SCHOOL OF ARCHITECTURE

UNIVERSITY OF PUERTO RICO-RÍO PIEDRAS
SPRING 2016

ARQU 5995 BASIC, INTERMEDIATE & ADVANCED REVIT | COURSE SYLLABUS
Schedule: Fridays 8:30 - 11:30 AM
Credits: 3 hours per week

INSTRUCTOR
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http://inhabitat.com/big-wood-skyscraper-design-earns-honorable-mention-from-2013-evolo-skyscraper-competition/

[BUILING INFORMATION MODELING OR BIM] // IS AN INTEGRATED PROCESS FOR COLLABORATION BEFORE CONSTRUCTION OR THE BEGINNING OF PROTOTYPE PRODUCTION. THIS PROCESS IS CHARACTERIZED BY EARLY DEVELOPMENT OF INFORMATION-RICH, COORDINATED, 3D MODELS THAT EVOLVE THROUGH A PROJECT LIFECYCLE, FROM PLANNING, DESIGN TO CONSTRUCTION OPERATIONS.

OVERVIEW

This software structure course explores the capacity of basic/intermediate digital architectural drawing and 3D modeling using Autocad and Revit Architecture ® as a tool for the representation of architectural design through the use of BIM technology. While many processes have shaped the framework of the built environment, Building Information Modeling encompasses a computer aided design process (CAD) that ultimately relies on intelligent, information-rich models as the foundation for design, simulation, and collaboration. On the other hand, architectural drawings feed the architects intention, ultimately giving feedback to the author and his mindset on execution processes.

CURRENT

Feasibility, structure, materials, sustainability, and project lifecycle all become active components, present from schematic design, design development, construction documents to project execution and administration. Therefore BIM is an approach to architecture that emphasizes the integration of the design, development, and most important the delivery process. In order to maintain competitive air and stay profitable in architecture as a business, firms adopt new workflows, organization, tools, and methods, all of which allow a better and more profitable execution of the design process. BIM is currently one of the major paradigm shifts in the building industry, encompassing the representation of building elements as data-rich 3D objects and the use of interdisciplinary building models as the primary source, allowing coordination, collaboration, and communication among design professionals. This allows an early and integrative insight into how buildings will perform, earlier approvals, higher quality, and achievement in sustainable design without compromising excellence in design execution.

OBJECTIVE

The course will be dedicated to understanding architectural drawings and 3D modelling as a design philosophy using Revit Architecture® and AutoCad as a tool and application for its execution. While students are not expected to know BIM or Revit Architecture ®, they are expected to present a critical and innovative mindset in their approach to understanding architectural drawing representation in the 21st century. While AutoCad executes in a vector, two dimension flow, Revit Architecture® is seen as an application that utilizes a single, parametric, 3D model to generate plans, section, elevations, perspective, details and schedules but by no means replaces the execution of other design processes. As a combination, this allows the development of all the necessary instruments to ultimately document the design of a building. This encompasses ways of representation in which intelligent components combine, not only to contain physical attributes but to also have functional behaviors familiar in the AEC, architectural design, engineering, and construction industry.

STRATEGIES

Ultimately the course strategies will be dictated by on-going semester in accordance with the School of Architectue at the University of Puerto Rico, but will rely on the workflows and methodologies adopted by the traditional and innovative AEC industry, aiming as a goal or milestone to simulate BIM current processes in architectural firms and learning AutoCad + Revit Architecture ®. While there are no exact methods, work arounds include design + model development (walls, families, materials, exporting documents + representation), collaboration with studio pin-ups, feedbacks with industry professionals, etc. The goal of these strategies will aim to expose the students to generate architectural drawings and technical representation of their final design project using AutoCAD and Revit Architecture ®.

METHODS OF PRODUCTION

TRADITION [CAD]

VANGUARD [BIM]

SIMULATE | DESIGN | DOCUMENT | VISUALIZE | BUILD

PROCESSES INVOLVED IN ARCHITECTURAL DESIGN EXECUTION

FACTORS INVOLVED IN BUILDING INFORMATION MODELLING

BIM [INTEGRATED MODEL]

