evaluation:** 5 points
9	Advance Character GUI		**Project:** Script Adv. GUI, 4 hours **Evaluation:** 5 points
10	Final Project Presentation		

Hours Breakdown

23	Total hours of reading required
8	Total hours of chapter/discussion questions
60	Total project hours (70 hours – 10 hours lab)
91	Total hours of out-of-class activities

COURSE OUTLINE

Chapter 1: Starting to Rig a Character
This chapter gets you started on rigging a character by introducing you to the character rigging process, and teaching you how to create and edit skeletons. It also discusses some of the trends in the character rigging profession, as well as the main goals and responsibilities of a rigging artist.

Chapter 2: Learning to Script in MEL
The fundamental techniques of MEL scripting are introduced in this chapter. You learn how to find useful MEL commands in Maya, and how to specify options through flags and arguments. The chapter introduces other essential coding techniques, such as variables, loops, and procedures. These techniques are then applied to begin scripting the rigging process.

Chapter 3: Scripting a Basic IK Biped Rig
This chapter shows you how to build a basic biped rig in both the interface and through MEL scripts. Interface techniques include creating icons, parenting nodes, and constraining channels. Scripting techniques include creating procedures that create all the rig controls, and process the data so it is available to the advanced scripts.

Chapter 4: Adding Advanced Rig Controls
Here you'll learn advanced rigging techniques that involve creating and connecting channels on the icons to drive every control in the rig. You also learn how to create sophisticated controls on the limbs and torso, including a spline IK backbone. The chapter explains each technique in the interface, and then examines it in MEL.

Chapter 5: Finishing the IK Biped Rig
This chapter teaches you how to finish the rigging process by assigning the advanced rig to the skin model with a smooth bind. It shows you additional skin deformation techniques, such as binding a proxy skin to simplify the weighting tasks and using blend shapes to create facial morphing. Much of the binding process, and even some of the skin weighting, is also done through MEL scripts.

Chapter 6: Scripting an Advanced Character GUI
The final chapter shows you how to MEL script advanced character GUIs (graphical user interfaces) that are custom-designed for animation. You learn how to incorporate images, buttons, fields, sliders, and views into a multi-panel window in Maya. This GUI streamlines and enhances the advanced rig controls, all through MEL.

CLASS ASSIGNMENTS:

Week One: Exercise 0.1	Introduction to the UI	Handout
Week Two: Exercise 0.2	Mechanical Modeling	Handout

Week Three:	Exercise 0.3	Character Modeling	Handout
	Exercise 0.4	Character Texture	Handout
	Exercise 0.5	Character Animation	Handout
Week Four:	Exercise 1.1	Basic FK Biped Rig	PG.40-51
Week Five:	Exercise 2.1	Beginning the Biped Rig	PG.124-139
Week Six:	Exercise 3.1	Examining the Skeleton	PG.151-160
	Exercise 3.2	Scripting the Icons for the Biped Rig	PG.163-172
	Exercise 3.3	Scripting a Basic IK Rig	PG.182-189
Week Seven:	Exercise 4.1	Examining the Advance Limp Script	PG.214-228
	Exercise 4.2	Scripting the Advance Head & Torso	PG.242-253
Week Eight:	Exercise 5.1	Scripting Skin Deformations	PG.281-289
Week Nine:	Exercise 6.1	Scripting the Advance GUI	PG.312-331

Chart 1.1

DSN443 Mel Scripting In Maya					
Review/Projects/Final	Week Assigned	Week Due	Possible Points	Papa Points	Papa Bear Codes
Structure Modeling	1	2	5	5	200
Mechanical/Texture Modeling	2	3	5	5	200
Character Modeling	3	4	5	5	200
Chapter One HW (Read and Pg.16-39)	3	4	5	5	500
Basic FK Biped Rig	4	5	5	5	300
Chapter Two HW (Read and Pg.86-94)	4	5	5	5	500
Biped Rig	5	6	5	5	300
Chapter Three HW (Read and Pg.142-150)	5	6	5	5	500
Scripting Basic IK Rig 3.1-3.3	6	7	5	5	300
Chapter Four HW (Read and Pg.193-211)	6	7	5	5	500
Adv. Limb Script 4.1-4.2	7	8	5	5	400
Chapter Five HW (Read and Pg.260 - 280)	7	8	5	5	500
Script Skin Deformations	8	9	5	5	400
Chapter Six HW (Read)	8				
Script Adv. GUI	9	10	5	5	400
Final Character Model and Rig Project	1	10	20	20	600
Participation (Projects, Homework, and Class)			10	10	700
Totals			100	100	

