

(DMUD 2009)

## Digital Modeling for Urban Design Syllabus

### Course Overview

This course serves as an introduction to fundamental techniques for urban design representation. The primary objective is to provide an entry point into software applications that aim to explore new modes of representation for contemporary urban design practice. Digital Modeling for Urban Design (DMUD) integrates the theoretical ideas framed by Reading New York Urbanism seminar. DMUD is also coordinated to work with UD Studio 1 by sharing the same New York City geographic study areas. In this course you will visualize various urban conditions through 3d digital modeling and animation completed in Autodesk Maya. Work from DMUD that will be compiled in Adobe AfterEffects will integrate with the Reading New York Urbanism course. We will utilize urban design modeling to represent physical space, spatial data, and atmospheric environments in both descriptive and generative ways. By the end of the semester you should expect to gain an effective cross-program workflow in addition to establishing a sense of control when using static 2d vector formats and 3d modeling with animation.

### Requirements

The course format will consist of lectures, readings, discussions, software instruction, and tutorial sessions. An additional weekend tutorial session is provided to supplement technical instruction (refer to course schedule). There will be a series of exercises that progressively lead to a final presentation. While DMUD will products will be completed in groups of two, every student is responsible for equal contribution to their group's products. Exercises will vary in submitted material ranging from prints to successive digital file uploads to the course blog site at [myu2011.com](http://myu2011.com). A final digital archive is also required.

### Urban Topics

We will structure our work through fundamental conceptual modes of thinking to visualize and understand urban systems and their visible and invisible relationships upon urban space. The subject of neighborhood will require you to observe, record, retrieve, and ultimately question how to re-present your nuanced perspective of a study site and its related components. Understanding the physical make up of the city will be the vehicle in which you will develop new digital techniques for urban design study and speculation.

Columbia University Graduate School of Architecture Planning and Preservation  
Master of Science in Architecture and Urban Design | Summer 2011  
A4528: Digital Modeling for Urban Design, 3 pts  
Tuesdays, 2-4pm, Avery 114  
Chris Kroner, Phu Duong (coordinator)

### **Digital Techniques**

1. Scale: nesting composites, zooming, key guide
2. Layering: elements and compositing
3. Simultaneous information: windows and tiles
4. Comparative analysis: overlays, tiles, metrics
5. Transitioning: growth, shrink, decay, speed
6. Zooming and panning: camera and display mechanics
7. Urban flux: night and day times, congestions, tides, cycles, flows, pressures

### **Representation Objectives**

1. Mapping as subjective endeavor with a specific intention or agency (GIS)
2. Choosing an appropriate media type and format: orthographics, aerials, urban sections, fly-throughs, and turntables (Maya)
3. Understand the nature, mechanics, and techniques of presenting urban design ideas to a large audience with digital media.
4. Controlled use of communication forms and effects

### **Evaluation**

In DMUD, creative uses of GIS data and pushing the limits of Maya modeling and animation for urban design consistently while sharing group work will qualify for a high-pass grade. Posting work-in-progress in a timely manner to support individual and shared learning experiences is required. Due to the time sensitive nature of the digital instruction in these courses, multiple absences may result in hindering individual skills learning and affect group collaboration efforts. This may result in a low-pass grade or failing grade. Consult the GSAPP student handbook for grading and program requirement policies.

### **Recommended Books**

Derakhshani, Dariush. *Introducing Maya 2012*. Sybex: 2011.  
Maestri, George and Mick Larkins. *Maya 8 at a Glance*. Wiley: Indianapolis. 2006.  
(This book is no longer in print, but some copies are still available)  
Tickoo, Sham. *Autodesk Maya 2011: A Comprehensive Guide*. CAD/CIM Technologies: 2010.  
Keller, Eric. *Mastering Autodesk Maya 2011*. Sybex: 2010.

