

**Department of Mechanical Engineering**  
**MEEN 4310 – Integrated Systems Design**  
**Fall 2017 Semester**

**Catalog Data:** The techniques of integrated systems design are treated. The student is required to utilize these techniques by performing a systems design. The formation of teams is facilitated. Instruction in team dynamics is provided. Presentation of intermediate and final results by each team to the class is required followed by peer response.

**Prerequisites:** **Senior Standing, Complete all junior classes or consent of the instructor**

**Class Hours:** Lecture, CH108/C2603 12:40 p.m. – 1:35 p.m., Mon. & Wed.  
Laboratory, C2603/L132 12:45 p.m. – 3:40 p.m. Fri.

**Office Hours:** 1:00 p.m. – 2:00 p.m., Tuesday, Thursday

**Required**

**Textbook:** Ullman, D., *The Mechanical Design Process*, McGraw Hill, 4<sup>th</sup> or latest edition

**References:** Dym, C. and Little, P., *Engineering Design*, John Wiley & Sons, 2000.  
Eggert, R. J., *Engineering Design*, Pearson Prentice Hall, 2005.  
GOAL/QPC, *The Team Memory Jogger – A Pocket Guide for Team Members*, ISBN 1879364514

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**Course Outcomes (ABET):**

- (a) an ability to apply knowledge of mathematics, science and engineering
- (c) an ability to design a system, component or process to meet desired needs
- (d) an ability to identify, formulate and solve engineering problems
- (e) an understanding of professional and ethical responsibility
- (f) an ability to communicate effectively
- (j) an ability to use the techniques, skills and modern engineering tools necessary for engineering practice
- (n) an ability to work professionally in both thermal and mechanical systems areas including the design and realization of such systems

- (o) an ability to work effectively as team members in mechanical engineering projects

**Course Objectives:**

1. Students will learn and understand the overall design process.
2. Students will complete a design project through the detailed design stage in a timely manner.
3. Students will enhance their ability to work in teams.
4. Students will demonstrate a professional level of communication (written, graphical/drawing and verbal) and presentation skills with clients, vendors and peers.

**Prerequisites by Topic:**

1. First course in engineering analysis
2. Second course in thermodynamics
3. First course in mechanical design
4. First course in mechanism
5. First course in CAD

**Topics Covered**

The emphasis in this course is not on studying from a list of topics, but rather it is a project course. Students work in teams on a semester-long project. Some topics covered include presentation and discussions on the design process, task planning and management, quality function deployment, techniques for concept generation, techniques for concept evaluation/selection, and design documentation. Depending upon the projects, other topics may also be included.

**Individual and Group Assignments**

MEEN 4310 course has both individual and group assignments as shown in Table 1.

Table 1 Assignments of MEEN 4310 Integrated Systems Design

<b>MEEN 4310 Integrated Systems Design</b>	
<b>Assignments</b>	
<i>Individual (50 points)</i>	<i>Group (250 points)</i>
Weekly report	Weekly Meeting Minutes
2 Memos	Project Abstract
Mid-term Peer Review	Specifications and constraints
Final Peer Review	Project Proposal
	Project Budget
	Project Schedule

	Concept Generation
	Concept Evaluation
	Midterm Report
	Midterm Presentation
	In class presentation 1
	In class presentation 2
	Final Report
	Final Presentation
	Team Semester Document

Each student must complete the individual assignments by themselves and individually submit the assignment to the Blackboard course website. For group assignments, there must be one submission each to both sections of the course via the Blackboard course website. There is no need for each team member to individually submit the group assignment.

## Grading Policy

### Assessment and Grading

There are two parts for grades: individual assignments (50 points) and group assignments (250 points).

#### *Individual Assignment Grading*

Item	How Many	Point Value	Total
Weekly Report	12	2.5	30
Mid-term Peer Review	1	5	5
Final Peer Review	1	5	5
Memos	2	5	10
TOTAL POINTS			50

Every week, each student is required to submit individual weekly report that is the progress report describing the work performed, the hours spent, and the future work (See the template in Blackboard). It is a submission based grade and if a student submits 85% of the reports, he or she gets the full points.

