

AET/CM A231, Structural Technology
Sections 051 and 251, CRNs 30195, 35986, 31175, and 35994
4 credits, Spring 2014

Instructor: J. Ellen McKay

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Secretary: Shana Kreh
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Hours: 8:00 am – 5:00 pm

Course meeting time and location

This course meets from January 13, 2014 through February 17 on Mondays – Thursdays from 8:00 AM to 11:30 AM in UC 123 and via Collaborate. Please attend in person if you can. This is an intensive 5-week course. Expect to spend 35 hours per week on the class.

Course description

Examines structural theory and the physical principles that underlie structural behavior. Includes the use of materials in a manner to maintain structural stability against natural forces such as gravity, wind, snow and earthquakes. Covers connection details and code requirements for wood, steel and reinforced concrete.

Course design:

4 credits (2 hours lecture + 4 hours lab)
Total time of student involvement: 180 hours
1) Lecture: 30 hours
2) Lab: 60 hours
3) Outside: 90 hours

Texts and supplies

Onouye, B. & Kane, K (2011). *Statics & Strength of Materials for Architecture & Building Construction* (4th ed.). Upper Saddle River, NJ: Prentice Hall.
Steel Construction Manual, (13th Ed.) (provided).

Supplies

- 1 each 8 ½” x 11” engineer’s computation pad (any color) ~ 100 sheets
- 1 each Mechanical Pencil with .7mm lead and eraser
- 1 each small triangle
- 1 each Scientific Calculator (NOTE: Smart Phone or Computer Calculators will not be allowed.)
- approx. \$10.00 for binding of Solutions Manual

Equipment and software/applications: required and optional

For CADD work, a higher end PC is strongly recommended. Here is the recommended configuration as of August 2013:

- Intel® Core i7 2600 gHz processor 16GB RAM
- 500 MB Hard Drive Space

- Keyboard and three button mouse
- Microsoft 7 operating system preferred
- A headphone with microphone system (approximately \$8-15) is required for those participating via Collaborate
- Dial up internet connection, 29.8 Kbps minimum. A high-speed connection is recommended.
- Software- recent versions of
 - Antivirus software
 - Java
 - Chrome or Mozilla Firefox browsers
 - Microsoft Word
 - Microsoft Excel
 - Adobe Reader
 - Flash Player
 - Windows Media Player (maybe)
- CADD software
Depending upon the specific class, the software requirements are the most recent versions of:
 - Autodesk AutoCAD
 - Autodesk Civil 3D
 - Autodesk 3D Studio
 - Design Review
 - Revit Architecture
 - Revit Structural
 - Revit MEP

These are expensive products to buy individually. They are available in the UAA labs for the AET program and the satellite labs across the UAA system. The packages are also available as [time-limited free downloads from Autodesk](#).

Prerequisites & expected skills

AET/CM A101, AET/CM A102, and MATH A105 with a minimum grade of C.

Instructional Goals and Learning Outcomes

Instructional Goal

Present the elements of structural design, including structural theory, material behavior, detailing, and codes.

Student Outcomes/Assessment Procedures:

Student Outcomes	Assessment Procedures
After successful completion of the course, the student will be	This outcome will be

able to do the following:	assessed by one or more of the following:
Illustrate the nature of forces on a structural framework	Solutions Manual Written Exam
Apply the fundamentals of statics to solve simple problems of structural design.	Solutions Manual Written Exam
Calculate bending, shear, and deflection for various beam types.	Solutions Manual Written Exam
Identify the properties of columns.	Solutions Manual Written Exam
Describe how wood beams and columns are designed for given loading situations.	Solutions Manual Written Exam
Describe how steel beams and columns are designed for given loading situations	Solutions Manual Written Exam
Describe how reinforced concrete beams and columns are designed for given loading situations.	Solutions Manual Written Exam
Classify the various types of walls.	Solutions Manual Written Exam
Describe the advantages and disadvantages of each wall type.	Solutions Manual Written Exam
Identify the design issues involved with each wall type.	Solutions Manual Written Exam
Relate the forces placed on connections to the design of fastening systems for wood-to-wood connections, wood-to-steel connections, and steel-to-steel connections.	Solutions Manual Written Exam

Course activities

Class sessions will consist of lecture/discussions and individual projects completed using CADD software and manual techniques in sketching and lettering. Emphasis will be on realistic assignments that duplicate structural engineering office procedures and terminology.

Calendar of topics and assignments

See separate files 231sprsched-2.pdf and 231 Reading.pdf

Grading scale and assignments

Grades for the course will be determined by a combination of points earned. A total of 2200 points may be earned by a variety of course related activities. Grade requirements are as follows:

A	2025 – 2200	(92%)
B	1850 – 2024	(84%)
C	1675 – 1849	(76%)
D	1500 – 1674	(68%) (175 point spread)

Points may be earned in the following ways:

1. Five (5) tests at 200 points each. The problems on the test will be similar to problems given on study guides handed out in the class before each test. The tests will be open book/note/homework. Tests will be graded on the correctness of the solution. All work must be shown to receive credit.

