

BUILDING INFORMATION MODELING

Aka: **BIM**ethods

“The Knowledge of Building Systems, Parametric Thinking, and 3D Data Driven Modeling”



Course Abstract:

Computer models are no longer objects that exist within virtual space and used separately from drawings and information. Instead, designers work within one unified model that contains parametric objects where programmed data efficiently changes and drives the design of the model. In essence, Building Information Modeling is the culmination of the knowledge of building systems, parametric and computational thinking, scripting, data management, and the fundamentals of digital 2D/3D drawing.

Utilizing Revit 2014, Dynamo (Revit’s Grasshopper), the Autodesk 360 Cloud, and exploring various complex architectural case studies, students will form an understanding of the theoretical concepts, terminology, underlying database structures, and the technical tools required to work within Revit’s various modeling environments. At the end of the course, students will be able to design an overall project that contains programmed/scripted variation of complex forms incorporated with parametric building elements; furthermore, students will present their projects with high quality photorealistic rendering techniques and document their design in various drawing formats within one unified BIM model.

Course Organization:

The semester is organized into three parts with the first acting as an introduction to parametric and kinetic design using inherent Revit programming capabilities. The second part is structured to go over various methods of parametric thinking while modeling complex geometries within Revit’s Conceptual Design Environment. The last part of the semester covers methods for modeling within Revit’s Family Environment and utilizing Revit tools beyond their initial intent to create detailed models in Revit’s Project Environment. The class is taught using step-by-step tutorials to go over the various techniques.

Evaluation:

Success in this course will be determined by the level of one’s engagement in the semester’s parts and presentation of projects. Other qualitative and quantitative factors that contribute to one’s grade include the following: the level of intensity, enthusiasm, and focus exhibited in the work, the quality, craft, and organization of the work, creativity and complexity of the design, documented process, and proven technological competency. Attendance, preparedness, and timely resolution of work and assignments also are factors within one’s grade. The following is the percentage breakdown of the course and grading:

Part 01:	Programming Parametric Kinetic Parts	30.0%
Part 02:	Adaptive Complex Canopies or Façade Forms	30.0%
Part 03:	Project Modeling and Parametric Components	30.0%
Participation:	Attendance, Preparedness, and Timely Resolution of Work	<u>10.0%</u>
		100.0%

Important Links:

- Class Website: <http://www.jrohdesign.com/revit/>
- Free Autodesk/Revit Software: <http://www.autodesk.com/education/free-software/revit>
- Free Dynamo 6.3 Plugin: <http://dyn-builds-data.s3-us-west-2.amazonaws.com/DynamoInstall0.6.3.exe>
- Free Dynamo 7.0 Plugin: <http://dyn-builds-data.s3-us-west-2.amazonaws.com/DynamoInstall0.7.0.exe>

Software Proficiency: Although a plus, no previous knowledge of Revit is required for this class. A basic knowledge of computers and experience with other 3D modeling, Computational Methods, and CAD programs is preferred.

Software Disclaimer: Loss of project assignments and student work because of computer failure, errors, and corruptions are not an excuse for missed accomplishments. Students are required to maintain hourly/daily backups of their work on multiple personal devices external to the computer lab. Note that USB Sticks are unstable and should not be used as your primary backup.

Software Access: Students have free access to the software in the STORR Computer Lab in Room 285; as well as, you can have free access on your own personal computers. You can gain access to Autodesk Software by registering with the Autodesk Education Community Website. Once login credentials are granted, download Revit 2014 and install it on a personal computer. Refer to << <http://www.jrohdesign.com/revit/faqs/> >> to see if your computer meets the minimum system requirements. Also download the appropriate Dynamo version (see the “Links” section above for all applicable links).

Recommended Text: Vandezande, James; Krygiel, Eddy; Read, Phil. Mastering Autodesk Revit Architecture 2014. Indianapolis, Indiana: Wiley Publishing, Inc., 2013.

