

# **ME 398 ENGINEERING DESIGN**

**SENIOR DESIGN CAPSTONE COURSE**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**NORTHWESTERN UNIVERSITY**

**INDUSTRY PROJECT SPONSORSHIP**

**OPPORTUNITIES**

## ***WORK WITH ENGINEERING STUDENTS TO FIND NEW SOLUTIONS TO YOUR BUSINESS'S UNSOLVED ENGINEERING PROBLEMS***

The Department of Mechanical Engineering at Northwestern University each year conducts a search for real projects from industry partners to assign to student teams in the ME 398: Engineering Design course.

Over the course of 20 weeks, students work with industry partners through the product development process, including user needs identification, specification development, creative concept ideation and development, detailed engineering analysis and concept evaluation, and fabrication of various fidelity prototypes, concluding with a final alpha-level functional prototype.

The course challenges students to create a novel solution to a client problem, while also providing in-depth engineering documentation to their client, justifying their design and providing a foundation for further development.

### **CALL FOR PROJECTS:**

The ideal project is a physical, multi-system product that will challenge student teams to design and manufacture a solution to an open-ended, unsolved problem. These physical products are ideally:

**Innovative:** The proposed project or problem may have multiple solutions, such as a new product idea, one-off manufacturing tool or system, or an improvement of a mature product with new ideas.

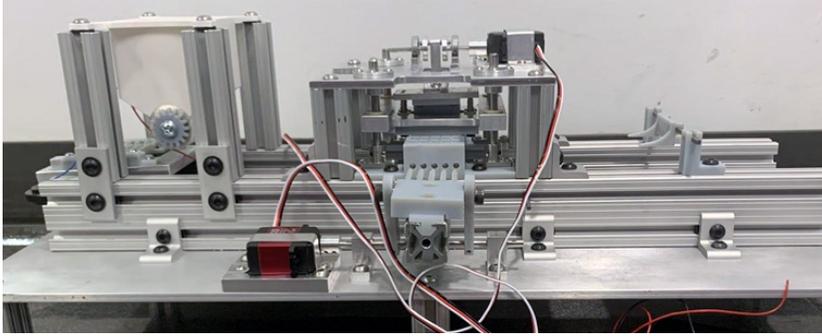
**Decomposable:** A project will have multiple subsystems that call on the various sub-disciplines of mechanical engineering, including statics and mechanical components, electronics, controls and programming, thermodynamics, or manufacturing.

**Minimal IP:** A team may operate with minimal limitations of intellectual property, either within the bounds of an existing product, or in the investigations into IP white space.

**Feasible for a college team:** Manufacturing and production will primarily take place at Northwestern. While there is a possibility for outsourcing production, students should be able to complete the projects using Northwestern facilities.



## PAST PROJECT EXAMPLES:



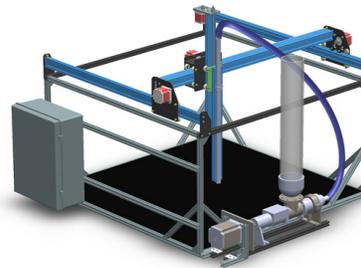
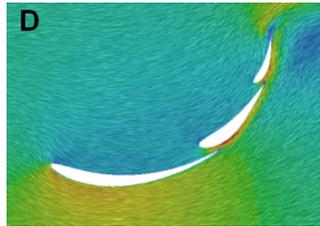
2022 - Drug Implant Manufacturing Line  
Client: Advanced Intelligent Manufacturing Lab - NU



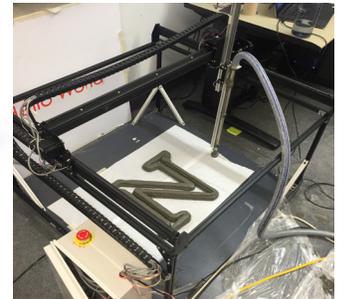
2019 - Off-Road Ambulance for use in rural 3rd-world African countries  
Client: Institute for Global Health, Northwestern & Project CURE



2019 - Carbon Fiber Vehicle Wing Package  
Client: Northwestern Formula Racing



2016 - Concrete 3D Printer Demonstration Unit  
Client: BuiltWorlds



## COURSE DETAILS

<b>Team Size:</b>	6 – 8 Students
<b>Project Length:</b>	20 Weeks: Fall-Winter or Winter-Spring quarters
<b>Presentations:</b>	2 Per quarter
<b>Prototype Iterations:</b>	2 Per quarter
<b>Quarter 1 Deliverable:</b>	Product Form & Functional Component Demonstration
<b>Quarter 2 Deliverable:</b>	Fully Functional Alpha-level Prototype



## **SPONSOR BENEFITS**

### **Access to Northwestern faculty and student talent**

All mechanical engineering faculty are committed to assisting capstone projects in their areas of expertise. Mechanical engineering faculty members are world-renowned and well recognized in all disciplines as Northwestern's program is one of the nation's best.

