

**SYLLABUS**  
**MENG 4243 – 201: Senior Design II**  
**Required Course - Spring 2022**

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 on office doors, 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 139	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, 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*, 5<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**

Topics	Topics
Materials Selection and Materials in Design	Manufacturing Processes
Materials Processing and Design	Detail Design
Engineering Statistics	Communicating the Design
Risk, Reliability, and Safety	Mechanical Case Studies
Robust and Quality Design	Leadership Qualities

## COURSE LEARNING OBJECTIVES AND RELATIONSHIP TO PROGRAM EDUCATIONAL OUTCOMES

Outcome-Related Course Learning	1	2	3	4	5	6	7
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 the goal of detail design		X	X			X	X
Name at least three tools to communicate the design			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 of two to three members from diverse backgrounds, with diverse skills and competencies. The projects devised by the faculty or the industry are a continuation of the projects started in the fall semester. This spring semester each group will carry out a set of tasks from parts ordering phase to a testing, collecting data, and analyzing phase.

- **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 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 their fabricated machine or designed process.

- **Testing and Results Processing Phase**

Toward the end of the semester, each group will submit to their faculty mentor a 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 project is there to guide the students, advise them and supervise them. The faculty mentor is not there to do the students' work. The faculty mentor expects the students to behave professionally and ethically throughout the duration of the project. Any student caught misbehaving in class, using foul language, making derogatory remarks in writing through emails or verbally in class may be dismissed from it. A complete dismissal from class for the remainder of the semester may occur if the offenses made by the student are considered very serious by the faculty mentor. Not attending or arriving late to scheduled lectures, labs, and meetings may cost the student the full attitude & absenteeism & participation & sharing knowledge with teammates and faculty mentor & ethics grade, 15%.
2. 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.
3. 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.
4. 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.

5. 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.
6. 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 faculty mentor in charge of the group, the machinist, the external company engineer or technician, and the purchaser. The purchase has to stay within the allowed budget.

### **LECTURE, HOMEWORK, EXAMS, AND LABORATORY**

This course consists of a one-mandatory hour lecture and four mandatory-hour laboratory design sessions per week. The one-hour lecture session includes a short talk by the instructor, and a general discussion of the projects progression (weekly assignments, difficulties, needs, and issues encountered). 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 to complete all required tasks. There will be a final written exam at the end of the semester on the lecture materials presented during the course. The mandatory exam counts for 10% and the homework count for 5% of the total course grade. You are expected to take the exam on the scheduled date and time it is given. No make-up exams are given. **It is absolutely forbidden during the exam session to use cell phones and/or other electronic devices with the exception of a simple hand calculator.**

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

Each group member is responsible for keeping a logbook containing a list of all the activities performed 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 **digital PDF copy** uploaded to a D2L Dropbox. The weekly progress report must contain a list of weekly activities, one page narrating the tasks performed during the week, relevant documents and drawings, pertinent calculations, and a copy of the weekly logbook. The supplied documents may contain mechanical components technical sheets, technical papers, electrical schematic, copies of drawings done with SolidWorks or other software during the week, etc...All software programs have to be well organized, saved (Pack and Go) on a memory key, and given to the faculty mentor by the end of the semester. Any other relevant document to the project has also to be saved in well organized folders on the memory key. It is mandatory to use short names with dates on all files. 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 60% 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 and commitment to the project during the spring semester. Students have to list **pro & cons** for each individual member of the group. The peer evaluation counts for 10% of the total student grade. The peer evaluations should be uploaded to a D2L Dropbox at the request of the main instructor.

### **ATTITUDE, ABSENTEEISM, PARTICIPATION, SHARING KNOWLEDGE, AND ETHICS**

The Attitude & Absenteeism & Participation & Tasks Achieved on Time & Sharing Knowledge with Teammates and Instructor & Ethical behavior of each member of the group is going to be assessed throughout the semester by the faculty mentor. The assigned grade will be based on class behavior, absenteeism, time spent on achieving tasks, punctuality, language, willingness to work and share knowledge with team members, faculty mentor, and machinist technician, appropriate ethical behavior, and more as deemed appropriate by the faculty mentor. The general grade for this item counts for **15%** of the total 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 in three or more of following university activities at the request of the faculty mentor throughout the two senior design semesters: University Undergraduate Research and Creative Activity Forum (fall 2021 and spring 2022), North Texas Area Students Conference (NTASC, spring 2022), Counsel of Undergraduate Research (CUR, spring 2022), IdeaMSU (spring 2022), Writing Conference Papers, etc... The students are supposed to have started those activities in the fall semester (draft poster, draft oral presentation, draft paper, etc...). The students are encouraged to write a **technical paper** about their senior design work. It is up to the faculty mentor to make this work mandatory or not. The participation in these activities counts for 10% of the total grade for each semester.