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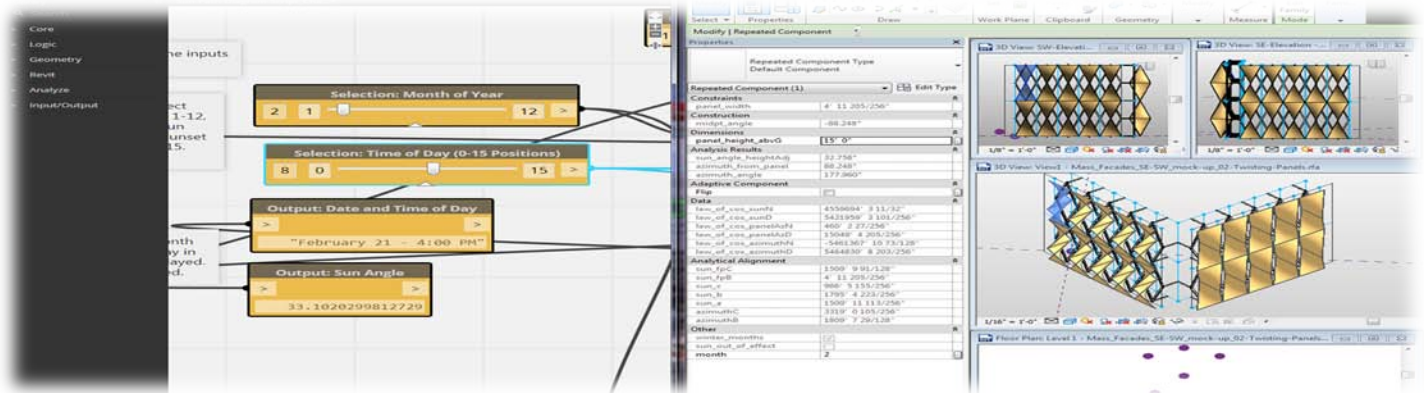
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The Class:

SCHEDULE OF TOPICS

Topics and Schedule are Subject to Change.

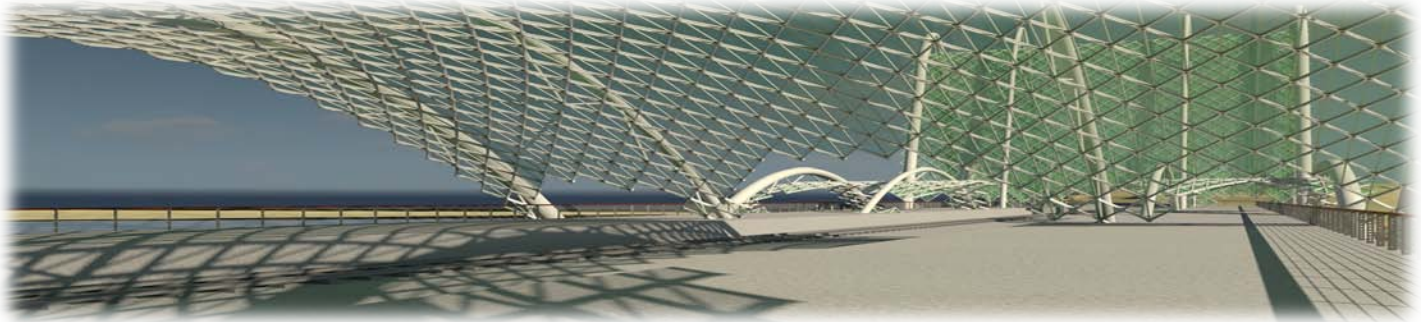
PART 01: PROGRAMMING PARAMETRIC KINETIC PARTS (UNDERSTANDING PARAMETERS AND LINKAGES WITH DYNAMO)



Class 01	2014-08-19	T	Introduction – The Class, Revit & Dynamo Interface
Class 02	2014-08-22	R	Adaptive Components (The Profile, the Individual & to Make Curtain Panel Pattern Based Families)
Class 03	2014-08-26	T	Case Study 1: Making a Folding Panel
Class 04	2014-08-28	R	Case Study 2: Making a Twisting Panel
Class 05	2014-09-02	T	Case Study 3: Making an Operable Oculus Panel
Class 06	2014-09-04	R	Dynamo Introduction to Point Things at the Sun and Connect Basic Case Study Parameters
Class 07	2014-09-09	T	Case Study Programming of Mock Up Panels to React to the Sun Kinetically (Computational Formulas)
Class 08	2014-09-11	R	Kinetic Parts Wrap-Up

PART 02: ADAPTIVE CANOPIES & FAÇADE FORMS

(UNDERSTANDING MASS FORMS, PROGRAMMED VARIATIONS, & ARMATURE DETAILS)



Class 09	2014-09-16	T	Parametric Bezier Curve Profiles (Revit & Dynamo Made)
Class 10	2014-09-18	R	Parametric Surfaces (Revit & Dynamo Made)
Class 11	2014-09-23	T	Panelized Surfaces, Voids, & Adaptive Structures
Class 12	2014-09-25	R	Adaptive Detailed Armature Subframes
Class 13	2014-09-30	T	Randomization of Components
Class 14	2014-10-02	R	Adaptive Canopies & Façade Forms Wrap-Up
Class 15	2014-10-09	R	MIDTERM DUE

PART 03: PROJECT MODELING & PARAMETRIC COMPONENTS

(UNDERSTANDING ALL REVIT PROJECT ENVIRONMENT TOOLS BEYOND THEIR ORIGINAL INTENT)