HOMEWORK:

Week 3
Chapter One: Read and complete the walk thru that starts on page 16-39

Week 4
Chapter Two: Read and complete the walk thru that starts on page 86-94

Week 5
Chapter Three: Read and complete the walk thru that starts on page 142-150

Week 6
Chapter Four: Read and complete the walk thru that starts on page 193-211

Week 7
Chapter Five: Read and complete the walk thru that starts on page 260-280

Week 8
Chapter Six: Read

PROJECT:

Now that you have completed all the exercises its time to create your final project which you will design, model, and texture a character of your own to rig an animate.

Begin with the design

- Draw at least 7 expression models. Expression models are poses which communicate a feeling. Make the manner in which your character expresses feeling clear, but consistent with the personality of your character.
    - DO NOT DRAW 7 HEADS!
        - Draw the ENTIRE FIGURE.
        - Capture the feeling of the expression in the gesture.
        - Render the drawings.
- Draw a front and side orthographic representation of your character.
    - Convey NO expression in this drawing-keep the attitude neutral.
    - Draw the arms out to the sides and slightly down.
    - Slight bend in the knees and elbows.
- Prepare the drawings digitally to be used as reference drawings (registered to each other, scanned, etc).

Model the character

- Model the character beginning with NURBS, following through with Polygons expressed as a SubDivision final model.

Texture

- Unwrap the UV data.
- Paint a reference texture.
- Create and apply textures to the character.

Rig the character

- Construct the skeleton.

Script the Advance Character UI

- Skin the character to the skeleton.
- Model the Blend Shapes.
- Build the control system.

Animate the character

- Animate the character speaking a line of dialogue.

Chart 1.2

Criteria	4 Points	3 Points	2 Points	1-0 Points
Storyboard/Concept	Completed stroyboard which includes key shots. Concept art has multiple poses and facial animations	Strong stroyboard which includes key shots. Concept art has multiple poses and facial animations	Stroydoard not appropriate did not include key shots. Concept art has very few poses and facial animation	No or very little detail in the stroyboard. Concept art has very little to no pose examples and facial animation
File Management	Object have been named. Scene organized in layers. Project folder has been created	Some objects have been named. All objects are organized in layers. Project folder has been set	No object named. Some objects are in layers project folder has not been set	No objects named. No objects organzed in layers. No project folder set
Character Model	The character model is fully developed with Texture,Rig, skinning, scripting, and a advance GUI system for animation	The character model is fully developed but missing one - two of the following: Texture, Rig, skinning, scripting, and a advance GUI system for animation	The character model is Partially developed but missing two - three of the following: Texture, Rig, skinning, scripting, and a advance GUI system for animation	The character is partially developed and missing four – five of the following: Texture, Rig, skinning, scripting, and a advance GUI system for animation
Script	The script is exceptionally well organized and very easy to follow	The script is fairly easy to read	The script is readable only by someone who knows what it is supposed to be doing	The script is not organized for readability
Presentation	All project parameters have been meet and exceeded, showing an expert facility, with emphasis on creative artistic presentation	All project parameters defined. Somewhat creative showing intermediate facility with presentation content	Most projects parameters meet. Show beginning prificiency with presentation content. Not creative	Does not meet requirements for project parameters
Total	(20 pts possible)		Points will be deducted for late work.	

Your Grades for this Course

Your final grade for this course will be based on an assessment by the Instructor of your performance on a number of course activities, which may include objective tests, classroom exercises, laboratory demonstrations, project papers, or other types of activities. The chart below indicates in what activities you will engage, how many possible points can be earned for each activity, and the percentage of your final grade that will be accounted for by each activity.

