

CE371 – STRUCTURAL ANALYSIS I [Spring 2017]

MWF 8:30-9:20pm, MSEE B012

<http://engineering.purdue.edu/~ce371>

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Office hours: Tue & Thu 2:30-4:30pm

Ph: 49-63372; kumar258@purdue.eduProblem-solving/help session: *TBD as necessary***OBJECTIVE**

To learn and practice classical methods of structural analysis to estimate response of simple, linear elastic structural elements and systems to external loads and disturbances.

REQUISITES

- . Good understanding of physics, statics, mechanics of materials, behavior of deformable bodies
- . Good understanding of geometry, calculus, and linear algebra
- . Interest in learning structural analysis

CATALOG DESCRIPTION SCOPE

Stress resultants (reactions, axial forces, shear forces, and bending moments) for beams and framed structures. Deflections of beams and frames by geometric methods (moment-area theorems and applications; conjugate beam analogy). Analysis of statically indeterminate beams and frames by classical stiffness methods; slope deflection and moment distribution. Influence functions and their applications.

OUTLINE**Lecture Topics****Suggested Reading (Hibbeler, 9th ed.)**

- | Lecture Topics | Suggested Reading (Hibbeler, 9 th ed.) |
|--|---|
| • Introduction - What Structural Engineers Do; Structural Systems and Loads | Ch. 1 |
| • Analysis of Statically Determinate Structures | Ch. 2 |
| • Reactions and Internal Loads (Axial Force, Shear Force and Bending Moment) in Beams and Frames | Ch. 4 |
| • Deflections <ul style="list-style-type: none">- Relationship between curvature and deflected shape (sketching deflected shapes)- Moment-Area Theorems- Conjugate Beam Analogy- Virtual Force Method | Ch. 8-1, 8-2
Ch. 8-4
Ch. 8-5
Ch. 9-3, 9-4, 9-7 |
| • Statically Indeterminate Structures <ul style="list-style-type: none">- Method of Consistent Deformations/Flexibility Method- Slope-Deflection Method- Moment Distribution Method | Ch. 10-1 through 10-5
Ch. 11
Ch. 12 |
| • Influence Functions for Statically Determinate Structures | Ch. 6.1 through 6.3 |

GRADING

- Homeworks: 20%
- Two term exams (closed notes; in class): 20% each
- Final exam (closed notes; in class): 40%

If you receive a non-failing/non-zero grade in at least 90% of the homework problems and if your final exam score is at least 60/100 and greater than the lower of your two term exam scores, your lower term exam score will be replaced with your final exam score.

Final grades will be based on standard grade division, at the discretion of the instructor:

$$A \geq 90 \mid 90 > B \geq 80 \mid 80 > C \geq 70 \mid 70 > D \geq 60 \mid 60 > F$$

When it comes to grades, what counts is not how much you think you know, what you think you could do, could have done, should have done, or how much you have progressed, but what you actually did and demonstrated on paper in the exams and the homework assignments.

Please be aware of the consequences of failing in this course.

HOMEWORKS

Homeworks will be distributed in class and posted on the course website.

Homeworks can be turned in on or before the collection date and time. Late submissions will not be accepted. The homework set with the lowest average score will be ignored in grade calculations.

- Your solutions should be intelligible and of professional quality.
- Use engineering paper and write legibly.
- Any solution that is not presented intelligibly will not be reviewed and will receive F grade.
- Do not crowd your solutions; start each solution on a separate page.
- Draw your illustrations neatly; use straight edge/ruler/French curves.
- Indicate relevant parameters, labels, and coordinates on your illustrations.
- State your assumptions where and when they would not be obvious.
- Your final answer should be easily identifiable. No multiple answers.
- Provide full solutions. If it is not possible to follow your solution logic easily, you may get F grade for your solution even if your “final” answer has the right value or expression.

You will receive feedback regarding the quality of your solution (in terms of letter grades *A*, *B*, *C*, *D*, or *F*).

Grades *A*, *B*, *C*, and *D* mean you have earned 100% of the grade for that assignment.

Grades *F* and *0* (zero) mean you have earned 0% of the grade for that assignment.

It is up to you to study and understand the concepts and steps involved in solving each problem. Homework solutions will be posted on the course website on/after the due date.

