THE OHIO STATE UNIVERSITY

4901.01/4901.02 ME General Capstone Design

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4901.01/4901.02: ME Capstone Design

- **Prof. Marzette's Course Philosophy**

  A student's capstone experience should be **memorable**, **enjoyable**, **and fulfilling**, while bringing together the deeply analytical aspects of the engineering curriculum with the fundamentals of design, and basics of engineering management (i.e., **practical**).

San Francisco black sand beaches along the west coast. Used to design a magnetorheological damper for capstone.

High-Level Course Goals

- Student will understand design as a process.
- Student will apply core engineering skills to the design process.
- Student will recognize and successfully navigate the challenges and complexity of the design process.
- Student will apply design as a process for taking an idea or need through to realization of a deliverable (component, system, or process).
- Student develops key professional and project management related skills and understands their relationship to the design process.
- Student appreciates design as the culminating ability and skill arising from their studies.

ME4901.01/02
Integrated, simplified, and reduced complexity project management (PM), systems engineering (SE), and designing engineering (DE) models.

Gate Reviews
PRR = Project Requirements Review

DCR = Design Concept Review

PDR = Preliminary Design Review

FXN = Functional Demonstration

CDR = Critical Design Review

PM

SE

DE

Initiation → Planning → Execution → Monitoring and Controlling → Closeout

ME4901.01

Problem Definition

PRR

Concept Development

DCR

Full System Validation and Testing

FXN / CDR

Integration and Verification to Requirements

ME4901.02

Detailed Design

PDR

Integration and Verification to Design Documents

Fabricate, Assemble, or Code (i.e. "build-to") Design Documents

Note: Feedback cycle factors into risk management and enables agility.

Plan → Design → Build → Test → Deliver

Where do projects come from?

Students

Industry

Faculty

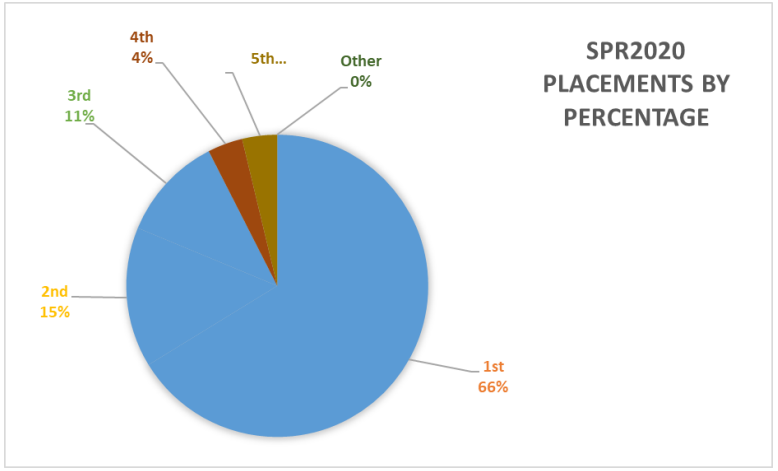
Community

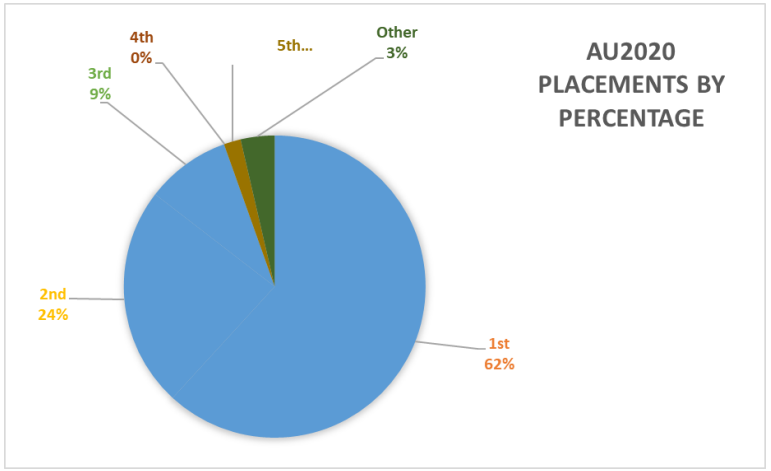
How are teams chosen?

