Course Syllabus: Machine Elements Design

College of Science, Mathematics & Engineering
MENG 4134 Section 101
Fall 2026

Contact Information

Instructor: Salim Azzouz & Pranaya Pokharel
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Office hours: M: 10-11 AM, T: 9-10 AM/2-3 PM, R: 9-10 AM/2-3 PM
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Course Description

Course Schedule: MWF 8:00 - 8:50 AM
Lab Schedules: (11A, 11B, 11C, T, 11AM-12:50PM, 1:00PM-2:50PM, 3:00PM-4:50PM)
Locations: Lecture: MY136 – Laboratories: MY 123
Course Description: Load and stress analysis of mechanical elements; materials failure theories, power transmission, design of machine elements such as: shafts, permanent joints, mechanical springs, rolling contact bearings, journal bearings, gears, belts, and flywheels. Companion lab.

Textbook & Instructional Materials

Shigley's Mechanical Engineering Design. Nisbett 99e: Shigley's Mechanical Engineering Design: 2024 Release Loose-Leaf for Fall 24., ISBN-9781266731716, Publisher McGraw Hill Education.

Main Topics Covered

Topics	Topics
Load and Stress Analysis	Mohr's Circles
Shocks and Impacts	Failure theories
Shaft Design	Power Screws
Welding	Mechanical Springs
Rolling-Contact Bearings, Lubrication and Journal Bearing	Gears, Spur and Helical Gears, Bevel and Worm Gears
Belts	Power Transmission
Finite-Elements Analysis	End of Topics

COURSE LEARNING OBJECTIVES AND RELATIONSHIP TO PROGRAM EDUCATIONAL OUTCOMES

Outcome-Related Course Learning Objectives	1	2	3	4	5	6	7
Understand and apply the method of sections to analyze internal forces in beams	X	X		X			
Understand and apply the failure criteria for ductile materials	X	X					
Understand the steps involved in designing a shaft using the stress failure criteria	X	X					
Understand the different types of stress involved in dimensioning power screws	X						
Understand and determine the average shear stress in fillet welds	X	X					
Estimate the torsional yield strength of a helical compression spring wire	X	X					
Determine a bearing load life based on a rated reliability	X	X					
Understand how is the Petroff equation for a journal bearing is derived	X						
Determine a shaft bearing loads for spur and bevel gears	X	X					
Understand how is the Lewis equation for estimating the bending stress in a gear tooth is derived	X	X					
Estimate the centrifugal tension force and torque experienced by a transmitting power flat belt	X	X					
Understand how can the Finite Element Method be used, and applied for stress analysis in mechanical structural parts	X	X					
Practice how to write formal and informal engineering reports			X	X	X		X
Experience how can you effectively work as a part of a team			X	X	X		X

1:an ability to identify, formulate, and solve complex engineering problems by applying the principles of engineering, science, and mathematics
2:an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental, and economic factors
3:an ability to communicate effectively with a range of audiences
4:an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5:an ability function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6:an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions
7:an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

CONTRIBUTION OF COURSE TO PROFESSIONAL COMPONENT
This course contributes to the engineering science component of the mechanical engineering program.

Study Hours and Tutoring Assistance

Plan to spend at least 6 hours outside of class to study the material and to work on homework assignments, and lab experiments. Do not wait until the last day to start working on your homework, lab report, or prepare for the exam.
Read and understand the course material after class, or at least review the course material before coming to class.
Utilize the instructor office hours throughout the semester to seek explanations from him.
Use the template with engineering or blank paper for all homework assignments. Use the blank sheets provided by the instructor for the exams. In engineering, neatness is a must, not a luxury. Be advised that you will be penalized for a lack of neatness.
Use a systematic approach to solve problems. If a problem involves drawing a graph, use Excel, MATLAB, or any other graphic software tool to draw the graph.
You are strongly encouraged to study in-group. Time to time a lab partner will be randomly selected for you.
Midwestern State University (MSU Texas) provides comprehensive, free tutoring assistance to its students primarily through the Office of Tutoring and Academic Support Programs (TASP). Located on the first floor of Moffett Library, TASP's Learning Center offers drop-in, one-on-one tutoring sessions that require no prior appointment for a wide variety of subjects, including writing, mathematics, sciences, history, and foreign languages.

