

Brigham Young University

Department of Mechanical Engineering

Course Title: **Static Systems in ME EN**
Course Time: Sec 1 MWF 10:00-10:50
Sec 2 MWF 2:00-2:50

Course No.: **ME EN 101**
Classroom: 321 EB
254 CB

Final Schedule:

Instructor: Dr. Ben Terry
Office: EB 360M

Office Hours: MTuWF 3:00-4:00
email: ben_terry@byu.edu

Class TAs: Several course TA's will be available in room CB 110 to answer questions.

Use of AI in the class:

The course components are designed to help you learn mechanical engineering statics. Use of AI *in any way* on graded work circumvents the learning process, is not allowed, and is an ethics and honor code violation. You are encouraged to use AI as you see fit to help you *learn* the material (e.g. explain concepts and generate quizzes and additional practice problems), but again, you may not use it in any way on any aspect of graded work.

Course Meeting Structure: This course is an "in-person" course. Students are expected to be in attendance. Student success is strongly correlated with regular class attendance. Students who feel sick (fever; cough; shortness of breath/difficulty breathing; chills; muscle pain; sore throat; new loss of taste or smell; etc.) should not attend class and should work with the instructor to develop a study plan for the duration of the illness.

Office Hours: The course TA's will hold hours where you can ask questions throughout a large portion of the week. Specifics of the times and location to contact the TA's will be posted to Learning Suite during the first week of classes. Office hours for Professor Terry will be in person at his office.

Prerequisites: PHSCS 121 and MATH 112: If you have not completed the prerequisites you should drop this course.

Text: Plesha, Gray, and Costanzo, Statics: Engineering Mechanics, 2nd edition.

Overview: The study of engineering statics is exciting and insightful into the phenomena that exist in the world around us. It is also a subject that is rigorous and mathematically intensive. Our approach will involve class discussions, text readings, working problems, special projects, and considering real-world static scenarios. What you learn from this course will depend upon your attitude and your commitment to becoming an independent learner and your willingness to work with others.

Recall that for a B grade, for each hour you spend in class, the expectation is that the average student will need to spend at least two hours outside of class on that subject. More time will be required to achieve excellence (an A grade) in a particular subject.

Objectives: The objective of this course is to provide an understanding and ability to mathematically model engineering statics systems, to learn a structured approach to solving real world problems, and to understand the broader mechanical engineering discipline. Specifically, the course content is broken into the 10 core topics listed below and for each topic there are certain competencies that you should achieve upon completion of the course.

Topics: Competencies (What you should be able to do upon completion of 101):

1. Vector Analysis: An understanding of forces and moments and an ability to perform mathematical manipulation of them using vector analysis.
2. Free-Body Diagrams: An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium for particles and rigid bodies.
3. Force and Moment Systems: An understanding of the analysis of systems of forces and moments and distributed loads and an ability to determine internal forces and moments in members.
4. Basic Computing for Parametric Evaluation: An ability to apply basic computing techniques to explore solutions of elementary static systems by changing variables and to produce publication quality figures.
5. Centroids and Moments of Inertia: An ability to calculate centroids and moments of inertia of 2-D and 3-D objects.
6. Friction: An understanding of friction and how to model it in static systems.

7. Static System Design: An understanding of the basic design process, including professional and ethical responsibilities, and an ability to apply that process to design, build, and test a static structure and meet competing constraints.
8. Real World Problem Solving: An ability to describe the ME EN Real-world Problem Solving Process and to transform real world scenarios (using the 5 P's) into analyzable statics problems.
9. Communicating Results of an Engineering Analysis: An ability to use a structured problem solving approach (SAFER) that effectively communicates the steps, results, and objectives of an engineering analysis to others.
10. Mechanical Engineering Discipline: An understanding of Mechanical Engineering as a discipline and how statics principles relate to core ME EN topics and to becoming an influential engineer.

Email/BYU Learning Suite: Learning Suite will be used to relay information relating to the class (HW assignments, hints on homework, etc.). Check your email and Learning Suite messages regularly. Homework assignments will be posted on the BYU Learning Suite with the due date specified.

Homework: Homework will be due weekly on Tuesdays by 11:59 p.m. The purpose of the homework is to solidify the principles discussed in class and the text so that mastery of the topic can be achieved. *There will be two types of problems assigned: homework practice and homework mastery.* Solutions to homework practice problems can be prepared using an abbreviated SAFER method on paper of your choice. Answers to even numbered homework problems from the text can be found at: www.mhhe.com/pgc2e. Working with others on homework practice problems is encouraged as long as all contribute equally, copying another person's work (or AI/online solutions) is not acceptable. Homework practice problems will be turned in digitally and students will complete an assessment on Learning Suite for each set of homework practice problems. *Homework mastery problems should be completed without discussion with other members of the class.* Both practice and mastery problems are to be submitted as a single file (pdf format) as explained in the individual homework assignment sheets. You may scan your work using any device that works for you. The SwiftScan app can be downloaded for free and is a quick effective method to use your phone to scan all of your work into a single file. Communicating solutions to real world engineering problems is a critical skill and is foundational to becoming an influential engineer. Thus, a significant portion of your score on homework mastery problems will be based on the professional nature of your solution. Solutions to all homework mastery problems should be prepared using the complete SAFER method and the problem solving template available for purchase from the bookstore for \$2.95/pad (shelved under author "Mechanical Engineering Department"), or downloaded from the course Learning Suite site. If preceded by reasonable personal effort, requests for help on all homework problems will always be cordially received by both the professor and the course TAs. Late homework will be accepted until 11:59 p.m. the day (Wednesday) after it is due at a penalty of 15%.

