

**SYLLABUS**  
**MENG 4243 – 201: Senior Design II**  
**Required Course - Spring 2025**

Faculty mentors: Dr. Salim Azzouz (MY 219G), Dr. Jan Brink (MY 138), Dr. Mahmoud Elsharafi (MY 219F), Dr. Yu Guo (MY 219A), Dr. Zeki Ilhan (MY 219E), Dr. Pranaya Pokharel (MY 219C), and Dr. Sheldon Wang (MY 137).

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Office Hours: See schedules displayed 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, Location & Schedule:

Session	Instructor	Room	Time	Session	Instructor	Room	Time
11A	S. Azzouz	MY 136	W 2:00 - 5:50 PM	11E	Z. Ilhan	MY 125	W 2:00 - 5:50 PM
11B	S. Wang	MY 131	W 2:00 - 5:50 PM	11F	M. Elsharafi	MY 123	W 2:00 - 5:50 PM
11C	J. Brink	MY 118	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**

A continuation of MENG 4143.

**COURSE PRE-REQUISITES**

Successful completion of MENG 4143.

**OTHER PREREQUISITES**

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

**OPTIONAL TEXTBOOKS**

Shigley's Mechanical Engineering Design, by *Richard G. Budynas*, and *J. Keith Nisbett*, 11<sup>th</sup> edition

Engineering Design, by *George E. Dieter*, 6<sup>th</sup> edition

Materials Science and Engineering, an Introduction, by *William D. Callister*, 10<sup>th</sup> edition

**REFERENCES**

Additional material will be provided in the form of handouts in D2L.

**TOPICS COVERED AND TIMETABLE**

When	Topics	When	Topics
week 1	Engineering ethics	week 11	Invited speaker
week 2-4	Materials selection and manufacturing processes	week 12	SD II project requirements
week 5-7	Case study: Dimensioning of a gear reducer	week 13-14	Case study: Bearings dimensioning
week 8	Engineering statistics	week 15	Leadership qualities
week 9	Risk, reliability, and safety	week 16	Oral exam and final report due
week 10	Robust and quality design	week 17	Written exam

**COURSE LEARNING OBJECTIVES AND RELATIONSHIP TO PROGRAM EDUCATIONAL OUTCOMES**

<b>Outcome-Related Course Learning</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
Explain the method for materials selection	X	X		X		X	
Cite at least three techniques for materials processing	X	X					
Explain the steps pertaining to the investment casting process	X	X					
Cite at least three probability distributions	X	X					
Explain the meaning of reliability in engineering design		X	X	X	X		X
Define quality in engineering design		X	X	X	X		
Explain how to determine a shaft FOS	X	X				X	X
Explain how to dimension a Ball Bearing for a specific application	X	X				X	X
Write formal and informal engineering reports			X		X		X
Work as part of a team			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 to 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 AND STUDENT PERFORMANCES ASSESSMENT**

### **GENERAL INFORMATION**

This course provides the students with the opportunity to work in an environment which closely simulates a real workplace environment. The students will work in groups composed in general, of two or three members from diverse backgrounds, with diverse skills and capabilities. The senior design group members were required to elect a leader and a treasurer (done in the fall semester), those positions might change and need to be confirmed again this semester. The current projects either proposed by the students, devised by the faculty or the industry and assigned to the students in the first week of the fall semester will be continued this spring 2025 semester. Each group will continue to carry-out a set of additional project tasks listed below. Those tasks are needed to complete the entire senior design project by the end of the spring semester.

- **Request for Funding and Parts Ordering Phase**

Sometimes in February each group will submit a final and complete request for funding for their project, a full bill of materials, and an exhaustive list of the ordered parts as well as their final 2-D and 3-D drawings with finalized dimensions and tolerances. Each group is required to prepare and present to their faculty mentor a PowerPoint presentation about the design concept, the type of parts ordered, the suppliers, and the projected total cost of the project.

- **Fabrication and Assembly Phase**

Each group has a maximum of two months, February and March, to carry out the fabrication and assembly phase of the project. By a date specified by their faculty mentor, each group through an oral presentation will present, submit, and demonstrate to the faculty mentor the fabricated machine and its functionalities. The described above procedure is also valid for a designed process.

- **Testing and Results Processing Phase**

Toward the end of the semester, each group will submit to their faculty mentor a fully working prototype or process of their final design. A partial oral presentation showing a testing procedure with pictured experiment set-ups is also required. Testing results have to be shown and discussed.