### **A new and innovative approach to an existing problem or challenge**

Northwestern Engineering emphasizes the user-centered design process throughout the undergraduate curriculum. This process excels at identifying unique and innovative solutions to complex problems.

### **Brand recognition**

Beginning their career searches, senior-year students are eager to explore companies that offer potential employment opportunities. Sponsorship will introduce a company and its capabilities to both students and faculty.

### **First access to recruitment within the department**

Sponsoring companies may consider the 20-week course as a long-term opportunity to recruit students and observe the quality of their work while identifying the most promising and best fit candidates.

### **Input on mechanical engineering curriculum**

The Department of Mechanical Engineering is continuously seeking industrial input on its curriculum, which will help the department produce better mechanical engineers capable of meeting needs across industries.

## **FINANCIAL SPONSORSHIP FOR PROJECTS**

### **Single Project Sponsorship: \$9000**

The course challenges students to construct multiple prototypes to help them understand the challenges in product development, testing, and iteration. High fidelity fabrication methods, such as advanced CNC machining or high resolution 3D printing, carry a high cost and are critical in the product development process. To support this resource intensive structure, we request that sponsoring companies donate \$9000 dollars to support a single project, which will be used to support each team's material needs and course overhead.

A sponsor may support one or more projects and may also consider open-category project topics set by the course faculty. In this model, student teams can explore product needs and solutions within a general, broadly defined topic, independent of a sponsor-defined project concept.

## **INTELLECTUAL PROPERTY**

The sponsoring company will own all intellectual property created or derived from this course with the requirement that students are named as co-inventors.

Non-disclosure agreements may be implemented between Northwestern and a sponsor, and students and sponsors as requested.

## SPONSORING COMPANY COMMITMENTS & EXPECTATIONS

Each submitted project and submitting company is requested to adhere to a basic set of guidelines for the capstone course:

1. A well-defined problem within the field of mechanical engineering
2. A project manager who is the primary point of contact for course instructors and students
3. Weekly commitment of 1-2 hours to address team questions and any other project requirements, plus a reasonable level of access to any information, data, or resources
4. Attendance at both end-of-quarter presentations (dates announced yearly)
5. An understanding that the role of Northwestern faculty is to ensure academic and technical integrity and rigor and not to directly participate in the actual development and production of the final product. The project outcome is a joint responsibility of the student team and project manager.
6. An understanding that there is no guaranteed final product from sponsoring a project. The capstone course is typically a student's first experience with the full product development process. The course instructors are committed to supporting each team to achieve a final goal, but no guarantee can be made.

## STEPS FOR SUBMITTING A PROJECT PROPOSAL

To submit a project for consideration, a one-page document with the following items is requested:

- An outline of the project to be submitted. This should primarily focus on the problem to be addressed and any necessary information for a technical, non-specialist individual to understand the project.
- Graphics, if applicable, which will clarify or further illustrate the problem
- Any potential or attempted solutions to the problem. (These items will not be shared with students.)
- Non-disclosure agreements or requirements, if required.

Please submit this document to **Michael Beltran at [mbeltran@northwestern.edu](mailto:mbeltran@northwestern.edu)**.

Following an initial review, the faculty team will respond with further steps.

## GENERAL INFORMATION & CONTACT

Michael Beltran      mbeltran@northwestern.edu      (847) 467-1995  
David Gatchell      d-gatchell@northwestern.edu  
Jeremy Keys      jeremy.keys@northwestern.edu

Additional information on course lecture topics, and previous projects can be provided upon request

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<https://www.mccormick.northwestern.edu/mechanical/>

## NORTHWESTERN MECHANICAL ENGINEERING

26 full time faculty members  
\$9 million/year funded research  
1 winner of the National Medal of Science  
1 winner of the National Medal of Technology  
6 members of the National Academy of Engineering  
2 members of the National Academy of Sciences  
4 members of the American Academy of Arts and Sciences  
17 faculty members are fellows of at least one professional society  
6 editors-in-chief of international research journals  
7 associate editors of at least one research journal  
13 awardees of young investigator awards (NSF Career, ONR, Whitaker Foundation)



ME 340-2 - Mass Production & Injection Molding



Northwestern Formula SAE Vehicle Team



ME 433 - Mechatronics & Robotics