

**SYLLABUS**  
**MENG 4243 – 201: Senior Design II**  
**Required Course - Spring 2020**

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**

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, 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 the form of handouts.

**TOPICS COVERED**

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

## 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 four to five members from diverse backgrounds, with diverse skills and capabilities. The projects devised by the faculty or the industry are a continuation of the projects started in the fall semester. Each group will carry-out a set of tasks from parts ordering phase to a results and testing 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 make 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 the instructor, each group through an oral presentation will present, submit, and demonstrate to the instructor their fabricated machine or designed process.

- **Testing and Results Processing Phase**

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

1. The instructor in charge of the project 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 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 instructor 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 instructor 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 instructor 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 notes and other materials posted on D2L are the strict property of the instructor and should not be given, copied, or communicated through electronic means to a third party.** 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 or the external company engineer or 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 second semester the students are required to submit their final project report, and their final project 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 spring semester, and will be required to complete the project in the following weeks after the end of the spring 2020 semester.**

Beside the weekly labs assignments, there will be a bi-weekly project checking homework, and an exam at the end of the semester on the lectures materials. Some homework will require the students to use the **Matlab software**. The exam is closed and open book and based on the materials studied during the class. The homework and the mandatory exam count for **20%** 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 **hard copy** and an **email document** containing 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 saved on a memory key and given to the instructor by the end of the semester. Any other relevant document to the project has also to be 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. If not timely submitted, they will still be accepted for a grace period of 48 hours but graded over 80% of the regular 100% grade. After the grace period, weekly reports will still be accepted and graded over 60% of the regular 100% grade. **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. Students have to list pro & cons for each individual member of the group. 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. Each student caught checking or typing on his cellphone or computer during class will see his attitude grade decreased by 0.5% at each occurrence. Each student caught doing other work during the senior design class will see his attitude grade decreased by 0.5% at each occurrence. Each student leaving the class for more than 5 minutes will be considered absent for that day of class!

#### **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 2019 and spring 2020), North Texas Area Students Conference (NTASC, spring 2020), Counsel of Undergraduate Research (CUR, spring 2020), IdeaMSU (spring 2020), 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 II FINAL ORAL PRESENTATION AND FINAL REPORT**

Toward the end of the semester, on **April 29<sup>th</sup>, 2020**, 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 instructor will review the draft report, write his own recommendations for the final report, and turn it to the students. **The students are required to submit the final report by May 8<sup>th</sup>, 2020.** 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 fall 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 May 8<sup>th</sup>, 2020.** The final oral presentation will be graded by the instructor, the department faculty and staff, 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%
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 time periods. If tools are needed during the weekend or evening period, please ask our lab technician (Mr. Jay Barnett) to provide you with what you need.

**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 engaged in collaborative research and creative works. For more information contact the Office of Undergraduate Research at (940) 397-6274 or by email at [EURECA](#) or better yet, stop by the UGR office located in the atrium of the Clark Student Center, room 161. Information and resources are also available at the [EURECA website](#).

## **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 as well as research and creative activities in engineering, art, music, theater education, business, health and social sciences, English, history, etc. 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 and Creative Activity Forum. Faculty members will introduce their research ideas on a forthcoming announced date. If you have any questions, contact the Office of Undergraduate Research at (940) 397-6274 or at email [EURECA email](#). More information and resources are available at the [UGROW website](#).

## **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 2020 Undergraduate Research and Creative Activity Forum (date will be announced). Instructions will be available later in the semester. Stay tuned.

## **COUNCIL ON UNDERGRADUATE RESEARCH**

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 find information on benefits and resources at [CUR](#) and sign up at no cost at [CUR Sign](#). I would like to personally invite you to become a member of CUR so that you benefit from all the opportunities CUR offers to you.

CUR Undergraduate Resources Webpage contains:

- Research Opportunities;
- Presentation Opportunities;
- Undergraduate Research Journals;
- CUR-Sponsored Student Events;
- The Registry of Undergraduate Researchers;
- And more!

## **SCHOLARBRIDGE**

Midwestern State University is excited to announce a new resource designed to address a commonly expressed student need, the creation of a centralized searchable database of faculty research interests and opportunities. We have entered into a partnership with [ScholarBridge](#), a website designed to help students participate in undergraduate research and creative activities. I strongly encourage you to join ScholarBridge at your earliest convenience.

**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.

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