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

The group is required to give a fifteen-minute oral presentation before a panel composed of the department faculty in charge of the senior design labs, the machinist-technician, the lab-technician, and eventually staff members. After the presentation, each group member will be asked to answer a series of questions posed by the panel regarding the project materials. **The oral presentation and oral exam are scheduled April 20<sup>th</sup>, 2022.** All final oral presentations should be uploaded to a D2L Dropbox folder set by the main instructor. The oral presentation and the oral exam count for 20% of the total student final grade.

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

Toward the end of the semester, on **April 13<sup>th</sup>, 2022**, 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, 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, write his own recommendations for the final report, and turn it to the students. **The students are required to submit the final report by April 20<sup>th</sup>, 2022.** Note: while many software tools can be used to develop a computer simulation, the most desirable one is SolidWorks Simulation or ANSYS, since these software are available in almost every computer in the department. Also the report has to address all the requirements specified in the handout personal sheet distributed by the faculty mentor at the beginning of the fall semester for each student. The final report counts for 15% of the total final student grade.

## COURSE GRADES

Course grades are based on the following items and summarized in the grading form, with the relative % weighting shown below:

Graded Items	Percentage Assigned to Items
Lecture Materials Written Exam and Homework	15%
Weekly Progress Report & Log books	15%
Peer Evaluation	10%
Attitude & Absenteeism & Participation & Tasks Achieved on Time & Sharing Knowledge with Teammates and Instructor & Ethics	15%
Public Presentations & Paper Publication & Poster	10%
Final SD II Presentation & Oral Exam	20%
Final SD II Project Report	15%
<b>Total maximum Grade</b>	<b>100%</b>

**If the material submitted by the students is partial, imperfect, and unfinished, the students will receive an incomplete grade (I) for the current spring semester, and will be required to complete the project in the following weeks after the end of the spring 2022 semester.**

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

Value Range of X (in %)	Letter Grade
$89.5 \leq X \leq 100$	A
$79.5 \leq X < 89.5$	B
$69.5 \leq X < 79.5$	C
$59.5 \leq X < 69.5$	D
$< 59.5$	F

## 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 period, please ask our machinist-technician (Mr. Frank Bohuslav) or 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.

### **ENGAGEMENT AT THE UNDERGRADUATE AND CREATIVE ACTIVITY FORUM: EXTRA CREDIT**

This extra credit opportunity will be available to all students in the course later in the semester. It involves attending the spring 2022 Undergraduate Research and Creative Activity Forum (date will be announced). Instructions will be available later in the semester. Stay tuned.

### **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.

### **COVID-19**

- Face coverings recommended, not required.
- Vaccination recommended, available.
- Reporting required for unvaccinated individuals in contact with positive or testing positive [https://msutexas.edu/coronavirus/report\\_covid\\_19.php](https://msutexas.edu/coronavirus/report_covid_19.php).
- Quarantine/isolation still in effect after reporting.

### **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://mwsu.edu/campus-carry/rules-policies>.

### **GENERAL EDUCATION STATEMENT**

Students in this course must demonstrate their competency in oral and written communication through written project tasks assignments. They must also demonstrate their ability to use the English language.

### **ACADEMIC INTEGRITY POLICY**

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 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.

### **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, and attendance policies, may be subjected to change with advance notice, as deemed appropriate by the faculty mentors.

*Dr. Salim Azzouz, Dr. Jan Brink, Dr. Mahmoud Elsharafi, Dr. Yu Guo, Dr. Zeki Ilhan, Dr. Pranaya Pokharel, Dr. Sheldon Wang, 12/15/2022.*