Every student needs to attend at least two technical/professional seminars or tours during the semester and is required to submit two memos based on those events. It is a submission based grade and if a student submits both memos, he or she gets the full points.

Each team member is required to submit peer reviews where contribution of each member to the project is evaluated based on the scale of 0 to 10 with 10 being the highest. Be honest and fair in giving the peer review rating of each team member (See the template in Blackboard).

**Group Assignment Grading**

Item	How Many	Point Value	Total
Weekly Meeting Minutes	12	2.5	30
Project Abstract	1	10	10
Specifications and constraints	1	10	10
Project Proposal	1	20	20
Project Budget	1	10	10
Project Schedule	1	10	10
Concept Generation	1	10	10
Concept Evaluation	1	10	10
Midterm Report	1	20	20
Midterm Presentation	1	20	20
In class presentation 1	1	10	10
In class presentation 2	1	10	10
Final Report	1	40	40
Final Presentation	1	20	20
Team Semester Document	1	20	20
TOTAL POINTS			250

**Grading Policy**

A	270 to 300
B	210 to 269
C	180 to 209
D	150 to 179
F	0 to 149

Each team is required to submit a mid-term report, a mid-term presentation, a final report, and a final presentation. Each team member is required to submit peer reviews where contribution of each member to the project is evaluated based on the scale of 0 to 10 with 10 being the highest. Be honest and fair in giving the peer review rating of each team member.

Please note that Individual team member may receive different scores for the group project (250 points) based on the efforts and time spent on the project. The performance of individual team member will be based on their peer review rating from other team members and instructors' assessment.

The main theme of the Capstone design is team work and proper evaluation of individual contribution to the team project is very important to the instructors. Every student is asked to submit their peer review so the instructors can evaluate contributions of

individual team member to the design project (See the peer review form in the appendix). In the peer review form, the highest rating is 10 and the lowest rating is 0. If the student's rating for each member is all equal (for example, somebody gave 10 to everyone), then that rating is not considered as NOT everybody contribute equally towards the group project. All the ratings, except the rating of 10 for each member by a member, for each member (except the rating of that particular member) are averaged and then use the average rating as a weighting factor to multiply the group project grade (250 points) for each student. So, the weighting factor for each student can range from 0 to 1 for the part of group project grade (250 points).

### **Materials required for grading**

- Weekly report: Each student must submit a weekly report via Blackboard.
- Group assignments: One team member or leader will submit the required materials for the group via Blackboard on the due date.
- Midterm report: Each group must submit the report via Blackboard on the due date.
- Midterm Presentation: One or more team members must make the presentation on their progress on the project in class. Each group must submit the presentation via Blackboard on the date of presentation.
- Final report: Each group must submit the report via Blackboard on the due date. The due date will be on or before the date of final presentation. The final report will be judged on the basis of scoring rubrics that will be made available via Blackboard.
- Final Presentation: Each team member must make a presentation on their contribution to the project in class. Each group must submit the presentation via Blackboard on the date of presentation. The final presentation will be judged on the basis of scoring rubrics that will be made available via Blackboard.
- Peer Evaluation: Each team member must evaluate the contributions of each team member including self towards the project by use of Peer evaluation form. The form will be submitted on the date of team interview to the faculty.
- Memos: Each student must write and submit 2 memos on seminars, workshops or tours that he/she attends during the semester.

### **Format/Style**

- Each report and presentation submitted will follow the specified format.

### **End of semester Deliverables**

- At the end of the semester, each team must submit the followings: team meetings and minutes (list the attending team members and record the discussions), team

design notebook, midterm and final reports, midterm and final presentation, and other relevant materials to the faculty in electronic form preferably on a flash drive.

- Team Interview: Each member of the design team will meet individually with the faculty to discuss the project related concerns, questions, and comments. All the deliverables including design notebook, team meeting dates and minutes, peer evaluation forms, will be submitted on the date of Team Interview.

## PROJECT ASSIGNMENTS

Team and individual assignments for Design Projects are listed below. Complete description of what is required for each task can be found in MEEN 4310 BlackBoard/class folder.