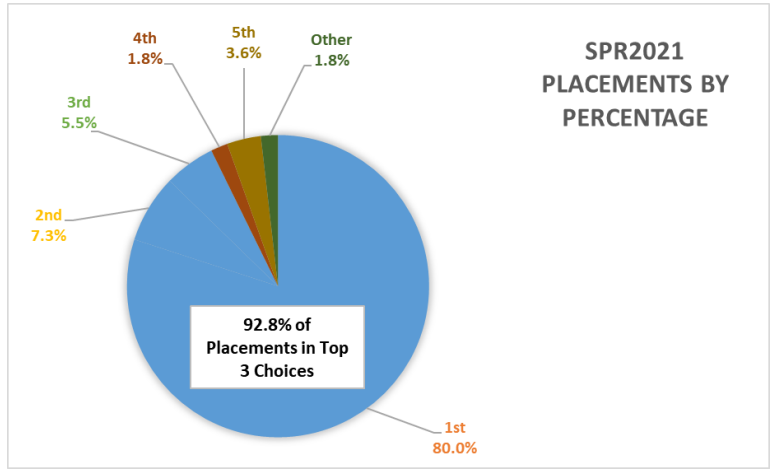
Personal Goal Setting → **Students Surveyed** → **Students Placed on Team 4-6**

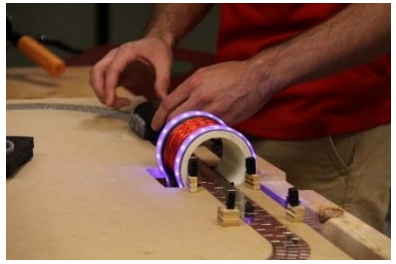
- Top 5 Projects
- Top 5 Technical Interests
- Short Narratives Top 3 Project

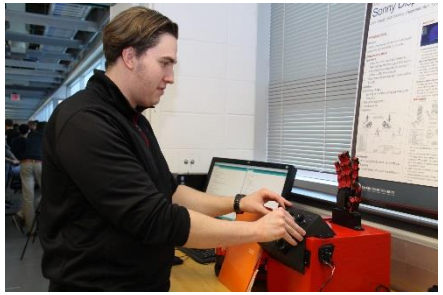
How are teams chosen?

