

## LARC 441 | Modeling Landscape | Fall | 2016

**Instructor:** Roark Congdon

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**TA:** TBA

**Room:** Gould\_114

**Hours:** Tues\_ 12:30-3:20

**Office Hours:** None to speak of, but I am generally to be found in Gould 137 Monday to Thursday during the day.

**Common View:**

<https://catalyst.uw.edu/workspace/roarkc2/54724/>

**Class E-mail:** *larch441a\_au15@uw.edu*

**Homework assignments/dropbox:**

<https://catalyst.uw.edu/gradebook/roarkc2/99079>

### Introduction

In this class we will explore Computer Aided Design as a powerful tool in landscape design, visualization and fabrication. The class will consist of 5 core units: **1)** 3D solids modeling, **2)** Digital Terrain Modeling and Vegetation

We will learn intermediate to advanced skills in software use while approaching 3D CAD as an expressive medium. We will examine it as a vehicle for the data-driven generation of form, as means of translating design ideas into physical form and as a means of communicating and/or analyzing the temporal qualities of landscapes.

The class will be taught with primarily in Rhino . **Objectives and Goals**

- Build skills in 3D modeling
- Encourage students to harness 2D/3D CAD as tool in the iterative design process
- Introduce students' to parametric modeling
- Teach students how to utilize CAD as a tool of making and craft
- Teach students how to utilize CAD to express movement and/or conduct environmental analysis
- Provide a strong foundation for further study of digital applications

### Classes

Classes will meet on Tuesdays between 12:30 and 3:20. As a general rule, lectures and in-class demonstrations will take place during the first half of class. The second portion of the class will reserved

for the completion of longer lectures/demos, RhinOlympics events and work sessions, during which Zhehao and I will answer questions.

### **Tutorials/Readings**

Readings on Rhino 5.0 and 3D modeling may be assigned in conjunction with select assignments.

### **Books, Software, Supplies**

- If you don't have it already, please purchase:  
*Working with Rhino 5.0 (Van der Kley) –Bookstore or online*  
*<http://www.rhinoacademie.com/index.php/en/10-homepage/20-working-with-rhinoceros-5-0>*
- I would also recommend purchasing:  
*Modeling the Environment (Cantrell) - online*
- Other references will be on reserve in the library and are listed below.
- I would recommend purchasing a thumb drive to **back up your files**.
- Individual educational Rhino 5.0 and Flamingo NXT - \$95
- licenses are available for purchase at the UW Bookstore Tech Center (4326 University Way NE) for \$95.00 each
- Individual educational Rhino 5.0 licenses are also available for download at a discounted rate (\$195.00) and bundles including Rhino 5.0, Flamingo, Penguin and Bongo (\$495.00) at *<http://www.rhino3d.com/sales/?Region=NA>*
- Other software and supplies will be specified during class and/or in handouts.

### **Other Print References:**

Inside Rhinoceros 5, Cheng

Parametric Architecture with Grasshopper, Arturo Tedeschi

Digital Drawing for Landscape Architecture, Cantrell and Michaels

### **CBE Resources:**

CBE Computing            <http://dev.be.washington.edu/?q=resources/computing/overview>

Student Equip.            <http://dev.be.washington.edu/?q=resources/computing/studentloanerprogram>

ArchNet <http://archnet.caup.washington.edu/>

Digital Fabrication: <http://dev.be.washington.edu/?q=node/27216>

### **Online Resources**

Rhino 5.0 <http://www.rhino3d.com/>

Flamingo nxt <http://nxt.flamingo3d.com/>

Grasshopper <http://www.grasshopper3d.com/>

RhinoCam <http://www.rhinocam.com/index.shtml>

Lands Design <http://www.lands-design.com/>

RhinoTerrain <http://www.rhinoterrain.com/en/home.html>

Bongo 3D <http://bongo.rhino3d.com/>

Ladybug <http://www.grasshopper3d.com/group/ladybug>

Adobe Premier <http://www.adobe.com/products/premiere.html>

### **Approximate Class Schedule**

(may be revised at any time)

Note, always check the catalyst site for project specifics, and actual due dates/deliverables.

This syllabus is handed out on day 1, and the projects and lectures are

**Projects will be due every Tuesday**

### **Homework:**

Turn in your projects, Multi\_ pager PDF and 3D models in a zip file

Label your homework as follows:

Every Zip File must be labeled as follows:

Last name\_ First Name\_ Homework\_01 02,03, etc...)

In the file, label your PDF as follows:

**Last name\_first name\_PDF\_01**

When you save your models to turn in, choose the option to “save small”

Label your models as follows

**Last name\_first name\_Model\_01**

**Week 1**

**9/29**

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**Introduction/Rhino Review**

Review of 2D and 3D basics; Quarter overview and project outline.

