



Lake Superior Automation
Portable Large-Scale
CNC Machine

Presentation: 1:00 pm | CASET 212

Demonstration: 1:30 pm | CASET 120

Team Members: Dan Baker (MfgET), Phil Coullard (EE), Justin Lagergren (MfgET), Kyle McKeachnie (ME), Grace Morse (EE), Matt Simon (ME)

Faculty Advisors: Jon Coullard & David Leach **Company:** Mactech (Redwing, MN) **Industrial Contact:** Joel Wittebraker

Project Description: Team Lake State Automation has been sponsored by Mactech On-site Machining Solutions to design, build, and automate a prototype CNC milling machine. The project came about due to the desire for increased flexibility and functionality of the current machine. The project entails an upgrade on an existing gantry mill which was originally manually operated. This machine is designed to work in a wide range of applications from ship maintenance to bridge building. It may be mounted and operated while in any orientation, and is completely mobile. The prototype machine features increased speed, accuracy and repeatability. New Fanuc hardware has allowed the machine to be operated by software which may be created off-site. Automation of the machine has greatly increased its capabilities and reduced human labor. The prototype design of the CNC milling machine is intended to be replicated by Mactech On-site Machining Solutions in the future. Team Lake State Automation has undertaken this project facing a fixed budget and a need to collaborate with multiple vendors.



Conveying Automation Solutions
Design & Installation
of Robotic Flowline
- Mechanical -

Presentation: 1:30 pm | CASET 212

Demonstration: 2:00 pm | CASET 125

Team Members: Rhett King (ME), Sara McKee (MfgET), Robert Meyers (ME), Matt Nelson (ME), Mike Smutny (ME), Matt Thomas (MfgET)

Faculty Advisor: Jim Devaprasad **Industrial Contacts & Support:** Eric Becks, Ron Bergamin, Josh Bodell & Jason Markesino

Sponsors: KUKA Robotics, mk Technology Group, SCHUNK, JR Automation, Parker Hannifin, Baumer, & Cognex

Project Description: Conveying Automation Solutions (CAS), along with Team ACE, designed and implemented a robotics training work cell in LSSU's Robotics Lab to be used for educating future engineering students, summer camps, and demonstrations to visitors. Team CAS installed 2 KUKA industrial robots, a linear conveyor used to transport workpieces between robots, and several types of end-of-arm tooling for the robots. Team CAS also designed the layout, pallets, fixtures, and other components for the work cell. In conjunction with Team ACE, user manuals, engineering documentation, and lab exercises were created. Teams CAS and ACE will present a demonstration project that will showcase the full capabilities of this work cell and the new technologies available in the robotics industry.



Controls & Vision Systems
Portable Robotics Cell
for Pharmacies

Presentation: 2:00 pm | CASET 212

Demonstration: 2:30 pm | CASET 124

Team Members: Aria Alizadeh (ME), Aron Baker (CE), Cole Bertolissi (EE), Scott Coburn (ME), Chance Randall (MfgET), Chris Reed (MfgET)

Faculty Advisor: Joe Moening **Company:** 4D Systems (Flint Township, MI) **Industrial Contacts:** Brett Newill & Jean-Pierre Rasaiah

Project Description: The Pharm-Assist project is an automated prescription dispensing machine designed to assist pharmacy employees and increase the time they are available for customer service. Team CVS was tasked with Phase 2 of the Pharm-Assist project, where the main goal was to reduce the cost of the workcell. Building off the previous team's proof of concept workcell, team CVS replaced the FANUC delta robot with a 3D gantry system they designed and built. Along with replacing the robot, team CVS converted a majority of the control of the system from PLC (Programmable Logic Controller) to Raspberry Pi (mini-computer). The main focus of Phase 2 was to build and test a rigid gantry design that would be reliable and fast (30 pills per minute). Other areas of focus for the project included reducing noise and vibration from the previous year's design, improving the security of the cell, and converting the power of the cell from 240 Volts to 110 Volts.



Wheel Inspection Systems
Vision System to Inspect
Automotive Rims

Presentation: 2:30 pm | CASET 212

Demonstration: 3:00 pm | CASET 120

Team Members: Audri Anderson (MfgET), Lee Archer (ME), Tyler Fontana (ME), Jenny Fredericks (EE), Chris Kyro (ME), Henry Palmer (CE)

Faculty Advisor: Dave McDonald **Company:** Esys Automation (Auburn Hills, MI) **Industrial Contact:** Mark Compton

Project Description: Team Wheel Inspection Systems (WIS) was tasked with researching and developing a system to automate the inspection of automotive rims. The system used an industrial camera and machine vision software to capture an image of a rim and analyze it. The project was sponsored by Esys Automation, a robotics integration company located in Auburn Hills, Michigan. Esys Automation specializes in turnkey automation for the automotive industry. The team developed a system that recognized and recorded images of rims. To execute this project, a vision shroud was designed and built to block outside light. Black-painted, matte, and chrome rims were analyzed in the system. To inspect the rim, a rim was placed within the shroud, a picture was taken, and Cognex VisionPro was used to analyze it. All attempted lighting configurations and vision algorithms were documented.

