

ME 3180: Machine Design, Fall 2026

Section A: Tu/Th 11:00am-12:15pm, Love 185

Instructor: Dr. Kirk J. Gomes

Office hours: M 12:00pm-2:00pm, TuTh 12:30pm-2:30pm, or by appt

Contact info: kirk.gomes@me.gatech.edu

Textbook: Budynas, R.G., and Nisbett, J.K., *Shigley's Mechanical Engineering Design, 11th Edition*, McGraw-Hill, 2020. **Buy the book.**

Prerequisites: ME 2110, COE 3001

Course Description: The selection, analysis, and synthesis of springs, joining and fastening methods, bearings, shafts, gears, and other elements. Design of assemblies. Computer-based methods.

Course Objectives: You will be able to analyze and design commonly used mechanical components to meet specifications, as well as to identify and establish the specifications and trade-offs for the selection and application of those components.

Course Outcomes

- Outcome 1: To teach students how to apply the fundamentals of engineering science to analyze and design commonly used mechanical components to meet specifications.
 - 1.1 Students will demonstrate the ability to apply fundamentals of engineering science to make proper assumptions, perform correct analyses, and draw upon different mechanical engineering subject areas in the analysis of bolted joints, shafts, bearings, springs, gears, and other components covered.
 - 1.2 Students will demonstrate the ability to design mechanical components using the analyses mentioned above.
- Outcome 2: To enable students to learn how to identify and quantify the specifications and trade-offs for the selection and application of components that are commonly used in the design of complete mechanical systems.
 - 2.1 Students will demonstrate the ability to take technical, economical, safety, quality, and other issues (such as environmental) into account when selecting and/or designing mechanical components. The breadth and depth of the issues taken into account by students are measurable indicators of their performance.
- Outcome 3: To illustrate to students the variety of mechanical components available and emphasize the need to keep learning.
 - 3.1 Students will demonstrate the ability to seek and learn new material outside the class topics through the completion of open-ended tasks including homework, report, term paper, computer assignment, and/or project. The amount and depth of new material identified and used by the student are measurable indicators of the student's performance.

Nominal Schedule (subject to change)

Week 1: Course overview, Combined Loads, Contact Stresses
Week 2: Stress Concentrations, Static Failure
Week 3: Deflections, Buckling
Week 4: Dynamic Loading, S-N Diagrams
Week 5: Basic Fatigue Failure, Fatigue Factors
Week 6: General Fatigue Failure
Week 7: Shafts and shaft connection hardware
Week 8: Bearings
Week 9: Gear Kinematics and basic design
Week 10: AGMA Gear Design, Intro to threaded fasteners
Week 11: Screws
Week 12: Bolted Joints
Week 13: Other connections
Week 14: Thanksgiving Break (25-27 November), no classes
Week 15: FEA
Week 16: Other Machine Elements

Final exam: Tuesday, December 15, 11:20 AM - 2:10 PM

Course Delivery Reminder

In accordance with the University System of Georgia (USG) rules for residential courses, this section is designated as ***in-person delivery***. That is, it is not a 'remote' or 'hybrid' class and the lectures will not necessarily be livestreamed or designed for video delivery. However, subject to the technology in the classroom and whether it can automatically produce accessible materials, a general recording of each session will be made available when possible.

Communication Reminder

General communications related to this course will be sent via *Canvas Inbox*. Please check it regularly and make sure that your notifications are configured so that they reach you.

In addition to the posted office hours listed above, I may be able to work out additional times. Please email me to set up an appointment, but be aware that individual meetings will rarely be able to happen the same week as the initial email! Unless it is a private issue (*e.g.* grades), office hours are **not individual time** (there are far too many of you to do them that way). Depending on how many students show up, office hours will be conducted in my office (Love 215) or the atrium of the Love Building on the second floor (primary) or the first floor (backup location).