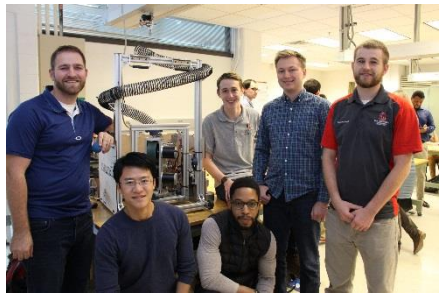


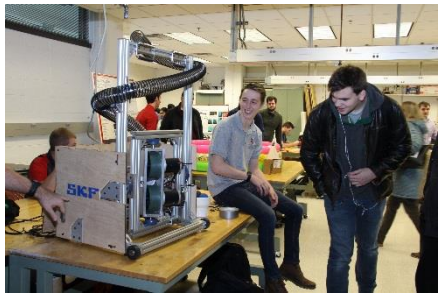


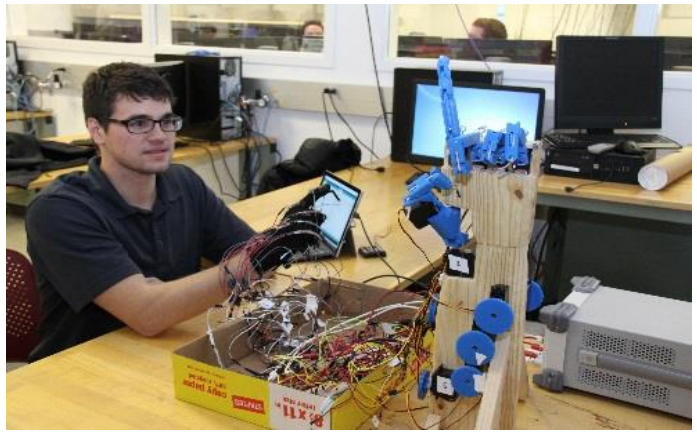


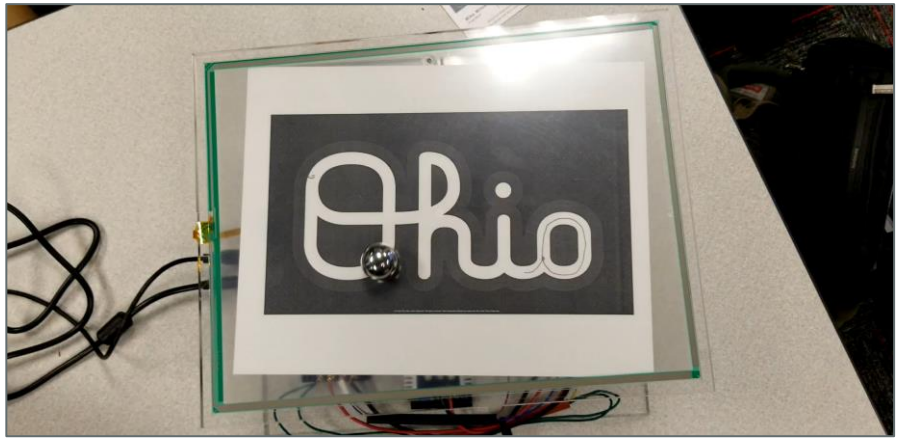








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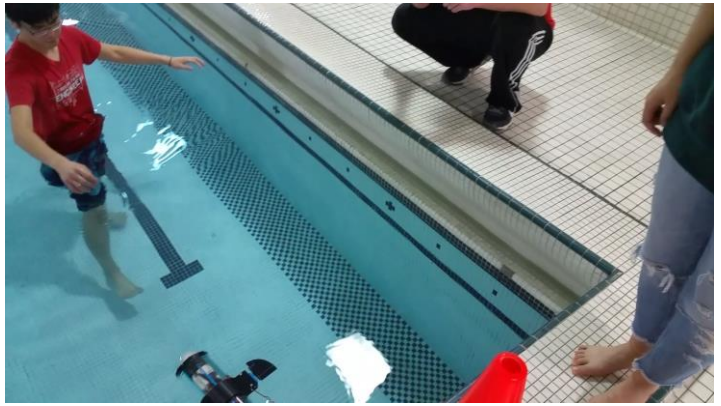
ENGINEER



Actions you could take Before next Fall.

Consider what you'd like to explore as a Project?

Plan your project with a faculty, industry, or community members in advance.

Setup an Appointment to discuss!

Marzette.1

Submit a Project Idea Early

https://go.osu.edu/maecapstonesurvey

KEY
BOLD = COMMUNITY PARTNER
☺ = STUDENT PROPOSED
GRAY = CAPSTONE

Project Mix

SPR2023 PROJECTS

- **[Schaeffler] Control Device for Solid State Battery Stack**
- **[MAE] Project Arusha Rover**
- ☺ Adjustable Walking Band Brace
- Cookie Extruder
- Di-Wheel - Rolling Around (and Around)
- Solar Powered Drone Platform

AU2022 PROJECTS

- **[HRST] Firing Duct Cool Vision Viewport Camera Addition**
- **[HONDA] Lightweight Clamp Rod and Clevis**
- **[HONDA] Lightweight Hybrid Clamp Arm**
- **[HONDA] Modular A Rack Packaging**
- **[MAE] In-Pipe Hydroturbine for Hydropower UV LEDs**
- **[MAE] Drone Propeller Efficiency: Test Stand Development**
- ☺ Robotic Arm: Pick-Pull-Place