Students in this course should be graded following Coleman University assessment practices and policies. A point system is used in the University to indicate student performance on various required activities or projects. For this course, it is recommended that points be distributed as follows:

Coleman University Grade Assignment Policy:

Percent	Letter Grade	Grade Points
94-100	A	4
90-93	A-	3.67
87-89	B+	3.33
84-86	B	3
80-83	B-	2.67
77-79	C+	2.33
74-76	C	2
70-73	C-	1.67
67-69	D+	1.33
64-66	D	1
60-63	D-	0.67
N/A	INC	0
N/A	W	0
60 or above	CR	0
59 or below	NC	0
N/A	I	0
N/A	W	0
N/A	AU	0
N/A	TR	0
N/A	WV	0

Legend	
CR = Credit	NC = No Credit
I = Incomplete	W = Course Withdrawal
AU = Audit	TR = Transfer Credit

WV = Waiver	

Academic Accommodation / Adjustment Policy:

In accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA), Coleman University offers accommodations to students with documented physical, psychological, and/or cognitive disabilities. Coleman University will adhere to all applicable federal, state, and local laws, regulations, and guidelines with respect to providing reasonable accommodations as required to offer equal educational opportunities to qualified disabled individuals.

To qualify for an academic accommodation under ADA, the student must provide adequate documentation of a disability. Students seeking academic accommodations should contact the campus ADA Coordinator at 858-966-3953 or via email at ada@coleman.edu. The ADA Coordinator will review the documentation provided and verify ADA coverage. Students covered under ADA must meet with the ADA Coordinator at the beginning of every term to determine the appropriate academic accommodations. Failing to meet with the ADA Coordinator at the beginning of every term may impact the availability of accommodations.

After the academic accommodations have been determined, the students' instructors will be notified by the ADA Coordinator. If any problems or concerns regarding the provision of accommodations occur, the student must inform the ADA Coordinator. If the student feels accommodation is not being made appropriately, the student may follow the published Student Grievance Procedures.

Maya Keyboard Shortcuts

Tool Commands	
Return	Complete Current Tool
~	Abort Current Tool
Insert	Enter Tool Edit Mode
Shift Menu+q	Select Tool
Shift Menu+q+LMB	Component Marking
Alt+q	Select Tool
Alt+q+LMB	Polygon Marking Tool
q+LMB	Mask Marking Tool
w	Move Tool
w+LMB	Move Tool Marking Menu
e	Rotate Tool
e+LMB	Rotate Tool Marking Menu
r	Scale Tool
r+LMB	Scale Tool Marking Menu
t	Show Manipulator Tool
'	Select Last Used Tool (Excluding Select, Move, Rotate, and Scale)
j	Snap Move, Rotate, Scale Tool
(= or +)	Increase Manipulator Size
-	Decrease Manipulator Size
Animation Commands	
s	Animate > Set Key
i	Insert Keys Tool (For Graph Editor)
Shift+s+LMB	Keyframe Marking Menu
Shift+s+MMB	Tangent Marking Menu
Shift+e	Set Key For Rotate
Shift+r	Set Key For Scale
Shift+w	Set Key For Translate
Alt+s	Cycle Handle Stiky State (For Ik Handles)
Hotbox Display	
Space	Hotbox
Alt+m	Default Hotbox Style (Zones and Menus Row)
Window & View Commands	
Ctrl+a	Toggle Attribute Editor And Channel Box
a	Frame All In Active Panel
a+LMB	History Operations Marking Menu
Shift+a	Frame All In All View
f	Frame Select In Active Panel
Shift+f	Frame Selected In All Views
]	Redo View Change
[	Undo View Change
'	Set Keyboard Focus To Command Line
Alt+'	Set Keyboard Focus To Numeric Input Line
F1	Help > Contents And Search
Moving Selected Objects	
Alt+Up Arrow	Move Up One Pixel
Alt+Down Arrow	Move Down One Pixel
Alt+Left Arrow	Move Left One Pixel
Alt+Right Arrow	Move Right One Pixel

