

NCSU MSE Senior Design - Overview

The basic format of our two-semester senior design program was established in the late 1980's to address the ABET-identified need for a comprehensive capstone design experience for our students.

Over the years this program has typically been directed by faculty with extensive industrial experience.

Although course content has varied over time due to curriculum revisions and credit hour changes, core content has remained:

- teach team building skills;
- teach design concepts;
- improve oral and written communication skills;
- have student teams work on real industrial problems, funded by industry and with deliverables to the industrial sponsor.

MSE Senior Design

Fall: MSE 423 (1 credit hour, structured)

Introduction to the Design Process

- lectures + software program from Granta Design
- teams of 3–4 students to work on design project*
- teams give oral presentation and written report

Major Projects (Industry Sponsored, \$5K)

Company project presentations; balancing student preferences and academic strength, teams of 3–4 students created; teams visit company to develop work plan; at end of Fall term teams give oral and written proposals for Spring term work.

*Example: Additive Manufacturing: Opportunities and Challenges for _____
(Biomaterials, Ceramics, Metals or Polymers)

MSE Senior Design

Spring: MSE 470 (3 credit hours, less structured)

- Spring term is dedicated to completion of the major project.
- Teams have company and faculty advisors; they communicate on a weekly for general guidance but the teams are expected to solve most of their problems independently.
- Teams have operating budgets (\$3K). They often use both NCSU and company facilities.
- Class meets about every 2 weeks for team progress updates (oral and written).
- At the end of the Spring semester final team reports (oral and written) are presented and judged. Cash prizes are awarded at a reception and at graduation.

Novel Project Examples

Undercover Colors (COE Engineering Entrepreneur Program)

This four person MSE senior design team is developing a materials-based solution to empower women against date rape drugs.

Their goal is to reduce the overall rate of drug-facilitated sexual assault by creating a risk for potential perpetrators to get caught, shifting fear from victims to perpetrators.

The team scored highly in multiple local and national entrepreneurial competitions and has received numerous cash prizes plus venture capital funding to facilitate their work.

Novel Project Examples

Bite Sleeve (Funded by Army Research Office)

This is an example of a successful interdisciplinary project between a team of MSE students and a team of the College of Textiles.

A bite sleeve is worn on a trainer's arm for protection and to assist in the canine training. The challenge was to design a bite sleeve using layered materials that properly simulated the characteristics of a human arm while protecting both the trainer and the dog from injury. If the bite sleeve does not properly simulate a human arm, a military working dog may disengage in reaction to the different sensation. This hesitation can cost a life.

The final bite sleeve construction was a success! The sleeve protected the trainer and the canine, held up through a training exercise, and was more realistic than the current standard!

Challenges & Opportunities

Growing enrollments (50+ seniors in 2015–2016 class) make the model of a unique company–sponsored project for each team + no more than 4 students per team a challenge.

Company retention and especially recruitment of new project sponsoring companies is a major challenge. These have recently evolved into a team effort where multiple MSE faculty coordinate their efforts to recruit new company sponsors from leads identified by all MSE faculty.

Recent experiences with truly interdisciplinary projects involving departments in combination with MSE have had mixed success due to substantial differences between senior design program structures in different COE departments.