

SYLLABUS
MENG 4143 – 101: Senior Design I
Required Course - Fall 2025

Faculty mentors: Dr. Salim Azzouz, Dr. Sheldon Wang, Dr. Yu Guo, Dr. Mahmoud Elsharafi, and Dr. Pranaya Pokharel.

Faculty mentors' offices No: MY 219G, MY 138, MY 219A, MY 219F, and MY 219C.

Main Instructor: E-mail: salim.azzouz@msutexas.edu, Tel.: (940) 397-4301

Office Hours: See schedules displayed on D2L, other days and times by appointment.

Lecture Schedule & Location: Lecture W **1:00 - 1:50 PM**, MY 136, Dr. Salim Azzouz.

Lab Section, Faculty mentors, Locations & Schedules:

Session	Faculty mentor	Room	Time	Session	Faculty mentor	Room	Time
11A	S. Azzouz	MY 136	W 2:00 - 5:50 PM	11F	M. Elsharafi	MY 123	W 2:00 - 5:50 PM
11B	S. Wang	MY 131	W 2:00 - 5:50 PM	11G	P. Pokharel	MY 121	W 2:00 - 5:50 PM
11D	Y. Guo	MY 140	W 2:00 - 5:50 PM				

CATALOG DESCRIPTION

Coursework emphasizes creative and critical thinking, planning, design, execution, and statistical evaluation of experiments, teamwork, and project management. This course integrates knowledge gained from most of the required courses in a major design project. Students will design, build, and formally present their completed projects to a panel of professional reviewers. Students will ideally work on projects from local industry. If not available, the students or faculty mentor may propose projects.

COURSE PREREQUISITES

Completion of all required MENG 3000 level courses or permission of faculty mentor.

OTHER PREREQUISITES

Basic computer skills, MATLAB, SolidWorks, SolidWorks Simulation, LabVIEW, Automation Studio, MS Word, MS Excel, hand calculator.

OPTIONAL TEXTBOOKS

Shigley's Mechanical Engineering Design. *Nisbett 99e: Loose-Leaf for Fall 24., McGraw Hill Education.*
Engineering Design, *By George E. Dieter, 6th edition, McGraw Hill Education.*
Materials Science and Engineering, an Introduction, *by William D. Callister, 10th edition, John Wiley.*

REFERENCES

Additional material will be provided in D2L.

TOPICS COVERED

Topics	Topics
Teamwork	Machining Processes
Brainstorming and Creativity	Manufacturing Processes
Engineering Design	Project Management

COURSE LEARNING OBJECTIVES AND RELATIONSHIP TO PROGRAM EDUCATIONAL OUTCOMES

Outcome-Related Course Learning	1	2	3	4	5	6	7
Demonstrate the ability to work effectively as a member of a team			X	X	X		
Explain the four fundamental brainstorming principles	X	X			X		
Explain the five mental steps leading to creative processes	X	X		X			
Lay down the seven basic steps of the engineering design process	X	X	X	X		X	X
Explain and demonstrate the machining operation performed on a lathe machine		X				X	
Explain and demonstrate the machining operations performed on a milling machine		X				X	
Explain the investment casting process		X	X	X		X	
Lay down the detailed procedure to design a shaft	X	X					
Understand and use the five processes involved in a project management			X	X			
Write formal and informal engineering reports	X	X	X	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.

COURSE ORGANIZATION

General Information

This course provides students with the opportunity to work in an environment that closely simulates a real workplace. Students will collaborate in groups of two or three, bringing together diverse backgrounds, skills, and competencies. Each senior design group is required to elect a team leader, a treasurer, and a report coordinator. Projects are proposed by faculty or industry partners and assigned to students during the first week of the fall semester. Each faculty member will provide a project description and outline the main goals to be achieved. Over the course of the two Senior Design I and II classes, each group will complete a series of project phases, including brainstorming, product design, fabrication, and final testing.

