The Art Institute of California – San Francisco
Course Syllabus

Course Number: GA3311
Course Title: Material and Lighting

Class Meetings: Mondays from 1-5pm in room 401 1170 Market
NO CLASS WEEK 9 FOR MEMORIAL DAY
Session/Year: Spring 2010
Instructor Name: Andrew Klein
Email Address: amklein@aii.edu,
Phone: not available
Website: www.kleinmakelearngood.com (has all the course notes)
Instructor Availability Outside of Class:
-1 tutoring hour per week, first come first serve: Tuesdays from 5-6pm in room 401. Reserve via email.
-Starting in week 3, 1 hour weekly lecture series "Why Don't You Know This, Season 2" in room 401, open to all students Noon-1pm. See posters around school for weekly topics.

Material & Lighting

Course Description:
In this class, students will be introduced to materials, textures and lighting strategies to add detail and realism to objects without adding complexity to the model. Students will simulate real world surfaces containing reflection radiosity and other effects.

Course Length:	11 Weeks
Contact Hours:	44 Hours
Lecture:	22 Hours per week
Lab:	22 Hours per week
Credit Values:	3 Credits

Course Competencies:
Upon successful completion of this course, the student should be able to:
- Apply traditional paint concepts, tools, and techniques for use in computer animation.
  - *Create textures through the use of digital cameras and scanners.*
  - *Use advanced painting techniques such as smudge, burn, clone, and fractals to create complex textures.*
- Develop critical ideas for surface treatment, lighting, and motion of 3D models.
  - *Demonstrate the rules of surfacing 3D images.*
  - *Use multiple image map types on a 3D model.*
  - *Demonstrate the use of local vs. global lighting.*

  - *Execute the lighting of a complex scene with coverage from pre-production to teardown.*
  - *Use textures and mapping to conceal low polygon count.*
- Analyze and evaluate and apply texture mapping strategies.
  - *Understand and apply UVW mapping coordinates.*
  - *Use image manipulation software to create tile able, color-limited maps.*
  - *Use layered image maps for realistic and industrial texturing.*
  - *Understand bitmap and procedural textures and the applications of each.*
  - *Paint organic creature textures.*
  - *Paint character accessories.*
  - *Paint natural textures.*
  - *Paint displacement textures.*
  - *Paint light gels.*
  - *Correlate real light with the computer rendition of light*
  - *Demonstrate the use of reflective lighting.*
  - *Lighting for live action vs. 2D and 3D back plates.*

Course Prerequisite(s): MA1134 Principles of 3D Modeling

Text(s): *Digital Lighting and Rendering*, by Jeremy Birn, Pearson Education (2000) ISBN: 1562059548
Digital Texturing & Painting, by Owen Demers; Pearson Education (2001) ISBN: 0735709181

Materials and Supplies: Note taking material, blank CDs or CDR.

Estimated Homework Hours: 4-6 hours per week.

Technology Needed: PC, Maya, PhotoShop, Wacom tablet

Grading Scale:
All assignments must have clear criteria and objectives to meet. All students shall be treated equitably. It will be that student's right to know his/her grade at any reasonable point that information is requested by that student. The criteria for determining a student's grade shall be as follows (on a percentage of total points basis):

A	100-93
A-	92-90
B+	89-87
B	86-83
B-	82-80
C+	79-77
C	76-73

C-	72-70
D+	69-67
D	66-65
F	64 or below

Process for Evaluation:

Attendance and Participation	10%
Weekly Assignments and Exercises	80%
Mid-Term Quiz	10%

FOR A MORE COMPLETE LOOK, VISIT:
http://www.andrewklein.net/bh/materials.html

Student Evaluation/Grading Policies:

- Class time will be spent in a productive manner.
- Grading will be done on a point system.
- Points for individual activities will be announced.
- All work must be received by the set deadlines.
- ABSOLUTELY NO WORK WILL BE ACCEPTED AFTER THE FINAL CLASS MEETS WEEK 11.

