

COURSE TITLE: Digital Fabrications: A primer course in the use of computer modeling for art and design.

TERM: Fall

LEVEL: 300

HOURS: 3

INSTRUCTOR: Kenneth Tracy kentracy@samfox.wustl.edu 917.370.7780

COURSE DESCRIPTION

Digital Fabrications: A primer course in the use of computer modeling for art and design.

This course will focus on fabrications both real and virtual.

The ubiquity of computers in design, studio art, communications, construction and fabrication demand that professionals become comfortable with their use. It is also important in a group of ever-specializing fields that one knows how to translate between different software and output platforms. This comfort and the ability to translate between platforms allow contemporary artists and designers to fabricate with ever-increasing freedom and precision.

This course will introduce students to 3D software with a focus on 2d, 3d and physical output. Through a series of projects students will learn to generate work directly from the computer and translate it into different types of output. Starting from first principles this course will cover the basics from interface to output for each platform used. The course will also familiarize students with a range CNC technology and other digital output for both small and large scale fabrication.

The course will be broken into 3 projects. In the first project students will focus on computer generated geometry and control systems. In the second project students will generate physical output and line drawings. The final project will focus on rendering, context and cinematic effects.

The software covered in this course includes, but is not limited to, Rhinoceros 3D, Maya, Illustrator and Photoshop. Additionally students will use the 3d printer, laser cutter and/or other digital output tools.

SCHEDULE

| Week | Topic | Description | Assignment/Tutorial |
|------|------------------------------|---|--|
| 1 | Introduction | Lecture Use of computers in Art and Design Demo Maya Interface and Video examples | Tut: Maya Interface |
| 2 | Polygons and Parametrics | Demo Polygon modeling and Maya parametric control tools | Tut: Maya Polygons Choose Precedents |
| 3 | Curves / Dynamics | Lecture History of NURBS geometry Demo NURBS Curves and Surfaces | Tut: NURBS surfaces Desk Crits |
| 4 | Deformers and Expressions | Lecture Coding and complex form Demo expressions and deformers | Tut: Deformers and Expressions |
| 5 | CNC Fabrication Introduction | Lecture on CNC applications and machines Demo Rhinoceros Interface and NURBS | Tut: Rhino Interface Assignment 1 Due |
| 6 | Assemblies | Lecture on digital fabrication frame vs skin Demo Slicing and 3d Intersection/Projection | Tut: Frame Model |
| 7 | Unraveling | Lecture 2d and 3d curvature Demo Unfolding, Unrolling, Pepakura | Tut: Skin Model Desk Crits |
| 8 | Re-Raveling | Lecture Connections Demo Flow along Surface and Connections | Tut: Joints, Flow Desk Crits |
| 9 | Rendering | Lecture Context and Rendering Demo Rhino V-ray rendering basics | Tut: V-ray Interface Assignment 2 Due |
| 10 | Lighting and Cameras | Lecture Framing and Cinema Demo V-ray Lighting and Cameras | Tut: Lighting Group Signups |
| 11 | Materials and Compositing | Lecture Texture and Context Demo Materials, UV maps and Compositing | Tut: Materials Desk Crits |
| 12 | Group Desk Crits | | Assignment 3 Due |

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Assignment #1: Animated Form

Modeling and Control Systems

Formal Precedent Model

For the first assignment you will create an animated model in Maya that emulates your **formal precedent**. At this point you have all selected a formal and tectonic precedent. Your task through the semester will be to use these precedents as the basis for a spatial system. In this first assignment you will make your system move later in the semester you will make it physical and then represent your system through renderings.

Creating your spatial system from your formal precedent will be a 3 fold process:

First select part of your formal precedent (for example a petal from a flower) and model it in 3d.

Second aggregate this part to create a surface or volume.

Third animate the system.

This process will require some back-and-forth experimentation. In modeling your system you may find that it is easier to use NURBS, polygons or subdivision surfaces. These methods determine both texture and formal properties but may also influence how you plan to animate the model.

When choosing a control system you should refer to the demos that you have seen in class. You should try different control systems and see what gives you the best effect. So far we have seen history, clusters, animation constraints, non-linear deformers, dynamics, dynamic constraints and key framing all used to control models. For this assignment you will animate your model using these or other Maya control systems. These animation effects should enhance your model but do not have to conform to the reality of your precedent.

Output Method, Format and Deadline

For your final projects please output a **15 second (360 frame)** movie using Playblast. The resolution for the playblast should be **720x480**. You should use qt or **quicktime** format and the encoding should be set to **MPEG4**. Please upload your files onto the ftp site. Put them in the Assignment 1 folder.

Time: 15 Seconds (360 frames)

Resolution: 720x480

Format: Quicktime

Encoding: MPEG4

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Section Leaders:

Assignment #2: Digital Real

Fabricating your Spatial System

Precedents

Now that you all have completed spatial systems based on your formal precedents you will start to use your tectonic precedents. Your tectonic precedents are industrial objects selected by you to help bring your formal precedents into physical reality. You will use the details of the tectonic precedent to enhance or intensify your spatial system. The tectonic precedents should meld with your formal precedents both aesthetically through the nuances in their form and practically through the way they are made.

Models / Assemblies

For this assignment you will make a 3d computer model and a physical model. The computer model will be both a 3d object, and sets of instructions for cutting and assembly. You should each produce a 2d cut sheet of all your parts with labels and/or other ways to index and map the parts so they can be assembled.

You will represent your models in 3 different ways:

3d Line Drawing (at least 1 drawing)

The purpose of this drawing(s) is to show how your piece is assembled and to highlight the details of your model. One option would be to draw an exploded axonometric (fig1) and show the parts relative to assembly sequence. Another option would be to show different views of the object assembled. Any other 3d line drawing that both shows the assembly and highlights the details of your model will be acceptable.

2d Part Layout (1 drawing)

This line drawing will show a map or array of parts flattened in 2d. The drawing should show the relationship between the parts. This drawing should be composed and not simply a nested cut sheet.

Photos of your Model (at least 3)

Once you have completed your physical model you will need to take photos of it. This should be done with care.

Use proper lighting. Overcast or shaded outdoor light works really well. You may also use well lit interior space be be conscious of the color of the light.

Also, use a good backdrop. Please use either a matte black (such as a felt or velvet sheet) or white background. These will work well to highlight your model.

Finally, take pictures from different angles and distances. It is important to have both detail or closeup and overall images.

Boards

Each student should produce a board with their precedents and the 3 elements listed above. Please include your name, the name of the course, the course number and your section leaders name in your layout. A sample layout will be provided showing the general organization of the elements.

Layout should be 12"x24" Portrait format

Images should be 300dpi

Use proper lineweights for your drawings

Print your layouts to PDF and post them on the ftp.

Also please post your photos loose along with the PDF.