Class 16	2014-10-14	T	Floors, Roofs, & Ceilings
Class 17	2014-10-16	R	Concrete & Steel Columns & Beams
Class 18	2014-10-21	T	Compound Walls, Wall Profiles, Sweeps, Reveals, Stacked Walls, and Openings
Class 19	2014-10-23	R	Doors, Windows, Curtain Walls and Doors, and Sloped Glazing
Class 20	2014-10-28	T	Spider Clip Curtain Walls
Class 21	2014-10-30	R	Zumthor Curtain Walls
Class 22	2014-11-04	T	Rail Profiles, Baluster Families, & Custom Railings
Class 23	2014-11-06	R	Stairs, Ramps, and Railings on Sloped Surfaces
Class 24	2014-11-11	T	Custom Stair & Railing Designs
Class 25	2014-11-13	R	Parametric Families
Class 26	2014-11-18	T	Parametric Families
Class 27	2014-11-20	R	Exterior Rendering, Material Editing, & Displaced Views
Class 28	2014-11-25	T	Interior Rendering & Lighting
Class 29	2014-12-02	T	Drawing Techniques and Sheets
Class 30	2014-12-09	T	FINAL DUE

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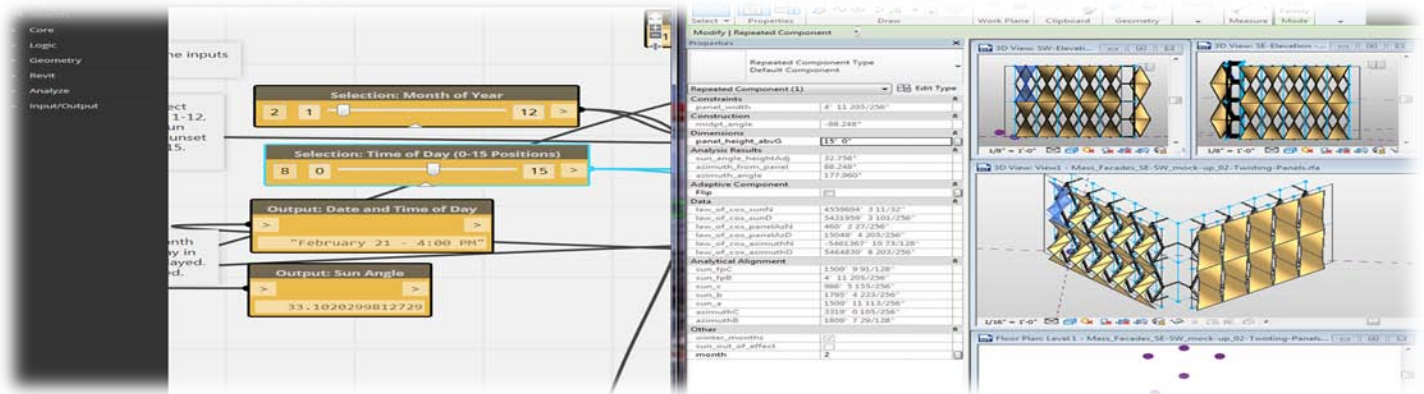
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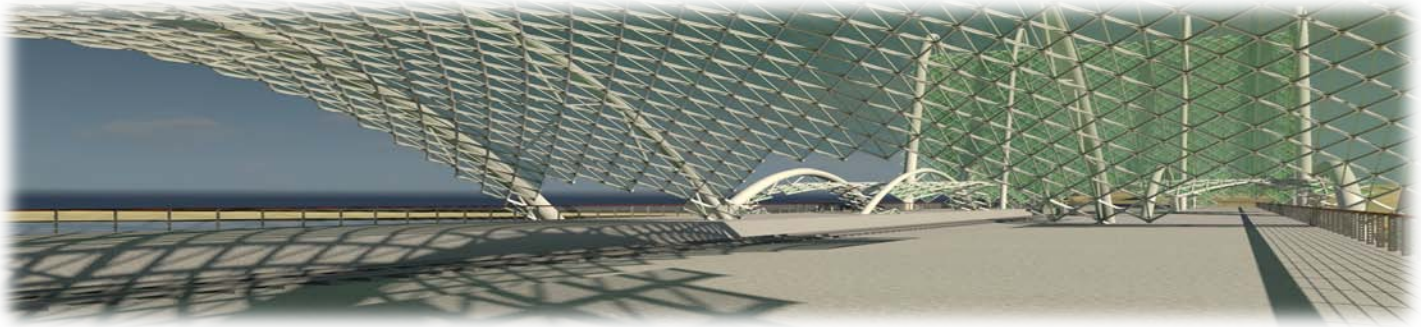
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Class 29	2014-12-02	T	Drawing Techniques and Sheets
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LEVELS OF ACCOMPLISHMENT | GRADUATE

