USC School of Architecture

PRELIMINARY
(in-progress, last updated 11/24/21)

Architecture 307: Digital Tools for Architects (Units: 3)
Spring Semester Tuesday / Thursday: 11:00 am – 12:20 pm, on-line

Instructor: Karen Kensek, kensek@usc.edu
Office: Watt 309 (but I am never there)
Office Hours: send email for appointment

Class Assistant: Yushi Wang, yushiw@usc.edu
Studio: third floor Watt Hall, MBS studio (southeast corner) – but she is not there
Office Hours: to be announced

Prerequisite(s): none
Recommended Preparation: basic computer skills, preferably also a 3D modeling program

Course Description and Learning Objectives
Building information modeling (BIM) is a digital paradigm shift, in many ways similar to that of the CAD revolution of the 1980s. What is BIM? How is it different from CAD? Why does an architecture student need to know about it? This course provides an introduction to BIM from the viewpoint of the architect (Revit Architecture, Enscape for visualization), engineer (Revit Structure and Revit Mechanical), and contractor (Navisworks). Depending on time, other software such as Insight (preliminary energy modeling), Fusion (rapid prototyping), FormIt (conceptual modeling), Bluebeam, Dynamo (visual programming), or BIM 360 will be explored.

In order to effectively learn about BIM, it is important that you go to class and keep up with the required readings. You are required to attend all the lectures and complete all the assignments on-time. In addition to many hands-on computer sessions by the instructor, there will also be guest lecturers from the profession. They have spent considerable time and effort to come talk with the class. Listen, be attentive, and ask appropriate questions. They are valuable resources.

In this class, you will
- Learn what BIM is and how it has changed the AEC (architecture/engineering/construction) industry
- Become reasonably proficient in Revit Architecture
- Learn some Revit MEP, with an emphasis on how files are linked together for collaboration between architects and engineers
- Learn how contractors use Navisworks Manage
- Understand what is virtual reality and apply it to your project using Enscape
- Explore other BIM related software programs such as Navisworks, Insight, BIM 360, or Dynamo depending on class time

Technological Proficiency and Hardware/Software Required
Download **Autodesk Revit** from http://students.autodesk.com . You will also be using Enscape and Navisworks Manage. More instructions will be provided during the semester on how to access other software as needed.

Required Readings and Supplementary Materials

Specific due dates for the readings are listed on the syllabus. You are required to have read the material **before** class. There may be in-class quizzes on the readings and/or required questions to answer. There will be other readings posted on Blackboard.
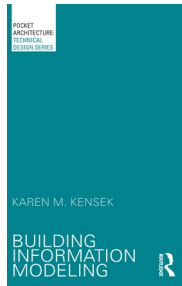
REQUIRED READING
Technical Design Series: Building Information Modeling (Routledge 2014)
Karen M. Kensek, LEED AP BD+C, Assoc. AIA
The book is available in English, French, Chinese, and Portuguese

http://www.routledge.com/books/details/9780415717748

Introduction

Chapter 1: BIM Overview
Parametric modeling and the virtual building model, BIM "dimensions", Level of development, Summary

Chapter 2: Stakeholders and BIM's Many Roles
Architects, engineers, consultants, Construction managers, contractors, sub-contractors, Fabricators, Facilities managers and owners, Summary

Chapter 3: Data Exchange and Interoperability
Interoperability, Data exchange workflows, Single model and federated model systems, Data and communication formats, Summary

Chapter 4: BIM Implementation, optional (but useful are going to work in an architecture office)
Transforming the office to BIM, Delivery methods, Legal issues, Office standards, BIM Execution Plan (BEP), Metrics for BIM maturity, Summary

Chapter 5: Beyond Basic BIM
BIM analytics, Cloud computing, Computational design, Increased sophistication of owners, Summary

Application: Project Case Studies
designLAB architects: Small BIM Tames Big Brutalism
ZGF: BIM in Transition: Making the Leap at a Large Firm
CASE: Building Information Coordinators
Mortenson Construction: Outstanding Project Success Through Collaboration

Conclusion

OPTIONAL READING
Design Computing: An Overview of an Emergent Field (Routledge 2016)
Brian Johnson
Chapter 5: Doing What Designers Do

https://www.routledge.com/Design-Computing-An-Overview-of-an-Emergent-Field/Johnson/p/book/9781138930971

Optional Teaching Videos: LinkedIn Learning (accessible from Blackboard)
There is a wealth of teaching videos on many topics!