Note: Tests may be retaken for credit only once. If you miss the original test you will only be eligible for the make-up test.

2. Five (5) Homework Problem Sets at 100 points each. Homework problems are to be drafted in the class standard format and will be due at the **beginning** of the class period in which they are due.
3. Five (5) Lab Projects at 100 points each.

NOTE: The homework problem sets and the lab projects will be graded on correctness of answer, however points will be deducted for unprofessional presentation (drafting). All homework, projects, and labs, completed or not, must be handed in at the **beginning** of class on the due date unless prior arrangements have been made with the instructor. All graded work may be corrected and resubmitted for revised credit provided the work was turned in on time. All work must be shown to receive credit.

4. Attendance at 100 points. Attendance is worth 5 points per day. Students will be assessed one (1) point for being late and/or one (1) point for leaving before the end of class. Students are required to attend regularly and participate actively. Students are responsible for class work even if there is a legitimate excuse for their absence. Unexcused absences may result in the student being dropped from the class or receiving a failing grade. University regulations require attendance in class. The instructor will use both the scheduled lecture period and the laboratory period to offer appropriate comments on assignments and to demonstrate useful techniques to accomplish your tasks. You are strongly advised to attend each class period and to work on you assignments during the scheduled laboratory period.
5. One (1) Solutions Manual at 100 points. The solutions manual will be due at the end of the course. It will consist of all **corrected** homework problem sets, lab projects, study guides, and tests **organized by topic** and bound into an 8 ½” x 11” format. The student will design the cover and have it printed on cover stock.

All grades are determined by competency based criteria evaluation. Students are evaluated on individual performances and are not graded in comparison with other students or a normal curve distribution. An “A” grade signifies that a student has achieved both comprehensive mastery of the required work and the minimum performance required for professional level competency as determined by industry standards for entry level technical positions. Regular attendance and active participation are expected and are considered part of the grading process. Students are responsible for class work even if there are legitimate reasons for absence. Faculty initiated withdrawals for non-attendance or disruptive behavior are as per current UAA catalog guidelines.

Class Policies

- Attendance policy - Students are required to attend regularly and participate actively.

Students are responsible for class work even if there is a legitimate excuse for their absence.

- Tardiness and leaving early policies - Students will be assessed one (1) point for being late and/or one (1) point for leaving before the end of class.
- Participation - Students are required to attend regularly and participate actively.
- Religious holidays. If a class meeting occurs on a religious holiday or cultural observance day and you are obligated to miss class for this event, you must notify the instructor in writing by the end of the second week of the semester.

University and Department Policies

See 231policy.pdf

Support services

1. **Disability support services.** Disability Support Services (DSS) is responsible for coordinating support services for UAA students who experience disabilities. To access support services, students must contact DSS and provide current disability documentation that supports the requested services. Additional information may be accessed at the DSS Office in Rasmuson Hall (RH105) or on-line at www.uaa.alaska.edu/dss.
2. **IT Services Call Center.** Is staffed 7 days per week, 363 days a year. They can assist you with password and PIN reset, software understanding, technical requests, as well as general questions about technology.
 - a. Hours of Operation
 - b. Monday - Friday 6:00 AM - 12:00 AM
 - c. Saturday & Sunday 8:00 AM - 5:00 PM
UAA Holidays 8:00 AM - 5:00 PM
In Anchorage: (907) 786-4646, option 1
Toll Free: (877) 633-3888, option 1

Safety

1. **Online.** UAA will never send you an unsolicited e-mail asking you for your password or other personal information. If you receive such a message, please delete it. If you have any concerns, contact the IT Call Center at (907) 786-4646, menu option 1, or via email at callcenter@uaa.alaska.edu. If you experience cyberbullying, cyberstalking, or other inappropriate conduct as part of your involvement in a UAA class, please notify your instructor immediately.
2. **On campus.** Safety is a priority at UAA. All members of the academic community are encouraged to take responsibility for their own safety by taking the time to locate the nearest exits and emergency telephones when they are in campus buildings. Safety concerns may be brought to the attention of UAA faculty or staff, or the University Police at (907) 786-1120 (V/TTY). For more safety information and the most recent campus crime report, visit www.uaa.alaska.edu/safety.
 - a. Personal Safety - Students should use the buddy system when going in and out of buildings at night. Walk in well-lit areas. The phones in the CADD Labs can be used to reach the Campus Police by dialing 61120.
 - b. Campus Police/Call Team Services - The UAA Campus Police will jump start

vehicles and retrieve keys from inside locked vehicles (be sure to have ID with you!).
786-1120

- C. Parking – Park in the UAA designated areas only at the University Center. If you typically utilize the southwest entrance (near La-A-Boy), please keep in mind that the spots nearest the door are reserved for customers of the mall.

