




# CE 470: BUILDING INFORMATION MODELING & INTEGRATED PRACTICE

## Spring 2013 Syllabus

Thursdays, 6:30 pm – 9:10 pm; Room: KOH 208

	Instructor	TA
	John Stebbins <a href="mailto:stebbins@usc.edu">stebbins@usc.edu</a>	Pedram Oskouie <a href="mailto:oskouie@usc.edu">oskouie@usc.edu</a>
Blog:	<a href="http://allroadsbim.com">http://allroadsbim.com</a>	
 Twitter:	<a href="http://www.twitter/johnstebbins">http://www.twitter/johnstebbins</a>	
 LinkedIn	John Stebbins	
 Facebook:	John Stebbins	

### 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: 6:30 – 7:50 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: 8:00 – 9:10 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 of Building D in the School of Cinematic Arts building complex using Revit. See handout on Blackboard for project specifications.

## 9. Class Communication

Blackboard will be used for class communication, assignment submissions, reading materials, and grading.

## 10. Course TA

Pedram Oskouie

Office Hours: Wednesdays, 11: AM – 1:00 PM, KAP 227

## 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 you 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
  - BUGie; meets every 3rd Tuesday, 6:00 PM at WLC in Rancho Cucamonga: <http://www.meetup.com/BUG-IE>
  - Los Angeles Revit Users Group: <http://losangelesrevitusersgroup.blogspot.com>
- Presentation on 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 2013 (Architecture, Structure & MEP)* by Daniel John Stine, SDC Publications ([www.sdcpublications.com](http://www.sdcpublications.com))
- Penn State BIM Execution Plan (download) – <http://www.engr.psu.edu/ae/cic/bimex>
- LACCD BIM Standards (download) – <http://standards.build-laccd.org/projects/dcs/pub/BIM%20Standards%20DB/released/PV-001.pdf>

## 15. Recommended Text:

- *Fundamentals of Building Construction: Materials and Methods*, by Edward Allen, Joseph Iano, John Wiley & Sons, Inc. ([www.wiley.com](http://www.wiley.com))

## 16. Recommended Software (if you choose to work at home):

Student Versions of Revit 2013 and Navisworks Manage 2013

You have all the software you need for class work on the USC lab computers, but if you choose to work at home, go to <http://students.autodesk.com>, register and download Revit 2013 and Navisworks Manage 2013 with your USC e-mail address. Once on the student site, go to the “Free Software>Download Center” and scroll down to Autodesk Revit. **Do not download the 2012 versions** of Revit Architecture, Structure, or MEP. A new feature of Revit 2013 is that Architecture, Structure, and MEP are now integrated into one program.

- 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.

**17. Related Software**

- Graphisoft ArchiCAD – <https://myarchicad.com>
- Google SketchUp – <http://sketchup.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.synchro ltd.com>
- IES (energy & performance analysis) – <http://www.iesve.com/content>
- Ecotect (energy & performance analysis) – <http://usa.autodesk.com/ecotect-analysis>

**18. BIM Resources On-line**

- All Roads Lead to BIM (Professor’s blog) – <http://allroadsbim.com>
- 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>
- Building Smart Alliance – <http://www.buildingsmartalliance.org>
- National BIM Standard (NBIMS) – <http://www.buildingsmartalliance.org/index.php/nbims>
- BIMStorm – <http://bimstorm.com>

**19. Revit Resources On-line**

- Revit Wiki On-line Help: – <http://wikihelp.autodesk.com/Revit/enu/2013>
- YouTube videos – <http://www.youtube.com> (search on “Revit, BIM or John Stebbins”)
- 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>
- BIM Boom/ Revit 3D – <http://bimboom.blogspot.com>
- Tips and Tricks Series by AECbytes – <http://www.aecbytes.com/tipsandtricks.html>

**20. 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	1/17	<p>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)</p>	<p>Lesson 3: build Small Office in class</p> <p>Getting started on laying out Workbook project:                      Law Office</p>	<p>Review Lessons 2, 4 &amp; 5 in required text (Design Integration Using Autodesk Revit 2013)</p> <p>Download Revit 2013 student version if you choose to work at home</p> <p>Complete Lesson 3                      Begin Lessons 6: start of Law Office                      Read “BIM Introduction &amp; Best</p>

