

LAMAR UNIVERSITY – COLLEGE OF ENGINEERING
Department of Industrial Engineering
INEN 4323/4385: IE Capstone Project: Systems Design I and II
Sections 01 and 48F
Last Update: August 20, 2017

1. Instructors

Alberto Marquez, Cherry 2203, Tel: 409-880-8809, Email: alberto.marquez@lamar.edu
Office Hours: Daily 10:00 to 11:00 AM
Online: by appointment

2. References

- a) Basics of Process Mapping. Robert Damelio. 2nd Edition. Taylor. ISBN: 9781563273766.
- b) Process Improvement Handbook. Boutros and Purdie. 14th Edition. Publisher MCG. ISBN: 9780071817660

3. Course Objectives

1. To give students opportunity in solving real-world industrial and system engineering problems with as much professional quality as is possible in an academic course.
2. To encourage students to integrate relevant material from other courses, including IE and other disciplines.
3. To further develop group problem-solving and interpersonal skills.
4. To further develop skills in making oral technical presentations.
5. To further develop professional report writing skills.

4. Student Learning Outcome

1. An ability to design a system, component, or process to meet desired needs (ABET Outcome 3)
2. An ability to function on multidisciplinary teams (ABET Outcome 4)
3. An ability to communicate effectively both in writing and orally (ABET Outcome 7)
4. An ability to design, develop, implement and improve systems that include people, materials, information, equipment, and energy (ABET Outcome 12)
5. An ability to integrate systems using appropriate analytical, computational, and experimental practices (ABET Outcome 13)

5. Course Overview

The course provides an opportunity for senior IE students to apply their knowledge and techniques to actual engineering problems in industry or research. The course activities centers on a system-design project either sponsored by a local company or research institutions. The project duration is two academic semesters. Typically, two or three students work together as a team on each project. Each team is supervised by a faculty mentor. Each project is expected to make progresses and achieve three milestones throughout the process:

- (1) Problem Definition. The team will work with the sponsoring organization to collect background information and to define the problem, including the scope, the goals, and the methodology, the expected outcomes, etc. Deliverable: project proposal (with in-class oral presentation).
- (2) Preliminary Analysis and Design, the outcome will be delivered at the end of first semester as midterm report)
- (3) Final Analysis and Design, the results will be documented in the written final report. The team will also give an in-class oral presentation or an oral presentation at the sponsoring organization if the sponsor requests one. A poster presentation that summarizes the project will be given by the team.

Prerequisites (INEN 4323): Co-requisite: INEN 4375; Prerequisite: INEN 4320 with minimum grade of 'C', INEN 3322 with minimum grade of 'C', INEN 3380 with minimum grade of 'C', MEEN 2302 with minimum grade of 'C', INEN 2373 with minimum grade of 'C' in two attempts or less, admission to the BSIE program, completed all IE courses through 3rd year, and senior standing.

Prerequisites (INEN 4385): INEN 4375 with minimum grade of 'C' and INEN 4323 with minimum grade of 'C'.

6. Course Requirements

a. Class Meeting:

The class will meet for all the lectures and in-class presentations. The tentative schedule for the lectures during the first semester is listed in the table below. The meeting during the second semester will be on-demand

bases, and the team will work closely with their faculty mentor and sponsors to keep making progress on the project.

b. Meetings with Mentor:

The purpose of the mentor meetings between the project team members and their mentor is to keep the mentor apprised of team progress, on-going and proposed activities, and any existing or contemplated problems. Mentor meetings provide project teams with an opportunity to seek advice. The team should prepare a written progress summary and meeting agenda in advance of each meeting. Please note:

(1) Mentor meetings should be scheduled at least once every two weeks. The meeting time should be selected based on the mentor's schedule and every team member's schedule. The recommended meeting time is during normal class hours, subject to faculty concurrence. Additional meetings during the mentor's open office hours or other designated times are encouraged.

c. Bi-Weekly Progress Summaries:

Every other week on Monday, each team will provide a bi-weekly progress summary to your faculty mentor. Send the report as an email attachment. These progress summaries should include a summary of what was accomplished during the previous two weeks, and what is planned for the new two weeks. Summary should be factual and to the point. Indicate which team members performed which activities. Activities should be explicitly tied to your project schedule (Gantt chart). If the schedule is revised, send that along with the bi-weekly summary. At the end of the summary, the team should provide a meeting agenda for the next mentor meeting.

d. Project Proposal:

Each team should prepare a project proposal after initial data collection and preliminary technical review. The proposal should define the problem, propose solution methodology, set timeline for a few anticipated project milestones. The proposal should be submitted to the faculty mentors and the instructor before the 6th week in the first semester. After getting approval from the faculty mentors, each team will give an in-class oral presentation on their project proposal during the 6th week in the first semester.

e. Midterm Report:

At the end of the preliminary design/analysis (end of the first semester) the work completed up to date should be described in a written midterm report (mid term of the academic year). The document should be written in a clear and concise manner with proper format. All report should be

turned in to the faculty mentor and the instructor at least one week before the scheduled oral presentation.

In addition to the written midterm report, each team will give an oral presentation to the class and the other interested parties, including representatives from the sponsoring organization. Each team will be given 30 minutes for presentation and 15 minutes for Q&A.

f. Final Report:

At the end of the final design/analysis (end of the second semester) each team will make a draft of the final report which describes all the significant work on the project. The draft report should be revised based on the comments and suggestions made by the mentor and the sponsor. The finalized report will be printed and professionally bound. One copy of the final report will be given to the project sponsor, one copy will be kept in the department, and each team member will have one copy to keep. Each team will give an oral presentation to the class and the other interested parties, including representatives from the sponsoring organization. Each team will be given 30 minutes for presentation and 15 minutes for Q&A.

g. Project Poster Presentation:

After the final written report has been approved by the team's mentor and the sponsor, the team will prepare a poster describing the significant aspects of their project. A poster session will be held before the final presentation. The poster session will be held for other IE/IT students and interested alumni and representatives from the sponsoring organizations.

7. Grading Criteria:

Your project will be graded as a team product; however, individual differentiation may be made if warranted. An individual can fail the course even if the project receives a passing grade.

Grades for the written report will be based primarily on technical contents. However, report style, format, grammar, and spelling are also important and reflect the professionalism of the authors. One of the objectives of the course is to give students opportunity in practicing and honing their written communication skills. Grade will be deducted for reports which fail to comply with the style/format guideline, or with significant amount of grammar and spelling errors.

Individual student's participation and professionalism will be evaluated based on the instructor and faculty mentor's observation on individual effort, individual class participation, feedback from the sponsoring organization, input from the team members, and individual performance in the presentations.

Policy

1. Your project is a "contract" between each member of your design team and the sponsoring organization.
2. Your team is accountable to the instructor and the sponsor for timely delivery of the results as promised. You must be aware of the importance of accomplishing the project objectives and meeting schedules/deadlines.
3. Your team must provide regular progress reports to the instructor and the sponsor; they must be kept advised throughout the project duration.
4. A team will not receive a grade unless the instructor or sponsor considers the report and the results to be acceptable. In case of incomplete projects, grade of I (incomplete), D or F will be given in either semester, depending on the conditions for which the grade was assigned. Students will have one long semester to turn an I into a passing grade, other wise, F will be given by default.
5. All work/communication/reports/presentations must be performed in a professional manner.
6. All information, including data, supplied by the sponsor must be considered confidential and should not be disclosed to outsiders without permission.
7. Each team member must submit regularly the "Activity Reports" and participate in the "Oral Progress Report" presentations.
Your project will be graded as a team product; however, individual differentiation may be made if warranted. An individual can fail the course even if the project receives a passing grade.

Project Proposals

You are required to submit an "Initial" project proposal using the [Proposal Guidelines](#) provided. I will grade this initial proposal and make constructive comments. Upon receiving the graded proposal, your team will submit a final proposal which I will grade and keep on file as our "contract": for the semester.

