A SHOWCASE OF ENTERPRISE AND SENIOR DESIGN STUDENT PROJECTS
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Mary Raber, Associate Director, Institute for Leadership and Innovation; Director, Enterprise Program

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Scope
Design Expo highlights hands-on, discovery-based learning at Michigan Tech. More than 600 students in Enterprise and Senior Design teams showcase their work and compete for awards. A panel of judges, made up of distinguished corporate representatives and Michigan Tech staff and faculty members, critique the projects. Many team projects are sponsored by industry, which allows students to gain valuable experience through competition, as well as direct exposure to real industrial problems. Design Expo is hosted by the College of Engineering and the Institute for Leadership and Innovation.

On the cover
Winner of the 2013 Undergraduate Expo Image Contest: LED display shield on arduino platform, photograph submitted by Andrew Ranta, Justin Breeland, Jacob Glair, Kellen Murray, and Meng Yang (Electrical Engineering) and Jeff Langlois (Computer Engineering). This remote-sensing system detects sand levels in each of the sanding containers on the GE EC4400 locomotive for sponsor Union Pacific.

Student Awards

BLACK & VEATCH

Building a World of Difference® Senior Design Award
Based on poster
First place—$150
Second place—$100
Third place—$75
Honorable mention—$50 (three to be awarded)

Enterprise Awards
Based on poster and presentation
First place—$300
Second place—$150
Third place—$100

Design Expo Image Contest
Photo or non-photo graphics
First place—$100
Second place—$50

Enterprise and Senior Design Patent Disclosure Competition
Winners announced at Design Expo
Best Overall—$250
Best Technical Specification—$150
Best Prior Art Review and Competitive Analysis—$100

More Special Thanks
To the distinguished judges who give of their time and talents to help make the Design Expo a success, to the faculty advisors who generously and richly support Enterprise and Senior Design, and to all the behind-the-scenes superstars (you know who you are)—thank you for your dedication to our students.
Reliable, modernized grid

Energy is essential to the way we live, work and play.

ITC operates, builds and maintains the region’s electric transmission infrastructure. We’re a Michigan-based company working hard to improve electric reliability and increase electric transmission capacity throughout the Midwest.

We’re ITC – your energy superhighway.

www.itctransco.com
Welcome to the Fourteenth Annual Design Expo!

The Design Expo highlights the core foundations of a Michigan Tech education: experiential learning; teamwork; application of theory, design, and innovation; leadership and communication; and multidisciplinary solutions to problems. The Enterprise and Senior Design students showcasing their projects today have embraced these foundations. We take tremendous pride in their accomplishments and hard work.

Michigan Tech’s innovative Enterprise Program enables interdisciplinary learning, leadership development, and team-based work. Teams of first- through fourth-year students from diverse disciplines operate much like real companies to develop products, processes, and services within their market space. Faculty advisors serve as coaches and mentors, with industry leaders playing a supporting role as collaborators and clients.

Senior Design enables small teams of highly dedicated students to explore and solve real industry challenges throughout their senior year. Our program connects students and industry through open-ended projects, which enable teams to experience and follow the complete design process—from ideation to realization.

We would like to take this opportunity to thank the many sponsors who generously support our educational mission by providing invaluable project experiences, along with guidance and mentorship for our students. The benefits of industry and academia working together as partners in higher education are clearly evident today, here at Michigan Tech’s Design Expo.

Sincerely,

Leonard J. Bohmann
Associate Dean for Academic Affairs
College of Engineering

Mary Raber
Associate Director,
Institute for Leadership and Innovation
Director, Enterprise Program
101
Meritor Ductile Iron Alloy Development

Casting ductile iron

Team Members
Collin Tether, Danielle Williamson, Melissa Wright, and Alex Thiel, Materials Science and Engineering

Advisor
Paul Sanders, Materials Science and Engineering

Sponsor
Meritor

Project Overview
Meritor approached our team with the challenge to develop a ductile iron alloy that, without heat treatment, displays mechanical properties exceeding those of grade 1 austempered ductile iron. Various alloying elements were researched as potential candidates for strengthening the ductile iron while preserving elongation. Initial ductile iron pours were alloyed with two elements at varying amounts to achieve an acicular microstructure consisting of ausferrite. While an ausferrite acicular microstructure was achieved in one set of castings, mechanical properties were not ideal. Continued research and tests were completed in order to improve the casting process, microstructure, and mechanical properties of the desired ductile iron alloy.