Student Handbook

Refer to: Student Handbook

Academic Misconduct Policy & Procedures

Academic Dishonesty: Cheating, collusion, and plagiarism (the act of using source material of other persons, either published or unpublished, without following the accepted techniques of crediting, or the submission for credit of work not the individual's to whom credit is given). Additional guidelines on procedures in these matters may be found in the Office of Student Conduct.
Office of Student Conduct
Since writing, analytical, and critical thinking skills are core learning outcomes of this course, you must prepare all assignments solely by yourself. Developing strong competencies in these areas will prepare you for a competitive workplace.

Prohibited AI Uses

Fully AI-generated content is strictly prohibited and will be treated as plagiarism. If this happens, you will receive a grade of zero. Prohibited content includes, but is not limited to:
Written Text: Complete homework, lab reports, including analysis paragraphs, and presentations during the course.
Technical Work: Theoretical calculations, step-by-step procedures, data sets, and graphic results.

Allowed AI Uses

You may use AI tools solely for basic editing, language polishing, and sourcing assistance. Allowed tools include:

Grammar & Spell Checkers: Tools like Grammarly or Microsoft Editor for fixing punctuation, typos, and basic syntax.

Translation Assistants: Services like DeepL or Google Translate to help clarify your own original phrasing. Citation Software: Tools like Zotero or EndNote to format references and bibliographies.

Moffett Library

Moffett Library provides resources and services to support student's studies and assignments, including books, peer-reviewed journals, databases, and multimedia materials accessible both on campus and remotely. The library offers media equipment checkout, reservable study rooms, and research assistance from librarians to help students effectively find, evaluate, and use information. Get started on this Moffett Library webpage to explore these resources and learn how to best utilize the library.

Grading

Course Grade: Students will be graded individually; no collective grades will be assigned for any of the listed graded items, except for lab work. The final course grade will be based on the scores earned in the three mandatory exams, the average score of homework, the average score of lab reports, and the general student attitude grade. The contributions to the final grade are as follows: The first exam (10%), the second exam (25%), the final exam (35%), homework average (10%), lab reports average (10%), and class participation, returned assignments' neatness, student behavior, attitude, and class attendance (10%), for a total of 100%.

Table 1: Percentages allocated to each assignment

The overall course average (X) is calculated as follows: X = 10% Exam 1 + 25% Exam 2 + 35% Final Exam + 10% Homework + 10% Lab Reports + 10% Participation/Behavior/Attendance/Ethics.

Assignments	**Percentage**
Exam 1	10
Exam 2	25
Final Exam	35
Homework average	10
Laboratory reports average	10
Participation/Behavior/Attendance/Ethics	10
Total	100

Table 2: Total points for final grade.

Grade	Percentage
A	90 to 100
B	80 to 89
C	70 to 79
D	60 to 69
F	Less than 60

Homework

Homework assignments will be posted on D2L Dropbox from selected chapters chosen by the instructor. All assignments must be completed using the mandatory homework template, available on D2L. Students are required to submit homework as a single PDF file uploaded to the designated D2L Dropbox. Any other file formats will be dismissed. Each submission must include: 1) the official homework question sheet as a cover page, 2) a clearly organized solutions with proper question numbering, and 3) neatly and legibly written work that follows the template guidelines. Certain assignments may require the use of MATLAB software. The homework is graded according the following rubric:

The homework was completed thoroughly, with detailed figures and accurate calculations. The student demonstrated significant personal effort in clearly explaining the solutions and showed creativity and ingenuity in problem-solving.	90%-100%
The homework contains numerous calculations with only a few minor mistakes or omissions. Some details are missing, but the student demonstrated personal effort in explaining and completing the assignments.	80%-89%
The homework is incomplete, with several problems or questions unanswered. Some results are incorrect, and the submission lacks sufficient explanations and detailed calculations. Overall, the work is superficial, and the student did not demonstrate genuine effort to complete the assignment.	70%-79%
The homework is entirely incomplete and poorly presented, with many problems and questions unanswered. Most results are incorrect, and the student did not demonstrate any effort to complete the assignment. The submission also lacks critical details.	50%-69%
Homework not uploaded to D2L	0%