1. The faculty mentor in charge of the group and the monitoring of the project is there to guide and help the students, advise them, supervise them, and evaluate their effective contribution to the senior design project. He is an integral part of the project.
2. The faculty mentor expects the students to behave professionally and ethically throughout the duration of the project. After class or lab start, the private use of cellphones, laptops, or any other electronic devices is strictly prohibited. Any student caught misbehaving in class, using foul language, making unethical written or verbal derogatory remarks about their classmates or the instructors, conducting private conversations during class or lab, working on anything that is not directly related to the course, playing, watching games or movies, drinking, eating or sleeping in class or lab, leaving the class or lab without the express permission of the instructor will result in heavy penalties for the student attitude grade (20%). Additionally, if the student intentionally slows down the normal pace of the project, do not turn-in his/her weekly report, logbook, and homework on regular basis, show a lack of respect to their teammates by unfairly dismissing their ideas, not listening to them, not communicating with them, and not attending the group outside meetings, such behavior will result in heavy penalties for the student attitude grade as well. If the above infractions are continuously repeated by the student, the instructor will drop the student from class and labs for the rest of the semester. Not attending or arriving late to scheduled

lectures, labs, and group/faculty meetings may cost the student the full attitude & absenteeism & project contribution & sharing knowledge with teammates and faculty mentor & attending group meetings & ethical behavior grade (20%).

3. It is brought to the attention of the students that the deliverable might change, depending on the project advancement, and/or encountered difficulties and problems during the project.
4. It is brought to the attention of the students that each one of them is expressly required to participate in all internal, external, partials, and finals senior design presentations.
5. It is brought to the attention of the students that any changes in the project design and drawings discussed with other faculty members, and/or the department machinist technician, and/or the department lab technician, and/or external company engineers or technicians must be reported immediately to the faculty mentor in charge of the project who will decide on whether to adopt these changes or not.
6. It is brought to the attention of the students that each final drawing of a machine part has to have the approved signature of the faculty mentor in charge of the group, the machinist technician, or external company engineer or technician before the component is ordered or manufactured.
7. It is brought to the attention of the students that each purchase of a machine part has to have the approved signature of the chair of the department, the instructor in charge of the group, the machinist, and the purchaser. The three signatures as well as the current budget have to be clearly shown on any purchase request. The purchase has to stay within the allowed project budget which is \$2,000/group.

#### **LECTURE, EXAMS, HOMEWORK, LOGBOOK**

This course consists of a one-mandatory hour lecture and four mandatory-hour laboratory design sessions per week. The one-hour lecture session includes mostly a talk by the instructor, and sometime a general discussion of the projects progression (weekly assignments, difficulties, needs, and encountered issues). The lab time will be spent by the groups working on their projects on their own and under the supervision of their faculty mentor and when needed the machinist technician or the external company engineer (s) or technician (s). The students are required to attend the whole lab session each Wednesday from 2:00 pm to 5:50 pm, and wait for their turn to meet with their faculty mentor. It is brought to the attention of the students that the lab-time is not sufficient to complete all the required weekly tasks. The students have to manage their own study schedule and find time for meetings to complete all required tasks.

The final exam will be in-person, face-to-face, and based on the materials studied and videos seen during the class lecture. **It is absolutely forbidden during the exam session to use cellphones and/or other electronic devices with the exception of a simple hand calculator.** No other documents are allowed with the exception of a formula sheet. The mandatory exam counts for **7.5%** the student total grade. Each student is expected to take the exam on the scheduled date and time it is given. No make-up exams are given.

There will be a weekly assigned homework. In each homework, students are asked to submit their full weekly report with their logbook (see template on D2L) and occasionally solve a problem related to the course materials. Each group member is responsible for keeping a logbook containing a list of all the activities related to the project performed during the current week. The students are required to upload the homework to a D2L Dropbox in a single file PDF format. The logbook and the solutions of the homework should be organized with the appropriate weekly report page numbering, and neatly written. Homework should follow the template posted on D2L. Homework count for **7.5%** of the total course

grade. Homework have to be turned-in on the due date specified and uploaded on the right Dropbox. Late homework will still be accepted till the end of the semester and graded with a maximum grade of 50% of the normal grade 100%.

