

SYLLABUS
MENG 4143 – 101: Senior Design I
Required Course - Fall 2020

Instructors: Dr. Salim Azzouz, Dr. Sheldon Wang, Dr. Jan Brink, Dr. Yu Guo, Dr. Zeki Ilhan, and Dr. Mahmoud Elsharafi and Dr. Pranaya Pokharel.

Offices No: MY 219G, MY 138, MY 137, MY 219A, MY 219E, 219F, and 219C.

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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, Instructors, Location & Schedule:

Session	Instructor	Room	Time	Session	Instructor	Room	Time
11A	S. Azzouz	MY 136	W 2:00 - 5:50 PM	11D	Y. Guo	MY 140	W 2:00 - 5:50 PM
11B	S. Wang	MY 139	W 2:00 - 5:50 PM	11E	Z. Ilhan	MY 125	W 2:00 - 5:50 PM
11C	J. Brink	MY 118	W 2:00 - 5:50 PM	11F	M. Elsharafi	MY 123	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 instructor may propose projects.

COURSE PREREQUISITES

Completion of all required MENG 3000 level courses or permission of instructor.

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, 10th edition*
 Engineering Design, *By George E. Dieter, 3rd edition*
 Materials Science and Engineering, an Introduction, *by William D. Callister, 9th edition*

REFERENCES

Additional material will be provided in D2L.

TOPICS COVERED

Topics	Topics
Teamwork	Machining Processes
Brainstorming and Creativity	Intellectual Property
Engineering Design	Project Management

COURSE LEARNING OBJECTIVES AND RELATIONSHIP TO PROGRAM EDUCATIONAL OUTCOMES

Outcome-Related Course Learning	1	2	3	4	5	6	7
Work as 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 steps of the engineering design process	X	X	X	X		X	X
Describe the machining operation done on a lathe		X				X	
Describe the machining operations done on a milling machine		X				X	
Explain the concept of intellectual property and the patent laws			X	X			
Lay down the detailed design of a mechanical part (Cam, Gears, etc.)	X	X					
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 AND STUDENT PERFORMANCES ASSESSMENT

General Information

This course provides students the opportunity to work in an environment which closely simulates a real workplace environment. The students will work in groups composed of three to four members from diverse backgrounds, with diverse skills and capabilities. The projects are devised by the faculty or the industry and assigned to the students in the first week of the fall semester. Each group will carry-out a set of project phases from a brainstorming phase to product fabrication and testing phase.

Brainstorming Phase

Within the first few weeks after the starting of the semester, by a date specified by the instructor toward the end of September, each group will submit a proposal report about its assigned senior design project and give an internal oral presentation. The report and the oral presentation feature the outcomes of the brainstorming sessions done by the group during the aforementioned period and articulate the adopted project design concepts.

Preliminary Design Calculations and Drawings for Parts and Assemblies

Based on the design concept outlined in the previous phase a defined set of preliminary design calculations and drawings for parts and assemblies are required for this step. By a date specified by the instructor toward the beginning of November, each group through an oral presentation will present and submit to the instructor a draft set of the preliminary design calculations and drawings for parts and assemblies.

Final Draft Proposal Report with Budget, Quotes, and Timeline

Toward the end of the semester, each group will submit a final major draft proposal report containing the final design, calculations, drawings for parts and assemblies with budget, quotes, realization timeline, references, and appendices. The instructor will review the draft proposal report, write his own final recommendations for the final report, and turn it to the students. A general template of the report will be sent to the students as guidance report.

Guidelines for the Students

1. The instructor in charge of the student group is there to guide the students, advise them and supervise them. The instructor is not there to do the students' work. The instructor 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 instructor. 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 instructor & ethics grade, which is 25% of the total grade.
2. It is brought to the attention of the student 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, engineers and technicians from sponsoring company, the department machinist technician, and the department lab technician must be reported immediately to the instructor in charge of the group 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 instructor in charge of the group, the machinist technician, and the department chair before the component is ordered or manufactured. The three signatures have to be clearly shown on any purchase request.
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 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 budget which is \$2,000/group.

Lecture, Homework, Exams, and Laboratory

This course consists of a one-mandatory lecture hour and four mandatory hour's 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 lab 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 instructor and when needed the machinist technician. 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 instructor. 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. In this first semester the students are required to submit their final proposal report, and their final proposal presentation with all the required deliverables specified in the project personal requirement sheet. **If the material submitted by the students is partial, imperfect, and unfinished, the students will receive an incomplete grade (I) for the current semester, and will be required to complete the project in the following weeks.**

Besides the weekly labs assignments, there will be a set of assigned homework as deemed appropriate by the instructor, and a final exam on the lecture materials during the semester. The students are required to upload the homework to a D2L Dropbox in PDF or Microsoft Word format. The solutions of the homework should be written using the posted homework template, organized with the appropriate questions numbering, and neatly written. Homework solutions should be submitted with the posted homework questions sheet as a cover page for the whole homework submission. Homework have to be turned in on the due date specified on the homework question sheet. 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%.

Due to COVID-19 pandemic, the exam will be a take home exam and based on the materials studied during the class lecture. The homework and the mandatory exams count for 20% of the total course grade. The exams will be posted on D2L on the agreed scheduled date. Each exam copy has to be uploaded digitally to a D2L Dropbox by the student as one single PDF or Microsoft Word file within a maximum of 24 hours of the exam posting date. The solutions of the exam should be written on engineering paper or blank sheets, organized with the appropriate questions numbering, and neatly written. After 24 hours the D2L Dropbox will be closed and not visible to the students. You are expected to take the exam on the scheduled date and given time. There will be no make-up final exam given anytime toward the end of the semester.

