CE 470: BUILDING INFORMATION MODELING & INTEGRATED PRACTICE

Instructor   **TA**
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Spring 2012 Syllabus
Thursdays, 3:30pm – 6:10pm; Room: RTH 109

1. Course Description
Building Information Modeling (BIM) is a centralized data-rich virtual project model that facilitates documentation, design exploration, model-based quantity take off and estimating, interference checking, construction coordination and sequencing, digital fabrication and 3D building information capture and visualization.

In this course, students will learn BIM's use in the industry (by different disciplines), examine geometry, spatial relationships, building information, quantities and properties of building components, and understand the benefit and improvement areas BIM offers. Integrated Project Delivery (IPD) is a project delivery approach that is almost a prerequisite for successful BIM projects. It integrates people, systems, business structures and practices into a process that helps optimization of project results, increases value to the owner and end user, reduces waste, and maximizes efficiency through all phases of design, fabrication, construction and life-cycle of the structure.

This course focuses on the role of BIM in the AEC industry and it covers recent developments in the area of IPD, both of which have a great potential to better project outcomes and maximize efficiency. In addition, this course brings cutting edge and emerging technology solutions into the classroom and tries to link these solutions into the BIM environment.

2. Objectives:
- Provide familiarity with the current BIM technologies
- Provide understanding of the shift from 2D representation to 3D building simulation
- Provide understanding of new means of coordination and collaboration of design and construction
- Provide understanding of the linking and maintaining continuity of existing and designed BIM information and other vital information, such as vendors for specific materials, location of details and quantities required for estimation, bidding and scheduling, into the model
- Provide understanding of new project delivery systems and technologies for 'integrated practice'
- Provide an outlook to how innovative technologies could be integrated into current AEC practices.

3. Teaching Methods
A combination of: lectures, hands on software training, project-based assignments and discussions. Additional out of class time will be required for directed learning, workbook assignments and reviewing relevant material and handouts.

4. Typical Class Session
Lecture and hands-on training: 3:30 – 4:50 PM Lectures will cover and expand on the workbook and reading assignments via demonstrations and hands-on exercises. If you miss a step during the hands-on tutorials, raise your hand right away and I will come and help you.

Big-picture BIM issues will also be communicated and discussed so that students can see how BIM provided by the architect fits into the entire design/build/manage process.

Studio: 5:00 – 6:10 PM The studio portion of the class will allow time for students to get a head start on completing the workbook and hand-out project assignments with direct assistance by the instructor.

Studio will also be used for informal and one-on-one instruction. Studio time will also be used for informal student presentations, critiques or discussions. Students are encouraged to walk around and look over the shoulders of other students in order to learn from each other.

5. Attendance
If you miss a class, it is your responsibility to ask at the next class what handouts you missed or find out about topics covered.

If you are late for class and miss roll, it is your responsibility to make sure I check you present; if not you will not get credit for attendance.

6. Class Participation
This will be a highly interactive class. There will be a lot of interchange between the instructor and the students. Questions are highly encouraged, but please keep them to the point, of general interest, and related to the subject matter being covered. BIM is a HUGE subject and this is merely an introduction. Please direct personal questions to the instructor at breaks or during one-on-one studio time.

7. Supplies Needed
- USB Memory Stick (thumb drive); recommended minimum size: 2 GB. Please put your name on it. Better yet, sign up at Dropbox.com and get 2GB of cloud storage for free!
- Class notebook and binder for handouts

8. Final Project
3D Model Build from scratch a constructability Model Building D of the School of Cinematic Arts building complex using Revit. See handout for project specifications.

9. Class Communication
Blackboard will be used for class communication, assignment submissions and reading materials.

10. Course TA
Hamid Hajian: hhajian@usc.edu
Office Hours: TBA

11. Evaluation
Grades will be based on completeness and quality of assignments, tests, attendance and willingness to collaborate.

- 15%   Attendance
- 10%   Quiz 1
- 10%   Quiz 2
- 30%   Completion of homework assignments #1-6
- 35%   Final Project
- 100%   TOTAL

12. Extra Credit
Personal initiative and enthusiasm expressed for the subject matter taken up in this class shall be acknowledged via extra credit points. To receive extra credit points, submit a one or two paragraph memo (print or e-mail) describing your extra credit activity, make a mini-presentation in class based on your research/discovery, or complete a mini research paper and you will receive extra points (out of 100 total points). Extra credit points can accumulate to a maximum of 5 points out of 100. Extra credit activity is a great way to raise your grade.