### **WEEKLY PROGRESS REPORTS AND LOGBOOK**

Each group member is responsible for keeping a logbook containing a list of all the activities performed/information received during the current week. This logbook will be used by the student to draft a personal weekly progress report. The weekly progress report must be turned-in the form of a **single digital PDF file** uploaded to a D2L Dropbox set-up by the group mentor. The weekly report should follow a template available on D2L and should contain technical documents, drawings, simulation results, calculations related to the project as well as a copy of the latest weekly logbook. The provided documents may contain mechanical components designed with SolidWorks, technical or specification sheets, finished or partial technical/report sheets, electrical, pneumatic, and PLC schematic, etc... Additionally, any drawings done with SolidWorks or other software on a weekly basis has to be saved (Pack & Go) on a memory key with a proper short name and given to the instructor at the end of the semester. Any other documents have to be organized in folders, and saved on the memory key. The weekly progress reports will be reviewed and graded by the faculty mentor on a weekly basis. Weekly progress reports and logbooks count for **15%** of the total grade, and are expressly due at the beginning of each laboratory session. If not timely submitted, they will still be accepted but graded over 50% of the regular 100% grade. **Each group member is responsible for submitting a personal one weekly progress report.**

### **PEER EVALUATION**

The instructor will conduct two peer evaluations during the semester. One in the middle of the semester and one at the end of the semester. Each group member will be asked to grade honestly his/her group peers based on his/her performance, contribution, and commitment to the project during the spring semester. It is **MANDATORY** for the students to list **PROS & CONS** for each individual member of the group on the peer evaluation. The peer evaluation counts for **10%** of the total student grade. The peer evaluations should be timely uploaded to a D2L Dropbox at the request of the main instructor. Not timely uploading the peer evaluation will result will result in a peer evaluation grade of 0% .

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

This item will be continuously assessed by the main senior design instructor and the group's faculty mentor for each member of the group throughout the spring 2025 semester. The final assigned grade will be based on class behavior, number of absences, time spent on achieving weekly and project critical tasks, attendance and punctuality on all meetings, positive/negative language usage, willingness to work and share knowledge with team members, faculty mentor, and machinist technician, appropriate general ethical behavior, and more other evaluating criteria (listed in bullet (1)) as deemed appropriate by the main instructor and the faculty mentor. The general grade for this item counts for **20%** of the total student grade.

### **PUBLIC PRESENTATIONS & PAPER PUBLICATION & POSTER**

It is brought to the attention of the students that each one of them is expressly required to participate in three of following university activities throughout the two senior design semesters: University Undergraduate Research and Creative Activity Forum (fall 2025 and spring 2025), North Texas Area Students Conference (NTASC, spring 2025). The following additional activities and contributions are also required as deemed necessary by the instructor: Counsel of Undergraduate Research conference (CUR, spring 2025), IdeaMSU (spring 2025), writing conference/journal papers, etc... The students are required to start preparing for these activities in the fall semester (draft poster, draft oral presentation, draft paper, etc...). The participation in these activities counts for **10%** of the total student final grade.

### **FINAL SENIOR DESIGN II PRESENTATION & ORAL EXAM**

The group is required to give a collective twelve-minute oral presentation and eight minutes questions for a total of 20 minutes before a panel composed of the department faculty in charge of the senior design labs. After the presentation, each group member will be asked to answer a series of questions prepared by the panel regarding the project materials. **The oral presentation and oral exam are scheduled Wednesday April 30, 2025 at 1:00 PM in MY 136.** It is **MANDATORY** that all final oral PPT presentations should be done in **Microsoft PowerPoint** and saved as is on the provided memory key. The oral presentation and the oral exam count for **15%** of the total student final grade.

### **SENIOR DESIGN II FINAL REPORT**

Toward the end of the semester, on **April 23<sup>rd</sup>, 2025**, each group will submit a final major draft report containing an introduction, a description of the final design with a complete set of 2-D and 3-D drawings for parts and assemblies, a theory for the machine concept or process, a testing procedures, a set of exhaustive results and/or simulations of different solutions, a request for funding, a bill of materials, a final detailed cost of the project with quotes, a detailed Gantt chart, references, appendices, and acknowledgments. The group has also to submit a draft for the final PowerPoint (PPT) presentation on the same day. The faculty mentor will review the draft report and the PPT presentation, writes his own recommendations for the final report, and turn it to the students to finalize it. **The students are required to submit the final report by April 30<sup>th</sup>, 2025.** It is **MANDATORY** that all final reports should be written in **Microsoft Word Format** and saved on the provided memory key. It is also **MANDATORY** that all groups show a **WORKING PROTOTYPE** of the design or **PROCESS** at the end of the semester May 2025. Each group is required this spring semester to produce and show a computer based design (2-D drawings, and 3-D drawings) and simulation of different (stress, flow, hydraulic circuits, PLC, etc.) solutions pertaining to their assigned project. Note: while many software tools can be used to develop a computer simulation, the most desirable ones are SolidWorks and ANSYS, since these software are available in almost every computer in the McCoy School of Engineering. Also the report has to address all the requirements specified in the individualized contract distributed by the group instructor at the beginning of the fall semester. The final report counts for **15%** of the total final student grade.