Exams

There will be two regular exams and a final exam at the end of the semester. Each exam will include the following, a) theoretical questions based on the textbook, designed to assess the students' ability to independently acquire and understand the course material, b) practical questions aimed at evaluating students' skills in analyzing, thinking critically, and solving engineering problems. Each exam will cover the course material taught prior to the first exam or between two consecutive exams. All exams will be conducted in class. Solutions must be written on the front side of the engineering paper or blank sheets only; the back side should not be used. Answers should be clearly organized, with proper question numbering, and neatly presented. During the exam, each student may use, 1) a single-page course summary sheet with writing on both sides, 2) a hard copy of the assigned textbook, 3) the instructor notes, and 4) a copy of their homework solutions. No other materials are permitted during the exam. During the exam, the use of cell phones, AI glasses, or any other electronic devices is strictly prohibited, except for a basic hand-held calculator. All cell phones and electronic devices will be collected at the beginning of the exam and returned at the end.

Laboratory Reports

In addition to the weekly three-hour lectures, two hours will be dedicated to lab experiments, result analysis, and lab report preparation. Lab reports are based on the material studied in class or presented as a course complement during the lab sessions. Organized and neat lab reports must be submitted on the due date at the beginning of class. Each group of students is responsible for submitting their own report in their own words. A student who was absent during a lab session cannot add their name to that lab group's report. Labs are graded according to the rubric provided in the table below. Students are encouraged to complete their lab work and submit it during the lab session whenever possible. Arriving late to the lab or leaving a lab session without the instructor's authorization will result in a penalty to the student's general attitude grade. For detailed lab guidelines, content, scheduling, and policies on late submissions, students should refer to the lab instructor: Dr. Pranaya Pokharel.

Submitted/Behavior	10	9.5	9	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0
Motivation	10	9.5	9	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0
Lab Theory	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Lab Procedure	10	9.5	9	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0
Results and Discussion	30	28	26	24	22	20	18	16	14	12	10	9	8	7	6	5	4	3	2	1	0
Conclusion	10	9.5	9	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0
Ref./Org./Neatness	10	9.5	9	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0

Extra Credit

Extra credit will be awarded to students who attend the Undergraduate Research and Creative Activities Forum (UGRCAF). To receive this credit, students must write a summary of two presentations they attended.

Late Work

Homework is due on the date specified on the assignment sheet. Failure to submit homework will negatively impact the student's participation/attitude grade. Late submissions will be accepted until the end of the semester but will receive a maximum grade of 50%. Every student must submit his own original work written in his own words. Duplicate, shared, or group submissions are not allowed unless explicitly authorized by the instructor.

Make Up Work/Tests

It is mandatory to take the exam on the scheduled date and time. If, for any unexpected or unforeseen reason, a student misses an exam, he/she must provide valid and convincing documentation explaining his/her absence. If the instructor agrees to take the documentation, and depending on his availability, a make-up exam will be prepared and administered on a mutually agreed upon date. The student has to be aware that the make-up exam may differ significantly from the regular exam.

Midterm Progress Report

In order to help students, keep track of their progress toward course objectives, the instructor for this class will provide a Midterm Progress Report through WebWorld for at-risk students. Midterm grades will not be reported on the students' transcript; nor will they be calculated in the cumulative GPA. They simply give students an idea of where they stand at the midpoint of the semester. Students earning below a C at the midway point should have a meeting with the professor and seek out tutoring. Please visit: https://msutexas.edu/academics/tasp/.

Important Dates

- Last day for term schedule changes: Check date on Academic Calendar.
- Deadline to file for graduation: Check date on Academic Calendar.
- Last Day to drop with a grade of "W": Check date on Academic Calendar.
- Refer to: Drops, Withdrawals & Void

Desire-to-Learn (D2L)

Extensive use of the MSU D2L program is a part of this course. Each student is expected to be familiar with this program as it provides a primary source of communication regarding assignments, examination materials, and general course information. You can log into D2L through the MSU Homepage. If you experience

difficulties, please contact the technicians listed for the program or contact your instructor.

Attendance

Students are expected to attend all meetings of the classes in which they are enrolled. Although in general students are graded on intellectual effort and performance rather than attendance, in this particular class absences may lower the student's grade because class attendance and class participation are deemed essential by the instructor, see grading table. An attendance sheet is maintained for each scheduled class session to keep an accurate record of student absences. A student with excessive absences may be dropped from a course by the instructor. Instructor's records will stand as evidence of absences.

