

**ARCH-615****Title:** Advanced Topics in Environmental Controls – Building Energy Performance Simulation**Units:** 4**Semester:** Spring 2017**Grading Type:** Letter-Graded**Course Type:** Regular class**Location:** Harris Hall #102**Day and Time:** Thursday 12:00 PM – 3:50 PM**Office hour:** By appointment

<b>Instructor</b>	Joon-Ho Choi, PhD
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*Professor Joon-Ho Choi is available by email and in his office at the times posted on Blackboard or by appointment.*

**Teaching Assistant:** Chen Zhong Chen Zhong <zhon906@usc.edu>**Office Location:** MBS Studio, 3<sup>rd</sup> floor, Watt Hall**Office Hours:** By Appointment + TBD

## Course Descriptionnn

Students studying in the field of architecture, environmental design, and building science should have an analytical skill for quantitative investigation and design decision process for a high-performance building. This course is aimed at giving senior or graduate students an exposure to a systematic evaluation process for building performance. This course introduces the concept of total building energy performance, delineating the full range of performance mandates required for today's architecture, including building integrity. The course will explore the relationship, opportunities, and conflicts of the performance mandates, and the integration of building systems necessary to achieve total building energy performance. Through lectures and seminar instructions, student should be able to develop a basis for environmental design performance and system design skills, towards creating high-performance buildings.

**Course Organization:** In the first half of each class student will present the prior week's project, and then in the second half of the class, there will be a lecture to introduce the next week's project.

**Grades:** This of this class as a USC team. Everyone must participate for this class to be a success. Some of you will have more prior experience than others is some areas. I believe students learn more from each other than from the faculty, so please help each other out, and you must participate in class discussion. This is why your class presentation of your work is so important and is considered as part of your grade. However, every student must submit only his/her own work. Grades are based on effort and participation and progress over the course during the semester, so if each of you completes all the assignments, on time, and contributes to class discussions, each of you should earn a good grade.

## Grading Breakdown

	Points	% of Grade
Mid-term project	400 (100 (ind)+300 (group))	40%
Final project	300	30%
Assignments	200	20%
Class participations	100	10%
TOTAL	1000	100%

## **GRADING POLICY**

1. General rule:
  - a.  $4.0 = 97.0 - 100 = A+$  Students in this range will get an A and commendation (the university does not give A+)
  - b.  $4.0 = 93.0 - 96.9 = A$
  - c.  $3.7 = 90.0 - 92.9 = A-$
  - d.  $3.3 = 87.0 - 89.9 = B+$
  - e.  $3.0 = 83.0 - 86.9 = B$
  - f.  $2.7 = 80.0 - 82.9 = B-$
  - g.  $2.3 = 77.0 - 79.9 = C+$
  - h.  $2.0 = 73.0 - 76.9 = C$
  - i.  $1.7 = 70.0 - 72.9 = C-$
  - j.  $1.3 = 67.0 - 69.9 = D+$
  - k.  $1.0 = 63.0 - 66.9 = D$
  - l.  $0.7 = 60.0 - 62.9 = D-$
  - m.  $0 = <60.0 = F$
2. Exception: The instructor reserves the right to adjust the low end weighted average cut-off score based upon the statistical distribution of the semester averages for A, B, or C final grades. For instance, if there is a large gap in the weighted averages at 88%, then the instructor may decide to award an A grade to all students above that value. This is done at the instructor's discretion and in no way should be constructed to mean that it will be done each and every semester. If a student wishes to earn a particular final grade then the student should focus on earning the minimum weighted averages described in the general rule.

## **EXTRA-CREDITS**

There will be extra credit problems, assignments or participations. These extra problems or assignments will help those students who feel that there is a need to improve their grade by performing some extra work.

## **Supplementary Materials and Resources**

- Mechanical and Electrical Equipment for Buildings (Grondzik et al., 12<sup>th</sup> edition, Wiley)
- California Energy Commission -Building Energy Efficiency Standard TITLE 24 (2016)
- ASHRAE 90.1 - 2016
- ASHRAE 55 Standards: Thermal Comfort - 2013

- ASHRAE 62.1 Standards: Ventilation for Acceptable Indoor Air Quality - 2013
- ASHRAE High Performance Building Handbook
- Indoor Environmental Quality (Thad Godish, CRC Press, 2000)
- Useful discussion group:
  - Society of Building Science Educators
    - <http://www.sbse.org>
    - [sbse@uidaho.edu](mailto:sbse@uidaho.edu)
  - EnergyPlus Support group
    - [http://groups.yahoo.com/neo/groups/EnergyPlus\\_Support/info](http://groups.yahoo.com/neo/groups/EnergyPlus_Support/info)
    - [EnergyPlus\\_Support@yahoogroups.com](mailto:EnergyPlus_Support@yahoogroups.com)
  - Building energy simulation user group
    - <http://lists.onebuilding.org/listinfo.cgi/bldg-sim-onebuilding.org>
    - [bldg-sim-request@lists.onebuilding.org](mailto:bldg-sim-request@lists.onebuilding.org)
  - California Energy Commission Hotline: 800-772-3300

## Course Notes

Lecture notes, syllabus, handouts, reading assignments, and any other course materials will be posted on Blackboard. Practice with building simulation tools for homework or assignments will be incorporated with the course.

