[Arch 434 Advanced Building Information Modeling Strategies]
Instructor: Craig A. Forneris ([craig.a.forneris@gmail.com])
Course Time: Mondays and Wednesdays 6:00 – 8:40 pm
Duration: June 4th – July 25th 2012 (8 weeks)
Course Location: Crown Hall Computer Lab
Course Type: Lecture and Lab

[Course Description]
Students will learn to use the most widely used Building Information Modeling Software Revit Architecture. The future of building will rely heavily on our abilities to define parametric relationships that facilitate efficient construction processes and energy efficient buildings. This course will not entirely be based on exploiting a digital tool to produce standardized construction documents; it will also teach a methodology of implementing digital tools to produce specific interrelated results. Primary focus will rest on parametric and family based digital design principles as defined by the software.

Students cannot be well informed designers without the use of precedents. The designer should always be rooted within the realities of the built environment. This course will use case studies of existing buildings as a way to integrate pioneering designs with modern digital tools.

Each student will choose a building to digitally model. Full comprehension of a building and its components transpires from the integration of two assemblies, established from conflicting directions, into one unified element. Therefore, each student will digitally model a significant portion of a corner of their chosen building and exploit the database structure embedded within the roots of the REVIT environment.

[Course Objectives]
- Evolve 2 dimensional practices into 3 dimensional models
- Creating Custom Models in the REVIT Environment
- Use Families and Parameters/Conditional Formulas to Explore Design Options
- Linking database Information to 3d dimensional representations
- Exporting to other Software Platforms for Visualization and Design Validation

[Suggested Texts and Resources]
- http://www.designreform.com
- http://www.revicity.com
- Mastering Autodesk Revit Architecture 2011
- Detail Magazine

[Homework and Evaluation]
10% Attendance
20%: Assignments
30%: Midterm
40% Final Building Model Project

*** Midterm and Final assignment will not be accepted late for any reason. Students are expected and cannot advance their projects in the class without full attendance. Each absence is equivalent to one week of work. After three absences students can expect a significantly lower grade.

We will choose the Midterm and Final project together as a class.
**Conceptual Design Phase**

**Description of Detail:**
Drawings in the form of minimal 2d line work with 3d dimensional massing models (Level of detail dependant on project). Visualizations in the form of analysis diagrams, 3d photorealistic renderings and/or line drawing perspectives.

**Input Data:**
- Program Data
- Project Budget
- Mass Families (Revit Library)
- 3D Scans - Point Cloud

**Revit Model Type:**
- Massing Models for Analysis and Space planning
- General Detail Model for Visualization Purposes.

**Associated Drawings:**
- Conceptual Plans
- Conceptual Elevations
- Conceptual Sections
- 3d Renderings – Basic (Arch Studios)
- Conceptual Analysis Diagrams
- Sun and Shadow Studies
- Other Analysis

**Associated Deliverables:**
- Visualization Images
- Physical Models
- Analysis Images
- Animations

**Schematic and Design Development Phase**

**Description of Detail:**
Conceptual design model serves as an underlayment for Production Model. Project Database likely to inform both models. Sheet sets are clearly defined with all Style templates for project standards developed. Consultant Models detailed and linked to production models. General Systems and Assembly are fine tuned in preparation for Construction Documents and verification Model.

**Input Data:**
- Conceptual Design Model and Spacial Indexing
- Consultant Models
- Building Codes and Permitting
- Financial Data and Project Timelines

**Revit Model Type:**
- Massing Models for Analysis and Space planning
- Detailed Model in Preparation for C.D. Phase.

**Associated Drawings:**
- Developed Plans
- Developed Elevations
- Developed Sections
- 3d Renderings – Full (Visualization Department)
- Details
- Detailed Schedules
- Associated Consultant Drawings

**Associated Deliverables:**
- Visualization Images
- Physical Models
- Analysis Images
- Animations
- Drawing Sets
- Design Verification Model(s)

**Construction Document Phase**

**Description of Detail:**
Signed off design model is used as underlayment for developed BIM model. Decisions on specific wall types, exterior fenestration, interior layouts made. Model reflects design intent and contains required detail to describe construction intent.

**Input Data:**
- Design Development Model
- Coordinated Consultant Models

**Revit Model Type:**
- Fully Developed Production Model

**Associated Drawings:**
- Finalized Plans
- Finalized Elevations
- Finalized Sections
- Finalized Details
- Complete Schedules
- Associated Consultant Drawings

**Associated Deliverables:**
- Drawing Sets
- Electronic Files (PDF, DWF)
Week 01

**Conceptual Modeling – Means, Methods, and Procedures**

**Modeling**

Conceptual Massing:
1. Importing Data and How to use it to your Advantage (CAD, Sketch-Up)
2. Solids vs. Voids (Limiting Use of Voids)
3. Project Massing Vs. Family Massing
4. Mass floors and Areas
5. Constraining the Model

**Phasing:**
1. File Structure for Multiple Schemes
2. Intro to Parameters
3. Shared Parameters
4. Project Parameters
5. Material Parameters

**Coordination**

Week 02

**Exterior Modeling and Setup for Data Extraction**

**Modeling**

Constraints and Patterns:
1. Grids and Levels
2. Host Elements by Face.
3. Curtain walls as a Pattern Tool
4. Curtain grids
5. Intro to Curtain Panels

**Coordination**

Design Options:
1. Loading Linked Files in Design Options
2. Controlling visibility through Phasing within the Design Option
3. Cameras
4. Controlling the Views.

Week 03

**Families as Pattern Elements and Unlocking the “I” in BIM**

**Modeling**

Constraints:
1. Reference Planes
2. Curtain Wall Families as Pattern Elements
3. Understanding the Fractal Nature of the Patterns

**Coordination**

Schedules:
1. Making a Schedule
2. Using the Shared Parameters to Schedule Building Data
3. Linking a Schedule to Design Options and Phases

Week 04

**Advanced Families and Formatting**

**Modeling**

Constraints:
1. Family Creation
2. Loading panels into pattern
3. Type vs. Instance Parameters
4. Making New Types within a Family to serve as an Instance

**Coordination**

Schedules:
1. Sheet Views
2. View Templates
3. Loading Views onto Sheets
4. Views Based on Design Options

Week 05

**REVIT – Output and Data Translation**

**Modeling**

Constraints:
1. Exporting to FBX
2. Workflow for Production Models
3. Workflow for Viz model

**Coordination**

Schedules:
1. Printing
2. Import into 3dsMAX.
3. Using the Revit MSO