Brainstorming Phase

Within the first few weeks of the fall semester, by a date specified by the faculty mentor (typically toward the end of September), each group must submit a proposal report on its assigned senior design project and deliver an internal oral presentation. The report and presentation should summarize the outcomes of the group's brainstorming sessions during this period and clearly present the adopted project design concepts.

Preliminary Design Calculations and Drawings for Parts and Assemblies

Building on the design concept developed in the previous phase, each group is required to prepare a defined set of preliminary design calculations and drawings for the project's parts and assemblies. By a date specified by the faculty mentor (typically mid-October), each group must submit a draft of these calculations and drawings and deliver an oral presentation to the faculty mentor.

Final Draft Proposal Report with Budget, Quotes, and Timeline

Toward the end of the semester, each group must submit a comprehensive draft proposal report that includes the final design, supporting calculations, drawings of parts and assemblies, budget, list of ordered and pending parts with quotes, project timeline, references, and appendices. The faculty mentor will review the draft, provide final recommendations, and return it to the students for revision. Groups are required to revise their report in accordance with the faculty mentor's feedback. A general template for the proposal report will be made available on D2L and must be followed as the official guideline.

GUIDELINES FOR THE STUDENTS

1. Faculty Mentor and Student Conduct

The faculty mentor supervising the students and project progress is responsible for guidance, advice, and evaluation of student contributions. The mentor is not responsible for completing the students' work. Students are expected to behave professionally and ethically throughout the project. Once class begins, the use of cellphones, laptops, or any other electronic devices is strictly prohibited unless authorized by the faculty mentor. Misbehavior such as the use of foul language among team members, unethical or derogatory remarks about a team member, faculty, or staff, private or disruptive conversations during class, working on unrelated tasks, playing or watching games or movies, eating, drinking, sleeping, or leaving the classroom without permission will result in significant penalties to the attitude grade. Additional penalties apply if a student intentionally delays project progress, fails to submit weekly reports and logbooks, disrespects teammates by dismissing their ideas, refuses to communicate, or does not attend group meetings. Repeated violations may result in removal from the course and labs for the remainder of the semester. Absenteeism or habitual tardiness to lectures, labs, and meetings with the group or faculty mentor may result in the loss of the entire attitude, attendance, contribution, and professional behavior grade, 20%.

2. Project Deliverables

Students are advised that deliverables announced at the beginning of the semester may be modified by the faculty mentor depending on project progress or unforeseen difficulties.

3. Presentations

All students are required to participate in every senior design presentation (internal, external, partial, and final).

4. Design Changes

Any changes to the project design or drawings discussed with faculty, industry engineers or technicians, the department machinist, or lab technicians must be reported immediately to the faculty mentor in charge, who will decide whether to approve the changes or not.

5. Final Drawings and Manufacturing

Every final drawing and manufacturing process for a machine part must be signed and approved by the faculty mentor.

6. Purchases

All part purchases must be approved and signed by the department chair, the faculty mentor, the machinist, and the purchaser. Purchase requests must include all required signatures as well as the current budget balance. All purchases must remain within the approved budget, \$2,000/group.

STUDENT PERFORMANCES ASSESSMENT

Lecture and Labs, Written Exam

This course consists of one mandatory one-hour lecture and four mandatory laboratory design, manufacturing sessions per week. The lecture primarily consists of faculty mentor presentations, with occasional general discussions on project progression, weekly assignments, encountered challenges, and project needs. Laboratory sessions are dedicated to group project work, carried out independently and under the supervision of the faculty mentor, with assistance as needed from the machinist technician or external company engineers/technicians. During some lab sessions, the machinist will demonstrate key machining operations. Students are required to attend the full lab session every Wednesday from 2:00 p.m. to 5:50 p.m. and wait for their scheduled meeting with their faculty mentor. Students are reminded that the allotted lab time is not sufficient to complete all required weekly tasks; they must manage their schedules and arrange additional meetings to ensure timely completion of work.