102
Design and Manufacture of a Blast Furnace Tapping Bit

Sand mold for drill bit

Team Members
Max Rebottaro and Matt Dazell, Mechanical Engineering; Daniel Freiberg, Materials Science and Engineering; Alisha Clark, Mechanical Engineering and Materials Science and Engineering dual major

Advisor
Paul Sanders, Materials Science and Engineering

Sponsor
ArcelorMittal

Project Overview
Tapping a blast furnace at ArcelorMittal's plant in East Chicago requires the use of single-use tap bits. As these bits bore through tap holes filled with refractory clay, they experience significant stress and wear due to intense heat and pressure. Currently, several rock drill bits are used to tap the furnace and the bit performance is based on operator perception. The team will: 1.) Design a tap bit geometry specifically for drilling into blast furnace tap hole clay. 2.) Select a material and manufacturing method for the tap bit. 3.) Manufacture the tap bit. 4.) Optimize current tap bit test rig hardware and controls to assess tap bit performance.

103
Chrysler Intake Camshaft Position Tracking

Plot shows the relationship between cam centerline advance and the effect of manifold pressure

Team Members
Jonathan Mahowald, Computer Engineering; and Andrew Krystiniak, Bryan Haslinger, and Jeffrey DuShane, Electrical Engineering

Advisor
Daniel Fuhrmann, Electrical and Computer Engineering

Sponsor
Chrysler

Project Overview
With the continuing push for higher fuel efficiency engines by automakers and legislators, performance and precision are being sought out wherever possible. Chrysler seeks to be able to better control their Variable Valve Timing and Exhaust Gas Recirculation by improving their calibration of the Camshaft Position Sensor. There is inherent mechanical error in the placement of this sensor during manufacturing. Our team is analyzing the Manifold Absolute Pressure sensor data in order to measure the offset of the Camshaft Position Sensor allowing for techniques that will improve fuel efficiency.
104 Quincy Mine Tour Vehicle

**Team Members**
Anne Jarvey, Andria Nyenhuis, Matthew Kowalkowski, Xin Diao, and Kyle Schmied, Mechanical Engineering

**Advisor**
Kevin Johnson, Mechanical Engineering-Engineering Mechanics

**Sponsor**
Quincy Mine Hoist Association

**Project Overview**
The Quincy Mine Hoist Association is a nonprofit organization that provides tours of the Quincy Copper Mine located in Hancock, Michigan. During the current tour, visitors travel 2,000 feet into the mine on a hay wagon pulled by a diesel-powered tractor. We were tasked with engineering a new passenger carrier that eliminates the diesel exhaust build-up inside the mine and provides a comfortable ride for passengers. Through concept selection, a center articulated, electric vehicle was chosen. We are responsible for delivering the chassis and passenger cabin designs.

Mine tour vehicle cabin concept

105 Lightweight POP Rivet Gun

**Team Members**
Eric Phillips, Caleb Walk, Justin Osterhout, Daniel Carpenter, and Anthony Carley, Mechanical Engineering

**Advisor**
Kevin Johnson, Mechanical Engineering-Engineering Mechanics

**Sponsor**
Chrysler

**Project Overview**
The purpose of this project is to take an existing POP ProSet 3400 Rivet Gun and modify some of its components to reduce the weight of the tool. Chrysler is the customer for this project, and rivet guns are increasingly being used by the company on its assembly lines. By reducing the weight of the rivet guns being used by its assembly line workers, the repeatability and accuracy of each rivet installation is increased as a lighter weight gun is easier for the workers to operate and reduces the likelihood of fatigue.