Reading: It is not possible to cover all relevant material in class, thus reading of the assigned material is expected prior to class time. *The material to be read prior to class period is shown on Learning Suite.* This will not only increase your exposure to the subject, but it will also prompt questions and class discussion on items needing clarification.

Lectures: Just as we cannot cover in class all of the information in the text, we will cover in class much information that is not found in text. Thus, it is most prudent to be an active participant in class in addition to being well versed in the text. *The topic of each class session for the entire semester is shown on Learning Suite.*

Special Problems/Projects: There will be multiple special problems and two design projects in conjunction with the course. The due date of the special problems/projects and the type of reporting required will be specified when they are assigned.

Quizzes: Quizzes will be due most days before class. The quizzes will generally consist of conceptual questions derived from the text, lecture, homework assignments, and special problems. The time requirement for each quiz will be typically less than 5 minutes and the lowest three quiz scores will be dropped before the final grade is determined. Make up quizzes will not be given.

Exams: Two mid-term exams and a final are scheduled, and the format will be closed book and closed note and will be administered in the testing center. An equation sheet will be provided in addition to any relevant information that is needed. Please plan now to be here on those days as university policy precludes giving of a final exam outside of its' regularly scheduled time.

Extra Credit: A few opportunities for extra credit will be given throughout the semester.

Grading Procedures:

Refer to LearningSuite for the breakdown of points for homework and mastery problems, quizzes, special problems, exams, etc.

If performance on the final exam is greater than the lowest midterm, the final exam score will replace this score. If everyone scores in the 90-100 range I will award everyone A's. However, I reserve the right to curve the grades if the class average lies below 80%.

If your cumulative grade on the Mid Term Exams and Final Exam (including all parts of those exam grades, e.g. extra credit, etc.) is less than 80%, then that cumulative exam grade will be your final grade in the class.

Example:

Exam 1 grade: 20%

Exam 2 grade: 90%

Exam 3 grade: 90%

Cumulative exam grade: 90%. This is not less than 80%, so your final grade will include all other course grades. Note: the 20% grade on Exam 1 was replaced with an 90% from the final exam.

Honor Code Standards: In keeping with the principles of the BYU Honor Code, students are expected to be honest in all of their academic work. Academic honesty means, most fundamentally, that any work you present as your own must in fact be your own work and not that of another nor that of AI. Violations of this principle may result in a failing grade in the course and additional disciplinary action by the university.

Students are also expected to adhere to the Dress and Grooming Standards. Adherence demonstrates respect for yourself and others and ensures an effective learning and working environment. It is the university's expectation, and my own expectation in class, that each student will abide by all Honor Code standards. Please call the Honor Code Office at 422-2847 if you have questions about those standards.

Mechanical Engineering Department's BIG: "To be recognized as the best undergraduate mechanical engineering program in the world and the alma mater for the world's most influential engineers."

Influential Engineers Develop:

CHARACTER: Influential engineers have integrity and strong desires to serve their community and their profession. They do the right thing, even when no one is watching or when others oppose it. Their influence is derived from strong moral principles and mutual respect. Their sphere of influence expands as others recognize and trust their character.

RESILIENCE: Influential engineers are resilient and learn from their failures. They persevere in pursuit of long-term goals. They embrace challenge and recognize effort is the path to mastery.

TECHNICAL EXCELLENCE: Influential engineers are innovative experts in their field. They solve significant, real-world problems by building models based on basic concepts and fundamental laws. They use state-of-the-art engineering practices and technologies to solve their models and obtain results.

COMMUNICATION SKILLS: Influential engineers communicate results and conclusions clearly and concisely. They persuasively present recommendations that prevent and solve problems. They are collaborative and always civil, particularly when others have differing viewpoints.

LEADERSHIP: Influential engineers lead in ethical behavior regardless of their position. They focus more on the greater good than on personal achievement. They make tough decisions when necessary. They inspire with genuine praise, correct with kindness when necessary and generously recognize the contributions and accomplishments of colleagues.

LIFELONG LEARNING AND SERVICE: Influential engineers consistently develop new skills and use their abilities and resources to enhance the lives of others.

Preventing Sexual Discrimination or Harassment: Sexual discrimination or harassment (including student-to-student harassment) is prohibited both by the law and by Brigham Young University policy. If you feel you are being subjected to sexual discrimination or harassment you may lodge a complaint with the Equal Employment Office (D-240C ASB) or with the Honor Code Office.

Students with Disabilities: If you have a disability that may affect your performance in this course, you should get in touch with the office of Services for Students with Disabilities (1520 WSC). This office can evaluate your disability and assist the professor in arranging for reasonable accommodations.