Classroom Policy:

- No food allowed in class or lab at any time. Drinks in sealable bottles allowed in classroom.
- Edible items brought to class or lab must be thrown out.
- If student elects to eat/drink outside class or lab door, missed time is recorded as absent.
- Attendance is taken hourly. Tardiness or absence is recorded in 15-minute increments.
- Break times are scheduled by the instructor at appropriate intervals.
- No private software is to be brought to lab or loaded onto school computers.
- No software games are allowed in lab (unless in course curriculum).
- Headphones are required if listening to music during lab. No headphones are allowed in lecture.
- Any student who has special needs that may affect his or her performance in this class is asked to identify his/her needs to the instructor in private by the end of the first day of class. Any resulting class performance problems that may arise for those who do not identify their needs will not receive any special grading considerations.

Disability Policy Statement:

It is our policy not to discriminate against qualified students with documented disabilities in its educational programs, activities, or services. If you have a disability-related need for adjustments or other accommodations in this class, contact the Disabilities Services Coordinator at 415-276-1060.

Academic Honesty Policy:

Students are expected to maintain the highest standards of academic honesty while pursuing their studies at AiCA-SF. Academic dishonesty includes but is not limited to: plagiarism and cheating; misuse of academic resources or facilities; and misuse of computer software, data, equipment or networks.

Student work that appears to violate AiCA-SF's standards of academic honesty will be reviewed by the Committee on Academic Honesty. If the work is judged to have violated standards of academic honesty, appropriate sanctions will be given. Sanctions include but are not limited to course failure and academic termination.

Suggested Course Outline

Week 1: Lecture: Introduction to mapping and materials. Diffusion-Gloss-Specularity-Reflection. Basic Maya materials, Texture files size issues, and an Introductionn to thehypershade window. We will also discuss the different channels in a material which can be alteredand mapped.

Lab: Apply appropriate materials to the provided Glass Cup and Book, and then apply texture maps to the already UV'd book by scanning or taking photos of a real book, or bydrawing realistic textures in photoshop. Use the Render Current Frame option in maya to save out an image of your work from the Rendering Camera that is already set up. Do not adjust the position of the Rendering Camera, the lights, or the objects.

Homework: Complete the Cup and book project to be turned in, in week 2.

Week 2: Lecture: Creating UVs. We will look at how to create and layout UVs for various objects using different projection methods, and UVlayout tools. Projecting UV maps,Utilizing the UV texture editor texture mapping simple objects.

Lab: We will play the UV mapping game from planarity.net. We will also begin work on unrwrapping all of the objects in the Alleyway scene.

Homework: Using the Alleyway scene provided, first model 3 new objects that seem fit for the scene and personalize the space. Next it will be up to you to apply UVs to all ofthe object in the scene so as to minimize distortion of the ramp-grid texture which has been applied to individual materials coresponding to individual objects. You will need to create 3 new materials for your 3 new objects as well. Using the Camera provided, and without adjusting it's position or the position of the ambient light, render out an image. You will submit this image as well as your .MA file for week 3.

Week 3: Lecture: Light and Shadow, Creating and Adjusting lights. We will talk about different types of light, color and intensity functions, as well as decay and shadows. We will discuss the differences between raytrace and depth map

shadows, as well as introduce the concept of per-vertex versus per pixel shading. We will also look at light linking, and creating volumetric fog.

Lab: We will go over how to add lights to our Alleyway scene, and how to add shadows and fog to these lights.

Homework: Using the already Uv'd Alleyway from last week, alter the material attributes for each object, remove the ramp-grid texture from the color slot, and apply apropriate lighting to the scene to simulate both night time light, and daylight (make sure to delete the ambiet light already in place). Render out TWO images to be turned in on week 4.

Week 4: Lecture: Texturing in Photoshop, Camearas, and More UV information. We will discuss how to create seamlessly tiling textures in Photoshop, how to define a custom brush shape, and how to use these in our materials. We will also look at setting up and defining cameras, using lens properties and Depth of Field. Finally, we will discuss how to transfer UVs from one object to another.

Lab: Altering Cameras, and Transferring UVs

Homework: Texture all of the objects in your alleyway scene, producing color channels for each object, and bump maps where appropriate. Adjust values for your camera.Render out a final image that will be submitted, along with your scene file in week 5. You will also be given a furnace object to place under the stairs. Texture this object, and render out a second version of the scene at night showing firelight coming from the furnace.

Week 5: Lecture: Using the Hypershade work area to create complex shading networks. We will examine the Shading Group, as well as both Maya and Mental Ray materials, examine their purpsoses, strenghts and weaknesses. We will also look at using the 2d and 3d procedural textures, as well as specific utility nodes. Special emphasis will be placed on the Sampler Info and Surface Luminance nodes, as well as learning how to configure Layered Textures and Shaders.