The final written exam will be administered in person and will cover material studied in lectures as well as videos shown in class. The use of cell phones or electronic devices is strictly prohibited, except for a basic calculator. Only a one-page study formula sheet will be permitted. Each student must take the exam at the scheduled date and time; no make-up exam will be provided. The written exam counts for 15% of the total course grade.

Weekly Progress Reports and Logbook

Requirements

Each student must submit a weekly progress report along with a personal logbook (template available on D2L). The logbook must document all project-related activities and information received during the week. The weekly progress report should be based on the logbook and must be uploaded as one unique PDF file along with the logbook to both the designated D2L Dropbox set up by the group's faculty mentor, and the

Dropbox set up by Dr. Azzouz. The weekly reports must be neatly written, organized, and clearly labeled according to the posted template. Each report should include: Technical specification sheets, hand-drawn sketches, SolidWorks drawings (Pack & Go files must be saved on a memory key and submitted to Dr. Azzouz by the end of the Fall 2025 semester), simulation results and graphics, schematic experimental setups, computer-designed circuits (e.g., PLCs, pneumatics, electronics), programming algorithms (MATLAB or other languages), experimental procedures and results, theoretical hand calculations, draft technical papers or reports, 2D/3D component drawings, and a copy of the latest weekly logbook. All critical documents (drawings, simulations, reports, etc.) must be organized in folders and saved on the memory key for final submission at the end of the semester.

Submission

Progress reports and logbooks are due at the beginning of each laboratory session. Late submissions will be accepted until the end of the semester but graded at a maximum of 50% of the total grade. Submitting identical material across two consecutive weeks will result in a failing grade (0%) for the second submission. It is strictly forbidden for students within the same group to submit identical reports or logbooks. Each group member is required to submit a unique, personal weekly progress report.

Grading

Weekly progress reports and logbooks are graded jointly by the faculty mentor (weekly progress report) and Dr. Azzouz (logbook). They account for 15% of the total course grade. The grading rubric is as follows:

Excellent (100%): Complete report and logbook with detailed documentation, sketches, SolidWorks drawings, simulation data, schematics, technical sheets, experimental procedures/results, and correct theoretical calculations. Demonstrates strong effort, clear explanations, and creativity in problem-solving.

Good (90%): Strong report and logbook with most required elements. Shows good effort, clear explanations, and sound problem-solving. May contain minor errors or omissions.

Satisfactory (80%): Report and logbook include some required elements but are missing key items. Demonstrates limited effort with occasional attempts at explanation and problem-solving. Contains noticeable errors and/or missing critical items.

Needs Improvement (70%): Weak report and logbook missing many elements. Minimal effort in documentation, explanation, or problem-solving. Contains numerous mistakes and omissions.

Poor (60%): Incomplete report and logbook missing most required elements. Little or no effort shown; major errors and omissions are present.

Failing (0%): No submission, or submission is plagiarized, identical to another student's work, or entirely irrelevant to the project.

Peer Evaluation

The main course faculty mentor will conduct two peer evaluations during the semester: one at mid-semester and one at the end of the semester. Each group member will be required to honestly evaluate their peers based on performance, contribution, and commitment to group tasks and project goals. It is **MANDATORY** for students to provide a list of both **PROS AND CONS** for each group member as part of the evaluation, a penalty on the grade will be applied if this information is not provided. Peer evaluations will account for 10% of the total course grade and must be uploaded to the designated D2L Dropbox when requested by the faculty mentor. Failure to submit the peer evaluation on time will result in a grade of 0% for this component.