Bibliography

- Allen, E. (2004). *Fundamentals of building construction: Materials and methods* (4th ed.). New York, NY: John Wiley & Sons.
- American Concrete Institute. (1994). *ACI Detailing manual. Publication SP-66* (94). Detroit, MI: Author.
- American Institute of Steel Construction. (2005). *Manual of steel construction* (13th ed.). Chicago, IL: Author.
- American Institute of Timber Construction. (1999). *Manual of timber construction* (4th ed.). Vancouver, WA: Author.
- Berg, D. M., & Marks, R. (1997). *Structural technology*. Los Angeles, CA: Architectural License Seminars.
- Burns, T. (1995). *Structural steel design - LRFD*. Albany, NY: Delmar.
- Goetsch, D. L. (1994). *Structural drafting* (2nd ed.). Albany, NY: Delmar.
- International Code Council. (latest). *International building code*. Falls Church, VA: Author.
- Jefferis, A., & Smith, K.D. (2010). *Commercial drafting and detailing* (3rd ed.). Albany, NY: Delmar.
- Kirkpatrick, J. M. (2011). *The AutoCAD book, drawing, modeling, and applications using AutoCAD 2011*. Upper Saddle River, NJ: Prentice-Hall.
- Krishnan, G. V., & Stellman, T. A. (2011). *Harnessing AutoCAD 2011*. Clifton Park, NY: Delmar.
- R. S. Means Co. (2011). *Means illustrated construction dictionary*. Kingston, MA: Author.
- Spence, W.P. (2011). *Construction materials, methods, and techniques* (3rd ed.). Albany, NY: Delmar.
- Speigel, L., & Limbrunner, G. F. (2008). *Applied statics and strength of materials* (5th ed.). Upper Saddle River, NJ: Prentice Hall.
- Underwood, R., & Chiurini, M. (2007). *Structural design: A practical guide for architects* (2nd ed.). New York, NY: John Wiley & Sons.
- Zalwski, W., & Allen, E. (1998). *Shaping structures: Statics*. New York, NY: John Wiley & Sons.

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POLICIES AND OFFICE STANDARDS

University Policies

1. **Attendance** - Students are required to attend regularly and participate actively. Students are responsible for class work even if there is a legitimate excuse for their absence. (See Chapter 7, page 67 of the UAA 2013-2014 Catalog.)
2. **Conduct** - Students are expected to exercise self-discipline and appropriate behavior. Conduct which obstructs or disrupts the teaching process will not be tolerated. (See Chapter 5, page 42-43 of the UAA 2013-2014 Catalog.)

NOTE: Class participation – There may be new, diverse ideas and perspectives presented during this course. It is my expectation that each person will demonstrate respectful behavior during our class sessions. It is my responsibility to facilitate our class discussions so that each student has an opportunity to participate. Having side conversations with others during class discussions, monopolizing class discussions, failing to yield the floor when requested, failing to follow faculty instructions all detract from the academic environment and the exchange of ideas. Those students who continually engage in these behaviors may be asked to no longer participate in class and may be referred for disciplinary action for alleged UAA Student Code of Conduct violations.

3. **Communication** – UAA uses email to communicate with students on many important matters. The University automatically assigns each student an official email account at the time of admission and registration. Students are responsible for knowing and, when appropriate, acting on the contents of all university communications sent to their official UAA email account. To receive communication at a different email address, students may forward email from their assigned UAA accounts to any valid third party email address of their choice that accepts forwarded email. (See Chapter 5, page 43 and Chapter 7, page 71 of the UAA 2013-2014 Catalog.)
4. **Back-ups** - Students are solely responsible for backing-up any data placed on the UAA S-drive. UAA specifically denies all responsibility and liability for the loss of data placed on the S-drive by students.
5. **Cheating** - Academic integrity is a basic principle which requires that students take credit only for ideas and efforts that are their own. Cheating is not tolerated at UAA and is grounds for dismissal from the University. (See Chapter 5, page 41-43 of the UAA 2013-2014 Catalog) Suspected cheating will be submitted to the Dean of Students Office for review.
6. **Tobacco Use** – Smoking is not permitted in university facilities, nor within 20 feet of exterior doors. (See Chapter 3, page 30 of the UAA 2013-14 Catalog). NOTE: Tobacco use of any kind is not permitted within the classroom, this includes smokeless and electronic products.