Weekly Progress Reports and Log Book

Each group member is responsible for keeping a log book containing a list of all the activities performed during the current week. This log book is used by the student to draft his/her weekly progress report. The weekly progress report must be turned-in the form of a document stack containing a list of the current weekly activities, a list of technical documents, a list of drawings, a list of calculations, and a copy of the log book. The list of documents may contain mechanical components technical or specification sheets, technical papers, electrical schematic, etc...). Any drawings done with SolidWorks or other software on a weekly basis has to be saved on a memory key and given to the instructor at the end of the semester. Any other document has to be also saved on the memory key and given to the instructor towards the end of the semester.

The weekly progress reports will be reviewed and returned to the students by the instructor on a weekly basis.

Weekly progress reports count for 10% of the total grade. The students are required to upload the weekly progress report to a D2L Dropbox in PDF or Microsoft Word format. The weekly reports should have the posted required cover page. They should be neatly written, well organized with appropriate paragraph and document numbering. Weekly report should be uploaded to a D2L Dropbox weekly before the beginning of the lab session. The maximum grade for the submitted weekly report on the due date is 100%. Late weekly reports will still be accepted till the end of the semester and graded with a maximum grade of 50%. Each group member is responsible for submitting his/her 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 fall semester. 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, sharing knowledge with teammates and instructor, and ethical behavior of each member of the group is going to be assessed throughout the semester by the instructor. The assigned grade will be based on class behavior, absenteeism, time on tasks, punctuality, language, willingness to work and share knowledge with team members, instructor, and machinist technician, appropriate ethical behavior, and more as deemed appropriate by the instructor. The general attitude, absenteeism, participation, sharing knowledge with teammates and instructor, and ethical behavior of the student count for 30% 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 of following university activities throughout the two senior design semesters: University Undergraduate Research and Creative Activity Forum (fall 2020 and spring 2021), North Texas Area Students Conference (NTASC, spring 2021), Counsel of Undergraduate Research (CUR, spring 2021), IdeaMSU (spring 2021), Writing Conference 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 grade for each semester. Due to the COVID-19 pandemic, these activities might take place online through Zoom.

Senior Design I Final Proposal Oral Presentation and Final Report

Toward the end of the semester, on November the 11th, 2020, each group will submit a final major draft proposal report containing the final design, calculations, drawings for parts and assemblies with budget, quotes, realization timeline, references, and appendices. The instructor will review the draft proposal report, write his own recommendations for the final report, and turn it to the students. **The students are required to submit the final proposal report by November the 18th, 2020.** All final reports should be uploaded to a D2L Dropbox folder set by the main instructor. While a working prototype of the design is due by the end of the academic year (May 2021), each group is required this fall semester to produce and show a computer based design (2-D drawings, and 3-D drawings) and simulation of different (stress, flow, frequency, fatigue, etc.) solutions of its 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 handout personal sheet distributed by the instructor at the beginning of the semester for each student. The report counts for 15% of the total final student grade.

The group is also required to give an oral presentation to an audience composed of the instructor, the department faculty, students, and possibly members from the military and the industry. **The oral presentations are scheduled November the 18th, 2020.** All final oral presentations should be uploaded to a D2L Dropbox folder set by the main instructor. The final proposal oral presentation will be graded by the instructor (5%), the department faculty, and eventually members from the military and the industry (5%). The oral final proposal presentation counts for 10% of the total student final grade. Due to the COVID-19 pandemic, these the final presentations might take place online through Zoom. The grades for the report and the oral presentation are based on each group member own efforts.

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 Exams and Homework	20%
Weekly Progress Report & Log books	10%
Peer Evaluation	10%
Attitude & Absenteeism & Participation & Sharing Knowledge with Teammates and Instructor & Ethics	25%
Public Presentations & Paper Publication & Poster	10%
Senior Design I Final Proposal Oral Presentation	10%
Senior Design I Final Proposal Report	15%
Total maximum Grade	100%

The scale below will be used to assign final course grades:

Value of X (in %)	Letter Grade
89.5-100	A
79.5-89.4	B
69.5-79.4	C
59.5-69.4	D
< 59.4	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 period. If tools are needed during the weekend or evening period, please ask our lab technician (Mr. Jay Barnett) to provide you with one.

Printed Copy of the Draft & Final Report

If a student needs a printed binded copy of their senior project by May 2021, they have to write a check of \$50 to our secretary (Mrs. Christina Miller).

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), 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@mwsu.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.mwsu.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: www.cur.org/resources/for_students and may sign up at:

members.cur.org/members_online/members/newmember.asp.

The CUR Undergraduate Resources Webpage contains:

- Research Opportunities
- Presentation Opportunities
- Undergraduate Research Journals
- CUR-Sponsored Student Events
- The Registry of Undergraduate Researchers
- 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 2021 has not been established yet; however, it will be announced in the upcoming spring semester. Information and resources are available at www.mwsu.edu/ugrow.

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 for at-risk students will be reported. 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.

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 homework assignments, lab reports, quizzes, and exams. 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 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, makeup work, and attendance policies, may be subject to change with advance notice, as deemed appropriate by the instructor.

Prepared by: Dr. Salim Azzouz and Dr. Mahmoud Elsharafi, Date: 08/19/2020

*Dr. Salim Azzouz, Dr. Sheldon Wang, Dr. Jan Brink, Dr. Yu Guo, Dr. Zeki Ilhan, Dr. Mahmoud Elsharafi, and Dr. Pranaya Pokharel.
08/20/2020*