CAD drawing of air reservoir improvement

106 Dust Removal System for ME-EM Sixth Floor Woodshop

**Team Members**
Gregory Hardy, Zachary Schneider, Ritik Singh, Bradley Johnson, Colin Lay, and Steven Clark, Mechanical Engineering

**Advisor**
Kevin Johnson, Mechanical Engineering-Engineering Mechanics

**Sponsor**
Department of Mechanical Engineering-Engineering Mechanics

**Project Overview**
Our team has been tasked to redesign the ventilation system for the sixth floor woodshop in the Department of Mechanical Engineering-Engineering Mechanics (ME-EM) R.L. Smith building. Currently, the system does not effectively capture and remove dust particles. The ventilation system consists of a fan connected to a series of ductwork leading to several stationary power tools. The fan draws air through duct branches while the machines are under operation to capture the wood dust. The system experiences flow losses, is prone to clogging, and is a potential safety hazard. It has not been tested to determine the proper pump size or confirm that the required flow rate for the machinery is met.

Woodshop
107
Eaton Low Cost Torque Sensor

Team Members
Keegan Larkin, Computer Engineering; Matthew Frantz and Derrick Hilicker, Mechanical Engineering; Patrick McKeon, Ryan Olson, and Robert Lemaux, Electrical Engineering
Advisors
Duane Bucheger, Electrical and Computer Engineering
Sponsor
Eaton

Project Overview
Our team researched and tested torque sensors for use in heavy-duty automotive applications to assist in gear shifting. To test possible torque sensors, we developed a dynamometer capable of testing sensors under a variety of conditions, including but not limited to temperature and varying torques.

108
PLC and PID Control System

Team Members
Abdullah Al Atwah, Ian Bumgardner, Mohammed Bushlaibi, and Joshua Erickson, Electrical Engineering Technology
Advisors
Aleksandr Sergeyev and Seyyedmohsen Azizi, School of Technology
Sponsor
School of Technology

Project Overview
A system that implements the use of PLC with PID control can increase the efficiency of the system. In this project, a system was developed to be used as a learning tool for PLC instruction and to analyze the use of PID control for a system. The system implements PLC and PID control to increase the efficiency of LED light adjustments to voltage changes in a solar panel.

109
Balise and RFID Use in Rail Systems

Team Members
Frank Kampe, Marketing; Kevin Heras and Daniel Holmerg, Management; Min Li, Operations and Systems Management
Advisors
Saurav Pathak, School of Business and Economics
Sponsor
Technical Expert Network

Project Overview
Balise are electronic transponders or beacons used in railways to provide the precise location of trains. They are most commonly used on high-speed passenger lines as part of automatic train control systems that monitor the actions of locomotive engineers and have the capability to take over the control of the train if the engineer fails to react appropriately to signals. Balise operate wirelessly, receiving a radio frequency (RF) signal transmitted from an accompanying module mounted under the passing train. Our team is interested in learning about the balise market in the US and their multiple applications in the rail industry today.
110 Transmission Torque Converter
Clutch Control Law Refinement/ Optimization

MATLAB vehicle model

Team Members
Chenchen Cui, Shane Grady, Jing Liu, Jacob Shuler, and Andrew Szajna, Electrical Engineering

Advisor
Jeff Burl, Electrical and Computer Engineering

Sponsor
Ford Motor Company

Project Overview
Our project consists of analysis and simulation of a control system for a lock-up clutch within a torque converter. Using a MATLAB script and simulink, we developed a model of a torque converter in conjunction with Ford Motor Company. Once this model was complete, we determined stability margin, mean square tracking error, normalized root mean square control input, percent overshoot, and rise time. These performance measures were used to select gains for various controllers.