**If the material submitted by the students at the end of the semester, including the final product, is partial, imperfect, and unfinished, the students will receive an incomplete grade of (I), and will be required to complete the project in the following weeks.**

## COURSE GRADES

Course grades are based on the following items and summarized in the below grading form:

Graded Items	Percentage Assigned to Items
Final Exam and Homework	15%
Weekly Progress Report & Log books	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 SD II Presentation & Oral Exam	15%
Final SD II Project Report	15%
<b>Total maximum Grade</b>	<b>100%</b>

**It is brought to the attention of each student that five (5) bonus points will be added to the final exam grade if the student writes two summaries (full half page each) related to a presentation given during the 2025 Undergraduate and Creative Activities Forum. In addition, three (5) more point will be added to the final exam grade if the student completes the semester course evaluation. The student has to provide a convincing proof that he completed the course evaluation.**

The below scale is used to assign the final course grade X:

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 (Done in the Fall 2024 semester)

A Student/Faculty contract will be read by the group instructor and signed by the all parties participating in the senior design laboratory. The student/faculty contract encloses the following items:

1. Contracting parties
2. Assigned faculty instructor
3. Goals and expected achievements of the project
4. Team member responsibilities

5. Meetings policy
6. Deadline policy
7. Ethical rules within the group
8. Archiving and recording the project documentation
9. Decision making
10. Resolving disputes

### **MACHINE SHOP & TOOLS AVAILABILITY**

Students are not allowed in the machine shop without the presence of the machinist. The machine shop is closed to the students during the weekend and evening time periods. If tools are needed during the weekend or evening periods, please ask our machinist-technician (Mr. Frank Bohuslav) or our lab-technician (Mr. Jay Barnett) to provide you with the needed tools.

### **PRINTED COPY OF THE DRAFT & FINAL REPORT**

The draft copies of the final report should be printed on both sides of the printing paper. If a student needs a printed bonded copy of their senior project, they have to write a check of **\$50** to our secretary (Mrs. Christina Miller).

### **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 each student's WebWorld account. At-risk students will be reported and will receive a midterm overall grade. 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.

### **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. Desai, face to face or via email, ([raj.desai@msutexas.edu](mailto: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, she will forward the case to the Grade Appeals Committee if necessary.

### **UNDERGRADUATE RESEARCH INFORMATION**

- **Research and Creative Activity Opportunities at MSU Texas**  
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](mailto:eureca@msutexas.edu) or better yet, stop by the UGR office located in the atrium of the Clark Student Center, room 161. Information and resources are available at [www.msutexas.edu/eureca](http://www.msutexas.edu/eureca).

- **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!

- **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](http://www.msutexas.edu/ugrow).

### **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, weekly progress reports, and exams. They must also demonstrate their ability to use the English language. The senior design II course is designed as an **INTENSIVE WRITING ENGLISH COURSE**.

### **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](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, AI-generated submissions 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.

### **INCLEMENT WEATHER**

Key decision-makers will monitor weather projections and communicate with local news agencies and WFISD leadership to make a delay or cancellation decision. The timeline is as follows:

<b>Event</b>	<b>Time</b>	<b>Day</b>	<b>Decision</b>
Inclement weather occurs during regular work/class day	3:30 PM	Day of inclement weather	Cancel classes/events after 5 PM
Overnight inclement weather expected	8 PM	Day before inclement weather	Close campus or delay opening
Delay called the day before but change to closure due to the extent of weather impact	6:15 AM	Day of delay	Close campus
No cancellation or delay decision made the night before	5:30 AM	Day after no decision made the night before	Close campus or delay opening

Delay/closure times are as follows:

- MWF class day: Delay to either 10 AM or 11 AM; all classes prior to opening do not meet.
- TR class day: Delay to 11 AM; all classes prior to opening do not meet
- Saturday or Sunday: Delay to either 10 AM or 11 AM; classes may start after campus is open.

Notification processes: Notification occurs through official campus channels and in communication with the local news networks. MSU channels include MSU Alert, MSU Safety app, Postmaster, and website headers. MSU Police and the Office of Marketing and Public Information.

**During the campus closure, the instructor will upload the notes related to the missed classes on D2L. He will ask the students to thoroughly study them. When class resume, the instructor will go briefly over the notes and will respond to any issues raised by the students. If the closure lasts more than a week, the instructor will start using the Zoom software to teach remotely the current courses.**

### **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 instructor.

*Prepared by: Dr. Salim Azzouz, Dr. Sheldon Wang, Dr. Jan Brink, Dr. Yu Guo, Dr. Zeki Ilhan, Dr. Mahmoud Elsharafi, and Dr. Pranaya Pokharel.  
1/17/2025*