Course Organization

- BIM: communication & collaboration: the roles of architect, structural engineer, & mechanical engineer
  Homeworks 1, 2, 3, and 4
- BIM: modeling, rendering, and animation
  Homeworks 5, 6, 7, and 8
- BIM in the Profession
  Homework 9
  Guest Lectures
- Final Project – techniques for going from Rhino to Revit

Grading Breakdown

	Percent of Grade	Assignments: unless otherwise indicated, assignments are done individually	Number of points
Homeworks	80%	Homework 1 (teams of 2): communication (office building)	10
		Homework 2: introduction to Revit modeling (house)	20
		Homework 3: (teams of 2): architecture, structure, mechanical (house)	10
		Homework 4: clash detection and sequencing (office building)	10
		Homework 5: families	20
		Homework 6: modeling (new house)	20
		Homework 7: rendering (new house)	10
		Homework 8: virtual reality and animation (new house)	10
		Homework 9: parametric families and adaptive components (new house)	10
Final Project	15%	Final Project (Rhino to Revit)	100
Participation	5%	Pop-quizzes	varies
		Questions on readings	varies
		Other	varies

Assessment of Assignments

Late work will NOT be accepted; turn in what you have ON-TIME.

It is critical that you finish by the deadlines that have been set. Feel free to get ahead in the work for the class, just not behind. Each assignment builds on the next. Sometimes you will be turning in a paper based assignment AND a file on Blackboard. Students are strongly encouraged to come by with work in progress for suggestions before the work is due and come by after grading to learn how they could improve in the future. Please read the assignments carefully – most are done as individuals, but some of the software exercises are done in teams.

Most assignments will be turned in both on Blackboard and as print-outs; read the specific requirements on each homework handout. They are due **before the beginning** of class. There are **no make-ups** on assignments, quizzes, or exams.

Course Schedule: A Weekly Breakdown

*Readings are due at the beginning of the week*

	TUESDAY	THURSDAY	READING
Week 1 Jan. 19, 21	Introduction to the Arch 307. Introduction to BIM.	Linking files, viewing, printing. Creating your first family, the title block.	*Introduction Chapter 6*
Week 2 Jan. 26, 28	Introduction to Revit. Instances, types, families Choosing a house.	**HWK 1 due** Introduction to Revit system families: walls, roofs, floors	*Chapter 7*
Week 3 Feb. 2, 4	Introduction to Revit in-place families. Site and site annotation.	Introduction to Revit loadable families: windows, doors, family editor.	*Chapter 8*
Week 4 Feb. 9, 11	Introduction to Revit Structure	**HWK 2 due** Introduction to Revit Mechanical	*Chapter 9*
Week 5 Feb. 16, 18	Clash detection Revit clash detection Navisworks clash detection	**HWK 3 due** Construction sequencing Revit phasing Navisworks sequencing	*Chapter 1*
Week 6 Feb. 23, 25	Detailing.	**HWK 4 due** Understanding families: system, loadable, in-place; curtain walls.	
Week 7 Mar. 2, 4	Understanding families: system, loadable, in-place	Editing and creating families. Creating parametric components: box, beam, door panel, overhang parameters: length, visibility	*Chapter 2*
Week 8 Mar. 9, 11	BIM as a database. Schedules and legends: doors and windows as examples.	**HWK 5 due** Room legend. Room labels with square footages. Sheet index. Families associated with these.	
Week 9 Mar. 16, 18	**BIM in the Profession**	Rendering: setting up view, materials	*Chapter 3*
Week 10 Mar. 23, 25	**WELLNESS DAY**	**HWK 6 due** Rendering: lights, cloud rendering, and illuminance.	optional *Chapter 4*
Week 11 Mar. 30, Apr. 1	What is VR and AR/MR? Introduction to Enscape. Animation and sound.	**HWK 7 due** Gaming Engines	