111 Bainitic Steel Alloy and Heat Treatment Optimization

Mill liner in the process of a heat treatment cycle

Team Members
Cody Torrez, Kelsey Whalen, Matt Tianen, and Travis Hepfner, Materials Science and Engineering

Advisors
Paul Sanders and Douglas Swenson, Materials Science and Engineering

Sponsor
ME Global

Project Overview
Our team is tasked with helping the North American ME Global foundries find the optimum heat treatment for this new bainitic alloy. Also, we will help develop the metallurgical and mechanical properties to fully characterize the alloy and compare the new material to the current industry standard.

112 Clock Testing Vision Monitoring

Lead designer Nathan Hampshire hashing out software design

Team Members
Nathan Hierl and Nathan Hampshire, Computer Engineering; Jie Peng and Qianman Wang, Electrical Engineering; Zhengyang Gu, Electrical Engineering Technology

Advisor
Shiyan Hu, Electrical and Computer Engineering

Sponsor
American Time

Project Overview
American Time has developed a reputation as “The Clock Experts” by providing synchronized clock solutions for schools, universities, healthcare facilities, businesses, and manufacturing plants since 1980. Key products include wired and wireless synchronized clock systems, IP network clocks, as well as a wide range of analog and digital wall clocks. In order to assist in quality control testing of newly produced clocks, our goal is to produce a software application using OpenCV and C++ that can detect and analyze clock timekeeping defects.
114
Pistonphone Adapter Design

Team Members
John Troost, Jaclyn Burtka, and Dustin Scherr, Mechanical Engineering; Travis Kuchar, Electrical Engineering

Advisor
James DeClerck, Mechanical Engineering-Engineering Mechanics

Sponsor
The Modal Shop Inc.

Project Overview
Our goal is to design and prototype a “pistonphone adapter.” This will include adapter inserts for different-sized microphones that will fit atop the 9110D Portable Vibration Calibrator in a similar fashion to the proximity probe holder—permitting the 9110D to operate as a frequency agile pistonphone calibrator.

Building a test device

115
Intelligent Railroad Signal Maintainer

Team Members
Will Dallmann and Ron Campbell, Electrical Engineering; Katherine May and Michael Mandalari, Computer Engineering

Advisor
Duane Bucheger, Electrical and Computer Engineering

Sponsors
Norfolk Southern Railway, Union Pacific Railroad, and Michigan Tech Rail Transportation Program

Project Overview
In the rail industry, maintenance crews oftentimes have to disable railroad crossing signals in order to work on track near the crossing signal. The crews disable the crossing signals using jumper cables to deactivate the crossing signal system. Very rarely these jumper cables are forgotten, leaving the possibility of a train passing through a disabled crossing signal. Our goal is to develop a solution that could minimize the human error involved with forgotten jumper cables and use this solution to improve the safety of the public and rail industry.

Our team with the Lift Assist during construction phase

116
BAE Systems Lift Assist

Team Members
Troy Drabek, Computer Engineering; Daniel Greene, Electrical Engineering; Brandon Miller and Gabe Martinez, Mechanical Engineering; Taylor Jayne, Biomedical Engineering

Advisor
Trever Hassell, Electrical and Computer Engineering

Sponsor
BAE Systems

Project Overview
BAE Systems asked our team to design and prototype their personal Lift Assist concept. The device is intended to be available commercially and for military application to ease the labor of soldiers. We have modeled and constructed a fully electrical device to assist any person with a lift exceeding their strength capacity. The device takes the burden of the grip and weight of the object while the user manipulates the object's position with light mechanical input. The Lift Assist allows lifts of various requirements and object geometries—proving its usability on almost any job.
### 117 Sound Level Alarm

Derek Kohlhase is working on assembling and calibrating the device.

**Team Members**
- Amie Chaloupka, Connor Chrisman, Derek Kohlhase, Andrew Lund, and Shannon Twomey, Biomedical Engineering

**Advisor**
- Michael Neuman, Biomedical Engineering

**Sponsor**
- Portage Health

**Project Overview**
Patients find it difficult to maintain restful sleep while at the hospital due to excessive noise. Previous Senior Design teams have created a device to detect noise levels and produce a visual signal when they have exceeded a predetermined threshold. The design will be evaluated via clinical trials performed at Portage Health. With the information gained from the experiment, we will evaluate the effectiveness of the design in reducing noise levels around patient care areas of the hospital.