TEXTBOOK (Recommended)

- *Structural Analysis*, R. C. Hibbeler, 6th, 7th, 8th, 9th eds., Pearson/Prentice Hall, 2006, 2008, 2011, 2014

SAMPLE REFERENCE BOOKS

- *Analytical Estimates of Structural Behavior* – C.L. Dym and H.E. Williams, CRC, 2012
- *Funds. of Structural Analysis* – K.M. Leet, C.-M. Uang, A.M. Gilbert, 4th ed., McGraw Hill, 2011
- *Fundamentals of Structural Analysis* – H.H. West and L. Geschwindner, 2nd ed., J. Wiley & Sons, 2002
- *Introductory Structural Analysis* – C.K. Wang and C.G. Salmon. Prentice-Hall, 1984
- *Intermediate Structural Analysis* – C.K. Wang. International ed., McGraw-Hill, 1983 (other ed.)
- *Structural Analysis* – A. Kassimali, 4th ed., Cengage Learning, 2010
- *Structural Analysis: A Unified Classical and Matrix Appr.* – Ghali, Neville, Brown, Spon Press, 2009
- *Structural Analysis in Theory and Practice* – A. Williams, ICC, 1st ed., 2009
- *Understanding Structures: An Intro to Structural Analysis* – M. A. Sozen and T. Ichinose, CRC, 2008

POLICIES

Academic Integrity and Course Honor Code

By registering for this course you agree to abide by the course honor code that **you shall never take unfair advantage of others in this course**. Purdue University academic policies and procedures apply:

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, University Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

Actions violating the University academic integrity and honesty policies will result in failure in the course. Those who are caught cheating and those who aid and abet cheating directly or indirectly will receive F grade (Failing) as the course grade for academic dishonesty. This policy applies to transgressions in exams as well as in homeworks.

Parties involved in dishonest activity will be reported to the Office of the Dean of Students for additional disciplinary action.

General Course Policies

You are expected to arrive in class and be seated on time and not leave the classroom before the instructor dismisses class, except for emergency reasons (emergency call or restroom use). If you will not be arriving on time or have to leave early because of your engagement in a university activity or a doctor's appointment, let the instructor know beforehand. If you arrive late or need to leave early, please use the back door.

If you are expecting an emergency phone call or text message, you need to let the instructor know at the beginning of a class. Otherwise, all cell phones, mobile devices including instant messaging/texting devices, and computers have to be turned off. No exceptions. Turning off the sound is not sufficient. Please be respectful towards your classmates and the instructor, and do not disturb the flow of the class.

If you have a question during a lecture, you are expected to ask the instructor immediately. Please see the instructor or the TA during their respective office hours if you need additional clarification of concepts or have questions. If you cannot come to office hours, ask for an appointment with the instructor/TA.

If you are not interested in listening to the lecture please consider yourself excused and do not come to the class. Activities not related to the immediate classroom meeting, such as reading unassociated documents, solving homework problems (CE371 or other), chatting, texting, browsing the Internet, sleeping, etc. are not permitted. **If you think you should rather be doing something else, consider yourself excused and do not come to the class.** If you are absent, you are responsible for catching up with the class. Individuals engaged in any activity that disturbs the attention of the class –including the instructor's– will be asked to leave the classroom immediately. Persistent nuisance makers will be reported for disciplinary action.

Collaboration Policy

Homeworks: You may discuss solution approaches and concepts with your CE371 classmates. However, you have to do and write your final solution on your own. Copying solutions (from others in class or from an outside source) is an act of cheating and a violation of the Purdue Academic Integrity and course honor codes. See above for the disciplinary actions to be taken against those who violate these codes.

Homework and exam solutions from previous years shall not be consulted. They are off-limits. If a transgression is detected, it will be considered a violation of the Purdue Academic Integrity and course honor codes, and will be dealt with accordingly (see above).

Exams: No collaboration, sharing, or cheating of any kind is allowed. Zero tolerance to transgressors.

Note that you may be asked to show your Purdue Identification Card in exams.

Attendance

It is strongly recommended that you attend classroom meetings. No attendance will be taken except in special circumstances to be decided by the instructor. The University policy for attendance is as follows:

Students are expected to be present for every meeting of the classes in which they are enrolled.

Students with Disabilities

If you have a medical condition affecting your performance in class, please follow the University policy and notify the instructor:

Purdue University is required to respond to the needs of the students with disabilities as outlined in both the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 through the provision of auxiliary aids and services that allow a student with a disability to fully access and participate in the programs, services, and activities at Purdue University.