Maya Keyboard Shortcuts

Traversing The Hierarchy	
Up Arrow	Walk Up The Current Hierarchy
Down Arrow	Walk Down The Current Hierarchy
Left Arrow	Walk Left Current Hierarchy
Right Arrow	
Modeling Commands	
Ctrl+Up Arrow	Display Coaser Sub-Division Level
Ctrl+Down Arrow	Select/Refine Sub-Division Component
Ctrl+F9	Convert Poly Selection To Verticies
Ctrl+F10	Convert Poly Selection To Edges
Ctrl+F11	Convert Poly Selection To Faces
Ctrl+F12	Convert Poly Selection To UV's
File Commands	
Ctrl+n	File > New Scene
Ctrl+o	File > Open Scene
Ctrl+s	File > Save Scene
Ctrl+q	File > Exit
Selecting Menus	
Ctrl+m	Show/Hide Main Menu Bar
Shift+m	Show/Hide Panel Menu Bar
h+LMB	Menu Set Marking Menu
F2	Show Animation Menu Set
F3	Show Modeling Menu Set
F4	Show Dynamics Menu Set
F5	Show Rendering Menu Set
Edit Operations	
z or Ctrl+z	Edit > Undo
Shift+z	Edit > Redo
g	Edit > Repeat
Shift+g	Repeat Command At Mouse Position
Ctrl+d	Edit > Duplicate
Shift+d	Edit Duplicate With Transform
Ctrl+g	Edit > Group
p	Edit > Parent
Shift+p	Edit > Unparent
Ctrl+x	Edit > Cut
Ctrl+c	Edit > Copy
Ctrl+v	Edit > Paste
Selecting Objects & Components	
F8	Switching Between Object and Component Editing
F9	Select Polygon and Subdivision Surface Vertices
F10	Select Polygon and Subdivision Surface Edges
F11	Select Polygon and Subdivision Surface Faces
F12	Select Polygon and Subdivision Surface UV's
Ctrl+i	Select Next Intermediate Object
Alt+F9	Select Polygon Vertex/Faces
<	Shrink Polygon Selection Region
>	Grow Polygon Selection Region

Maya Keyboard Shortcuts

Display	
4	Shading > Wireframe
5	Shaded Display
6	Shaded and Textured Display
7	Lighting > Use All Lights
d+LMB	Display Quality Marking Menu
1	Low Quality Display Setting
2	Medium Quality Display Setting
3	High Quality Display Setting
Playback Control	
Alt+	Move Forward One Frame
Alt+(Comma)	Move Backward One Frame
.	Go To Next Key
(Comma)	Go To Previous Key
Alt+v	Turn Playback On/Off
Alt+Shift+v	Go To Min Frame
Snapping Commands	
c	Snap To Curves
x	Snap To Grids
v	Snap To Points
j	Move, Rotate, Scale Tool Snapping
Shift+j	Move, Rotate, Scale Tool Relative Snapping
Painting Commands	
Alt+f	Flood With Current Value
Alt+a	Turn Show Wireframe On/Off
Alt+c	Turn Color Feedback On/Off
Alt+r	Toggle Reflections On/Off
u+LBM	Artisan Paint Operation Marking Menu
b	Modify Upper Brush Radius
Shift+b	Modify Lower Brush Radius
Ctrl+b	Edit Paint Effects Template Brush Settings
i	Modify Artisan Brush Stamp Depth
m	Modify Max Displacement (Of Sculpt Surfaces and Sculpt Polygon Tools)
n	Modify Value
/	Switch To Pick Colour Mode
'	Select Cluster Mode (Of Paint Weights Tool)
8	Open Paint Effects Panel
o+LMB	Poly Brush Tool Marking Menu
o+MMB	Poly UV Marking Menu
Tumble, Track, Dolly	
Alt+LMB	Tumble Tool
Alt+MMB	Track Tool
Alt+RMB	Dolly Tool
Objects Show/Hide	
Ctrl+h	Display > Hide > Hide Selection
Ctrl+Shift+h	Display > Show > Show Last Hidden
Alt+h	Display > Hide > Hide Unselected Objects
Shift+i	Show > Isolated Select > View Selected