SPR2022 PROJECTS

- **[MAE] ARUSHA Rover Medical Workstation**
- ☺ Basketball Backboard Mounting Lift
- ☺ Motorcycle Swing Arm Front Suspension
- ☺ Skateboard Brakes
- ☺ Walking Locomotion in the Field of Soft Robotics
- Di-Wheel - Rolling Around (and Around) - Group 1
- Di-Wheel - Rolling Around (and Around) - Group 2
- Solar Powered Drone Platform
- Cookie Extruder
- Gravity Battery System

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Project Mix

AU2021 PROJECTS

- **[DHL] Supply Chain Facilities Sustainability**
- **[HONDA] Engine Hanger Lift Design**
- **[HONDA] Modular Packaging Prototype**
- **[HRST] Series 5 Mechanical Pipe Seal**
- **[MAE] Multi-Mode Drone**
- **[MAE] Two Axis Inverted Pendulum**
- **[ZOO] Elephant Vending Machine**

SPR2021 PROJECTS

- **[HRST] Firing Duct Enhanced View Port Prototype Remote Viewing Enhancement**
- **[HONDA] Bumper Instrument Panel Fixture Design**
- **[HONDA] Water Intrusion Simulation**
- **[MES] Electric Vehicle Inverter Module Thermal Analysis and Testing**
- **[MAE] Design, Prototyping, and Testing of a Robotic**
- **[MAE] Develop a Prototype 3D Printer**
- Prosthetic Hand: Compact Joint Design
- ☺ Gravity Battery System
- ☺ Autonomous Competition Rack
- ☺ Gas Thruster Controlled Drone
- ☺ Personal Vehicle Integrated Entertainment Ride System
- ☺ Mini-Baja: Gearbox with Integrated Selected 4WD
- Plate and Ball Demonstration
- Multi-Mode Drone
- Fish Team
- Strandbeest
- Cable Driven Parallel Robotic Manipulator

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SPR2021 PROJECTS

- **[HRST] Firing Duct Enhanced View Port Prototype Remote Viewing Enhancement**
- **[HONDA] Bumper Instrument Panel Fixture Design**
- **[HONDA] Water Intrusion Simulation**
- **[MES] Electric Vehicle Inverter Module Thermal Analysis and Testing**
- [MAE] Develop a Prototype 3D Printer
- [MAE] Design, Prototyping, and Testing of a Robotic Prosthetic Hand: Compact Joint Design
- Gravity Battery System ☺
- Autonomous Competition Rack ☺
- Gas Thruster Controlled Drone ☺

- Personal Vehicle Integrated Entertainment Ride System ☺

- Mini-Baja: Gearbox with Integrated Selected 4WD ☺
- Plate and Ball Demonstration
- Multi-Mode Drone
- Fish Team
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- Cable Driven Parallel Robotic Manipulator

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Project Mix

AU2020 PROJECTS

- **[HONDA] Die Casting Cooling System Analysis**
- **[CINCI ZOO] Iterate & Improve the display of the Elephant Vending Machine**
- **[HONDA] Instrument Panel Transport Cart Design**
- **[HONDA] Engine Hanger Lift Design**
- **[HONDA] Automated Grommet Loading Design**
- **[HRST] Series 5 Mechanical Pipe Seal Leakage Testing & Improvements**
- **[PRECEIN] Alertware Device**
- **[MAE] Kit Build a PCR: A Design Study**
- 2021 ASME IAM3D Competition: Unmanned Aerial Racing Cargo Vehicle (UARCV) ☺
- Granular Jamming Mechanical End Effector ☺
- Two axis inverted pendulum
- Robotic Instrument - Reed Organ