Final Presentation

- 1) Wear business casual clothes
- 2) Give me electronic copy of your slides, simulation, report and anything else
- 3) Bring a single master copy of your final report unbound
- 4) Bring two copies of your final report in individual 3-ring binders. (copies can be made at Lamar)
- 5) We will present in Cherry 2629
- 6) Please provide your presentation to me at least 2 hours before your scheduled presentation so it can be loaded on the computer
- 7). Practice your presentation

- 8) All faculty members are invited to attend, thus anticipate questions and prepare for them particularly any numbers or numerical analysis

Project Report:

Complete a project on a physical system, including data collection, model building, programming, and output interpretation. Undergraduate students and graduate students can form a group of two. Make sure your project is organized. Clearly indicate each section listed above with a heading and tab (if necessary). Projects that are not clearly labeled will lose points. Do not include meaningless pages of printouts

Project contents

All projects will be typed and have the following content areas:

1. Cover page with your name, date and Project Title
2. Abstract (200 words or less)
3. Table of Contents
4. Introduction: Description of the process
 - Flowchart of process
 - Layout
 - What is it?, Why is it important,
 - Problem Statement – what problem you are addressing
5. Literature review
6. Data Collection methodology: Describe how you collected each set of data. Be specific: state the beginning and end of each process you studied. Include a spreadsheet that identifies the activity that you are collecting data on, start and end points.
7. Data Collection: Display the data you collected in a spreadsheet
8. Print out of model(s)
9. Print out of numerical results
10. Data Analysis: Describe how you analyzed the data. For instance:
 - Provide print outs of your Input Analyzer results
 - Discussion of how you used the results in your simulation model.
 - Include reports from OptQuest, PAN and Minitab if you used them.
 - Statistical analysis – hypothesis testing, ANOVA
11. Modeling assumptions discussion
12. Validation and verification discussion
13. Identify limitations, constraints, bottlenecks and problems in the system with numerical results and discussion. (provide a complete discussion)

14. Design a new process(es) – develop **alternative** processes (models) that will overcome the bottleneck or other problem(s). Discuss the details of each change you made to the process. Include numerical data and print outs to support your claims
15. Discussion of how the improved model(s) is better than the original model including a summary chart showing the numerical differences and benefits
16. Conclusions – identify the model you recommend to be implemented and describe why you recommend this model. Address issues such as optimality, practical implementation issues, criteria and methodology by which your selection was made.
17. Appendix: All raw data used in your model and other items you feel important to include
18. Upload into blackboard your working computer models (your ARENA models, Excel files, etc, for instance). Provide a document that explains the content of each file.

Project Format:

Please adhere to Lamar University's thesis format. You may find it in this link: <http://graduatestudies.lamar.edu/thesis-guidelines/form-and-style-guidelines.html>

Cell phones, pagers and other communication devices:

Students are asked to have their communication devices on a silent mode during class. These devices must be placed out of sight during an exam

INEN 4323 (First Semester)

Deliverable	Percentage		
Bi-Weekly Project Progress Report	20%		
Project Proposal (6th week)	10%		
Project Proposal Presentation	5%		
Midterm project report (end of semester)	30%		
Midterm Report Presentation (end of semester)	5%		
Practicum test	20%		
Reading assignments	10%		

INEN 4385 (Second Semester)

Deliverable	Percentage
Final Report	50%
Final Presentation	20%
Poster Presentation	10%
Participation/ Professionalism /Self evaluation	20%

Letter grades for INEN 4323 and INEN4385

Score	Letter Grade
90-100	A
80-89.99	B
70-79.99	C
50-69.99	D
<50	F

Due Dates:

- Final test: Dec 7
- Project Initial proposal: Oct 10
- End of semester report due: Nov 30

Important Dates:

- Last day to drop or withdraw without academic penalty: Sep 29
- Last day to drop or withdraw with academic penalty: Nov 3