It is the student's responsibility to notify the Disability Resource Center of an impairment or condition that may require accommodations and/or classroom modifications.

Absence due to Health Problems/Concerns

If you think you may have a cold, flu, or any other contagious disease, or simply not feeling well, please: 1) see your doctor or visit PUSH immediately; 2) do not come to class; you may safely consider yourself excused from attending class. Just let the instructor know by sending him an email regarding your absence. You do not need to provide doctor's report for occasional classroom absence due to health concerns.

In the case of a health problem prohibiting you from attending class for more than two consecutive lectures, please be prepared to present a report from your doctor. If you miss/will be missing an exam due to a health problem, you need to present, preferably before but not later than 24-hr after the exam, a report from the doctor who examined you. The report has to include the time and location of the doctor's examination of you and the doctor's recommendation that you should be exempt from taking an exam at the scheduled time. **A PUSH/doctor's appointment note stating that you visited PUSH/doctor is not sufficient documentation for exemption.** A report by a doctor who did not examine you in person will not be accepted.

Students missing classroom meetings are responsible for catching up with the rest of the class.

Health and Other Emergencies

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Here are ways to get information about changes in this course.

1. The instructor or the TA will email you information through a one-way, broadcast type mailing-list: spring-2017-ce-37100-001@lists.purdue.edu.
2. If you want to communicate your questions to the instructor directly, the best way to reach him is via email at ayhan@purdue.edu. A much less efficient way to reach him is by phone at (765) 496-8270.
3. The course website at <http://engineering.purdue.edu/~ce371> will be updated with information.

In case of a campus emergency closure, virtual classroom meetings, for example via WebEx, could be held. Should such an action become necessary, you will receive an email with information as to how you can participate in virtual meetings for this class. Until then, we will keep our classes as "real" as possible. If for any pandemic or other emergency reasons one or more of the exams need to be cancelled the following weights will be used in calculating the final grade for performance in this course:

- One term exam cancelled: HW: 20%; One term exam: 30%; Final exam: 50%
- Both term exams cancelled: HW: 20%; Final exam: 80%
- Final exam cancelled: HW: 20%; Term exams: 40% each



EMERGENCY PREPAREDNESS SYLLABUS ATTACHMENT

EMERGENCY NOTIFICATION PROCEDURES are based on a simple concept – if you hear a fire alarm inside, proceed outside. If you hear a siren outside, proceed inside.

- **Indoor Fire Alarms** mean to stop class or research and immediately evacuate the building.
 - Proceed to your Emergency Assembly Area away from building doors. **Remain outside** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.
- **All Hazards Outdoor Emergency Warning Sirens** mean to immediately seek shelter (**Shelter in Place**) in a safe location within the closest building.
 - “Shelter in place” means seeking immediate shelter inside a building or University residence. This course of action may need to be taken during a tornado, a civil disturbance including a shooting or release of hazardous materials in the outside air. Once safely inside, find out more details about the emergency*. **Remain in place** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.

**In both cases, you should seek additional clarifying information by all means possible...Purdue Emergency Status page, text message, email alert, TV, radio, etc...review the Purdue Emergency Warning Notification System multi-communication layers at http://www.purdue.edu/epps/emergency_preparedness/warning-system.html*

EMERGENCY RESPONSE PROCEDURES:

- Review the **Emergency Procedures Guidelines**
https://www.purdue.edu/emergency_preparedness/flipchart/index.html
- Review the **Building Emergency Plan** (available on the Emergency Preparedness website or from the building deputy) for:
 - evacuation routes, exit points, and emergency assembly area
 - when and how to evacuate the building.
 - shelter in place procedures and locations
 - additional building specific procedures and requirements.

EMERGENCY PREPAREDNESS AWARENESS VIDEOS

- "Shots Fired on Campus: When Lightning Strikes," is a 20-minute active shooter awareness video that illustrates what to look for and how to prepare and react to this type of incident. See: <http://www.purdue.edu/securePurdue/news/2010/emergency-preparedness-shots-fired-on-campus-video.cfm> (Link is also located on the EP website)

MORE INFORMATION

Reference the Emergency Preparedness web site for additional information:
https://www.purdue.edu/epps/emergency_preparedness/