![Image of the device being assembled](image1.jpg)

### 118 Wireless DA and SP Using Mobile

Data acquisition testing and output reading for developing the mobile fish finder.

**Team Members**
- Mitch Fedie and Alexandra Kitchen, Marketing; Yi Yuan and Natalia Lebedeva, Finance; Zhaogeng Sun, Management

**Advisors**
- Zeyad Ahmed and Saurav Pathak, School of Business and Economics

**Sponsor**
- Michigan Tech

**Project Overview**
Our team and ZTA Technologies teamed up to develop a mobile fish finder that connects to smartphones and tablets via Bluetooth wireless technology. This mobile fish finder will offer all of the features a traditional, stationary fish finder has, plus the benefits of a higher-resolution display and mobile capabilities at a fraction of the cost. Connection will be seamless with the mobile device and will be able to connect to multiple devices instantaneously. Be prepared to fish like you never have before.

![Image of a mobile fish finder](image2.jpg)

### 119 Single Cylinder Engine Conversion

Sondre, Dan, and Jake unpack the high-pressure fuel system.

**Team Members**
- Benjamin Dion, Andrew Komurka, Sondre Sandvik, Jacob Strack, Reuben Usimaki, and Daniel Van Alstyne, Mechanical Engineering

**Advisor**
- Aneet Narendranath, Mechanical Engineering-Engineering Mechanics

**Sponsor**
- John Deere

**Project Overview**
Our team converted a John Deere 3.9L four-cylinder diesel engine to function with a single active cylinder for combustion and emissions testing. The converted engine incorporates a modified and instrumented cylinder head from a 4.5L sister engine as well as a fuel system and instrumentation from a 2.9L sister engine. These modifications of the 3.9L engine will allow John Deere to expedite engine development by facilitating quick combustion system variation, eliminating cylinder-to-cylinder measurement variability, and providing careful air and fuel control. In addition, single-cylinder testing will reduce both fuel and prototype part costs.
120 Automated Aircraft Sealant System

**Team Members**
Alison Hilditch, Andrew Reed, Nicole Maggi, and William Yahr, Mechanical Engineering; Matthew Courchaine and Patrick Harris, Electrical Engineering

**Advisor**
Aneet Narendranath, Mechanical Engineering-Engineering Mechanics

**Sponsor**
HGS Aerospace

**Project Overview**
Our team is continuing project development on automating the process of applying a mixed two-part sealant onto an aircraft component. The current industry-standard manual sealing process results in increased process time and technician injury, which we are aiming to reduce. The specific goal for this project’s design is to dispense sealant along a complex two-dimensional path with the aid of a vision-capable, 6-axis, robotic arm. We will provide a proof of concept that will be used for future development.

121 Friction Stir Welding of Aluminum Castings

**Team Members**
Alex Seidl, Anthony Konieczny, Chris Shaw, and Stephanie Tankersley, Materials Science and Engineering

**Advisor**
Dan Seguin, Materials Science and Engineering

**Sponsor**
American Axle and Manufacturing

**Project Overview**
Die cast aluminum is a difficult material to weld with conventional welding processes. The presence of porosity and entrapped gases in the base material limits the ability and quality of a fusion weld. The solid state joining technique of friction stir welding (FSW) may be a viable process that would decrease manufacturing expenses and weight of drivetrain components by removing additional fasteners and gaskets typically used in sealing components. Two alloys of aluminum were examined: a die cast A380 and sand cast A356. Designed experiments testing the weldability of A380 and A356 were conducted through microscopic and mechanical testing.