DESIGN VISUALIZATION
ANIMATION/RENDERING
CLIENT VISION/GOALS
DOCUMENTATION

LEED DOCUMENTATION
SUN SHADING
DAYLIGHTING
ENERGY MODELLING
WATER USE
MATERIALS

CONTRACTOR USE
CONSTRUCTABILITY
DIRECT TO FABRICATION

POST OCCUPANCY EVALUATION
LIFE CYCLE ANALYSIS
REGULATORY REQUIREMENTS

SITE
FFE
ACOUSTIC
COMMUNITY

PROGRAMMING
FACILITY MANAGEMENT

COST ESTIMATING
SPECIFICATIONS
CONSULTANT INTEGRATION
INTERFERENCE CHECKING

BIM [INTEGRATED MODEL]

SKILLS ADQUIRED WITH COURSE STRUCTURE

A. COLLABORATION
+ COPY AND MONITOR IN A LINKED FILE
+ USE WORKSHARING
+ MPORT DWG FILES INTO REVIT

B. DOCUMENTATION
+ CREATE AND MODIFY FILLED REGIONS
+ PLACE DETAIL COMPONENTS AND REPEATING DETAILS
+ TAG ELEMENTS (DOORS, WINDOWS, ETC.) BY CATEGORY
+ USE DIMENSION STRINGS
+ SET THE COLORS USED IN A COLOR LEGEND SCHEME

C. ELEMENTS
+ CHANGE ELEMENTS WITHIN A CURTAIN WALL (GRIDS, PANELS, AND MULLIONS)
+ CREATE COMPOUND WALLS
+ CREATE A STACKED WALL
+ DIFFERENTIATE SYSTEM COMPONENTS AND FAMILIES
+ CREATE AND MODIFY FAMILY CATEGORIES
+ CREATE A NEW FAMILY TYPE
+ MODIFY AN ELEMENT'S TYPE PARAMETERS
+ USE REVIT FAMILY TEMPLATES

D. MODELLING

+ ASSETS REVIEW WARNINGS IN REVIT
+ CREATE A BUILDING PAD
+ DEFINE FLOOR FOR A MASS
+ CREATE A STAIR WITH A LANDING
+ CREATE ELEMENTS SUCH AS FLOORS, CEILINGS, OR ROOFS
+ GENERATE A TOPOSURFACE
+ MODEL RAILINGS
+ WORK WITH PHASES
+ A MODEL ELEMENTS MATERIAL

L (DOOR, WINDOW, FURNITURE)
+ EDIT A MODEL ELEMENTS MATERIAL (DOOR, WINDOW, FURNITURE)
+ CHANGE A GENERIC FLOOR/CEILING/ROOF TO A SPECIFIC TYPE
+ ATTACH WALLS TO A ROOF OR CEILING

E. VIEWS
+ DEFINE ELEMENTS PROPERTIES IN A SCHEDULE
+ CONTROL VISIBILITY
+ USING LEVELS
+ CREATE A DUPLICATE VIEW FOR A PLAN, SECTION, ELEVATION, DRAFTING VIEW
+ CREATE AND MANAGE LEGENDS
+ MANAGE VIEW POSITIONS ON SHEETS
+ MOVE THE VIEW TITLE INDEPENDENTLY OF THE VIEW
+ ORGANIZE AND SORT ITEMS IN A SCHEDULE

F. USER INTERFACE
+ DEFINITIONS
+ UI NAVIGATION/INTERACTION
+ DRAWING WINDOW
+ NAVIGATION CONTROL
+ ZOOM

G. FILE MANAGEMENT
+ DEFINITIONS
+ PROJECT FILES
+ OPEN EXISTING REVIT PROJECT
+ CREATE NEW REVIT PROJECT
+ SAVING AND EXPORTING

H. VIEWS
+ VIEW CONTROL AND PROPERTIES
+ VIEW TYPES
+ CREATING AND MANAGING CAMERAS

I. LEVELS
+ PLACING LEVELS
+ DEFINITIONS

J. WALLS
+ HOME TAB WALL
+ OPTIONS BAR
+ OPENINGS
+ JOIN
+ MATERIALS

K. DOORS
+ HOME TAB DOOR
+ OPTIONS BAR
+ MODEL IN PLACE

L. COMPONENTS
+ HOME TAB COMPONENT
+ OPTIONS BARA
+ PLACING AND IMPORTING COMPONENTS
+ FAMILIES

M. COLUMNS AND GRIDS
+ DEFINITIONS
+ HOME TAB GRID
+ GRID PROPERTIES
+ HOME TAB COLUMN
+ COLUMN PROPERTIES
+ MODIFY

N. STAIRS AND RAILINGS
+ STAIR TYPES AND PROPERTIES
+ STAIR PLACEMEN OPTIONS
+ RAILING TYPES AND PROPERTIES
+ RAILING PLACEMENT OPTIONS