Examples of extra credit projects:
- Report on an article or blog entry related to BIM in construction management
- Present and comment on a YouTube video you found on-line
- Attend and report on a webinar you attended
- Report on a book your have researched on BIM in construction management
- 5-minute presentation of any additional building you modeled in Revit
- 5-minute presentation of a productivity tip you learned in Revit
- A PowerPoint or Keynote presentation related to BIM in construction management
- Attend a FREE local Revit User Group meeting:
  - SCRUG; meets every 3rd Thursday, 6:30 PM at LPA, Inc., Irvine: http://www.meetup.com/scrug-oc to join
  - BUGie; meets every 3rd Tuesday, 6:00 PM at WLC in Rancho Cucamonga: http://www.meetup.com/BUG-IE
- Presentation of BIM-based collaboration in the AEC industry
- 5 page research report on a BIM subject of your interest

13. Final Grades
Grade breakdown by percentage of a possible 100 total points:
- A   100 - 90%   Work exceeds expectation, always attends class
- B   80 - 89%   Very good work, almost always attends class.
- C   66 - 79%   Good work, good attendance
- D   65 - 50%   Late, incomplete, or sloppy work, infrequent attendance
- F   49% or less   Missing or copied work, poor attendance

14. Required Textbook and Study Materials
- *Design Integration Using Autodesk Revit 2012 (Architecture, Structure & MEP)* by Daniel John Stine, SDC Publications (www.sdcpublications.com)
- Penn State BIM Execution Plan – http://www.engr.psu.edu/ae/cic/bimex
- LACCD BIM Standards – http://standards.build-laccd.org/projects/dcs/pub/BIM%20Standards%20DB/released/PV%2D001.pdf
- LACCD Sustainable Design Standards – http://standards.build-laccd.org/projects/dcs/pub/Sustain%20Design%20Standards/released/PV%2D001.pdf

15. Required Software:
Student Versions of Revit Architecture 2012 and Navisworks Manage 2012
Go to http://students.autodesk.com, register and download Revit and Navisworks
- Revit and Navisworks are PC only, but can be used on a Mac with Boot Camp (ships free with your Mac: go to Applications/Utilities/Boot Camp Assistant) or Parallels (http://www.parallels.com) that allows a Mac to run Windows. NOTE: to run Revit on a Mac, you must have a copy of the Windows operating system.

16. Related Software
Graphisoft ArchiCAD	– https://myarchicad.com
Google SketchUp	– http://sketchup.google.com
Bentley Architecture	– http://www.bentley.com/en-US
Digital Project	– http://www.gehrytechnologies.com
Vectorworks from Nemetschek	– http://www.nemetschek.net
Virtual Construction	– http://www.vicosoftware.com
Tekla	– http://www.tekla.com/us/Pages/Default.aspx
Solibri	– http://www.solibri.com (model review & clash detection)
Synchro	– http://www.synchroltd.com
IES (energy & performance analysis)	– http://www.iesve.com/content
Ecotect (energy & performance analysis)	– http://students5.autodesk.com

17. BIM Resources On-line

All Roads Lead to BIM	– http://www.digitalvis.com/allroads
BIM and Integrated Design	– http://bimandintegrateddesign.com
All Things BIM	– http://allthingsbim.blogspot.com
BIM Forum	– http://www.bimforum.org
AECbytes	– http://www.aecbytes.com
Eat your CAD (from the UK)	– http://www.eatyourcad.com
Building Smart Alliance	– http://www.buildingsmartalliance.org
National BIM Standard (NBIMS)	– http://www.buildingsmartalliance.org/index.php/nbims
BIMStorm	– http://bimstorm.com

18. Revit Resources On-line

Revit Wiki On-line Help:	– http://wikihelp.autodesk.com/Revit/enu/2012
YouTube videos	– http://www.youtube.com (search on "Revit")
Revit City	– http://www.revitcity.com/index.php
AUGI (Autodesk User Group International)	– http://forums.augi.com (navigate to AEC > Revit)
Club Revit	– http://clubrevit.com
The Revit Kid	– http://therevitkid.blogspot.com
BIMBoom	– http://bimboom.blogspot.com
Tips and Tricks Series by AECbytes	– http://www.aecbytes.com/tipsandtricks.html

