A4715: Spring 2020
ReThinking BIM

Instructor:
Jared Friedman [jbf2162@columbia.edu]

Time & Location:
Thursdays 7-9 pm // 115 Avery

INTRODUCTION

Our capabilities as architects today to create and leverage organized building data is continuously expanding the possibilities for designing and understanding what we build and how we can build it. At the same time, this kind of literacy is becoming even more essential as our daily lives are increasingly saturated with structured data; of which provides us with invaluable insights and feedback that alter our decisions, behaviors, and validate our ideas. This class puts forth the challenge for students to develop robust data driven methodologies and computational frameworks that intensify creative iteration and validate design solutions by utilizing various parametric design platforms to build tools and workflows for analysis, automation, simulation , optimization, representation, and so forth.

This course is intended to provide foundational knowledge of relevant modeling software and visual programming interfaces, while also discussing contemporary applications of these tools in the industry. Each lecture is split into two parts: the first being a discussion about a particular topic, and the second part being an instructional demo. In the first third of the semester, students will utilize Revit to model an existing piece of architecture in New York City as a means to learn the basics of the tools with several lectures and tutorials that address more advanced topics. Students will then re-design their initial draft with this new toolset according to a conceptual proposal put forth at the beginning of the semester. Post midterm the class will develop more advanced parametric and data-driven design methodologies that focus on achieving a revised set of design goals.

COURSE GRADING CRITERIA

- 50%: Final Project Submissions (including progress submissions)
- 35%: Weekly Assignment Postings (Individual non-final project submissions)
- 15%: Attendance and Participation

COURSE REQUIREMENTS

- Experience with at least one 3D modeling software
- Attendance of lectures and desk crits
- Completion of all assignments

SCHEDULE

Session	Date	Topics	Assignments
1	1/23	Intro to BIM & Parametric Thinking, BIM in Practice *Demo*: Revit UI, Views, Links, Grids, Levels, Floors, Walls, Families	Complete Tutorials Begin existing case study model
2	1/30	Collaboration in AEC, Data Exchange *Demo*: Type/Instance, Columns, Beams Curtain Walls, Circulation, Roofs, Views, Graphics	Complete Tutorials Progress case study model
3	2/6	Intro to Visual Programming Part I (Dynamo), Intro to Final Project *Demo:* Point Clouds, Dynamo	Point Cloud Exercise Dynamo Exercise Form project groups/Concept Proposal
4	2/13	Composite Drawing Techniques *Demo:* Tips and tricks for developing drawings and renders from digital models	Complete Tutorials Composite drawings from project models
5	2/20	Guest Lecture TBD / Parametric Components in Practice *Demo:* Revit Families and Adaptive Components	Complete Tutorials Build your own Family (individual) Progress on final project proposals
6	2/27	Intro to Visual Programming Part II (Grasshopper), Interoperability Part I *Demo:* Adaptive Components Continued, Intro to Grasshopper UI	Complete Grasshopper Tutorials Design a component for your project
7	3/5	Working with Data / Visual Programming Part III *Demo: (*Grasshopper) Lists, Trees, Serialization	Complete Tutorials Grasshopper exercises
8	3/12	Interoperability in BIM, Environmental Analysis Part I *Demo:* Interoperability tools, Intro to Grasshopper plugins	Progress on final project Part A Deliverables
9	3/26	Desk Crits	Progress on final project Part A Deliverables
10	4/2	Coding in the AEC industry *Demo:* Environmental Analysis Part II, Animations	Progress on final project
11	4/9	Desk Crits	Progress on final project
12	4/16	Guest Lecture TBD / AEC Tech *Progress Pinup / Presentations*	Progress on final project
--	5/7		**FINAL Project Due**

ASSIGNMENTS

Throughout the semester students are expected to keep up with the course assignments with due dates as shown in the schedule. The content and dates of submissions are subject to change where deemed appropriate. Further details on each of these submissions will be discussed during lectures.

Part I

The first portion of the course will revolve around developing a model of the Lever House building in Manhattan. Students will be expected to independently model the building in Revit utilizing the lessons learned from the first four sessions of the course. After Session #3 we will form groups and students will begin developing the early steps of their final project submission. By Session #7 each teamed is expected to have developed an existing conditions Revit model, some form of parametric or adaptive component, and a first pass at some Composite Drawings that begin to show the graphic direction of the final project submission. More details will be provided during lectures.

Part II (Final Submission)

Beginning in Session 8, all assignments will be geared towards making progress on the final project submission. There will be various options for final project tracks (more detail provided in Final Project Handout document):

Option 1A: Lever House Adaptation / Intervention

This submission should consist of a proposal for an adaptation/intervention of the case study building modeled in Part I of the semester that utilizes the knowledge acquired throughout the course. Proposals should propose design solutions driven by data-centric workflows that are focused on a particular portion of the building (enclosure, interior programming, public space, etc.).

Option 1B: Other Case Study Adaptation / Intervention

If you wish to substitute the Lever House model with a case study from another course or studio, this is certainly welcome. It will just need to be made clear what portion of the project will be developed within the context of this course for the final submission.

Option 2: Propose Your Own AEC-focused Startup & Workflow

For this option students will propose their own company that addresses inefficiencies within the AEC industry. The focus of the proposal should not be the business model itself, but rather a digital workflow that you propose in order to streamline various processes. Proposals should clearly identify the incoming data sets in which they are working with, and how they are interpreting this data. The final deliverable may choose to rely on wireframing and graphic representation of interfaces, etc., but should include some sort of a functioning prototype of the proposed workflow.

COURSE FORUM AND SUBMISSIONS

OVERVIEW

Submissions for assignments will be handled using our Discourse Forum. All enrolled students will receive an invite following the first class. The discussion forum will be used by the instructor to post class material and by students to submit their assignments. Students will also be encouraged to use the platform to ask questions and engage others in class related discussions.

LINK
http://forum.rethinkingbim.com

COURSE RESOURCES

These are some basic sources that may be used throughout the semester.
More detailed resources will be provided throughout the semester.

ReThinking BIM Tutorials: https://vimeo.com/user4826920 &
https://www.youtube.com/channel/UC82U-lpftjA7lCeb9Rhdraw
Dynamo Forum: https://forum.dynamobim.com/
Grasshopper/Rhino Forum: https://discourse.mcneel.com/c/grasshopper
Revit API Docs: https://apidocs.co/apps/revit/2019#
Revit Architecture Forum: https://forums.autodesk.com/t5/revit-architecture-forum/bd-p/133
LinkedIn Learn: https://www.linkedin.com/learning/revit-2019-essential-training-for-architecture-imperial
Essential Algorithms & Data Structures: https://www.rhino3d.com/download/rhino/6.0/essential-algorithms