Introduction of quarter long project

Homework:

Project 1 assigned

**Project 1**

Create six rough layouts by hand on the sheets of paper you have been given. Scan, import, (using the picture plane command) and correctly scale those images into a rhino model. Turn in a jpeg of the imported images. Remember to label your projects properly.

Using the text tool, put your name in the Rhino Model

Also using the text tool, write the following sentence below your name:

I understand that I must keep this rhino model and all of the imported images in a folder.

If I take the rhino model out of the folder, the imported images will not appear, as the model and the images will no longer be linked. The model, the images, and the folder must always travel together.

Skills: Picture plane

Laser Cutter training will happen the next couple Tuesday evenings, 6-9 pm in groups of up to 8 people. We will cancel some classes later this quarter to make up for your being trained out of class.

You need to attend Laser Cutter training, even if you have already been trained. It is a required part of this class.

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**Week 2****T10/04****Deliverables due, Tuesday October 4**

Project 1:

**SIX** imported and scaled sketches with Rhino plan of park

**In Class Lectures**

Basic Modeling review, Complex modeling, Boolean operations, Complex curvature

NURBS, Splines, etc.

Principles and introduction to modeling of curved objects

Introduction to topography creation:

Beyond surfaces of revolution and sweeps. (NURBS, patches, handles, nodes)

Commands:

Loft, patch, sweep1 rail, sweep 2 rails

**Homework:**

Refine and choose a park design; begin to create a 2D digital models/outlines/layout and rough in their footprints in the park.

Design and create 3D models of a Bollard and a Bike Rack.

Read: Planning a model, turn in questions.

Fabrication project 1 Assigned

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**Week 3****T10/11****Digital Terrain Modeling/Rendering**

## **Deliverables due**

A multi-page PDF of Project 2 as well as Fabrication Project 1

Multi page PDF will include:

Images of 3D models of the bike rack and Bollard. Images of a 2D plan, drafted in Rhino.

Zipped file of Rhino model and minimum 4 page minimum (digital) 11 x 17 pdf with summaries/write-ups/problems/successes, etc...

Write up questions/answers included in the reading "Planning a model"

Bring in an analog study of fabrication project 1

Homework:

In your park design, create and include a 3D model of a "Play Mound" approximately 400sf, and 6' high at its tallest. Include steps to the top, a slide, and a retaining wall. Think about safety, the mound may be an excellent place to include the required fence as well.

Lay out and draft the paving/paths that will be in your park. Create (using 2D tools) the area where the play structure will be.

## **Week 4**

**T10/18**

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Deliverables:

Create and Turn in a multi-page, 11 x 17 digital pdf of support materials/presentation for park.

Preliminary Rhino model of park, with any 3D models you have created included in situ. Include the paths, bollard bike rack, play mound, and area for the play structure.

## **LECTURE**

More modeling ticks

Introduction to Rhino render

Concepts: Texture

Homework: Begin experimenting with some texture maps and material simulation, turn in (digital) 11x 17 virtual pdfs to the catalyst site of your rendered objects and park design.

Begin to create a massing model of your play structure. Feel free to create and turn in analog sketches as well, but you must turn in a digital model.

Create a bench in Rhino.

## **Week 5**

**T10/25**

### **Deliverables due**

#### **project 3:**

Two 11x 17 virtual pdfs to the catalyst site of your rendered objects and park design.

Lecture

Introduce fabrication project 1; developable surfaces, introduce fabrication project 2,

Homework:

Fabrication project 1, (project 4)

Deliverables Due fabrication project 1 (project 4) :

Fabrication project 1, 1 physical model, jpegs of the model, 1 rhino model

Lecture

Homework:

Project 5, Begin refining design for play structure. Create rough massing models of the overall structure.

Create a Rhino model of the existing bus stop and the park sign, place them in the park.

In a folder, turn in the following:

Turn in one 11 x 17 digital pdf of model (schematics ok) and the preliminary rendered park design, with a special emphasis on natural lighting

1 rhino model (rendering), 1 rhino model (of physical model, fabrication one)

Turn a separate, stand-alone PDF of fabrication project 1

Bring your finished fabrication project 1 to class

**Week 6****T11/1**

Deliverables Due fabrication project 1 (project 4) :

Fabrication project 1, 1 physical model, jpegs of the model, 1 rhino model

Lecture

Editing, Visibility & Lights, ADDING LIGHT: SHADE & SHADOW

#1 Lights (point, spot, sun, area, real), Shade & Shadow

#2 Hidden-surface removal by z-buffering. Creation and management of geometric detail. Symbols: instances v. copies.

Homework:

Project 5, Begin refining design for “physical model of park” turn in one 11 x 17 digital pdf of model (schematics ok)

Turn in one 11 x 17 pdf of rendered park design, with a special emphasis on natural lighting

1 rhino model (rendering), 1 rhino model (of physical model)

**Week 7****T11/8**

Deliverables project 5, fabrication project 2:

Review fabrication project 2, which is due today, closed polygon mesh model only no physical artifact due, one 11 x 17” pdf describing project, with proof that mesh model is closed.