Lab: We will look at procedurally texturing the Fruitbowl scene, as well as taking a midterm quiz to demonstrate materials and lighting skills aquired thus far. You will be given several images of classical paintings to choose from. During a specified amount of time in class, you will create simple geometry (boxes, cones, spheres, etc...) mimicing the objects in the scene. Your task will be to render out an image with the correct color temperature for the lighting and for the surfaces of the objects, producing shadows where needed as well.

Homework: Light and Texture the objects in the fruit bowl scene using only procedural textures. ABOVE ALL ELSE: BE CREATIVE IN THE WAY YOU LINK YOUR NODES. Due week 6.

Week 6: Lecture: Using all of Maya's Renderers. We will examine the Render Settings Window, and look at the Maya Hardware, Software, and Vector Renderers, as well as Mental Rayfor Maya. We will discuss raytracing in more depth and discuss the concepts of Global Illumination, Final Gather, and Caustics.

Lab: We will look at how to set up a Cornell Box Simulation using GI and FG. We will also use the Vector Renderer to produce wireframe renders.

Homework: Build your own cornell box and produce two renders. In one, use mental ray for maya to render out the effects of global illumination and final gather to produce softened shadows and color bleeds. In the second render, use maya's vector renderer to produce wireframes. These are due week 7.

Week 7: Lecture: UV mapping polygons part 2. We will examing complex pelting and unfolding techniques to layout UVs for the human hand.

Lab: Pelting UV layout demonstration.

Homework: Unwrap the provided human hand, then paint out a texture for the hand or use photo refecences in photoshop to add detail. Provide 1 render for week 8, in addition to your UV map.

Week 8: Lecture: Baking: its not just for brownies. We will examine multiple ways that textures can be "baked". First we will look at how to Bake Shadows and reflections to file.Examining the concept of Ambient Occlusion, we will discover how that too can be baked into a Cavity Map. We shall look at how to bake 2d and 3d procedural textures to our UV layouts. Then finally we will look at how to bake High-Poly model information into Low-Poly models using the Transfer Maps function. In this we will examine the concepts of Displacement Mapping, Normal Mapping. We will also look at how to convert a height map to a normal map in Photoshop.

Lab: We will use the Treasure Chest scene to demonstrate all of the topics covered in the lecture.

Homework: You will Produce 3 renders (one from each designated camera in the scene file provided) of the Treasure Chest and Coins. The Renders Must exhibit the following qualities:

FOR THE TREASURE CHEST:
-A Normal Map created from the Transfer Maps function
-A Color Map created in Photoshop off the UV snapshot and Normal Map info
-A Specular Map created by modifing the color map in Photoshop. Used to indicated what is or isnt shiny.
FOR THE COINS:
-Uv map one coin to maximize the 0 to 1 space with no overlapping
-Transfer the Uvs from the UV mapped coin to all the others.
-A Color Map, either drawn or created from photoreference in Photoshop
-A Normal Map, modified from a Bump Map, Created in Photoshop Using the NVidia Filter for Normal Map Generation in Photoshop (plugin)

Week 9: Lecture: 3 point lighting, and Creating Toonshaders in the Maya Vector Renderer, and in the Software Renderers with Ramps. We will also examine the uses of color, specular and bump maps in creating character textures, looking specifically at skin and hair.

Lab: Begin working on Head Model.

Homework: Texturing a Head. Use a head you have modeled in a previous class, use my blank demo head (see the 3pt lighting examples above), or if you are a speedy modeler,you can create one from scratch. You will be painting texures for this head and applying appropriate materials. Minimum Requirements for this project are a Color Map and a Difference Map of Some sort (bump, displacement, normal). This will be due in Week 11 AT THEBEGINING OF CLASS.

Week 10: Lecture: The 3d Paint tool and the IPR renderer. We will examine the uses for the 3d paint tool in Maya (hair, base colors, and painting over seams). We will also examine usingthe Interactive Photorealistic Renderer to tweak 3d painted channels such as bump or transparency.

Lab: Painting the human face. We will also look at two ways to texture eyeballs, both procedurally, and from photoreference.

Homework: Work on your chosen project, due at the start of class in week 11.

Week 11: Project assessment, hand in your projects for evaluation: Final Crit.