ATTITUDE & ABSENTEEISM & PROJECT CONTRIBUTION & SHARING KNOWLEDGE WITH TEAMMATES AND FACULTY MENTOR & ATTENDING GROUP MEETINGS & ETHICAL BEHAVIOR

This course component will be continuously assessed by the main senior design instructor and the group's faculty mentor for each student throughout the fall semester. The final grade will be based primarily on peer evaluations, class behavior, attendance and punctuality, number of absences, time spent achieving

weekly and project goals, use of appropriate or inappropriate language, willingness to collaborate and share knowledge with team members, evaluations of lab work by the faculty mentor and machinist technician, adherence to ethical standards, and other relevant criteria (as listed above under student guidelines) deemed appropriate by the main instructor and faculty mentor. This component accounts for 20% of the total course grade.

Public Presentations & Paper Publication & Poster

Students are expressly informed that each one of them is explicitly required to participate in the three following university activities over the course of the two senior design semesters: the University Undergraduate Research and Creative Activity Forum (fall 2025 and spring 2026) and the North Texas Area Students Conference (NTASC, spring 2026). Additional activities and contributions may also be required at the discretion of the group faculty mentor, including: the participation in the Council on Undergraduate Research Conference (CUR, spring 2026), the IdeaMSU contest (spring 2026), writing journal or conference papers, preparing posters, and similar tasks. Students are expected to begin preparing for these activities during the fall semester (e.g., drafting posters, oral presentations, or journal/conference papers drafts). Participation in these activities will account for 10% of the student's final grade.

Final Oral Exam

The group is required to deliver a ten-minute collective oral presentation before a panel consisting of the department faculty overseeing the senior design course and labs and invited guests. Following the presentation, the group members will have ten minutes to answer a series of questions prepared by the panel regarding the project's materials and outcomes. The total duration of the presentation and Q&A session is strictly limited to twenty minutes. The oral presentation and exam are scheduled for Wednesday, December 3, 2025, at 1:00 PM in MY 136. It is MANDATORY that all final presentations be prepared in Microsoft PowerPoint and saved to a memory key provided by the department lab technician, Mr. Jay Barnett.

Final Project Proposal Report

Toward the end of the semester, on Wednesday, November 26, 2025, each group must submit a final major draft proposal report containing the following mandatory components:

- Detailed introduction and motivation for the project
- Complete description of SolidWorks 2-D and 3-D drawings for parts and assemblies
- Theoretical calculations and/or computer-based simulations of a machine or physical process
- Schematic drawing of the measurement setup and experimental testing procedure
- Preliminary results, graphs, and analysis
- Current budget with attached quotes and purchase records
- Gantt chart timeline
- References for consulted technical papers, books, and websites
- Acknowledgements of internal or external advisors and all helpers during the fall semester
- Appendices (all drawings, results, technical specification sheets, quotes and purchase requests, etc.)

The faculty mentor will review the draft proposal report, provide written recommendations, and return it to the students. Students are required to revise the draft according to the mentor's recommendations. The final written proposal report, incorporating all the above requirements, must be submitted no later than Friday, December 5, 2025. It is MANDATORY that all final reports be prepared in Microsoft Word and saved to a memory key provided by the department lab technician, Mr. Jay Barnett.

While a working prototype of the design is due by the end of the academic year in May 2026, each group is required this fall semester to produce and present a computer-based animated design (2-D and 3-D drawings) and simulations addressing various aspects of the assigned project tasks (e.g., stress analysis,

flow velocity field, hydraulic circuits animation, PLC, Arduino, Raspberry Pi programming, etc.). Note: Although multiple software tools may be used for simulations, the preferred ones are SolidWorks Simulation and ANSYS, as these are available on nearly every computer in the McCoy School of Engineering. Additionally, the final proposal report must meet all requirements specified in the individualized contract sheet distributed by the faculty mentor at the beginning of the semester. The proposal report counts for 15% of the total final grade.