Preparation, Attendance, and Participation Reminder

Class preparation, attendance, and participation are essential for you to learn the material. You should also expect multiple questions via the *PointSolutions* clicker app throughout each class.

Homework, Design Problems, and Doing your own work

Homework assignments will be through McGraw Hill Connect and must be **submitted by 11:59 pm on the deadlines indicated in Canvas.**

For these assignments, you may discuss solution strategies with classmates. However, **all assignments are individual. That is, all submitted work must be your own and all work for this course is governed by the Georgia Tech Honor Code.** As a guideline, if you are working independently from someone else, you will not both be looking at the same piece of paper or computer screen. It is not acceptable to share your screen or files containing either completed or partially completed work to anyone else. **Similarly, while you may use external resources (reference materials, AI assistants, etc.) for the homework, you cannot use them for the tests and final exam.**

Exams

There will be two tests and a final exam. The test dates and syllabus will be posted on Canvas, however the final exam is scheduled by the Institute. To maintain consistency, **it is not generally possible to make up an exam or take it at another time.** Remote (digitally-proctored) exams are also not allowed for this class. There may be extreme cases, however, in which someone must miss an exam. In that case, please let me know as early as possible and be prepared to present an institute-approved excuse well in advance (in the case of Georgia Tech official activities) or as soon as you can (in the case of a health issue). In such cases, we will work with Academic Advising or the Office of Student Life, as appropriate, to determine and document an appropriate course of action.

For the exams, the only electronic device permitted is one calculator, which **must be on the list of calculators approved by the NCEES** for use on the Fundamentals of Engineering Exam as of 1 October 2026. As stated on that list (ncees.org/exams), the acceptable types are: TI-30X, TI-36X, Casio fx-115, Casio fx-991, HP 33s, and HP 35s. While any model containing the text shown for the TI and Casio models are fine, only the exact models stated for the HP calculators are acceptable. Please note that **no other types of calculators will be allowed, so please plan accordingly.**

Late Policy

Unless announced otherwise, homework assignments are due before midnight on the due dates specified in Canvas. **Assignments that are late will receive no credit.**

Grading Policies

Your grade in the course will be determined by your mastery of the subject, not by your relative performance with your peers. That is, it is possible for everyone to get an 'A' in the course or for everyone to fail it. Your **minimum** grade in the class will be according to the following scale (for a grade of x):

- A $90\% \leq x \leq 100\%$
- B $80\% \leq x < 90\%$
- C $70\% \leq x < 80\%$
- D $60\% \leq x < 70\%$

In general, numerical grade scores depend on many factors, including details of the assignments and grading rubrics. As a result, I do take the grade distribution into account when grading. Under no circumstances will this lower your letter grade.

The grading for this course will be weighted as follows:

Homework Assignments	20
Test 1	25
Test 2	25
Final Exam	30
	100

- The tests and the final exam are traditional pen-and-paper format. There is space provided on the tests to put down your solutions, but you are welcome to use your own scratch paper.
- For all the tests and the final exam, you are allowed to have a calculator (please see **Exams** section above for details) and one 8.5" x 11" sheet of paper with no restrictions on the contents and you can use both sides of the sheet to write or print whatever you feel is needed for the test. This sheet does not have to be turned in with the test, so you can reuse or append more information as needed. You will be provided a copy of any additional resources that are needed for the tests and final exam.
- The tests are 75 minutes and the final exam is 170 minutes.
- The tests and final exam will consist of problems that are similar in concept to those covered in the lectures and the homework. Do not expect to see a problem that you have seen before in the lectures or the homework, but with the numbers changed. The problems will almost always require multiple steps to calculate the quantities asked for in the question.
- This is how the tests will be graded. All tests have 10 points of extra credit built into the test, so the maximum potential score is 110. As mentioned earlier, the test problems will almost always involve multiple calculation steps, which produce intermediate quantities. In almost all cases, arriving at the final solution is impossible without these intermediate quantities. Depending on the work involved in determining these intermediate quantities, points are awarded proportionally. Final answers are also awarded points proportionally. When I am grading your tests, I look for these intermediate quantities as well as your final answers and if all your answers (intermediate and final) are incorrect or missing, the lowest that you can score on any of the tests is somewhere around a 50. To summarize, there is no partial credit, but if everything that you turned in is wrong, you don't end up with a score of 0 either. This ensures that if you do poorly on one of the tests, it does not necessarily mean that you will end up with a low overall grade.