O. ROOF AND FLOORS
+ROOF TYPES AND PROPERTIES
+ ROOF ELEMENTS
+ FLOOR TYPES AND PROPERTIES

P. SKETCHING
+GEOMETRY
+ FILLET, TRIM
+ SNAPS

Q. ANNOTATIONS
+ TEXT
+ DIMENSIONS
+ TAGS

R. SCHEDULES
+ SCHEDULE TYPES
+ LEGENDS
+ KEYNOTES

S. CONSTRUCTION DOCUMENTS
+ SHEET SET UP
+ PRINTING AND EXPORTING
+ RENDERING

http://www.zundelcristea.com/en/architecture/evolo-tower/

IMPORTANT DEFINITIONS

1. AS-BUILT MODEL: The final model that shows how a building was actually delivered and assembled. Also referred to as Record Model.

2. BUILDING INFORMATION MODEL: (BIM) An integrated process aimed at providing coordinated, reliable information about a building project throughout different project phases -- from design through construction and into operations. BIM gives architects, engineers, builders, and owners a clear overall vision of the project -- to help them make better decisions fster, improve quality, and increase profitability of the project.

3. CLASH DETECTION: The process of checking for clashes and interferences in the design of one or more BIM models. Also referre to as model mediation.

4. COLLABORATIVE PORJECT MANAGEMENT: A software solution that enables effective management of and collaboration on all project-related communication, information, and business processes across the plan, build, and operated phases of the buildiing lifecycle. The most common processes include collaborative documentation, design, bid, construction, cost, and operations management.

5. CONSTRUCTION MODEL: The model used to simultate and analyze the construction of a building.

6. COORDINATION MODEL: A model created from two or more models, used to show the relationship of multiple building disciplines such as architectural, civil, structural, and MEP

7. CORE COLLABORATION TEAM: The group of people --which should include some from each party working on the project, such as the owner, architect, contractor, subconsultants, suppliers, and trade contractors --responsible for completing a BIM Deployment Plan, creating the document management file folder structure and permission levels in the collaborative project management system, and enforcing the action plan set out in that document throughout design and construction of the project.

8. DESIGN INTENT MODEL: The model used to communicate the design intent of a building.

9. INDUSTRY FOUNDATION CLASSES (IFC): A neutral and open file format structure developed by the International Alliance for Interoperability (IAI) to enable interoperability between modelling software systems.

10. INTEGRATED PROJECT DELIVERY (IPD): A project delivery process that integrates people, systems, business structures, and practice to collaboratively harness the talents and insights of all participants in order to optimize project results, increase value to the owner, reduce waste, and maximize efficiency throughout all phases of design, fabrication, and construction.

11. MODEL INTEGRATOR: A tool used to combine and/or link design files from different software platforms.

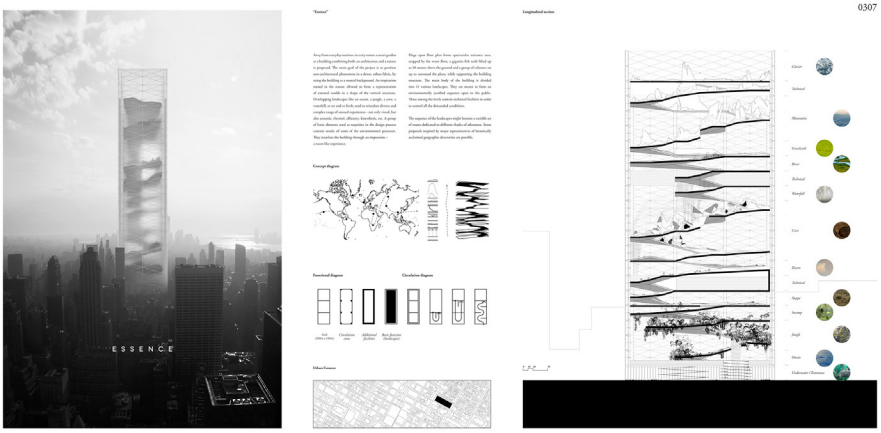
12. MODEL MANAGERS: The project team member responsible for managing the collaboration and sharing of electronic files during the project. Model managers are also responsible for maintaining integrity of BIM models, which cna include gathring, linking, and uploading update models.