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Project Mix

SPR2020 PROJECTS

- Climbing Rope Management System ☺
- **(** Design Outreach **) Wound Vacuum Pump ☺**
- Cam-less Engine Design ☺
- **(** NASA **) Lunar Excavator ☺**
- Gravity Battery System ☺
- Myoelectric Prosthetic for Quadriplegics - Mechanical Prosthetic ☺
- Autonomous QB ☺
- Myoelectric Prosthetic for Quadriplegics - Interface and Controls ☺
- **(** NSBE **) Project Arusha Rover Deployable Medical Workstation**
- **(** MAE **) Develop a Prototype 3D Printer**
- **(** MAE **) Design, Prototyping, and Testing of a Robotic Prosthetic Hand: Compact Joint Design**
- Inclusive Science - An Interactive Experience for Disabled Explorers ☺
- **(** MAE **) The Fine Motor Skills Project**
- Fish Team
- Coffee Roaster
- Multi-Mode Drone

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Project Mix

AU2019 PROJECTS

- **(** MAE: **) Design, Prototyping, and Testing of a Robotic Prosthetic Hand with a Variable Stiffness**
- **(** MAE **) Solid State Battery Compression Tooling**
- **(** Honda **) Wrap Guard Equipment**
- **(** HRST **) Access Door Upgrades to Improve Sealing Reliability ☺**
- **(**Caterpillar**) OSU Caterpillar 2019 Will-Fit Fuel Injector Study ☺**
- **(** Honda **) Stamping Blank Destack Feeder**
- **(** Honda **) Stamping Die Augmented Reality**
- **(** Honda **) Parts Shipping Rack Strength Analysis**
- **(** Honda **) Die Casting Cooling System Analysis**
- **(** HRST **) Firing Duct Enhanced View Port Prototype Refinement and Testing ☺**
- Solar Water Purifier ☺
- Two axis inverted pendulum ☺
- Cable Driven Parallel Robotic Manipulator
- Fish Team: Docking Station

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Project Mix

SPR2019 PROJECTS

- Anti-lock System Braking for Bicycles ☺
- **Auto Guardian**
- Autonomous Chess Board ☺
- Autonomous Lawnmower
- Autonomous Quarter Back ☺
- Cam-less Engine Design ☺
- Carbon Fiber Formula SAE Wheels ☺
- **Coffee Roaster**
- **Design Outreach Water Insecurity Solutions ☺**
- Develop a Prototype 3D Printer
- **Drive Ohio**
- Electric Riding Lawnmower ☺
- Fish Team - Platform
- Multi-Mode Drone
- **Project Arusha Rover Deployable Medical Workstation**
- Robotic Instrument - Reed Organ ☺
- ***Tackling Human Mobility*** ☺
- The Help-Me Device ☺

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Project Mix

AU2018 PROJECTS

- Cable Driven Parallel Robotic Manipulator
- Develop a Prototype 3D Printer
- Fish Team: Platform Development
- Haptic Feedback System
- **Honda: Brake Fill System Study**
- **Honda: NSX Paint Skid Cleaner**
- **Honda: Overhead Side Panel Carrier**
- **Honda: Overspray Collection System**
- **Honda: Paint Heat Recovery**
- **HRST: Duct Burner View Port Enhancement**
- **The Timken Company: Bearing Assembly Cycle Time Reduction**
- Truing Machine for Bicycle Wheels

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Project Mix

AU2017 PROJECTS

- **Honda: Brake Fill Study**
- **Honda: NSX Super Carrier**
- Burning Man Vehicle
- Cable Driven Robot
- Coffee Roaster
- Drone Constraint & Control
- Fish Team: Platform Development
- Make a Model Hand: Force Feedback
- Robotic Guitar
- Strandbeest: Multi-team Project
- Foot Pressure Monitoring Device
- *Silverware Roller* ☺

SPR2018 PROJECTS

- Automated Lawnmower: Platform Development
- *Autonomous Shuttle* ☺
- *Bicycle Automatic Transmission* ☺
- *Campus Personal Transport System* ☺
- Fish Team: Docking Station
- Fish Team: Platform Development
- Foot Pressure Monitoring Device
- Regenerative Braking - Mechanical Regeneration (Bicycle)
- Robotic |: Instrument:|
- *The Hockey Defensive Robot* ☺
- *Zenith Directional Heading of Multistage Rocket* ☺