

MAE 206, Engineering Statics

3.0 Credit hours, Fall 2024, GEP course: none
Prerequisites: GPA = 2.5, C or better in both PY 205 and MA 241
Co-requisite Recommendation: MA 242
Credit is not allowed for both MAE 206 and CE 214.

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Note: this syllabus is not a contract and can be altered at any point with advanced notice to accommodate the educational goals of the course.

MAE 206 includes: 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.

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)	Distributed Forces (1)
Particles and Point Forces in Two Dimensions (2)	Centroids (2)
Free Body Diagrams and Equilibrium for Particles in Two Dimensions (2)	Moments of Inertia (3)
Forces and Equilibrium for Particles in Three Dimensions (2)	Fluid Statics (2)
Rigid Bodies and Moments in Two Dimensions (2)	Beams (1)
Free Body Diagrams and Equilibrium for Rigid Bodies in Two Dimensions (3)	Beams: Shear and Bending (3)
Moments in Three Dimensions (1)	Trusses (3)
Free Body Diagrams and Equilibrium in for Rigid Bodies in Three Dimensions (2)	Frames & Machines (3)
Friction (4)	Review (3)
	Exams (3)

Expenses: A computer and calculator are required. Note: only [FE-approved calculators](#) are allowed on the exam. No other expenses should be incurred. (The text is free.) No laboratory or transportation is required for this course.

Grading Scale:

A+	very 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		
A-	87 – 89	B-	77 – 79	C-	67 – 69	D-	57 – 59		

Notes: grades are neither rounded nor curved: 89.999999 will be an A-. Please note this includes a 3-point built-in curve.

Assistance: The message boards are available for help, both from other students and from Dr. Howard. Office Hours will be posted in Moodle. Please use email only for personal issues: anna_howard@ncsu.edu

Class Meeting Times: 8:30 – 9:25 (Sections 1 & 605, EB3 2124), 9:35 – 10:25 (Section 2, EB3 2201)

Forum Guidelines: Students are encouraged to participate in the message boards. If you know the answer to a question posted on the forum, please answer it. Do not post answers or step-by-step solutions.

Email Policy: Email your instructor for anything which affects only you. For class topics where the answer would be useful for others, please use the forums.

Online: Students must log into Moodle between every class to complete quizzes, exams, and homework. Students who do not participate in the online environment for more than 4 consecutive days will be deemed marked non-participatory.

Attendance: Students are expected to come to class every day. Students will be marked non-participatory after 4 absences.

This class does not differentiate between an excused absence and an unexcused absence. Because of the nature of the group work, class cannot be “made up” since you missed working with your team. If you miss a class, you will need to learn the material on your own and be ready to participate with your team for class on the next day.

Sick or quarantined students should NOT come to class; please request permission to attend the 8:30 class in Zoom by emailing anna_howard@ncsu.edu for permission to join the online class. You can participate in Zoom and Wooclap and thus avoid being marked absent. If you are too sick to come to class, the lowest daily grades in each phase of the class is dropped. Students who are so sick as to be unable to participate in the course for a week or more should discuss alternative accommodations with the professor.

The Wooclap grade is participation credit for working the problems in class with your group or with the group of students who are in the Zoom room. Therefore, students who access Wooclap without being in the classroom or in the Zoom room are cheating.

Students do not need to send in excuses for classes other than exams. A makeup exam requires a doctor’s note or a verification from Regulations and Records through myPack.ncsu.edu and notification to the professor in advance. Makeup tests must be completed immediately upon your return. (The grade percentage from a missed exam without a makeup is added to the final exam percentage.)

Non-Participatory Students: Students marked as non-participatory either from not participating online or from not attending class will be given one warning; continuing to miss class or miss online assignments after the warning may result in sanctions such as not being assigned to in-person teams for classwork or being barred from taking the final exam.

MAE 206 Activities and Grade Breakdown:

Individual Effort (see Academic integrity next page) – scrap work must be uploaded to Gradescope for credit:

- Final exam 22%: Tuesday, Dec 10, 7:00 – 9:30 pm (all sections) (Warning: this is an evening exam.) All exams are closed book, closed notes, and proctored in person.
- 3 midterm exams 13% each: Exam dates: September 9, October 11, November 4 during class
Note that neither the instructor nor the LA’s nor the facilitators will answer questions during exams. Exams are considered summative assessments.
- Weekly quizzes 17%
Weekly quizzes are something where you can ask for hints – but only from your instructor or the LA’s. Your final grade for the weekly quiz will be the maximum of your weekly quiz grade and 50% of the average of the daily practice quizzes. (For example, if after all your attempts you have 100, 90, and 95 on your three practice grades, that average is 95. No matter what your grade is on the weekly quiz you just took, your final grade will not be lower than $95 * .5 = 47.5$.)
- In-class quizzes 3%: each class begins with a one-question quiz to encourage being prepared and on time. Note that entering the word-of-the-day in Wooclap is required to get credit. (If you miss the word, email anna_howard@ncsu.edu.) These quizzes cannot be made up if you are late or absent, but the lowest grade is dropped from each quarter of the semester.
- Projects 2 and 3 (due on days 14 and 28) and the first part of Project 1 (due on day 2) are individual effort.