Course Grades

Students are informed that each one of them will be graded individually. There is strictly no collective grade for any of the items listed in the table below. Course grades are based on the following items and their assigned weights, summarized in the grading table below:

Graded Items	Percentage Assigned to Items
Senior Design Written Exam	15%
Weekly Progress Report & Logbook	15%
Peer Evaluation	10%
Attitude & Absenteeism & Project Contribution & Sharing Knowledge with Teammates and Faculty Mentor & Attending Group Meetings & Ethical Behavior	20%
Public Presentations & Paper Publication & Poster	10%
Final Proposal Presentation & Oral Exam	15%
Final Proposal Report	15%
Total maximum Grade	100%

The below grade range scale will be used to assign the final course grade:

Value Range of X (in %)	Letter Grade
$90 \leq X \leq 100$	A
$80 \leq X < 90$	B
$70 \leq X < 80$	C
$60 \leq X < 70$	D
< 60	F

Student/Faculty Contract

A Student/Faculty Contract will be proposed by the group's faculty mentor and signed by all parties participating in the senior design laboratory. The contract covers the following items:

- Contracting parties
- Assigned faculty mentor
- Project goals and expected outcomes
- Team member responsibilities
- Meeting policies
- Deadline policies
- Ethical rules within the group
- Archiving and documentation procedures
- Decision-making procedures
- Dispute resolution procedures

Each group must upload its finalized contract to a designated D2L Dropbox.

Machine Shop, Lab Rooms & Tools Availability

Students are not allowed in the machine shop or laboratories without the presence of the machinist, the lab technician, a staff member, or the group's faculty mentor. The machine shop is closed to students during weekends and evenings. If tools are required during these times, please contact our lab technician to obtain them. Students are not allowed in the machine shop while wearing open-toe shoes.

Printed Copy of the Draft & Final Report

If a student needs a printed bonded copy of their senior project by May 2026, they have to write a check of \$50 to the engineering department secretary, Mrs. Christina Miller.

CONFLICT RESOLUTION

If a misunderstanding or a conflict arises between the student and the faculty mentor. Please follow this conflict resolution procedure:

- 1) The student should contact the faculty mentor face to face or via e-mail if there is an issue with the course or the faculty mentor. 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 GENERAL RESEARCH INFORMATION**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.

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
- and more!

MIDTERM PROGRESS REPORT

In order to help students, keep track of their progress toward course objectives, the main instructor and the faculty mentors 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/>.

CAMPUS CARRY STATEMENT

Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information regarding campus carry, please refer to the University's webpage at <http://msutexas.edu/campus-carry/rules-policies>.

GENERAL EDUCATION STATEMENT

Students in this course must demonstrate their competency in oral and written communication through written homework assignments, lab reports, exams, and final project reports. They must also demonstrate their ability to use the English language.

ACADEMIC INTEGRITY POLICY AND ETHICS

Scholastic dishonesty will not be tolerated and will be prosecuted to the fullest extent. You are expected to have read and understood the current issue of the student handbook:

https://msutexas.edu/student-life/_assets/files/handbook.pdf.

regarding student responsibilities & rights, and the intellectual property policy information about procedures and what constitutes acceptable on-campus behavior. Any form of plagiarism will not be accepted, and will be heavily reprimanded. For more information, please visit the MCOSME student resources website: https://msutexas.edu/academics/scienceandmath/student_resources.php.

Since writing, analytical, and critical thinking skills are part of the learning outcomes of this course, all writing assignments should be prepared by the student. Developing strong competencies in this area will prepare you for a competitive workplace. Therefore, fully AI-generated content such as reports,

presentations, entire description of a machine or a process, theoretical calculations, procedures, graphic results, analysis paragraphs, are not permitted and will be treated as plagiarism.

DISABILITY SUPPORT SERVICES

Students registered with Disability Support Services should have a letter verifying their disability and the appropriate accommodations.

DISCLAIMER STATEMENT

Information contained in this syllabus, other than grading, late assignments, makeup work, and attendance policies, may be subject to change with advance notice, as deemed appropriate by the main course faculty mentor.

*Prepared by: Dr. Salim Azzouz, Dr. Sheldon Wang, Dr. Yu Guo, Dr. Mahmoud Elsharafi, and Dr. Pranaya Pokharel.
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