

**SYLLABUS**  
**MENG 4143 – 101: Senior Design I**  
**Required Course - Fall 2019**

Instructors: Dr. Salim Azzouz, Dr. Jeong Tae Ok, Dr. Jan Brink, Dr. Yu Guo, Dr. Zeki Ilhan, and Dr. Mahmoud Elsharafi.

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

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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, Instructors, Location & Schedule:

Session	Instructor	Room	Time	Session	Instructor	Room	Time
11A	S. Azzouz	MY 121/131	W 2:00 - 5:50 PM	11D	Y. Guo	MY 140	W 2:00 - 5:50 PM
11B	J. T. Ok	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, 10<sup>th</sup> edition*  
 Engineering Design, *By George E. Dieter, 3<sup>rd</sup> edition*  
 Materials Science and Engineering, an Introduction, *by William D. Callister, 9<sup>th</sup> 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**

<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>
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 semester. Each group will carry-out a set of projects 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 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 period a defined set of preliminary design calculations and drawings for parts and assemblies is 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, 30%. A 0.5% decrease in the total course semester grade is applied for each unjustified absence.
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, and/or the department machinist technician, and/or 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 and the machinist 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 instructor in charge of the group, the machinist, 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 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 bi-weekly homework, and a final exam on the lecture materials during the semester. The exam is closed and open book and based on the materials studied during the class. The homework and the mandatory exams count for 20% of the total course grade. You are expected to take the exam on the scheduled date and time it is given. There will be no make-up exam 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 Log Book**

Each group member is responsible for keeping a log book containing a list of all the activities performed during the week. This log book will be used by the student to draft a weekly progress report. The weekly progress report must be turned-in the form of a document stack containing a list of activities, a list of 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 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. Any other document has to be also saved on the memory key.

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, and are expressly due at the beginning of each laboratory session. No late report will be accepted. Each group member is responsible for submitting one weekly progress report.

### Peer Evaluation

At the end of each scheduled informal or formal presentation, each group member will be asked to grade his/her peer based on his/her performance during the design process past period. The peer evaluation counts for 5% of the total grade.

### 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 2018 and spring 2019), North Texas Area Students Conference (NTASC, spring 2019), Counsel of Undergraduate Research (CUR, spring 2019), IdeaMSU (spring 2019), 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.

### Senior Design I Final Proposal Oral Presentation and Final Report

Toward the end of the semester, on November the 26<sup>th</sup>, 2019, 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 draft report will also be distributed to all Senior Design faculty for a preliminary grading. **The students are required to submit the final proposal report by December the 4<sup>th</sup>, 2019.** While a working prototype of the design is due by the end of the academic year (May 2020), 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, frequency, fatigue, etc.) solutions of its assigned project. Note: while many software tools can be used to develop a computer simulation, the most desirable one is SolidWorks, since this software is 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 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 December the 4<sup>th</sup>, 2019.** The final proposal oral presentation will be graded by the instructor, the department faculty, and eventually members from the military and the industry and counts for 10% of the total student final grade. 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%

Graded Items	Percentage Assigned to Items
Peer Evaluation	5%
Attitude & Absenteeism & Participation & Sharing Knowledge with Teammates and Instructor & Ethics	30%
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**

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

#### **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>.

#### **Research and Creative Activity Opportunities at MSU**

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](mailto: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](http://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](http://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!

### **Undergraduate Research Opportunities and Summer Workshop (UGROW)**

Like EURECA, 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 2020 is has not been established yet; however, it will be in the spring. Information and resources are available at [www.mwsu.edu/ugrow](http://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.

### **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 instructors.

*Dr. Salim Azzouz, Dr. Jeong Tae Ok, Dr. Jan Brink, Dr. Yu Guo, Dr. Zeki Ilhan, Dr. Mahmoud Elsharafi,  
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