19. Class Structure & Schedule
Class sequence, dates, and topics are subject to change

#	Date	Lecture Topics	Hands-on Studio/ Quizzes	Reading to begin/ Assignments due
1	1/10	COURSE INTRODUCTION Course overview and administration BIM INTRODUCTION The difference between CAD and BIM History of BIM What is BIM and what is NOT BIM? How BIM is changing the Building Industry BIM Authoring for Architecture: Introduction (Revit Architecture)	Lesson 3: build Small Office in class Getting started on laying out Workbook project: Law Office:	Review of Lessons 2, 4 & 5 in required text (Design Integration Using Autodesk Revit 2012); Download Revit Architecture 2012 student version if you choose to work at home Complete Lesson 3; begin Lessons 6: start Law Office
2	1/17	OVERVIEW OF BIM TOOLS Software environments/ solutions/ classifications BIM guidelines Revit interface introduction Object hierarchy in Revit Introduction of the final project	Work on Law Office project	Lesson 7 Study LACCD BIM Guidelines (see in Section 14 above)
3	1/24	BIM AUTHORING: Architecture Modeling Basics (Revit Architecture) Building elements Project set-up Setting up grids and levels Exterior walls Interior walls	Work on Law Office project	Lesson 8 **Submit Law Office through Lesson 7 (Architectural), due midnight 1/24**

		Curtain walls		
4	1/31	BIM AUTHORING: Architecture Windows and doors, Stairs and circulation Roofs, Floor systems and, Ceilings	Work on Law Office project	Lesson 9
5	2/7	BIM AUTHORING: Structure; MEP & FP systems Site and mass	Work on Law Office project	Lesson 10-11
6	2/14	BIM AUTHORING: Materials in Revit Site and mass	Work on Law Office project	Lesson 12-15
7	2/21	BIM for Contractors and Construction Managers Schedule, take-offs & estimating (5D), bidding Introduction laser scanning–collecting as-built information Elevations, Sections, and Details Modeling Levels of Development (LOD)	**QUIZ 1 (Revit modeling)**	(http://www.aecbytes.com/buildingthefuture/2006/LDAC_story.html) (http://bimlaccd.blogspot.com/p/videos.html) **1. Workbook model due (Law Office), midnight 2/14**
8	2/28	REVIT PARAMETRIC FAMILIES Parametric family modification How to create custom elements for the model	Getting started on component family creation: office desk	"Creating the Perfect Family" handout
9	3/6	SPATIAL COORDINATION (Navisworks Manage) Organizing the spatial coordination effort Integrating/appending all BIM models (A, S, C, MEP & FP), Navigating around the model Interference checking: Setting up clash tests managing clashes	Introduction of Final Project Finding floaters and disconnects on Law Office model	Instructor's "Spatial Coordination" handbook **2. Turn in assignment on schedules and quantity take-off based on Law Office, due midnight 3/6**
	3/13	**SPRING BREAK-NO CLASS**		
10	3/20	SPATIAL COORDINATION (Navisworks Manage) Creating viewpoints Clash detection reporting, Sharing the model with the rest of the design team Implementation and Interoperability Between Disciplines	Clash detection reporting on Law Office model	Instructor's "Spatial Coordination" handbook **3. Turn in assignment on family object creation from "Creating the Perfect Family" handout (office desk) in .RFA format, due midnight 3/20**
11	3/27	4D CONSTRUCTION SEQUENCING (Navisworks TimeLiner) Linking geometry to tasks and durations	Getting started on Law Office construction sequence animation	**4. Turn in Collision Report on spatial coordination of Law Office model in .NWD format due midnight 3/27**

12	4/3	SUSTAINABILITY & BIM Green Design/Green Construction Design Optimization Energy Analysis	**QUIZ 2 (Navisworks & model coordination process)**	Interoperability and Sustainable Design: (http://www.aecbytes.com/feature/2008/Interoperability_SustainableDesign.html) LACCD Sustainable Design Standards (link on p. 3) **5. Turn in assignment on BIM based 4D simulation of Law Office in .NWD format; due midnight 4/3**
13	4/10	BIM IMPLEMENTATION PLANNING IFCs MasterFormat/Uniformat/OnmiClass COBie	Work on Final Project	Download and study Penn State BIM guidelines (link on p. 3)
14	4/17	How to collaborate in a BIM environment Integrated Project Delivery (IPD)	Work on Final Project	
15	4/24 (last class)	BIM FOR OWNERS Why Owners care about BIM Who is using it, for what, why and when? Use of BIM in building operations and facilities management	Work on Final Project	**6. Turn in summary of USC FMS paper in .PDF or .DOCX format; due midnight 4/24**
	4/28-5/1	**Study days, no class session this week**	Work on Final Project	
	5/2-9	**Exam week; no class session this week**	Finish and submit Final Project	**7. FINAL PROJECT: due by midnight Friday 5/4 in .RVT and .PDF format** **Extra credit memos due**

