MAE 206, Engineering Statics
3.0 Credit hours, Spring 2015, GEP course: none
Prerequisites: GPA = 2.5, C or better in both PY 205 and MA 241
Co-requisite Recommendation: MA 242
Text: *Vector Mechanics for Engineers: Statics*, by Beer, Johnston, & Mazurek (9th or 10th editions)
Course pack: available from Lulu.com at http://goo.gl/45IBqU or from the bookstore
Clicker: TurningTechnologies XR or NXT clicker (RemotePoll is acceptable but not preferred.)

Basic concepts of forces and moments in equilibrium. Distributed forces, friction forces, moments of inertia, and fluid statics. Applications to structures and systems including frames, machines, and trusses. Credit is not allowed for both MAE 206 and CE 214.

Learning Objectives: The student will be able to
1. Model physical systems using free body diagrams;
2. Write the equations for static equilibrium for particles, rigid bodies, and systems (trusses, frames and machines);
3. Model correct reaction forces and moments and solve the equations of equilibrium for them;
4. Account for friction and fluid pressure loads in equilibrium problems;
5. Calculate and graph internal forces and moments;
6. Calculate centroids and moments of inertia using integration or composite body methods;
7. Determine equivalency for systems of loads.

Topics Covered: (numbers in parentheses indicate number of 50-minute class periods on each topic)
Course Introduction, Prerequisites Review (1)
Particles and Point Forces in Two Dimensions (2)
Free Body Diagrams and Equilibrium for Particles in Two Dimensions (2)
Forces in Three Dimensions, Equilibrium for Particles in Three Dimensions (2)
Rigid Bodies and Moments in Two Dimensions (2)
Free Body Diagrams and Equilibrium for Two-Dimensional Rigid Bodies (3)
Moments in Three Dimensions (1)
Free Body Diagrams and Equilibrium in Three Dimensions (2)
Friction (4)
Distributed Forces (1)
Centroids (2)
Moments of Inertia (3)
Fluid Statics (2)
Beams (1)
Beams: Shear and Bending (3)
Trusses (3)
Frames & Machines (3)
Review (3)
Exams (3)

Online: Students must log into Moodle between every class to complete quizzes, exams, and homework. Students deemed to be non-participatory in the online environment for more than 5 consecutive days will need to speak with the professor before being assigned a group.

Expenses: The text, course pack, and a clicker are required. Homework that is submitted on paper must be on engineering paper. Students need to have access to a computer for the exams. Calculators for the exams must be FE-exam approved. No other expenses should be incurred. No Laboratory or Transportation is required for this course. (Students should bring the course pack and a calculator to class every day.)

Grading Scale:
A+ rare B+ 84 – 86 C+ 74 – 76 D+ 64 – 66 F 0 – 56
A 90 – 100 B 80 – 83 C 70 – 73 D 60 – 63
Note: grades are not rounded. For example: 89.999999999 will be an A-. No curve is anticipated.
**Preparation:** All students should spend an hour at minimum before class each period preparing for the material covered that day including reading the textbook, filling in the skeleton notes in the course pack, reading the online class notes, watching the YouTube introductory videos, and/or any combination of these.