Recording Classes

Recording classes is generally prohibited without the professor's explicit permission. Such recordings, when permitted, are for personal use only and may not be uploaded to the internet or otherwise shared, transmitted, or published without the professor's prior consent. Some faculty may not permit recordings of their classes. When it is feasible and appropriate, students may record classes to accommodate disabilities under the Americans With Disabilities Act, with prior approval of Disability Support Services. Such recordings may not be uploaded to the internet or otherwise shared, transmitted, or published.

Instructor Class Policies

To maintain a productive, respectful, and engaging learning environment, all students are expected to follow these basic community standards:

Device & Distraction Management

Silence your phone, keep your phone in your bag. Do not text, scroll, or take calls during class.

Use laptops for classwork labs only, open tabs related to the current lecture. Avoid social media, messaging, or unrelated browsing, as it distracts students sitting behind you.

Minimize noise, avoid side conversations while the instructor or a classmate is speaking.

Attendance & Participation

Be punctual, arrive and sit down before class begins. Entering late disrupts the entire lecture room. Stay until the end, do not pack up your bags, zip your backpacks, or rustle papers before the instructor officially dismisses class.

Engage respectfully, raise your hand to contribute. Keep your comments on-topic, professional, and respectful of diverse perspectives.

Professional Communication

Treat emails to the instructor as formal correspondence. Always include your Course/Section Number in the subject line, use a professional greeting (e.g., Dear Professor [Name]), and check your spelling.

Wear closed-toe shoes and long pants for science/engineering labs.

Change of Schedule

A student dropping a course (but not withdrawing from the University) within the first 12 class days of a regular semester or the first four class days of a summer semester is eligible for a 100% refund of applicable tuition and fees. Dates are published in the Schedule of Classes each semester.

Conflict Resolution

If a misunderstanding or a conflict arises between the student and the instructor. Please follow this conflict resolution procedure:
1) The student should contact the instructor face to face or via e-mail if there is an issue with the course or the instructor. The faculty and the student will discuss this face to face or via email. Hopefully a resolution is reached on the issue.

2) The student should notify the faculty via email again if the issue still did not get resolved after the first encounter or communication.

3) The student can then contact the Chair of the McCoy School of Engineering, Dr. Raj Desai, face to face or via email, (raj.desai@msutexas.edu), and discuss this issue. Dr. Desai will discuss the issue at hand with the faculty member. Dr. Desai will discuss the result of this discussion with the student. Hopefully a resolution is reached on the issue after this.

4) The student should notify the Chair via email if the issue still did not get resolved.

5) The Chair will contact the Dean and try to resolve the conflict. In case the conflict deals with the student grade, the Dean will forward the case to the Grade Appeals Committee if necessary.

Undergraduate Research

EURECA
Enhancing Undergraduate Research Endeavors and Creative Activities (EURECA) is a program that provides opportunities for undergraduates to engage in high-quality research and creative activities with faculty. EURECA provides incentives and funding through a system that supports faculty and students in a cooperative research process. For more information contact the Office of Undergraduate Research, (940) 397-6275 or by sending a message to eureca@msutexas.edu or better yet, stop by the Undergraduate Research office located in the atrium of the Clark Student Center, room 161. Information and resources are available at www.msutexas.edu/eureca.

UGROW
Like EURECA, the Undergraduate Research Opportunities and Summer Workshop, UGROW provides opportunities for students to conduct research with faculty. However, the research occurs in the summer. For five weeks, UGROW students experience the authenticity of scientific research in faculty's laboratories, in a highly interdisciplinary environment. Students work on projects of their choice and present their findings at the end of program and the MSU Undergraduate Research Forum. Faculty members publicize research projects in the spring. The application deadline for UGROW 2025 has not been established yet; however, it will be announced in the upcoming spring semester. Information and resources are available at www.msutexas.edu/ugrow.

Proposed EURECA or UGROW Projects
The current faculty - Dr. Salim Azzouz - has several proposals for EURECA or UGROW projects. The proposed projects are the following:
Biomimicry - Studying the mathematical line/surfaces in a seashell pattern
Energy - A gravity based solar public night light
Energy - Desalinating water using wind or solar energy
Energy – Designing new types of vertical wind turbines
Materials Science - Determining the chemical composition of various collected rocks, and the processes to extract their basic components
Materials Science: Testing different manufacturing processes to cut and polish rocks
Numerical Methods: Using the Finite Elements Method to solve structural engineering problems

If you are interested in working on any of the above projects through the EURECA or UGROW undergraduate research programs, please contact Dr. Azzouz directly.

