

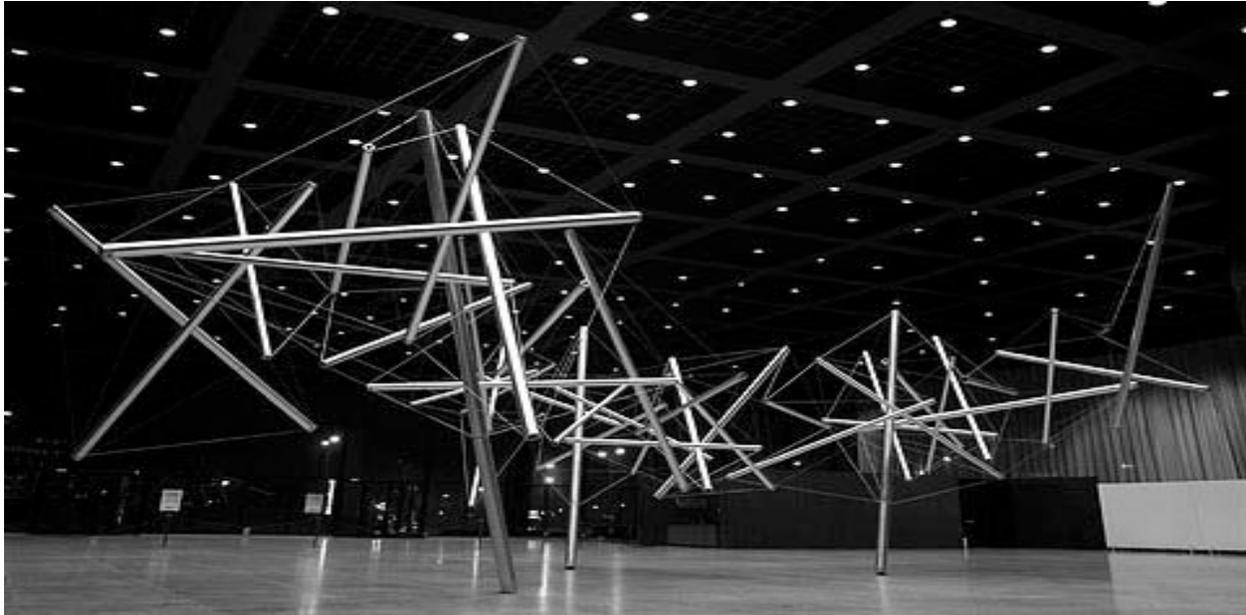
## Kansas State University | AP Design

### ARCH 347 - Structural Systems in Architecture 1

Spring 2015

**instructor:** Bruce Wrightsman, Assistant Professor  
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**credit hours:** 4hr



#### objective

In his treatise, the “Ten Books on Architecture” Roman writer, engineer and architect Vitruvius coined the phrase “*firmitas, utilitas, venusta*”, which translated means “firmness, commodity and delight”. These are tenets by which architecture has largely been defined, and their breadth encompasses polar disciplines; the ephemeral quality of art and beauty is solidified through the permanence and efficiency of structure and engineering. Such unique conditions will always inexorably link architect and structural engineer.

The objective of the structures curriculum is to promote critical thinking and elucidate structural thinking and architectural design thinking as the same. The curriculum is comprised of two courses: ARCH 347 – Structural Systems in Architecture 1 taught in the spring semester and ARCH 448 Structural Systems in Architecture 2 taught in the fall. The two-course curriculum is organized into 3 modules covering a broad range of structural design topics.

This course, ARCH 347 is an introductory course to structure as a building system. It will include an overview of historical and contemporary structural systems and their components, including wood, timber, steel, concrete, masonry, and hybrid structures. It will cover the essential mechanics of how gravity and lateral forces are propagated through a structural system from load to building foundation; developing a basic understanding of how, as well as how these are analyzed and controlled through structural design and planning.

## organization

Lectures MWF 9:30a -10:20a; Seaton 063

Lab sessions T 3:55p - 5:45p; individual studios

While the lectures are about passive learning, the labs are about active learning. They will serve as a forum for inquiry and exploration of the lecture content. Assigned readings, and assignments will require group interaction dialog to stimulate critical thinking and illuminate ideas. Attendance in lab is required and will be taken into consideration in final semester grades.

Projects There will be (2) projects required for the semester. The projects are didactic. Developed with the intent of linking the rigor of the hand (intuitive) with the analytical rigor of the mind. The projects will be completed as a series of lab assignments within your studio. The project expectations and point values are different and will be indicated when the project assignment is handed out. All project assignments are due at the date and time scheduled. No projects assignments are accepted after the deadline.

Lab Assignments varied dates.