### MAE 206 Activities and Grade Breakdown:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Final Grade Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily Grades</strong></td>
<td>10%</td>
<td><em>introductory quizzes &amp; class participation with clickers</em></td>
</tr>
<tr>
<td>(37 non-exam class days)</td>
<td></td>
<td>Each day begins with a quiz on the class preparation materials. These 3-min (clicker) quizzes are graded 0 for no answer, 1 for incorrect answer, and 2 for correct answer. Each quiz (individual effort) is half of the daily grade. The remaining half of the daily grade is participation in the remaining clicker questions after the initial quiz. Group work is encouraged on these questions.</td>
</tr>
<tr>
<td><strong>Topic Quizzes</strong></td>
<td>10%</td>
<td><em>online topic quizzes in Moodle</em></td>
</tr>
<tr>
<td>(26 quizzes)</td>
<td></td>
<td>Online topic quizzes are designed to allow repeated attempts to solve problems (three quiz attempts allowed). There is no minimum grade. Limited discussion with other students is allowed.</td>
</tr>
<tr>
<td><strong>Homework</strong></td>
<td>10%</td>
<td><em>on-paper homework problems</em></td>
</tr>
<tr>
<td>(1 per week, 14 or 15 total; 1 project counts as 2 HW)</td>
<td></td>
<td>Homework problems are to be completed every day and will be collected once a week (approximately 5 problems). These are graded by the TA. Homework may be submitted on paper in class or as a scanned document (PDF only) in Moodle. Matlab and Maple use is encouraged; limited discussion with other students is allowed.</td>
</tr>
<tr>
<td><strong>Midterms</strong></td>
<td>45%</td>
<td><em>online midterms in Moodle</em></td>
</tr>
<tr>
<td>(3 exams)</td>
<td></td>
<td>Midterm exams are taken on student computers in Moodle in the classroom during the regular class period with proctors. All the exams are closed book, closed notes; only FE-approved calculators allowed</td>
</tr>
<tr>
<td><strong>Final Exam</strong></td>
<td>25%</td>
<td><em>online final exam in Moodle</em></td>
</tr>
<tr>
<td>(1 exam)</td>
<td></td>
<td>common final; taken on student computers in Moodle in the classroom with proctors; closed book, closed notes; cumulative; only FE-approved calculators allowed</td>
</tr>
<tr>
<td><strong>Checkpoint Quizzes</strong></td>
<td>0%</td>
<td><em>online daily quizzes in Moodle</em></td>
</tr>
<tr>
<td>(37 quizzes)</td>
<td>10% for online-only students</td>
<td>Checkpoint quizzes (5-7 questions each) highlight some of the basic points. Students should take these quizzes before class to double-check that they have understood the basics before they come to class. One attempt is allowed. The minimum grade for an attempted quiz 50%. Checkpoint quizzes are not required except for online-only students. Online-only students may drop their four lowest grades; up to four checkpoint quizzes may be used to replace missing daily grades for in-class students.</td>
</tr>
</tbody>
</table>

**Office Hours:** 3405 EB3, MWF 10:30 - 11:00 & by appointment. Appointments are available between 7:45 and 8:15 am on MWF or between 12:05 and 1:45 MWF. Dr. Howard is generally not on campus on Tuesday and Thursdays but can be reached by appointment online at bit.ly/howard-office or in the forums. Contact information for the TAs will be posted in the announcements forum in Moodle.

**Additional In-Class Policies:**

**Electronics:** Cell phones and computers may not be used during class. Students using unapproved electronic devices during class may lose 50 points from that day's daily grade at the discretion of the professor.
**Individual Work:** The intro question should be individual work. After that question, students are required to work in assigned groups during class.

**Additional Online Policies:**

**Email:** The forums are our main communication avenue. E-mail only if you need help with a personal issue that is inappropriate for a message board like individual grades or questions about your particular exam. In general, the turn-around time for emails ranges from zero to as much as four days. If you want more immediate help, please use the forums.

**Forum Guidelines:** If you know the answer to a question posted on the forum, please answer it. However, please do not post answers or step-by-step solutions to the homework or quizzes.

**Exam Grading:** Grades will be posted in Moodle as soon as possible. Grades are tentative until they have been verified by your instructor. (Sometimes grades go up or down based on grading discrepancies in Moodle.) Partial credit is awarded on Moodle based on the answers you select. No additional credit is given for work on your scrap paper. Exam solutions are not provided.

**Individual Work:** Topic Quizzes and in Moodle may be discussed but not worked on together.

**Privacy:** Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

**Additional Homework Policies:**

**Legibility / Professional Products:** Any problem which is not clearly laid out in a professional, legible fashion will receive no credit. Homework should have no more than two problems per page. Homework submitted on paper must be stapled on engineering paper, front side only. Homework submitted online must be in a single PDF of high quality. (Cell-phone photos are not acceptable.) Unprofessional submissions will lose points or may be returned ungraded.

**Significant Digits:** Students should keep five significant digits in all calculations and round to three at the end of the problem for full credit.

**Free-body diagrams:** All homework problems unless explicitly excluded must include a free-body diagram in the solution to receive any credit.

**Individual Work:** Homework may be discussed but should be worked individually. The group project at the semester end must be a new design: please note that for group projects, each member takes responsibility for the integrity of the group. (If one member is cheating, you will all be reported.)

**Absences, Missed Assignments:**

**Absences:** Students are expected to come to class every day. Absences 1-4 are accommodated by using a checkpoint quiz as the daily-grade makeup. (The lowest four daily grades are replaced by the highest four checkpoint quizzes automatically.) Absences beyond the fourth must be discussed with the professor to allow continuation in the class. If all five (or more) absences are deemed excused, more checkpoint quizzes can be used as daily grades. Students with 5 or more absences must complete a contract with the professor to be eligible to participate in in-class group work.