				Methods Manual” (Blackboard)
2	1/24	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 link in Section 14 above)
3	1/31	BIM AUTHORING: Architecture Modeling Basics (Revit) Building elements Project set-up Setting up grids and levels Exterior walls Interior walls Curtain walls	Work on Law Office project	Lesson 8  <b>Submit Law Office through Lesson 7 (Architectural), due midnight 1/31</b>
4	2/7	BIM AUTHORING: Architecture Windows and doors, Stairs and circulation Roofs, Floor systems and Ceilings	Work on Law Office project	Lesson 9
5	2/14	BIM AUTHORING: Structure; MEP & FP systems Site and mass	Work on Law Office project	Lesson 10-11
6	2/21	BIM AUTHORING: Materials in Revit Site creation and massing	Work on Law Office project	Lesson 12-15
7	2/28	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)	<b>QUIZ 1 (Revit modeling)</b>	( <a href="http://www.aecbytes.com/buildingthefuture/2006/LDAC_story.html">http://www.aecbytes.com/buildingthefuture/2006/LDAC_story.html</a> )  ( <a href="http://bimlaccd.blogspot.com/p/videos.html">http://bimlaccd.blogspot.com/p/videos.html</a> )  <b>1. Complete Workbook model due (Law Office), midnight 2/28</b>
8	3/7	REVIT PARAMETRIC FAMILIES Parametric family modification How to create custom elements	Getting started on component family creation: office desk	Read “Creating the Perfect Family” handbook
9	3/14	SPATIAL COORDINATION (Navisworks Manage) Organizing the spatial coordination effort Integrating/appendig all BIM models (A, S, C, MEP & FP), Navigating around the model	Introduction of Final Project  Finding floaters and disconnects in Law Office model	Begin Instructor’s “Spatial Coordination” handbook  <b>2. Turn in assignment on schedules and quantity take- off based on Law Office, due midnight 3/14</b>
	3/21	No class-Spring Break		
10	3/28	SPATIAL COORDINATION (Navisworks Manage)	Clash detection reporting on Law Office model	Instructor’s “Spatial Coordination” handbook

		Interference checking: Setting up clash tests Managing clashes Creating viewpoints		<b>3. Turn in assignment on family object creation from “Creating the Perfect Family” handout (office desk) in .RFA format, due midnight 3/28</b>
11	4/4	SPATIAL COORDINATION (Navisworks Manage) Clash detection reporting Sharing the model with the rest of the design team Implementation and Interoperability between disciplines		
12	4/11	4D CONSTRUCTION SEQUENCING (Navisworks TimeLiner) Linking geometry to tasks and durations	Getting started on Law Office construction sequence animation  <b>QUIZ 2 (Navisworks &amp; model coordination process)</b>	<b>4. Turn in Collision Report on spatial coordination of Law Office model in .NWD format due midnight 4/11</b>  Interoperability and Sustainable Design: ( <a href="http://www.aecbytes.com/feature/2008/Interoperability_SustainableDesign.html">http://www.aecbytes.com/feature/2008/Interoperability_SustainableDesign.html</a> )  LACCD Sustainable Design Standards (link on p. 3)
13	4/18	BIM IMPLEMENTATION PLANNING IFCs MasterFormat/Unifomat/OnmiClass COBie	Work on Final Project	<b>5. Turn in assignment on BIM based 4D simulation of Law Office in .NWD format; due midnight 4/18</b>  Download and study Penn State BIM guidelines (see link on p. 3)
14	4/25	How to collaborate in a BIM environment Integrated Project Delivery (IPD)	Work on Final Project	
15	5/2 (last class)	BIM FOR OWNERS Why owners care about BIM Use of BIM in building operations and facilities management	Work on Final Project	<b>6. Turn in summary of USC FMS paper in .PDF or .DOCX format; due midnight 5/2</b>
	5/4-7	<b>Study days</b>	Work on Final Project	
	5/8-15	<b>Exam week; no class session this week</b>	Finish and submit Final Project	<b>7. FINAL PROJECT: due by midnight Thursday 5/9 in .RVT and .PDF format</b>  <b>Extra credit memos due by midnight Thursday 5/9</b>

## 21. 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, pages 21-22):

1. Examination behavior – any use of external assistance during an examination shall be considered academically dishonest unless expressly permitted by the teacher.
2. Fabrication – any intentional falsification or invention of data or citation in an academic exercise will be considered a violation of academic integrity.
3. 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.
4. 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 on-line, from places like *seek.autodesk.com*, 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. Headphones should be worn.

### **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 your 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!*