13. PARAMETRIC: The relationships among and between all elements of a model that enable coordination and change management. These relationships are created either automatically by the software or manually by users as they work.

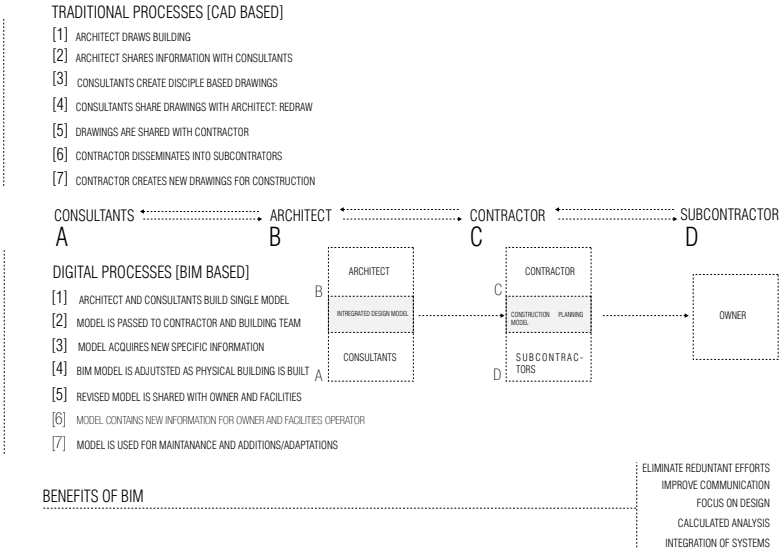
14. PROJECT SYSTEM ADMINISTRATOR (PSA): The persona who administers, and sets up folders, for the collaboration project management system. Responsible for managing and creating new users accounts, as well as contact and company information.

LIST OF EXAMPLES PROJECTS DONE IN REVIT

1. Ekris Utrecht BMW, ONL
2. Wuhan Greenland Center, Adrian Smith + Gordon Gill
3. Shangaih Tower, Gensler
4. Abu Dhabi International Council Headquarters, AEDAS
5. 290 Mulberry, Shop Architects
6. Botswana Innovation Hut, Shop Architects
7. Baku Flame Tower, Azerbaijan, HOK
8. Masdar Headquarters Project, Adrian Smith + Gordon Gill
9. Roseisle Distillery, AECOM
10. Dongjiang Port Zone in Tianjin, CCDI
11. Miami Science Museum, Grimshaw Architects
12. One World Trade Center: The Freedom Tower, SOM
13. Korea Gas Corporation Building, Heerim Architects
14. College of DuPage Technology Education Center, De Stefano
15. Active House, House for Life, AART Architects
16. Paredes School Center, Atelier Nuno Lacerda Lopes
17. Inspiria Science Centre, AART Architects



UNDERSTANDING OF BIM PROCESS IN PROJECT EXECUTION



DETAILED GUIDELINE FOR COURSE

BLOCK 1

TOPIC 1: USER INTERPHASE

1. APPLICATION MENU OPTIONS
2. INTRODUCTION TO RIBBON
3. INTRO TO THE PROJECT BROWSER
4. PARAMETERS IN THE STATUS BAR
5. WORK AREA AND VIEW CONTROLS
6. GRAPHIC DISPLAYS AND VIEW CUBE
7. OVERVIEW OF PROPERTIES TAB
8. REVIT COMMANDS & SHORTCUTS
9. INSTANCE VS. TYPE PARAMETERS

TOPIC 2: PROGRAM INTEROPERABILITY

1. INTRODUCTION TO IMPORT SETTINGS
2. IMPORT VS. LINKING DATA
3. MANIPULATING LINKED DATA
4. LINKING DETAILS
5. IMPORTING 3D DATA
6. EXPORTING 2D DATA
7. EXPORTING AND DOWNLOADING FROM AUTODESK SEEK

TOPIC 3: MODELLING AND MASSING FOR CONCEPTUAL DESIGN

1. MASSING AND FUNCTIONALITY
2.SCHEDULING AND CREATING FLOOR FACES
3.EXPLORATION WITH INTUITIVE MASSING
4. IN PLACE SOLIDS
5. STARTING VOIDS AS SOLIDS
6. MASS FAMILIES
7. CREATING OPENING SHAFTS