7. **Right-to-Know Information** - Hazard Communication Program. There are no known chemical hazards in the AET Department.
8. **Student ID Cards** - Students are advised to carry UAA Student ID cards (the Wolf Card) at all times while they are on campus. Your Wolf Card will also be needed to access the CADD Labs (card readers on the east entrances). Cards can be obtained or renewed at the Wolf Card office near the main entrance by taking your current registration paperwork with you.
9. **Personal Safety** - Students should use the buddy system when going in and out of buildings at night. Walk in well lit areas. The phones in the CADD Labs can be used to reach the Campus Police by dialing 61120 for emergencies.
10. **Campus Police/Call Team Services** - The UAA Campus Police will jump start vehicles and retrieve keys from inside locked vehicles (be sure to have ID with you!). 786-1120 is the non-emergency number.

Department Policies

1. **Emergency Exits** - There are many exits from the UAA portion of the University Center. Refer to the escape route handout and take some time after class to familiarize yourself with each location. If the fire alarm sounds, we are required to leave the building as quickly as possible. Once outside move at least 50 feet away from the building.
2. **Fire Extinguisher** - The closest fire extinguishers are on the wall just outside of the west entrance to UC 123 (across from Donn's), and on the wall outside of the east entrance to UC 121. There is also one in the main hall.
3. **Food/Drink** – Food and drinks are allowed at the conference table only, and are **not** allowed at the computer stations.
4. **Equipment Use** - Certain equipment and books are available for student use through the Department. Loan agreements must be completed prior to using the equipment or books. If the equipment or book is not returned in the same condition as when borrowed, or if the equipment or book is lost, it will be the responsibility of the student to replace or pay for replacement of the item. Failure to return equipment/books will result in the withholding of grades and denial of future registration at UAA.
5. **Final Grades** - Final grades will not be posted. Final grades are available on the Wolfink approximately one week after the end of the semester.

Office Standards

1. **Projects** - All projects submitted for grading shall be presented in a neat and professional manner. All projects shall be done in pencil **not** pen.
2. **Punctuality** - Class begins at 8:00 am sharp. Students are expected to be in their seats and ready to participate.
3. **Lettering** – Class standard engineering style lettering, **all caps**.
4. **Border/Titleblock** - There is a class standard border and titleblock for use on all projects in this class.
5. **Sheet Layout, Labels, Fraction Style** – There is a class standard layout for problems, a standard for unit labels and fraction style.

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PRELIMINARY SCHEDULE*

*Subject to revision as needed.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY
1/13 INTRODUCTION Outline, Grading, Labs, Notebook, Equipment, Office Standards Math Review HW #1	1/14 Beam Reactions HW #1 (cont'd) DUE: HW #1	1/15 LP #1 SG #1 DUE: HW #1 (cont'd)	1/16 TEST #1
1/20 HOLIDAY MLK/CIVIL RIGHTS DAY	1/21 Shear & Moment HW #2 DUE: LAB #1	1/22 HW #2 (cont'd) DUE: HW #2	1/23 LP #2 SG #2 DUE: HW #2 (cont'd) TEST #2 (Take-home)
1/27 Steel Frame HW #3 DUE: LAB #2	1/28 HW #3 (cont'd) DUE: HW #3	1/29 LP #3 SG #3 DUE: HW #3 (cont'd)	1/30 TEST #3
2/3 Wood HW #4 DUE: LAB #3	2/4 HW #4 (cont'd) DUE: HW #4	2/5 LP #4 SG #4 DUE: HW #4 (cont'd)	2/6 TEST #4
2/10 Concrete & Masonry HW #5 DUE: LAB #4	2/11 HW #5 (cont'd) DUE: HW #5	2/12 LP #5 SG #5 DUE: HW #5 (cont'd)	2/13 TEST #5 Equipment check-in DUE: LAB #5 SOLUTIONS MANUAL NOTEBOOK

Reading assignments on next page.

Text: *Statics & Strength of Materials for Architecture & Building Construction (4th Edition)*

by Barry Onouye & Kevin Kane

WEEK	CHAPTER	PAGES	
Week 1	1	1-14	Introduction
	2	15-22	Force
		42-45	Moment
		59-60	Resultant
		61-64	Equilibrium
3	64	Free Body Diagrams	
	74-78	Equilibrium of Rigid Bodies	
Week 2	7	332-347	Shear and Moment
		348-359	Semigraphical Method
Week 3	4	195-198	Load Tracing
	5	267-273	Stress & Strain
	6	300-342	X-sectional Properties
	8	365-368	Bending & Shear
		422-437	LRFD
10	494-529	Connections	
Week 4	Handouts		Wood Properties
			Wood Beam Design
	9	438-448	Columns
		474-478	Wood Columns
	483-486	Wood Column Design	
Week 5	Handouts		Reinforced Concrete
			R/C Beam Design

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