**Late Homework:** Homework is due at the beginning of class. Late homework may be scanned and submitted online in the Assignments tab in Moodle until 6 pm without penalty; after 6 pm no homework is accepted. (Please make sure your homework was actually uploaded.) Homework may never be turned in by email. Homework should be turned in either entirely online or entirely on paper and not split between the two options.
Late Topic Quizzes: Once per semester a student is allowed to request a makeup topic quiz for 50% credit. This request must be in writing to anna_howard@ncsu.edu.

Late Checkpoint Quizzes: Checkpoint quizzes cannot be made up after the due date. Note that quizzes which are not attempted by the due date cannot be viewed at all.

Makeup Exams: Makeup exams are available only for excused absences. A student who will miss the exam for any reason (other than sickness so severe that email is impossible) must notify his professor in advance, Missing an exam due to sickness requires documentation from a physician AND notification to the professor as soon as possible. Makeup tests must be completed as soon as possible upon your return.

Other Policies:

Non-Discrimination Statement: NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://www.ncsu.edu/policies/campus_environ or http://www.ncsu.edu/equal_op. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO)."

Disabilities Statement: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at Disability Services Office, Campus Box 7509, 919-515-7653 at Student Health Services Center, 2815 Cates Ave, Ste 1900, www.ncsu.edu/dso. Once registered, students should make an appointment to request specific accommodations with their professor. (This conversation must by law be private and thus should not occur after or before class in the presence of other students.)

Academic Integrity:

Academic Integrity: Engineering is a life-and-death occupation: failing to behave carefully and ethically can cost innocent people their lives or health. ASME has a code of professional ethics which you should read. NC State University also has an honor code which we follow (and which you should read.)

Please be aware: infractions will be submitted to the university. Any student found to be in violation of these policies faces a minimum penalty of academic probation for eight years for a first offense with suspension or expulsion for later offenses.

You may ask your instructor or TA for help outside of class time as often as you like. You may ask other students verbal questions about the homework after you have both attempted all the problems. You may not at any point work directly from another students' homework, project, quizzes, or exams. You may not share your previous exams or homework with other students this semester or in the future. You may not use solutions to our problems which you find shared from other students either in person or online.

Mathematical software such as Maple, Mathematica, etc. are acceptable aids as long as all the work is your own. You are strongly encouraged to learn these software packages as they will be very useful to you as an engineer. If you use these programs, you may include a printout of your code with your homework, but you should still write down everything you would otherwise.
8.2 Cheating: Cheating is the giving, taking, or presenting of information or material by a student that unethically or fraudulently aids oneself or another person on any work which is to be considered in the determination of a grade or the completion of academic requirements or the enhancement of that student's record or academic career. Cheating includes, but is not limited, to the following actions:

| (a) Copying from someone else's assignment, examination, or other academic exercise; | Anything that you get a grade for in a course is included here. If you can see someone else's work while you're doing your own, that's copying. |
| (b) Possessing, buying, selling, removing, receiving, or using, at any time or in any manner not prescribed by the instructor, any information related to an instrument of academic evaluation; | This includes even owning solutions, accessing a web-based solution not provided by the course, looking at tests or homework from old students, etc. |
| (c) Using materials, equipment, or assistance in connection with an assignment, examination, or other academic exercise which have not been authorized by the instructor, including but not limited to, notes, calculator, or other technology; | Reusing or altering Matlab code from previous semesters on the project is expressly disallowed. Using graphing calculators on the exams is not allowed. |
| (d) Obtaining or attempting to obtain in a dishonest manner any material relating to a student's academic work; (e) Working with another or others in completing an assignment, examination, or other academic exercise when the instructor has required independent and unaided action; | Homework may be discussed with other students, but must be completed independently. It should be impossible to identify your study partner. Online quizzes should be your own work as well. |
| (f) Attempting to influence or change an academic evaluation, grade, or record by unfair means; (g) Permitting another student to substitute for one's self in an academic evaluation; (h) Marking or submitting an examination or evaluation material in a manner designed to deceive the grading system; (i) Failing to comply with a specific condition of academic integrity which has been clearly announced in a particular course; (j) Submitting, without prior permission of the instructor, any work by a student which has at any time been submitted in identical or similar form by that student in fulfillment of any other academic requirement at any institution; | You may not resubmit previously graded work -- even if it is your own from a prior semester. |
| (k) Submitting of material in whole or part for academic evaluation that has been prepared by another individual(s); (l) Submitting data which have been altered or contrived in such a way as to be deliberately misleading; or (m) Providing false information to the University in any manner to achieve an unfair advantage, enhance one’s record, or complete a requirement. | You may not copy a homework solution from your partner. Working it together on the board and then both of you copying your homework off the same board is NOT permissible. Homework should be completed individually. |