### INDIVIDUAL ASSIGNMENTS

Description	Due
Weekly progress reports (see details in class folder)	Wednesday 5 pm, each week
Anonymous peer evaluation of fellow team members	On the date of midterm presentation
Project notebook (see details in class folder)	Week 15
Anonymous peer evaluation of fellow team members (see details in class folder)	Week 15
Seminar/Field trip memos	Week 15

### TEAM ASSIGNMENTS

Description	Due
Project abstract	Week 2
Meeting Minutes	Every Week
Product design specification (including customer needs and engineering specification)	Week 3
Gantt chart and team schedule	Week 4
Design proposal and review	Week 5
Concept generation	Week 6
Concept evaluation	Week 7
Midterm report & presentation (Formal oral presentation )	Week 8
Material selection	Week 9
Engineering analysis	Week 10
Economic and cost analysis	Week 11-12
Engineering drawings	Week 13-14
Final report and final presentation	Week 15

## **TENTATIVE ASSIGNMENTS and SCHEDULE**

### ***Week 1: Design team and design process***

Read Section 3.5 – 3.6 Design teams, Section 4.2 Design process + a file in class folder and Sections 6.2 – 6.11 QFD and Engineering Spec.

### ***Week 2: Preliminary Development of Engineering specifications***

Each team should be formed and a design project should be selected.

For each team, discuss and answer the following questions. Create your own QFD (quality function development) diagram.

1. Who are your customers?
2. What are the customers' requirements? What method do you use to collect customers' requirements? Identify the types of customers' requirements.
3. Determine relative importance of the requirements: To whom is the requirement important? How is a measure of importance developed for this diverse group of requirements?
4. Research on the current products – aware of what already exists, and how to improve what already exists.
5. Generate engineering specifications.
6. Relate customers' requirements to engineering specifications.
7. Determine a target value for each engineering problem.
8. Identify relationships between engineering requirements. For example, adding damping coefficient may increase the stability of the system, while it decreases the speed of system's response.

### ***Week 3-4: Project planning and schedule***

Read Chapter 5. Project Definition and Planning, learn Microsoft Project software and two files in Project Planning folder of class Notes folder

Following the materials in the Chapter 5, develop a plan for your project. a) Identify the participants on the design team; b) Identify and state the objective for each needed task; c) Estimate the resources needed for each task; d) Develop a schedule and a cost estimate for the design project. You may use Microsoft Project software to make the timeline (Use weeks as the unit in the bar chart).

### ***Week 5: Project proposal and design review***

Read the project proposal example (a pdf file) in the folder of "Assignment Description" in our class folder. Based on what you read on the proposal preparation, each team is required to complete and submit your design proposal.

### ***Week 6: Conceptual designs and concept generation***

Read Chapter 7. Based on what you read on Ch. 7, each team is required to complete Concept Generation for your design project.

***Week 7: Concept evaluation***

Read Chapter 8. Based on what you read on Ch. 8, each team is required to complete Concept Evaluation for your design project.

***Week 8: Mid-Term Report and Presentation***

Prepare and submit the mid-term report and make the in-class presentation on October 19. Read the Midterm Presentation file in Assignment Description folder, and prepare your presentation. Manage your time; you have 10 min to present and 5 min to answer questions. Each team member should submit their individual peer review forms of each team member.

***Week 9-10: Engineering analysis and material selection***

Each team should start the engineering analysis of their design project (at least some components) and material selection for each component.

***Week 11-12: Design Review, Engineering analysis and economic analysis***

Each team should complete first run of engineering analysis of their design project and economic analysis of the project cost.

***Week 13-14: Engineering drawings and bills of materials***

Each team should complete engineering drawings of individual components and bills of materials for the project.

***Week 14: Design Review***

Each team should present the third design review and prepare a draft of the final report.

***Week 15: Final report and presentation, Peer evaluation and team interview***

Each team must make their final presentation of their design project and submit the final report. Each team member should submit their individual peer review forms of each team member. Each team will meet with the faculty to discuss their project. The 2 memos related to tours and seminars are also due at the interview. **DO NOT PRESENT MORE THAN 20 minutes.**

## **Plagiarism and Cheating:**

Students are specifically warned against all forms of cheating and plagiarism. The Lamar University Student Handbook states:

Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. Punishable offences include, but are not limited to, cheating on an examination or academic work which is to be submitted, plagiarism, collusion, and the abuse of resource materials. (81)

One aspect of the handbook's definition of cheating is, "purchasing, or otherwise acquiring and submitting as one's own work any research paper or other writing assignment prepared by an individual or firm" (82). Plagiarism is defined as, "the appropriation and the unacknowledged incorporation of another's work or ideas into one's own offered for credit" (82).