The Course Professor will govern the assessment and evaluation of student performance. Performance or status will be officially recorded, as per University policy, by submitting marks (Satisfactory/Unsatisfactory) at midterm and (A through C) at the end of the term. The interpretation of letter grades is as follows:

A - Extremely developed and accomplished work. The student's work is exceptional, exhibiting a rigorous, insightful understanding of the issues and concerns of the project. The inquiry and productions have been intense and focused. Graphic and three dimensional representation skills are excellent, oral and writing abilities are advanced. The work is complete, and presented on time in a sophisticated manner. Enthusiasm and initiative are high. The student is always in search of new ideas, greater development, producing more than is required.

B - Highly developed and considered work. The student's work is above average, exhibiting an in-depth understanding of the issues and concerns of the project. The inquiry and productions have been thorough. Graphic and three dimensional representation skills are well developed and precise, oral and writing abilities are above average. The work is complete, and presented on time in a thorough manner. Enthusiasm and initiative are shown. The student searches for new ideas, greater development, producing more than is required.

C - Competent work. The student's work is average, exhibiting a basic understanding of the issues and concerns of the project, but lacking depth in development. Graphic and three dimensional representation skills are adequate, oral and writing abilities are average. The work is complete, and presented on time, satisfying basic presentation requirements.

U – Unsatisfactory Work. The students work is weak, lacking depth in development at many levels, and not of passing quality. Intentions are not carried through. Graphic and three dimensional representation skills are weak, oral and writing abilities are limited. The work is incomplete, or presented late.

Attendance | Rules: Attendance is mandatory. Students shall be engaged in the course throughout the scheduled class period. Since the course will be conducted in an atmosphere of mutual respect and the instructor and student share responsibility for the collective culture of the class, all participants are expected to contribute to the course's intellectual life by attending to the following:

- Pro-active participation in all discussions, presentations (pin-ups), and reviews, as well as a mature response to deadlines, schedules, and targeted project completion. As a student, you shall be aware that professors are not inclined to step-by-step tutorial based instructions. Students need to take risks and be responsible for their own project.
- Respectful interaction at all times and circumstances of this course. Be mindful of your conduct when engaged in experiences and discourses with those who differ from you in appearance, race, ethnicity, beliefs, gender, sexuality, style, politics, or intellectual position held. All students are required to abide by the UNC Charlotte Sexual Harassment Policy as referenced at << <http://www.legal.uncc.edu/policies/ps-61.html> >> and the policy on Responsible Use of University Computing and Electronic Communication Resources as referenced at << <http://www.legal.uncc.edu/policies/ps-66.html> >>. Sexual harassment, as defined in the UNC Charlotte Sexual Harassment Policy, is prohibited, even when carried out through computers or other electronic communications systems, including course-based chat rooms or message boards.
- All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office or online as referenced at << <http://www.legal.uncc.edu/policies/ps-105.html> >>.
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Students with Documented Disabilities: Students in this course seeking accommodations to disabilities must first consult with the Office of Disability Services and follow the instructions of that office for obtaining accommodations.

LEVELS OF ACCOMPLISHMENT | UNDERGRADUATE

The Course Professor will govern the assessment and evaluation of student performance. Performance or status will be officially recorded, as per University policy, by submitting marks (Satisfactory/Unsatisfactory) at midterm and (A through F) at the end of the term. The interpretation of letter grades is as follows:

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B - Highly developed and considered work. The student's work is above average, exhibiting an in-depth understanding of the issues and concerns of the project. The inquiry and productions have been thorough. Graphic and three dimensional representation skills are well developed and precise, oral and writing abilities are above average. The work is complete, and presented on time in a thorough manner. Enthusiasm and initiative are shown. The student searches for new ideas, greater development, producing more than is required.

C - Competent work. The student's work is average, exhibiting a basic understanding of the issues and concerns of the project, but lacking depth in development. Graphic and three dimensional representation skills are adequate, oral and writing abilities are average. The work is complete, and presented on time, satisfying basic presentation requirements.

D - Underdeveloped, unresolved work. The student's work is below average, lacking depth in ideas and development, but of passing quality. Graphic and three dimensional representation skills are weak, oral and writing abilities are limited. The work is incomplete, or presented late.

F - Unsatisfactory Work. The student's work is weak, lacking depth in development at many levels, and not of passing quality. Intentions are not carried through. Graphic and three dimensional representation skills are weak, oral and writing abilities are limited. The work is incomplete, or presented late.

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