Support Resources

Mastering the material for this class while managing a full course load and maintaining your health can be challenging. Georgia Tech provides resources ranging from academic support

to personal support, to health care. Some good places to start are the Center for Academic Success (success.gatech.edu), the counseling center (counseling.gatech.edu), and the health service (health.gatech.edu). However, feel free to contact me or your ME academic advisor for additional ideas. While I might not be able to provide much personal help outside of the mechanical engineering academics, there's a reasonable chance I'll be able to help you find someone with the appropriate expertise.

Georgia Tech Policies

Discrimination and Harassment

Georgia Tech prohibits discrimination, including discriminatory harassment, on the basis of race, ethnicity, ancestry, color, religion, sex (including pregnancy), sexual orientation, gender identity, gender expression, national origin, age, disability, genetics, or veteran status in its programs, activities, employment, and admissions. This class adheres to and supports those guidelines. Put simply, no form of harassment or discrimination is allowed in this class. In keeping with the professional nature of this course, only professional behavior is acceptable between the instructor and the students and between students.

If I make any statements in class that you feel are inappropriate or marginalizing, please let me know. If you are uncomfortable telling me in person, you may report it on the anonymous midterm survey or on the CIOS at the end of the course. In letting me know, please make sure to tell me what I said so that I can avoid it in the future.

ADA Statement

If you have a documented disability as described by the Rehabilitation act of 1973 and the Americans with Disabilities Act (ADA) that may require you to need assistance attaining accessibility to instructional content to meet course requirements, please contact the ADAPTS staff as soon as possible to verify your disability and specify the accommodation you will need. It is then your responsibility to meet with your instructor. Please be aware that no retroactive accommodations will be provided, so you should contact me as soon as possible.

Academic Dishonesty

Georgia Tech has an honor code (<http://osi.gatech.edu/content/honor-code>), which applies to all of your academic work. The full text is on the website, but it includes the following:

Section 3. Student Responsibilities

Students are expected to act according to the highest ethical standards. The immediate objective of an Academic Honor Code is to prevent any Students from gaining an unfair advantage over other Students through academic misconduct. The following clarification of academic misconduct is taken from Section XIX Student Code of Conduct, of the Rules and Regulations section of the Georgia Institute of Technology General Catalog: Academic misconduct is any act that does or could improperly distort Student grades or other Student academic records. Such acts include but need not be limited to the following:

Possessing, using or exchanging improperly acquired written or verbal information in the preparation of any essay, laboratory report, examination, or other assignment included in an academic course;

Substitution for, or unauthorized collaboration with, a Student in the commission of academic requirements;

Submission of material that is wholly or substantially identical to that created or published by another person or person, without adequate credit notations indicating authorship (plagiarism);

False claims of performance or work that has been submitted by the claimant;

Alteration or insertion of any academic grade or rating so as to obtain unearned academic credit;

Deliberate falsification of a written or verbal statement of fact to a member of the Faculty so as to obtain unearned academic credit;

Forgery, alteration or misuse of any Institute document relating to the academic status of the Student.

While these acts constitute assured instances of academic misconduct, other acts of academic misconduct may be defined by the professor. Students must sign the Academic Honor Agreement affirming their commitment to uphold the Honor Code before becoming a part of the Georgia Tech community. The Honor Agreement may reappear on exams and other assignments to remind Students of their responsibilities under the Georgia Institute of Technology Academic Honor Code.