Group Work allowed:

- Daily participation 3%: from Wooclap during class. Each class period is scored as one grade, half of which is the in-class quiz and half of which is the participation in the remaining Wooclap questions. Attendance code is required for credit.
- Preparation quizzes 6%: in Moodle, due at 9:15 am each class day for full credit. 25% deduction for late work.
- Projects are overall 10%. Group project components are due on days 6, 7, 8, 28, 35, 39, and 40.

Exam Grading: Grades will be posted in Moodle as soon as possible. Grades are tentative until they have been verified. (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.

Significant Digits and Free-Body Diagrams: Students should keep five significant digits in all calculations and round to three **at the end** of the problem for full credit. Work submitted without a free-body diagram will receive no credit.

Legibility / Professional Products: Any problem which is not clearly laid out in a professional, legible fashion will receive no credit. Work must be shown. Unprofessional submissions will lose points.

***Academic Integrity:** We will operate under the NC State [honor code](#) at all times. Infractions will always be reported. If in doubt whether assistance is allowed, please ask. For individual effort assessments as indicated above:

Allowed	Not Allowed
<ul style="list-style-type: none"> • Help from your instructor • Hints from your LA's • Any material provided in our Moodle site • Reviewing your <i>graded</i> work with your teammates • Asking questions on the forums 	<ul style="list-style-type: none"> • Working on individual effort assignments with a partner, tutor, or anyone else or sharing numbers • Discussion where two students can see the same paper or white board • Written help from anyone or including seeing prior work • Looking up answers or hints on the internet or in someone else's files/work • Reviewing solutions from anywhere beyond our class sites • Sharing your homework or exams with anyone else • Discussing exams before all students have taken them • Posting the problem to the internet outside of our class sites • Reusing a project design from a prior semester (All teammates will be equally guilty.) • Posting homework or exam questions to the web

Mathematical Tools: Mathematical software such as Maple, Mathematica, Wolfram Alpha, 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 should still write down everything you would otherwise including free-body diagrams (FBDs) and equations of equilibrium. (We don't need your code.) You may not use these tools on the exams.

Artificial Intelligence:

- No tool can replace your own thinking or analysis. (This includes generative AI such as Chat GPT and “tutoring” sites like Chegg.)
- Scientific calculators and the mathematical software as above are sufficient for the assignments in this class. Students should check with the professor before using other technologies.
- Students should indicate every technology used (beyond those listed above as available).
- Codes such as for Matlab or Wolfram should be original. (You should not use someone else’s code.)
- To cite any generative AI, you must include the prompt you entered. For example, ““Describe the symbolism of the green light in the book The Great Gatsby by F. Scott Fitzgerald” prompt. ChatGPT, Feb 13, 2024. version, OpenAI, as released 8 Mar. 2023, chat.openai.com/chat.”
- AI is not designed for and should not be used to solve engineering problems as a stand alone product. If you use any generative AI in your work, provide evidence of
 - how you used the AI tool,
 - how you verified its accuracy and reliability,
 - how you integrated its output with your own work, and
 - how you acknowledged its limitations and biases.

Students should be prepared to defend their work orally upon request. If you cannot explain and defend your analysis, you will not receive credit.

Ethics: Engineering is a life-and-death occupation. Remember the question: “What’s the difference between a doctor and an engineer? A doctor can only kill one person at a time.” Engineers can kill a hundred people with a single mistake. Start as you mean to go on and only turn in work that you have done yourself. Failing to behave carefully and ethically can cost innocent people their lives or health. For your reading: [ASME's code of professional ethics](#) and [NSPE Code of Ethics for Engineers](#).

Please be aware: I always submit academic integrity violations to the Office of Student Conduct. Any student found to be in violation of these policies faces a minimum penalty of academic probation for a first offense with suspension or expulsion for later offenses.

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. All classes will be recorded. It may be that you will appear on camera incidentally. Class videos are set to be deleted and will not be reused in perpetuity with any student faces on camera without explicit permission. (The back of your head may be visible.) Students should not reproduce or share recordings in any way (including electronically or posting in any web environment) with those not in the class in this semester.

Non-Discrimination Statement: MAE 206 strives for a safe environment free from all forms of discrimination. Discrimination based on race, color, religion, creed, gender, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law, NC State University policy, and basic decency. Discrimination or harassment will not be tolerated. In accordance with federal law, North Carolina State University is prohibited from unduly impinging on the rights of the members of the university to practice their sincerely held religious beliefs. The university is required, once notified that a religious accommodation is needed, to reasonably accommodate employees and students whose beliefs, practices, or observances conflict with requirement of the course unless doing so would pose an undue hardship. If such an accommodation is required, students should meet with the instructor to craft an appropriate accommodation.

Disabilities Statement: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, 2751 Cates Avenue, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) 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.)