122 Cathode Formulation for Primary Lithium Batteries

**Team Members**
Kellan Martin, Taylor Michels, Michael Warhus, and Emily Wolbeck, Materials Science and Engineering

**Advisor**
Peter Moran, Materials Science and Engineering

**Sponsor**
Boston Scientific

**Project Overview**
Our team identified materials which improve the performance of lithium batteries. We evaluated additives that demonstrated an increase in battery performance.
Wearable Heart Rate Monitor

Team Members
Jonathan Mahan, Nils Bergman, Corey Ernst, Kent Daavittila, and Michael Bostwick, Biomedical Engineering

Advisor
Michael Neuman, Biomedical Engineering

Sponsor
Department of Biomedical Engineering

Project Overview
Our team designed a wearable heart-monitoring shirt able to collect, process, transmit, and display cardiographic data on a third-party device.

Variable Height Assist Chair

Team Members
Christian Haiss, Nick Christenson, Shawn Troyer, Te Yu, and Fanxing Meng, Mechanical Engineering

Advisor
Aneet Narendranath, Mechanical Engineering-Engineering Mechanics

Sponsor
Department of Mechanical Engineering-Engineering Mechanics

Project Overview
The purpose of this project is to address the vertical mobility needs of someone who has difficulty standing for long periods of time. The chair has the ability to elevate the user to different levels enabling many common household tasks. The customer for this project is not confined to a wheelchair and did not want a product that resembled one. Existing assist chairs have a feature that lifts the user to a standing position that was also not desired. The goal of this project was to design and build a prototype of a variable height assistive chair.

Boat Trailer Tug

Team Members
Robert Chase, Brenden Schulz, and Paul Strzalkowski, Mechanical Engineering Technology

Advisor
John Irwin, School of Technology

Sponsor
Great Lakes Research Center

Project Overview
It takes multiple people to maneuver a boat on a trailer around the Michigan Tech Great Lakes Research Center. During the winter months the boat is stored indoors and needs to be moved from time to time. In confined spaces, an internal combustion vehicle is not practical due to space constraints and emission concerns. Manually maneuvering the boat and trailer is strenuous. We are to design a tug device that can make this task an effortless, one-man job. The goal is to design and build the tug under budget and to deliver a fully functional product by April 2014.
126
Center Beam Railcar Repurpose Design

The fishbelly of the proposed converted railcar is shown with the added members in green.

Team Members
Jocelyn Tervo, Riley Peterson, Becky Schlak, William Melcher, Alec Bolthouse, and Nathaniel Scheetz, Mechanical Engineering

Advisor
Kevin Johnson, Mechanical Engineering-Engineering Mechanics

Sponsors
NU-Rail and Michigan Tech Rail Transportation Program

Project Overview
There are currently thousands of idle center beam railcars being stored across the United States. These railcars were once heavily used for carrying dimensional lumber, but after the housing industry crashed they were not fully utilized. Our team has been tasked with the objective to create a conversion design that will enable the use of these idle railcars in a growing industry, specifically the oil industry. We must create a conversion design with multiple constraints and objectives in mind.

127
Rotary Cartridge Assembly System

Testing an early prototype

Team Members
Benjamin Abraham, Sarah Daniels, and Kristi Ross, Mechanical Engineering

Advisor
Eddy Trinklein, Mechanical Engineering-Engineering Mechanics

Sponsor
Lendrex

Project Overview
Our team is designing a system to expedite the assembly process of rotary cutting tool cartridges. Endres Machining Innovations LLC (EMI) has developed the Gen-II Rotary-Tool System, a specialized cutting tool system for applications where a high thermal load and/or tool wear is a major concern. The current assembly time for the cartridge is over seven minutes. Because EMI engineers assemble these cartridges by hand, the process is costly, and either a semi- or fully-automated assembly system is desired.