Proposed calendar

Session	Date	Day	Topic/Activity
1	29-Aug	T	Introduction, description of course goals and procedures, Bi-Weekly Report Guidelines,
2	31-Aug	TH	DMAIC process,
3	5-Sep	T	Process Mapping, Presentation Guidelines
4	7-Sep	TH	Faculty presentation of projects
5	12-Sep	T	Organization of projects teams, Assignment of projects, How to write a project proposal using the Proposal Guidelines, Team charter, Define problem,
6	14-Sep	TH	Employability Skills
7	19-Sep	T	How to conduct a Literature Review, Formatting of references, Case Study: Plant layout at a local job shop
8	21-Sep	TH	How to create a data collection plan and identify variables
9	26-Sep	T	Flowchart exercise, Process Design
10	28-Sep	TH	How to write a report using the Mid-Term Report Guidelines and the Final Report Guidelines.
11	3-Oct	T	ISSO 9000 Process documentation
12	5-Oct	TH	Project management using MS Project
13	10-Oct	T	Product development: House of quality
14	12-Oct	TH	Presentations of proposal (video taped), IEDAC- Online students will present also
15	17-Oct	T	Presentations of proposal (video taped), IEDAC – Online students will present also
16	19-Oct	TH	Review of statistical techniques (experimental design)
17	24-Oct	T	Review of engineering economy
18	26-Oct	TH	Understanding the customer, Systems thinking, systems methodologies
19	31-Oct	T	Data visualization
20	2-Nov	TH	Teams meet with faculty mentor
21	7-Nov	T	Teams meet with faculty mentor
22	9-Nov	TH	Teams meet with faculty mentor
23	14-Nov	T	Teams meet with faculty mentor
24	16-Nov	TH	Teams meet with faculty mentor
25	21-Nov	T	Teams meet with faculty mentor
26	23-Nov	TH	Teams work on project/presentation
27	28-Nov	T	Teams work on project/presentation
28	30-Nov	TH	Teams work on project/presentation
29	5-Dec	T	Teams presentation
30	7-Dec	TH	Final test

8. Policy:

Safety and Emergency Procedures

The Department of Risk Management at Lamar University has formulated procedures for various emergencies including fire evacuation, building evacuation, chemical release emergency, severe weather evacuation, and handling suspicious letters/packages. When on campus, call Ext. 8311 for all emergencies.

Emergency Procedures

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 severe weather and violence/active shooter:

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 Logistics

Proctored tests: All test are to be proctored. Test can be, either on campus or in a remote certified proctoring center. It is the responsibility of the student to let the instructor know three weeks prior the test, that the student will need a proctoring center other than presenting the test at Lamar Campus at the designated place and time.

Final project: The final project includes an executive summary, and extended report, and a presentation. The presentation should be in the form of a link to a video server or a power point file with your voice recorded. The presentation should not be shorter than 7 minutes and not longer than 15. The executive summary is one page long plus one page for tables and graphs. A complete detail of the project will be given after the first partial test.

Online Sessions: There will be weekly reviews for the online section. The time and day will be defined later.

Academic Dishonesty: It is the philosophy of this Department, this instructor, and Lamar University that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include failing the course, suspension or expulsion from the University.

"Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission of credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, or any act designed to give unfair advantage to a student or the attempt to commit such acts."

Academic Continuity Plan

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) for instructions about continuing courses remotely.

Attendance and Drop Policy: For the in-class section, attendance is **required** at every class period unless pre-approval is obtained or circumstances preclude obtaining pre-approval. The Policy for making up missed course work (including examinations): Missed or late course work can only be made up if pre-approval is obtained. Otherwise, a grade of zero is assigned for the missed work. For the on-line section, online session attendance is not mandatory but strongly suggested.

Americans with Disabilities Act (ADA): 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. 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 ordrc@lamar.edu to arrange a confidential appointment with the Director of the DRC to explore possible options regarding equitable access and reasonable accommodations. If you are registered with DRC and have a current letter requesting reasonable accommodations, we encourage you to contact your instructor early in the semester to review how the

accommodations will be applied in the course. Students should meet with the Instructor during the first week of class to discuss their special needs and advise the instructor of any special needs, abilities or limitations and to discuss the instructor's expectations in class participation, performance and work standards. Any disclosure by the students of their need for accommodations is recognized to be extremely sensitive and all conversations and other communications will be kept protected and confidential and disclosed on a need-to-know basis only. Students are responsible for contacting and consulting with the DRC prior to contacting the instructor about any disabilities.