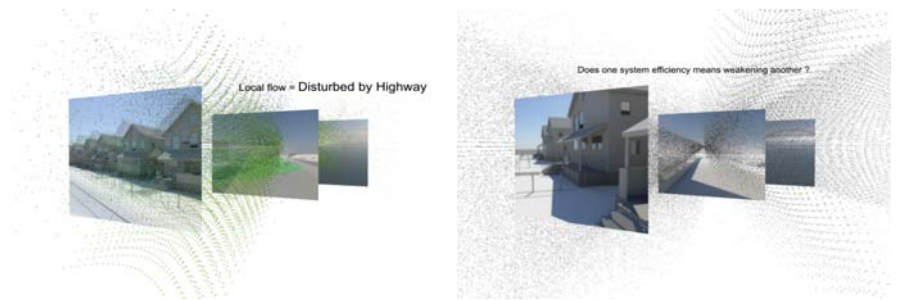
### **AV/DV Resources**

GSAPP Helpdesk: <http://www.arch.columbia.edu/resources/help>  
GSAPP Av/Dv: <http://www.arch.columbia.edu/av>

### **Instructor Contacts**

You are encouraged to email all instructors with class/instruction related questions. All matters regarding attendance, medical information, and other course related logistics and issues should be addressed directly to the coordinator. Office hours are by appointment.

Chris Kroner, Adjunct Assistant Professor, [dck2103@columbia.edu](mailto:dck2103@columbia.edu)  
Phu Duong, Adjunct Associate Professor (coordinator), [ptd6@columbia.edu](mailto:ptd6@columbia.edu)  
Brandt Graves, Digital Assistant, [bsg2106@columbia.edu](mailto:bsg2106@columbia.edu)



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## DMUD Maya Learning Objectives Overview

### Class 01\_CITY TYPOLOGIES | Interfaces and geometries

- Set Up a New Project
- Adjusting and Controlling Units
- Import DWG file
- Import a Reference File
- Create and Organize Layers
- Curves: Degree, curve points and control vertex
- Polygons: Vertex, edge and faces
- Surfaces: Isoparm and control vertex
- Understanding, creating, moving and modifying primitives
- History: Network System
- Snaps, Shortcuts and manipulator
- Measure Tool
- Tutorial: Animating cameras, Animate manipulator*

### 06/14 Class 02\_LINES TO SURFACES | Modeling with NURBS curves and surfaces

- Create 1Degree and 3Degree Curves
- Open/Closing Curves
- Rebuilding Curves
- Attaching Curves
- Planar Surfaces
- Lofted Surfaces
- Extruded Surfaces (along a path)
- Tutorial: Modeling a Suspension Bridge with curves and simple parametric script for multi-extrude*
- Attaching Surfaces
- Modeling with Primitives Forms
- Intersecting and Trimming Surfaces
- Boolean Tool
- Duplicating Surface Curves
- Animating Attributes
- Tutorial: Importing GIS to Maya*

### 06/21 Class 03\_SURFACES TO VOLUMES | Modeling with polygons and subdivisions

- Polygon Primitives
- Polygons from lines
- Create Polygon Tool
- Normals
- Modeling with Primitives Forms
- Boolean Tool
- Subdivide and Extrude Faces
- Cut Faces
- Fill Holes
- Split Polygon Tool
- Insert Edge Loop Tool

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*Tutorial: Modeling a Brownstone*

*Tutorial: Subdivision Modeling*

**06/28 Class 04\_MATERIAL STATES | Materials and Textures [terrain template]**

Terrain

Hypershade/graph

Creating materials and applying textures

Mechanics of Texture mapping

Template Material Library (Water, Glass, Xray)

Mapping Video onto surface

Introduction to Paint Effects

*Tutorial: Terrain*

*Tutorial: Animating Material*

**07/05 Class 05\_EFFECTS | Lighting [lighting template]**

Creating and manipulating lights

Spot and directional lights, area lights

Introduction to Final Gather and Global Illumination

Physical Sun/Sky, HDRI Lighting

Rendering without lights

*Tutorial: Designing a streetlight*

**07/12 Class 06\_ACTIONS | Animated Dynamics**

Deformations

Parenting and Constraints

Creating a camera

Adding a background

Attaching camera to a path (flying over)

Using camera to cut a section

Timeline and key framing

Fields and constraints

Nparticles

Flow along curve

Flow along surface

Creating soft and rigid bodies

*Tutorial: Rain/Snow upon a surface*

**07/19 DMUD/RNYU MIDTERM**

**07/26 Class 07\_SPECULATIONS | Advanced Dynamics**

Joints

Skeletons

Fluid dynamics

Wind Tunnel Analysis

Maya Fur

nCloth

Maya Hair

*Tutorial: Dynamic Skeleton Surface*

*Tutorial: Skeleton Truss*

*Tutorial: Wind Tunnel Analysis*

**08/02** Deskcrits

**08/09** Deskcrits

**08/16** Crit Screenings

**08/18 DMUD/RNYU FINAL REVIEW**

**08/19** Final Videos + Archive Due