Week 12 Apr. 6, 8	Conceptual mass Adaptive components (2 pt / 4pt) Parameters: length, visibility, offset, material	**HWK 8 due** Conceptual mass Adaptive components (pattern based) Parameters: length, visibility, offset, material	*Chapter 5*
Week 13 Apr. 13, 15	**BIM in the Profession**	**HWK 9 due** **BIM in the Profession**	
Week 14 Apr. 20, 22	Interoperability Rhino to Revit, part 1 Final project discussion.	**WELLNESS DAY**	*Conclusion*
Week 15 Apr. 27, 29	Interoperability Rhino to Revit, part 2	**Other topics in BIM** Dynamo. Generative components. BIM 360. Insight. Class summary.	optional *Johnson, Chapter 5*
FINAL May 11	**Final Project due, Tuesday, May 11, 11 am**		

Student samples of homework 6

Spring 2016, Arch 307. Andrew Herrera
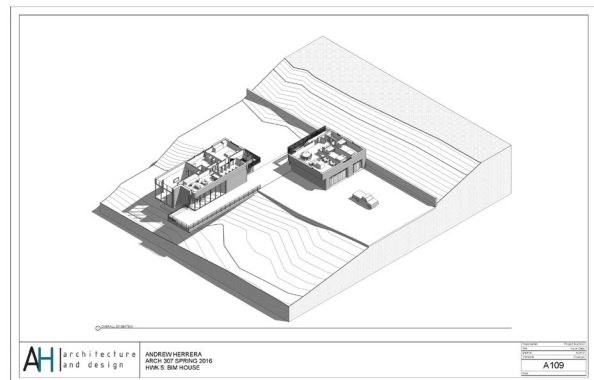
Spring 2016, Arch 307. Ana Michel

Spring 2016, Arch 307. Magdalini Vraila

Statement on Academic Conduct and Support Systems

Academic Conduct
Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" https://policy.usc.edu/scampus-part-b/. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems
Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. https://engemannshc.usc.edu/counseling/

National Suicide Prevention Lifeline - 1-800-273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. http://www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. https://engemannshc.usc.edu/rsvp/

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: http://sarc.usc.edu/

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. https://equity.usc.edu/

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. https://studentaffairs.usc.edu/bias-assessment-response-support/

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. http://dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. https://studentaffairs.usc.edu/ssa/

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. https://diversity.usc.edu/

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, http://emergency.usc.edu

USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.
Provides overall safety to USC community. http://dps.usc.edu

Religious Holidays

The University of Southern California recognizes the diversity of our community and the potential for conflicts involving academic activities and personal religious observation. The University provides a guide to such observances for reference and suggests that any concerns about lack of attendance or inability to participate fully in the course activity be fully aired at the start of the term. As a general principle students should be excused from class for these events if properly documented and if provisions can be made to accommodate the absence and make up the lost work. Constraints on participation that conflict with adequate participation in the course and cannot be resolved to the satisfaction of the faculty and the student need to be identified prior to the drop/add date for registration. After the drop/add date the University and the School of Architecture shall be the sole arbiter of what constitutes appropriate attendance and participation in a given course.

Please contact **Karen Kensek at kensek@usc.edu by the end of the second week of class** if you anticipate conflicts with religious holidays including missing lectures, inability to finish homework assignments on-time, or other items that may hinder your work in this class.

Accreditation Statement

The USC School of Architecture's five year BARCH degree and the two year M.ARCH degree are accredited professional architectural degree programs. All students can access and review the NAAB Conditions of Accreditation (including the Student Performance Criteria) on the NAAB Website, http://www.naab.org/accreditation/2009_Conditions.aspx .

The Master of Landscape Architecture degree program (for USC's +3 students with no prior design education, and our +2 for students admitted with advanced standing) is currently in "Candidacy Status" for accreditation by the Landscape Architecture Accreditation Board. All students can access and review the LAAB accreditation standards/process at http://www.asla.org/Education.aspx .

Other notices

The estimate for the books for this course and other expenses is approximately $75.

Spring 2019: Visitor center renderings in Enscape and Revit (507). (Gaorge Yang)