**Attendance:** We expect everyone to have their work pinned up or their Power Points loaded on the class computer within the first 10 minutes after the hour, so please come early.

**Bottom Line:** The most important issue is that you are responsible for your own personal learning. You need to help us help you. If you find yourself falling behind you must let us know. We will try to give you feedback if we think you are getting off track.

## Assignment Submission Policy

Deliverables are defined as any work required from the student that was assigned for acquisition or preparation outside of the regular classroom, e.g. web-based reference documents, homework, take-home quizzes, and projects. All deliverables are mandatory and due at the beginning of class on the required due date. Failure to submit a deliverable on-time and reasonably well attempted shall result in a deduction of 50% of the assigned point value,

with an additional 10% deducted for each full-day late until such work is delivered into the instructor's possession, properly completed. Any deliverable not properly submitted within one calendar week of a required due date may result in a failing grade to the student in this course. Any student who may be absent from class on the due date may submit their work beforehand directly to the instructor, or, on the due date via another student. Exceptions to this policy shall be considered with adequate justification.

### **Statement for 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 (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP: [http://sait.usc.edu/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html), (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) [ability@usc.edu](mailto:ability@usc.edu).

### **Statement on Academic Integrity**

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, ([www.usc.edu/scampus](http://www.usc.edu/scampus) or <http://scampus.usc.edu>) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>. Information on intellectual property at USC is available at: <http://usc.edu/academe/acsen/issues/ipr/index.html>.

### **Emergency Preparedness/Course Continuity in a Crisis**

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.

### **ARCH 615 SCHEDULE OF CLASSES (Tentative)**

Date	Week	Individual Project Due	Lecture Topic	Group Project (DOE Race to Zero) Due
Jan. 11	1		Climate Consultant, Thermal Comfort, Guidelines	Team-up
Jan. 18	2	Climate Analysis: Individual Presentation (By climatic similarity) (individual presentation)	HEED (choose a home to use for the next up to 3 weeks)	Discuss and define design constraints and goals.
Jan. 25	3	Analyzing your own home (individual presentation)	HEED ( <b>Home Energy Efficient Design</b> )	Discussion of architectural drawings. Discuss potential mechanical, electrical and construction technologies to be adopted (Group presentation)
Feb. 1	4	Energy Performance in HEED (individual presentation)	DesignBuilder + EnergyPlus – Design (same residential building) - Design	Discussion and selection of appropriate mechanical, electrical and landscaping strategies. (Group presentation)
Feb. 8	5	DesignBuilder + EnergyPlus – Design	DesignBuilder + EnergyPlus (same residential building) - System	<b>Completion of architectural drawings (Group presentation)</b>
Feb. 15	6	DesignBuilder + EnergyPlus-System (individual submission)	Revit and IES VE +Apache - Design <b><u>WITH NEW Project BUILDING</u></b>	Completion of mechanical, electrical system, and construction drawings and details. (Group presentation) Completions of early financial and energy analysis based on assumptions. <b>Submit a mid-point report.</b> (See the previous years')
<b>Feb. 20</b>		All team members must complete a progress report.		

Feb. 22	7	Revit and IES VE-System (individual presentation)	Revit and IES VE + Apache – System <b><u>WITH NEW BUILDING</u></b>	Completion of energy and financial analysis. (Group presentation)
Mar. 1	8	Revit and IES VE-System (individual submission)	eQuest (same residential building) –Design	Completion of any make-up (Group presentation)
Mar. 8	9	Energy Performance in eQuest-Design (individual submission)	<u>Final project discussion</u>	Completion of any make-up (Group presentation)
Mar. 15	10	<b>Spring break</b>		
Mar. 22	11	<b>MID-SEMESTER PROJECT PRESENTATION</b> (No individual work submission)		Final Project Report, Project Summary and PPT to be submitted. + <u>Group presentation in PPT and Poster. (for Mid-term review on Group project)</u> Revise Group Project Submission (March 29)
Mar. 29	12	<b>High Performance Site Tour</b> (Submit your individual project notebook (for Mid-term review on Individual work)).		
<b>Apr. 3</b>		<b>Final Project Report Submission to DOE</b>		
<u>Apr. 5</u>	<u>13</u>	Present <b>Final Project Abstract</b> to class.	Lecture: Calibration process (Choi) or Guest Lecture (TBA)	
Apr. 12	14	Discuss Individual Final Project	Guest Lecture: TBA	
Apr. 19	15	Discuss half-way point problems of final projects	Guest Lecture: TBA Course Wrap-up + Final Jury Organization and format of Final Presentation	
<b>Apr. 21-22</b>		<b><u>DOE Race-to-Zero Competition, Golden, CO</u></b>		
TBA		Final Presentation	Tentative; 12 to 4 PM (TBD)	Technical report + Presentation file submission in DOCx and PPTx.