In addition to the lab assignments integrated into the projects, some lab sessions will have graded lab assignment required. The assignments are intended to build on the material covered in the lectures. The assignments will typically be completed individually and due at the BEGINNING of the lab due date. No lab assignments will be accepted after the lab assignment time.

Notebook Due final exam week

Each student will be responsible for submitting a semester notebook. This notebook will be worth 10 points. It should contain all your notes from the semester, any graded assignments and exams, notes and process material from your project. It should be organized in a clear and presentable manner in a three-ring notebook or spiral notebook with your name clearly on the front cover

Exams There are two exams for the semester. Both exams will be given in lab and you will have the 1 hour, 50 minute lab time to complete them. The labs are as follows:

Lab 7: Mar 07; Seaton 063

Lab 12: Apr 21 ; Seaton 063

Final Exam Thursday, May 14 - 11:50a-1:40p; Seaton 063

## required course texts

The Structural Basis of Architecture by Bjorn N. Sandaker, Arne P. Eggen and Mark R. Cruvellier. Routledge, 2011. ISBN-10: 0415415470

**supplemental texts** (on reserve at Weigel library)

Logic of Machines and Structures, Paul Sandori

Structure as Architecture. Andrew W. Charleson

Understanding Structures. Fuller Moore.

## k-state online

You are required to retrieve information for the course through the course website. Lecture power points/files, homework solutions, supplementary example problem and their solutions will be posted at K-State Online ([www.online.ksu.edu](http://www.online.ksu.edu)). Students are responsible to follow the new material posted and bring print-outs to the class. If you are having problems downloading the files, please contact the instructor.

**prerequisites** - All students enrolled in ARCH 347 – Structural Systems in Architecture 1 should have successfully completed ARCH 248 – Fundamentals of Architectural Technology, as well as all the necessary prerequisite coursework including Physics and College Algebra. If you have not, please come and speak with me immediately.

## **k-state 8**

Natural and Physical Sciences  
Empirical and Quantitative Reasoning

### **gta's**

Your GTA's are here to help you as much as possible. The GTA's will primarily be working with you in your lab sessions. The instructor will be floating around between lab sections assisting the GTA's where needed. They will be responsible for grading your lab assignments and exams and assisting in the grading of the projects. Please be considerate of their time. Remember, they are students as well and have deadlines of their own. Each will set their own office hours during the first week of classes. Each GTA will be assigned to an individual studio following the first week of classes. The GTA's for the Spring 2015 semester are:

Alex Palmer — ARCH GTA	apalm@ksu.edu
Maria Roca Landivar – ARCH GTA	ceciroca@ksu.edu
Brianna Stevens - IAPD GTA	bnsteven@ksu.edu

### **Semester Evaluation**

The final grades for the semester will be determined by the amount of points accumulated during the semester from the lab assignments, (2) projects and (3) exams. The point breakdown for the semester is as follows

Lab Assignments = 25 points
Exam 1 = 50 points
Exam 2 = 50 points
Final Exam = 50 points
Project 1 = 30 points
Project 2 = 50 points
Notebook = 10 points
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Total Points possible = 265 points

### **grading**

Grading will be comprised of total point accrued for the projects, lab assignments, mid-term and final exams. The projects will vary in point value. The lab assignments will be worth a total of 20 points. The mid-term exams will be worth 50 points each and the Final exam will be worth 50 points. Letter grades will be as follows (as percentage of 100).

A	90%+	(238 points and up)
B	89 – 80%	(212 – 237 points)
C	79 – 70%	(185 - 211 points)
D	69 – 60%	(159 – 184 points)
F	59 and below	(158 points and below)

Grades will be entered, as they are available on KSOL. Disputes with grades on test, lab assignments or projects must be made to your GTA no later than 1 week of receipt.

All grades for assignments, projects, exams, etc., will be rounded up (ie. 49.3 will be rounded up to 50) and are final. I will NOT round up more. Please note however that the points listed above are the total points required for the respective grade for the semester. There may be possible extra points available during the semester but that will be determined during the progress of the semester. As such I will NOT do not 'curve' final grades. If you earn 237 points for the semester you will earn a B. I will not bump your grade to an A. Please do not ask. Remember, I don't give grades - you earn them.

### **extra credit**

No individual student will be given the opportunity to earn extra credit or bonus points unless the opportunity is extended to all students.

### **late assignments**

Assignments are due on the date indicated on the assignment sheet. Late assignments are NOT accepted. Excused absences have no impact on due dates or the late assignment policy.

Computer problems (printing problems, computer crashes, etc.) are not acceptable excuses for late work. You have 24/7 accessibility to the computer lab in Seaton Hall 111-112 with all the computer software you will need. If you are having computer issues please consult the AP Design IT office (basement of Seaton Hall) or the K-State IT office in Hale Library. It is not the responsibility of the GTA's or myself to help you with technology questions.

