

Advanced Digital Modeling for Urban Design

CourseNo: ARCHA6834_001_2014_3

Meeting Time: M 09:00A-11:00A **Meeting Location:** [AVERY HALL 600](#)

Instructor Information:

Jose Isaias Sanchez and Michael Szvios

This seminar extends the 3d modeling and animation curriculum for urban design study at the GSAPP. It advances the Maya skills taught in Digital Modeling for Urban Design during the first semester of the MSAUD program. Thus, fundamental knowledge of Maya is a prerequisite for this course. Advanced DMUD will explore dynamic generative software technologies applicable to urban modeling, analysis and representation that will prepare graduates with innovative ways to deploy data to inform the creative process relevant to contemporary design practices. There will be a focus on methodologies for exploring zoning and fabric related modeling.

The learning sequence consists of three parts.

Part I: Dynamic Systems: Experimenting with new Fabrics

Environmental simulation software modules will be explored and assimilated into active modeling data and consequently yield a model that is responsive to both, change of initial model data and design input. This dynamic simulation can be investigated in its initial “fluid/particle” state or converted to a facet-based mesh with the ability to generate geometric models suitable for urban design research. In terms of representation, the purpose of these investigations allows students to connect the relationship between time-based modeling processes and physical space.

Part II: Datascares: Existing Urban Fabric

The next chapter is geared to identify and understand the nature of data-sensitive digital mass for building informative simulation models to inform schematic designs. This approach allows for a preliminary mapping of research data into a 3D domain with the intention to provoke design inquiry. Statistical data, volumetric models, vector and pixel drawings will be generated or imported into a 3D environment. This is instrumental to enabling the model-mapping into a "live" model that is inherently responsive to post-feeds of re-generated input. By generating a "reactive" model, design ideas inform a workflow for interactive or reflective design consideration (generative and descriptive modes of utility) for class discussion.

Part III: Presentation

The concluding part of the course packages the products of previous individual lessons into a presentation format for final review and comment. This is another opportunity for MSAUD students to utilize their Aftereffects skills gained from Reading New York Urbanism (prior summer term). Students without video compilation knowledge will be able to complete their final deliverables via a case-by-case individual instruction and assistance.

Week 1 Sept. 8:
Dynamics: Particles I

- Introduction to Dynamics
- Geometry in the context of Dynamics
- Create Particle Tool
- Particle Emitter Types
- Particle-based reactive massing models and force fields
- Converting geometry to particles volumetric models
- Adding force fields to the particle volumetric models
- Creating Soft Bodies Mapping

Week 2 Sept. 15:
Dynamics: Particles II & Path Animation

- Urban movements and tendencies mapping using particle systems
- Tracing movement with particles along a path
- Changing particle reactive properties over time
- Changing particle reactive properties using mathematical expressions
- Particle Instancing
- Curve Flow Animation

Week 3 Sept. 22:
Dynamics: Particles III

- Creating Pattern Density Maps with nParticles
- Dynamic pattern and frequency with nParticles
- Creating a dynamic massing model from nParticles

Week 4: Sept. 29
Dynamics: Fluid Dynamics I

- Fluid Dynamics and Density Masking
- Fluid Dynamics Object Path Mapping
- Fluids to Geometry
- Fluids and Force Fields
- 2D and 3D Fluid Containers

Week 5 Oct. 6:
Dynamics: Fluid Dynamics II

- Temperature Mapping
- Reactions as Models for Urban Systems
- Envelope Testing Through Wind Studies
- Ocean Creation

Week 6 Oct.13:

Rendering I: Mental Ray Rendering Workflow

- mia_material_x
- Rendering and Color Space
- Linear Rendering Workflow
- Physical Sun & Sky
- Mental Ray Lights

Week 7 Oct. 20

Dynamics: nCloth I

- Layering Dynamic Geometry with nCloth
- Shrink Wrap Geometry
- Developing physical material resistance mapping with nCloth.
- Curve Dynamic Mapping

Week 8 Oct. 27

Dynamics: nCloth II

- Pressure Generated Geometry
- Minimal Surface Geometry
- Geometry Optimization
- Interactive Playback.

Week 9 Nov. 10

Dynamics: nHair I

- Create Dynamic Curves.
- Creating Geometry from nHair
- Strand Collision with Other Objects
- Integrating nHair with Other Systems

Week 10 Nov. 17

Dynamics: nHair II

- Path Mapping Using nHair
- Weaving to Create Structure
- Using nHair to Create Flexible Zoning
- Interactive Playback

Week 11 Nov. 24

Dynamics: Rendering Dynamics for Animation

- Baking Dynamic Simulations
- Creating Particle Cache for Rendering
- Optimizing Dynamics for Rendering

Week 12 Dec. 1

Paint Effects: Nature Creation - Image-based Modeling

- Paint Brush Tool
- Make Paintable Geometry
- Paint Effects & Collisions
- L-Systems
- Animating the environment
- Rendering Paint Effects

Week 13 Dec.8

Advanced Rendering Techniques for Large Data Models

- HDR Lighting
- High Dynamic Output
- Contour Line Rendering.
- Rendering Setup for Animation
- Rendering in Layers
- Rendering in Passes
- Rendering File Management