

MSE 489 Project Assignment

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I. Overview

The Senior Design Capstone Experience in the Materials Science and Engineering Department spans two semesters, MSE 480 in the fall and MSE 489 in the spring. The entirety of MSE 489 is devoted to the senior design project. This project is the culminating experience of the undergraduate curriculum and requires students to apply all of the skills and knowledge that they have acquired in previous years.

II. Roles

The Senior Design Capstone Experience is complete as part of a team. The team is composed typically of four to five students. In addition to the students, each team has one (or occasionally two) faculty mentors, with whom they will meet on a weekly basis during the second half of the semester. Projects also have a sponsor. Usually this sponsor is an industrial liaison.

II.A. Students

The role of the students is to complete all the work necessary to satisfy the requirements of the project as defined by the industrial liaison and the faculty mentor. These requirements are described in general in this document. Students may distribute work among members of the team but the work should be shared equally. If it becomes apparent that there are problems with the initial distribution of labor, a change should be made on the fly. Students should attempt to reassign work internally and, if that does not solve the problem, should consult with their faculty mentor for an equitable workload. These teaming issues should be tackled as soon as there is a suggestion that there could be a problem. Do not wait until there is a full scale crisis.

II.B. Faculty Mentor

The role of the faculty mentor is to guide the students and keep them on track. Typically, these duties involve (i) weekly meetings with the students, (ii) providing feedback on the draft of the written report and (ii) providing feedback on a rehearsal of the oral presentation.

II.C. Industrial Liaison

The role of the industrial mentor is to provide the problem statement and the context in which the work is being done. The participation of the industrial mentor varies from project to project. The minimum participation involves four points of contact:

- introducing the project to the student team (about halfway through fall semester)
- providing feedback to the team based on presentation and report (end of fall semester)
- approving the timeline and work plan for spring semester (start of spring semester)
- providing feedback to the team based on final presentation and report (end of spring)

Some industrial liaisons prefer much greater interaction. There have been cases where the industry partner attends the weekly meetings with the students and faculty mentors either every week or biweekly. Students will adjust to the style of the industrial liaison.

III. Project Deliverables

In MSE 489, the senior design project has four deliverables from the students: a poster presentation at EUR̄CA, a written report, an oral presentation and a peer evaluation. The written report and oral presentation are presented twice, once in the middle of the semester with work to date and the final report/presentation at the end of the semester.

III.A. Written Report

The written report includes the first sections of the senior design report that were generated in MSE 480. Results, discussion and conclusions are added during the spring semester. The final report is due at the end of the spring semester.

This written report contains the following required components. A rubric for the grading of the written report is provided on the course website. Importantly, the rubric scores both technical and written elements of the report.

III.A.1. Abstract

The abstract provides a synopsis of the project. It contains four parts: Introduction, statement of methods, important results and conclusions. Usually each of the four parts is one or two sentences.

III.A.2. Introduction & Problem Statement

Students will introduce the project and provide a motivation for the work. There should be a clear statement of the problem.

III.A.3. Background

Students will perform a review of the literature and provide the necessary background to the project so that the target audience can understand the work. The students should consider their classmates assigned to other projects to also be part of the target audience. Almost any project

relies on some new scientific knowledge outside the standard curriculum. Students should make sure that their classmates can understand their report and presentation.

III.A.4. Materials and/or Process Selection

Design requires consideration of multiple alternatives. This project must include an explicit comparison of multiple materials or processes. If the industry sponsor has requested comparison between two or more candidates within a narrow subset of materials, the team should, in their review of the literature, perform a wider investigation of competing technologies, in order to place this project in a broader context. Almost certainly, the report will include “Ashby Plots” using the EduPack software, as part of the materials selection process.

III.A.5. Evaluation of Solutions Under Multiple Constraints

In addition to technical performance, students are required to consider economic, environmental, societal and ethical constraints in the design process. Often these constraints arise in the motivation or in the criteria for selection of materials.

III.A.6. Results and Discussion

The report must contain results and discussion. Every figure and table that appears in the results and discussion must be accompanied by text describing the plot or data.

III.A.7. Statement of Impact

A statement of impact of the solution should be included. The students should state how the solution will impact the company as well as other stakeholders, including society at large. To the best of their ability, students should quantify the impact.

III.A.8. Conclusions

The report should contain a conclusions section. No new material is presented in the conclusions.

III.A.9. Gantt Chart

The project in MSE 480 should create a timeline to complete the project through the end of MSE 489. This timeline should take the form of a Gantt Chart. In the final project, a revised Gantt Chart corresponding to what actually took place should be provided.

III.A.10. References

Students are required to use EndNote software for the bibliography of their report. The final report must contain at least ten sources that are archival, refereed journals, typically indexed in the Web of Science database. Some of these articles can (should) include technical as well as economic, environmental, societal and ethical information.

III.A.11. Anti-Plagiarism Report

Students will submit their final report to the iThenticate plagiarism detection software. The iThenticate report will then also be submitted with the final report. If there is a high degree of similarity with another work, which is justifiable, students may opt to include their justification.

III.B. Oral Presentation

The second student deliverable for the project is the oral presentation. Many of the introductory and background slides generated from the final presentation in MSE 480 will be reused in MSE

489. This presentation constitutes the first sections of a final senior design presentation that is continued in MSE 489 and is due at the end of the spring semester. The target length of this presentation is a twenty-five minutes.

This presentation presents a selection of the components in the written report. A rubric for the grading of the oral presentation is provided on the course website. Importantly, the rubric scores both technical and communication elements of the presentation.

III.C. Participation Grade

The third student deliverable for the project is the individual participation grade, based on peer evaluation. Students will provide a score for themselves and their fellow teammates. The team mentor will also provide a score for each student member of their team, which constitutes an additional 10% of the course grade.

III.D. Poster at EUR̄CA

The fourth student deliverable for the project is a poster presentation at EUR̄CA. The poster is a condensed version of the high-lights of the project and is targeted at a more general audience beyond Materials Scientists and Engineers.

IV. Schedule

The schedule for this course is provided in a separate document located on the course website at <http://utkstair.org/clausius/docs/mse489/pdf/schedule.pdf>