### **assignment format**

Make sure your lab assignments and other assignments will be completed on graph/grid paper (no lined or blank paper) are legible and organized. A template for all required assignment format is on the last page of the syllabus. All assignments are to be completed using this template unless specifically stated otherwise. Any assignment turned in for a grade not complying with the assignment format will not be graded, marked as a zero and returned. There will be NO opportunity to re-submit the work for credit.

### **outside assistance**

Students are encouraged to make use of the resources such your GTA your class material and myself to advance your studio projects. I will have office hours (3 hours per week). If necessary, schedule a time with your GTA's or me to talk about your project.

## **CLASSROOM POLICIES**

### ***Expectations for classroom conduct***

Class attendance and ability to meet deadlines are essential. Professional behavior is expected in class. This includes showing respect and listening attentively to the instructor, guest lecturer, and teaching assistant(s). Cell phone and other electronic devices should be turned off during class and not used.

### **Disruptive or unprofessional behavior may negatively impact your final grade.**

All student activities in the University, including this course, are governed by the Student Judicial Conduct Code as outlined in the Student Governing Association By Laws, Article VI, Section 3, number 2. **Students who engage in behavior that disrupts the learning environment may be asked to leave the class.**

### ***Academic Honesty***

**Academic cheating and /or plagiarism** (presenting part or whole of another person's work as your own) is considered a serious offence and will not be tolerated. If you are caught cheating or plagiarizing, it will result in failure of the exam, report, or entire course.

Kansas State University has an Honor System based on personal integrity, which is presumed to be sufficient assurance that, in academic matters, one's work is performed honestly and without unauthorized assistance. Undergraduate and graduate students, by registration, acknowledge the jurisdiction of the Honor System. The policies and procedures of the Honor System apply to all full and part-time students enrolled in undergraduate and graduate courses on-campus, off-campus, and via distance learning. The honor system website can be reached via the following URL: [www.k-state.edu/honor](http://www.k-state.edu/honor). A component vital to the Honor System is the inclusion of the Honor Pledge, which applies to all assignments, examinations, or other course work undertaken by students. The Honor Pledge is implied, whether or not it is stated: "On my honor, as a student, I have neither given nor received unauthorized aid on this academic work." A grade of XF can result from a breach of academic honesty. The F indicates failure in the course; the X indicates the reason is an Honor Pledge violation.

### **Students with Disabilities**

Students with disabilities who need classroom accommodations, access to technology, or information about emergency building/campus evacuation processes should contact the Student Access Center and/or their instructor. Services are available to students with a wide range of disabilities including, but not limited to, physical disabilities, medical conditions, learning disabilities, attention deficit disorder, depression, and anxiety.

For a student enrolled in courses on the Manhattan or Olathe campus, contact [dss@k-state.edu](mailto:dss@k-state.edu); on Salina campus, contact Danielle Brown, [dnbrown@k-state.edu](mailto:dnbrown@k-state.edu); and for online courses, Andrea Blair, [andreab@k-state.edu](mailto:andreab@k-state.edu). 202 Holton Hall, 785-532-6441, <http://www.k-state.edu/dss/>.

### **House Rules**

- Class participation, Mutual respect, and punctual meeting time.
- Cellular phones and other electronics that are not being used for class should be turned off during lectures.
- No Sudoku or other games, cell phones, text messaging, newspapers etc. Anyone who engages in behavior that disrupts the learning environment may be asked to leave the class.
- Food and drinks are not allowed in the lecture room (Seaton 063). Please clean up after yourselves. If you brought it into the room please be sure to leave with it.
- If you have any question – ask it.
- If you have any suggestion – offer it.
- Be open and talk to me about your expectations, needs etc.
- Do not wait till the end of semester for TEVALs to provide your feedback.
- **Let's have fun and learn together.**

### **Schedule overview and outline**

ARCH 347 – Structural systems in Architecture 1, is comprised of two modules. The first module **Philosophy of Design: history + process + representation** introduces students to structural design thinking as an integrated design process that directly aligns with architectural thinking. The second module: **Structural Behavior** focuses on developing the visualization (graphic) and analytical (structured formulas) skills needed to understand structural analysis as a design problem. The outline of modules and topics is as follows:

#### **MODULE 1 - PHILOSOPHY OF DESIGN**

- Structure as tectonic object
- Structure as tectonic space

#### **MODULE 2 – STRUCTURAL BEHAVIOR**

- Principles of Equilibrium
- Loads
- Material systems
- Bending behavior - Beam and the Slab
- Axial behavior – Compression and Tension
- The Truss and the Space Frame
- The Frame and Lateral Stability
- Funicular Shapes