Students seeking to avoid plagiarism should consult with the course instructor, recent handbooks like The Little, Brown Handbook and the MLA Handbook for Writers of Research Papers, consultants in the Writing Center, or websites such as <http://www.utexas.edu/depts/doc/sjs/academicintegrity2.html>.

The Texas State University System has established the following Disciplinary Procedures for Academic Dishonesty:

- (1) **Academic Process.** All academic dishonesty cases may be first considered and reviewed by the faculty member. If the faculty member believes that an academic penalty is necessary, he/she may assign a penalty but must notify the student of his/her right to appeal to the department chair, the dean, and eventually, to the vice president for academic affairs (whose decision shall be final) before imposition of the penalty. At each step in the process, the student shall be entitled to written notice of the offense and/or of the administrative decision, and opportunity to respond, and an impartial disposition as to the merits of his/her case. After completion of the academic process, the academic officer making final disposition of the case shall refer the matter to the chief student affairs officer for any additional discipline that may be appropriate.
- (2) **Disciplinary Process.** In the case of flagrant or repeated violations, the chief student affairs officer may take such additional disciplinary action as he/she deems appropriate. No disciplinary action shall become effective against the student until the student has received procedural due process under *Subsection 5.6* and following exception as provided under *Subsection 5.15* of the Texas State University System Board of Regents Handbook.

## **Students with Disabilities:**

Lamar University is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is located in the Communications building room 105. Office staff collaborate with students who have disabilities to provide and/or arrange reasonable accommodations.

For students:

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact the DRC at 409-880-8347 or [drc@lamar.edu](mailto:drc@lamar.edu) to arrange a confidential appointment with the Director of the DRC to explore possible options regarding equitable access and reasonable accommodations.

## **Emergency Procedures**

In the event of an announced campus closure in excess of four days due to a hurricane or other disaster, students are expected to login to Lamar University's website's homepage ([www.lamar.edu](http://www.lamar.edu)) for instructions about continuing courses remotely.

Many types of emergencies can occur on campus; instructions for severe weather or violence/active shooter, fire, or chemical release can be found at: <http://www.lamar.edu/about-lu/administration/risk-management/index.html>.

Following are procedures for the first two:

### **Severe Weather**

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in an interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

### **Violence/Active Shooter (CADD)**

- **CALL** - 8-3-1-1 from a campus phone (880-8311 from a cell phone). Note: Calling 9-1-1 from either a campus phone or cell phone will contact Beaumont City Police Dispatch rather than University Police.
- **AVOID**- If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY**- Barricade the door with desks, chairs, bookcases or any other items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it is safe.

- **DEFEND-** Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

### **Academic Continuity Statement**

In the event of an announced campus closure in excess of four days due to a hurricane or other disaster, students are expected to login to Lamar University's website's homepage ([www.lamar.edu](http://www.lamar.edu)) for instructions about continuing courses remotely.

### ***Detailed Course Schedule***

Week #1	Engineering Design Process
Week #2	Project Selection, Design Team Formation
Week #3	Problem Statement, Project Schedule, Responsibilities, Milestones, Deliverables
Week #4	Constraints, Performance Criteria
Week #5	Design Proposal and <b><i>First Design Review</i></b>
Week #6	Conceptual designs, design matrix
Week #7	Evaluation of conceptual designs
Week #8	Final design selection, <b><i>Mid-Term Report/Presentation</i></b>
Week #9	Engineering Analysis, Material selection
Week #10	Engineering Analysis, Material selection
Week #11	<b><i>Second Design Review</i></b> , Details of Parts, Engineering economic analysis
Week #12	Details of Parts, Engineering economic analysis
Week #13	Standards, Codes, Engineering Drawings
Week #14	<b><i>Third Design Review</i></b>
Week #15	<b><i>Final Report/Presentation</i></b> , Peer Evaluation, Team interview with faculty