20. Academic Responsibilities and the Fine Print:

Students with Disabilities
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. Your letter must be specific as to the nature of any accommodations granted. DSP is located in STU 301 and is open 8:30 am to 5:30 pm, Monday through Friday. The telephone number for DSP is 213-740-0776.

Academic Integrity
The University, as an instrument of learning, is predicated on the existence of an environment of integrity. As members of the academic community, faculty, students, and administrative officials share the responsibility for maintaining this environment. Faculties have the primary responsibility for establishing and maintaining an atmosphere and attitude of academic integrity such that the enterprise may flourish in an open and honest way. Students share this responsibility for maintaining standards of academic performance and classroom behavior conducive to the learning process. Administrative officials are responsible for the establishment and maintenance of procedures to support and enforce those academic standards. Thus, the entire University community bears the responsibility for maintaining an environment of integrity and for taking appropriate action to sanction individuals involved in any violation. When there is a clear indication that such individuals are unwilling or unable to support these standards, they should not be allowed to remain in the University." (Faculty Handbook, 1994:20)

Academic dishonesty includes: (Faculty Handbook, 1994: 21-22)
Examination behavior – any use of external assistance during an examination shall be considered academically dishonest unless expressly permitted by the teacher.

Fabrication – any intentional falsification or invention of data or citation in an academic exercise will be considered a violation of academic integrity.

Plagiarism – the appropriation and subsequent passing off of another's ideas or words as one's own. If the words or ideas of another are used, acknowledgment of the original source must be made through recognized referencing practices.

Other Types of Academic Dishonesty – submitting a paper written by or obtained from another, using a paper or essay in more than one class without the teacher's express permission, obtaining a copy of an examination in advance without the knowledge and consent of the teacher, changing academic records outside of normal procedures and/or petitions, using another person to complete homework assignments or take-home exams without the knowledge or consent of the teacher.

The use of unauthorized material communication with fellow students for course assignments, or during a mid-term examination, attempting to benefit from work of another student, past or present and similar behavior that defeats the intent of an assignment or mid-term examination, is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tensions accompanying examinations. Where a clear violation has occurred, however, the instructor may disqualify the student's work as unacceptable and assign a failing mark on the paper.

Instructor's notes: Plagiarism also includes copying and pasting 3D architectural system family elements (walls, slabs, roofs, ceilings, floors) into your own project from a source other than your own original work or submitting modeling work based on starting out from a source other than your own. This does not apply to objects like windows, doors or other loadable family components that can be downloaded from on-line and used in your projects.

Unauthorized material communication with fellow students for course assignments also includes sharing of digital models and data when the intent of all assignments are based on individual student's work.

Return of Course Assignments
Returned paperwork, unclaimed by a student, will be discarded after a year and hence, will not be available should a grade appeal be pursued following receipt of his/her grade.

Cell Phones
Please keep these items on vibrate and low volume settings (or turn them off) during lectures. If you choose to take a call, you must step outside and you are responsible for getting missed lecture information from classmates. No long phone conversations are allowed in class during lecture and studio time.

Music and Headphones
Music is encouraged if it enhances your work habits during open studio time. Due to the diversity of our student population and tastes in music, *headphones should be worn.* Alternatively, we often use the classroom speakers to play music via the Internet.

Food and Drink
Food and beverages are not allowed except for water bottles with caps. Students may take a brief break during studio at their own discretion to consume snacks outside the classroom.

Equipment
Keep the workstations clean and orderly. **Please shut down you computer** at the end of class and don't forget to take your memory stick.

Supportive Learning Environment
Let's work together to promote a classroom environment that will stimulate learning and the free exchange of ideas, in the spirit of civility and collaboration, at all times. Let's agree that disruptive or discourteous behavior does not have a place in this classroom.

Now, let's have fun together learning so we can go out and do great things!