Automation Controls Engineering



Design & Installation
of Robotic Flowline
- Control/Electrical -

Presentation: 3:00 pm | CASET 212

Demonstration: 3:30 pm | CASET 125

Team Members: Matt Maher (MfgET), Phil Paris (MfgET), Matt Patmore (EET), Wyatt Smrcka (EET), Micah Stuhldreher (CE)

Faculty Advisor: Jeff King **Industrial Contacts & Support:** Eric Becks, Ron Bergamin, Josh Bodell & Jason Markesino **Sponsors:** Same as Team CAS

Project Description: Team Automation Controls Engineering (ACE) created an educational KUKA robotic platform for students at Lake Superior State University along with Team CAS. This project created a robotics cell which allows students to familiarize themselves with KUKA systems and also train students how to correctly follow safety standards used in industry today. This project features two KUKA KR5 R1400 robots. These robots offer new capabilities such as synchronous robot movement. The cell includes a linear slide that allows the robots to send items between each other. The cell also features safety equipment including light curtains and an area scanner. These features are new to LSSU's robotics lab and offer a unique learning experience for students. This project helps keep LSSU's robotics lab current with technology used in industry today.



**Superior Racing
Mini Baja Cart
Chassis & Drivetrain Divisions**

Project Description: Team Superior Racing has created a Society of Automotive Engineers (SAE) mini baja kart for competing in national off-road competitions. The new kart was designed to be rugged, adjustable, and reliable; and to include data acquisition.

The chassis portion of the kart consists of the frame, suspension, steering, data acquisition, sensor integration, and safety equipment. The drivetrain portion of the kart consists of the engine, transmission, axles, spindles, hubs, wheels, and brakes. Each team member designed, fabricated, and validated individual design areas to create a unified all-terrain vehicle.

Presentation (Both Teams): 3:30 pm | CASET 212
Demonstration (Both Teams): 4:15 pm | CASET 120

Chassis (Team SRC) Division Members:

Megan Berkompas (ME), Adam Birkeland (ME),
Lauren Graham (EE), August Klotz (ME), Gary Komora (MfgET)

Drivetrain (Team SRD) Division Members:

Alex Guzman (ME), Jordan Huff (ME), Isaiah Murray (ME),
Colton Rausch (ME), Max St. Pierre (MfgET)

Faculty Advisors: Robert Hildebrand (Team SRC)

David Leach (Team SRD)

Support: Zak Mahmud

Sponsors: Control Products, Inc., Chippewa Motors, Airgas, Precision Edge, Continental, Aggressive Manufacturing Innovations, Will Ross, CVTech, SAE



Welcome to the School of Engineering & Technology

Team Presentation*/Demonstration Tentative Schedule

LSA 1:00*/1:30pm, Room 120 WIS 2:30*/3:00pm, Room 120
CAS 1:30*/2:00pm, Room 125 ACE 3:00*/3:30pm, Room 125
C.V.S. 2:00*/2:30pm, Room 124 SRC&SRD 3:30*/4:15pm, Room 120

***All Presentations Will Be in CASET Room 212**

Students will be available throughout the afternoon for informal demonstrations and questions.

The Engineering Living Learning Community House (Chippewa Hall) will be open for tours.

2016-17 Senior Projects Faculty Board Members

This group serves as advisors, overseers, and guides to help the teams through their overall process:

Paul Weber (Chair), Jon Coullard, Jim Devaprasad, Robert Hildebrand, Jeff King, David Leach, Dave McDonald, and Joe Moening

Special thanks to Eric Becks, Laura Bofinger, and Zak Mahmud

The School of Engineering & Technology comprises the following disciplines:

- Computer Engineering
- Electrical Engineering
- Mechanical Engineering
- Electrical Engineering Technology
- Manufacturing Engineering Technology

All of the Lake Superior State University senior engineering and engineering technology bachelor's students are required to complete a challenging senior design project. The students work in multidisciplinary teams and use a composite of their technical and general education courses to successfully complete these projects.



**For more information about LSSU's
School of Engineering & Technology
www.lssu.edu/eng or 906-635-2207**



LAKE SUPERIOR STATE UNIVERSITY

**The School of
Engineering & Technology**

presents the

Class of 2017 Senior Design Project Presentations & Demonstrations



**Friday • April 28, 2017
1:00 p.m. – 5:00 p.m.**

in the

**Center for Applied Science and
Engineering Technology**