Homework:

Fabrication project 3, Model box

Lecture

GIS Simplification and transfer between media/software

TBA

**Week 8****T11/15****Digital Fabrication**



Study/process model due/ Review/ desk critiques

Week 8 May 19:

Deliverables, fabrication project 3, Model Box Model case due

/ Review/Work Session

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**Week 9**

**T11/22**

Deliverables, fabrication project 3, Model Box Model case due

/ Review/Work Session

AutoCAD INTRO

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**Week 10**

**T11/29**

Work Session

AutoCAD drawings of park due

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**Week 11**

**T12/6**

Final Review, all Projects due

Deliverables:

Print out 4 fully rendered pdfs describing project, which is really 2 models, the park, and the model of the park, turn it all in inside the cool box you made.

Bring in your physical model of the park, and the cool box it will travel in.

Turn in a big file (compiled into a single document) with each weeks assignment in it, your final digital models, 1 for rendering, 1 for fabrication, and photos of your final model.

## **DESCRIPTION OF PROJECTS**

**Playground project: Physical and digital models**

**LA 441**

## Fall 2016

Utilizing the rhino model as a point of departure, you will create a park and a piece of playground equipment. This project has two main goals:

- To develop a "critical eye" with regard to computer graphic (CG) images by developing your understanding of and experience with 3D modeling & rendering. Images are communicative tools, linked together and used to "tell a story" to someone else.
- Introduce you to some fabrication techniques and concepts. You will also employ Rhino and utilize some of the fabrication tools. By the completion of this project, everyone should understand that CAD/CAM activities are not something that is executed with the simple push of a button, despite what various glossy architecture blogs would have us believe.

Models, both physical and digital, are not "objective reality" from which rendering programs simply produce precise "snapshots". They are "authored"—created and manipulated to accomplish a particular communication goal. There are overlaps between digital techniques in model making and rendering using traditional media—different visual results, but similar authorship goals, responsibility and opportunity. THINK about what story you are telling with each image, model, and object.

You cannot approach a physical model the same way you approach a digital model. Although the departure point is the same, the endpoints are very different. This project will require you to use the computer as both a tool, and a medium. Everyone in this course should have taken LA 440, and should be introduced to rhino 5.0. Please let me know if this is not the case.

Playground/park Program Requirements: (feel free to add extra elements if you feel it will enhance the design)

1. Seating, benches, etc...
2. Grass and trees and other foliage.
3. Concrete and/ or brick paving throughout the park.
4. Soft groundcover or synthetic material below the play structure (see below). Note: The play area must be dropped 6" below the existing topography. Include a curb perimeter as well.
5. Fence or some sense of enclosure somewhere
6. Trash receptacles, and a fire hydrant
7. Bollards
8. Bike rack

9. A “Play Mound” approximately 400sf, and 6’ high at its tallest. Include steps to the top, a slide, and a retaining wall.

10. Model the existing bus stop, perimeter sidewalk, and the city park sign.

9. A 25’x 25’ (approx.) modular play structure which contains: a slide, a ladder and/or steps, monkey bars, “ tubes” to crawl through, and roof portions. Materials, steel, wood, plastic

The modular play structure will be the bulk of this project. Begin by creating an overall design of your play structure. Refine your structure into modular components; consider how they will fit together, both in reality, and in your model. Create blocks or instances of the individual modules; you will need to do this for both the rendering model, and the fabrication model. Think carefully about blocks and instances when creating your modules.

Nearly every week, you will be required to create digital models and renderings of your park and your modular structure. You will also be required, from time to time, to fabricate, using the laser cutter or 3d printer, physical studies and/or components of said model.

The Rendering model:

It is my belief that each week you will learn a little more about modeling and rendering, and therefore your digital models will improve a bit each week. One of the things you will realize, if you don’t already know it is that when it comes to rendering, polygons, textures, and lights are expensive. You may very well find the perfect view, and turn that same view in every week. Same view, only better, every week.

The physical model:

You will be required to digitally fabricate (please aim for a 90% digitally fabricated) model of either your entire park at a small scale, your piece of playground equipment at a larger scale, or both. It is really up to you, what type of model you choose to create, and at what scale you choose to create it. The material choices are up to you as well, the laser cutter will cut most anything, wood, paper, board, acrylic, MDF, leather, etc... You are also welcome to 3d print some parts as well. Be sure to read the handouts on planning a model.

The Cool Box:

FINAL PROJECT DELIVERABLES

4 fully rendered 11 x 17 physical pdfs describing project.

The project, which is really 2 models, the park, and the model of the park, and the cool box it goes in.

Each week’s assignment in it, your final digital models, 1 for rendering, 1 for fabrication, digital files of the abovementioned pdfs, and photos of your final model, and model box combo.

**LA 441**

**Fall 2016**