Council on Undergraduate Research (CUR)
To support undergraduate research and creative activities, Midwestern State University holds an enhanced institutional membership with the Council on Undergraduate Research (CUR). This institutional membership includes unlimited memberships for any interested faculty, staff, and students. Students may find information on benefits and resources at:
https://www.cur.org/engage/undergraduate/.

The CUR Undergraduate Resources Webpage contains:

Research Opportunities
Presentation Opportunities
Undergraduate Research Journals
CUR-Sponsored Student Events

Refund and Repayment Policy

A student who withdraws or is administratively withdrawn from Midwestern State University (MSU) may be eligible to receive a refund for all or a portion of the tuition, fees and room/board charges that were paid to MSU for the semester. HOWEVER, if the student received financial aid (federal/state/institutional grants, loans and/or scholarships), all or a portion of the refund may be returned to the financial aid programs. As described below, two formulas (federal and state) exists in determining the amount of the refund. (Examples of each refund calculation will be made available upon request).

Services for Students with Disabilities

In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Midwestern State University endeavors to make reasonable accommodations to ensure equal opportunity for qualified persons with disabilities to participate in all educational, social, and recreational programs and activities. After notification of acceptance, students requiring accommodations should make application for such assistance through Disability Support Services, located in the Student Wellness Center, (940) 397-4140. Current documentation of a disability will be required in order to provide appropriate services, and each request will be individually reviewed. For more details, please go to Disability Support Services.

Emergency Aid Resources for Basic Needs

Unexpected life circumstances can affect anyone. If you are experiencing challenges meeting basic needs, such as housing, utilities, food, transportation, healthcare, technology, textbooks or other life necessities, resources may be available to help. Visit the Student Emergency Support and Resources webpage to learn more, and explore emergency support opportunities through MSU and how to access them.
For additional information, please contact the Office of Student Affairs in the Clark Student Center #108, (940) 397-7500, student.affairs@mstuexas.edu.

College Policies

Campus Carry Rules/Policies

Refer to: Campus Carry Rules and Policies

Smoking/Tobacco Policy

Midwestern State University seeks to provide a safe, healthy, pleasant environment for its faculty, staff, and students. To this end, the use of tobacco products, including smoke and smokeless tobacco, and the advertising, sale, free distribution, and discarding of tobacco products shall be prohibited in all indoor and outdoor facilities and in all university vehicles. The policy extends to faculty, staff, students, vendors, guests, and visitors.

Alcohol and Drug Policy

To comply with the Drug Free Schools and Communities Act of 1989 and subsequent amendments, students and employees of Midwestern State are informed that strictly enforced policies are in place which prohibits the unlawful possession, use or distribution of any illicit drugs, including alcohol, on university property or as part of any university-sponsored activity. Students and employees are also subject to all applicable legal sanctions under local, state and federal law for any offenses involving illicit drugs on University property or at University-sponsored activities.

Campus Carry

Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes has prohibited. The new Constitutional Carry law does not change this process. Concealed carry still requires a License to Carry permit, and openly carrying handguns is not allowed on college campuses. For more information, visit Campus Carry.

Active Shooter

The safety and security of our campus is the responsibility of everyone in our community. Each of us has an obligation to be prepared to appropriately respond to threats to our campus, such as an active aggressor. Please review the information provided by MSU Police Department regarding the options and strategies we can all use to stay safe during difficult situations. For more information, visit MSUReady – Active Shooter. Students are encouraged to watch the video entitled "*Run. Hide. Fight.*" which may be electronically accessed via the University police department's webpage: *"Run. Hide. Fight."*

Grade Appeal Process

Update as needed. Students who wish to appeal a grade should consult the Midwestern State University MSU Catalog

*__Notice:__ Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor.

Course Schedule:

All activities, assignments, and exam are posted as scheduled in the D2L main course page.

Week	Activities/Assignments/Exams	Due Date
Posted in D2L	Detailed instructions on the Activities and Assignments are posted in D2L	Clearly posted in D2L