BLOCK 2

TOPIC 4: INTRO TO BUILDINGS + MODELLING/MASSING

1. INTRODUCTION TO WALLS, DOOR, AND WINDOW TYPES
2.GENERATING CURTAIN SYSTEMS AND GRIDS
3.MODELING STAIRS, RAMPS AND RAILS
4.RELATIONSHIP BETWEEN ROOFS, FLOORS AND CEILINGS
5. HOST ELEMENTS VS NON-HOSTED
6. OVERVIEW OF COMPONENTS AND FAMILIES

TOPIC 5: ADJUSTING GRAPHIC QUALITY

1.INTRODUCTION TO SHEET TEMPLATES
2MATERIAL PROPERTIES
3.APPEARANCE VS. GRAPHIC
4.OBJECT STYLES AND LINE SETTINGS
5. LINE STYLES AND FILL PATTERNS
6. ROOM TAG AND COLOR SCHEDULES
7. USING MODEL TEXT AND MODEL LINES
8. AREA & LEGEND PARAMETERS

TOPIC 6: REVIT & PROFESSIONAL PRACTICE

OFFICE VISIT

BLOCK 3

TOPIC 7: 3D VISUALIZATION

1.SETTINGS FOR ANALYTIC VISUALIZATION
2. CHECKING VISUAL STYLES AND OVERRIDES
3. ADJUSTING PHOTREALISTIC SETTINGS
4. CREATING AND ADJUSTING A SECTION BOX
5. ADJUSTING RENDERING SETTINGS
6. CREATING AND EXPORTING ANIMATION PATHS
7. USING AND ADJUSTING ARTIFICIAL LIGHTING

TOPIC 9: BIM MANAGEMENT

1. UNDERSTANDING A BIM WORKFLOW
2.STAFFING A BIM PROJECT
3. QUALITY CONTROL AND BIM
4. UNDERSTANDING WORKSHARING
5. MANAGING WORKFLOW WITH WORKSETS
6. SAVING WORK
7. UNDERSTANDING ELEMENT OWNERSHIP
8. CAMERAS IN REVIT

TOPIC 10: DOCUMENTATION

1. CREATING DETAILS AND REGIONS
2.ADJUSTING VISIBILITY SETTINGS
3. DOCUMENTING PLANS
4. LAYING OUT SHEETS
5. ANNOTATING WITH TEXT AND KEYNOTES
6. SAVING WORK
7. ANNOTATING WITH TAGS AND LABELS
8. ADDING DIMENSIONS

BLOCK 4

TOPIC 11: WORKING WITH CONSULTANTS

1. DEVELOPING A BIM EXECUTION PLAN
2.COORDINATION AND LINKED MODELS
3. USING COORDINATION TOOLS
4. ATTACHMENTS VS. OVERLAY
5. ANNOTATING WITH TEXT AND KEYNOTES
6. INTERFERENCE CHECKINGSAVING WORK

TOPIC 12: PHASING AND GROUPING

1. PHASING GEOMETRY, ROOMS AND VIEWS
2.PHASE SETTINGS
3. ASSIGNING PROJECT PHASES
4. PHASES FILTERS
5. GRAPHIC OVERRIDES
6. GEOMETRY PHASING

TOPIC 13: INTRODUCTION TO ENERGY MODELING

1. CONCEPTUAL ENERGY ANALYSIS
2.CREATING A SOLAR PATH
3. DETAILED ENERGY MODELLING
4. EXPORTING TO GBXML
5. PROJECT LOCATION, BUILDING ENVELOPE AND ROOMS + VOLUMES

ONLINE RESOURCES

https://gallery.autodesk.com/a360rendering
http://www.hokbimsolutions.com/
http://www.som.com/content.cfm/blackbox_technological_trajectory_5
http://villagebim.typepad.com/villagebim/structure/
http://autodesk-revit.blogspot.com/
http://wikihelp.autodesk.com/Revit/enu/2012
http://www.hokbimsolutions.com/
http://www.bimtaskgroup.org/education-and-training-videos/
https://www.agc.org/learn/education-training/building-information-modeling-education-program
http://bim.psu.edu
http://www.revitcity.com/resources.php
http://bimopedia.com/2013/04/02/revit-bim-the-best-resources-from-2012/

SOFTWARE TEXT AND REFERENCE-AUTODESK OFFICAL

Read, Krygiel and Vandezande. Mastering Autodesk Revit Architecture 2013, John Wiley & Sons, Indianapolis, 2012.
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