128
Stair Climbing Cane

Team during compressive testing of prototype

Team Members
Melissa Mack, Travis Neu, Alyssa Hynnek, Caitlyn Privette, and David Rosen, Biomedical Engineering

Advisor
Bruce Lee, Biomedical Engineering

Sponsor
Department of Biomedical Engineering

Project Overview
Ascending and descending stairs present a significant stability problem to disabled people. Our team decided to design a cane to help with this problem. Our stair-climbing cane adds two prongs to the normal cane structure so that the cane can be in contact with two steps simultaneously, increasing stability and therefore safety for the user. We performed prototype validation by compressively loading the cane. To demonstrate increased stability, we had human subjects compare the stair-climbing cane and a normal cane on stairs and collected kinematic data from both.
129 Geomagnetically-Induced Current Monitoring

Geomagnetic disturbances are caused when solar winds interact with the Earth’s magnetosphere.

Project Overview

ITC Holdings is the nation’s largest independent electricity transmission company. ITC operates high-voltage transmission systems in the midwestern United States, serving a combined peak load in excess of 25,000 megawatts. Geomagnetically-Induced Currents (GICs) are currents induced in the electrical transmission system as a result of interactions between solar winds and the Earth’s magnetosphere. These currents can cause equipment damage and are even responsible for causing widespread blackouts in the past. Regulations may require transmission companies, like ITC, to monitor GICs in the future. Our team has been tasked with designing, building, and testing a GIC detection system.

Team Members
Christopher Cena, Kevin Furlong, Nuoya Xu, and John Yurgil, Electrical Engineering
Advisor
John Lukowski, Electrical and Computer Engineering
Sponsor
ITC Holdings

130 Roadside Repair Module

New spare tire system

Project Overview

The purpose of our project is to create a new system to lower and store a spare tire. The designed system needs to take up less space than the current system, therefore maximizing the amount of cargo space available to the customer.

Team Members
Zhe Liu, John Cretens, Kyle Ver Hoef, and Ryan Hess, Mechanical Engineering
Advisor
William Endres, Mechanical Engineering-Engineering Mechanics
Sponsor
Chrysler

131 ME-EM Lab Mass Air Flow Manifold

Flow sensor

Project Overview

Our goal is to design, manufacture, and implement a testing apparatus to measure the mass flow rate for new Michigan Tech ME-EM department curriculum lab equipment.
132 Chrysler Roadside Repair Module

Team Members
Mike Rinke, Jeremy Moseley, Nghia Truong, and Rachel Smith, Mechanical Engineering

Advisor
William Endres, Mechanical Engineering-Engineering Mechanics

Sponsor
Chrysler Group LLC

Project Overview
Our team was commissioned by Chrysler Group LLC to design a better method for mounting, raising, and lowering an under-slung spare tire while packaging all of the necessary tools and accessories in a more compact and practical way within a roadside repair module for a 2017 Chrysler SUV with third-row seating. The problem lies in storing a spare tire within the vehicle with a third row of seats. A redesigned under-vehicle storage and raising and lowering system for the spare tire is required to optimize the amount of storage space for the end user in the rear of the vehicle.

133 Wireless Data Acquisition and Signal Processing Using Mobile Devices (Fishfinder)

Team Members
Yixiong (Elliot) Tang, Brian Vandevoorde, and Shane Clifford, Electrical Engineering; Kyle Krueger and Josh Frankovich, Computer Engineering

Advisor
Duane Bucheger, Electrical and Computer Engineering

Sponsor
ZTA Technologies LLC

Project Overview
Our team determined the feasibility of creating a prototype of a wireless mobile fishfinder. The unit will look to use a commercially available sonar transducer and transmit the signal wirelessly to a smartphone to be processed.

134 Safety Glasses Sanitization Cabinet

Team Members
Morgan Doering, Jon Koski, and Matt Martin, Mechanical Engineering Technology

Advisor
Nick Hendrickson, School of Technology

Sponsor
School of Technology

Project Overview
The School of Technology machine shop at Michigan Tech often holds public tours. Safety glasses are required in most areas of the machine shop, and the current solution is to reuse safety glasses without disinfection. OSHA standards state that all shared protective eyewear must be disinfected after each use. Our goal was to design and construct a user-friendly sanitation apparatus to avoid manual cleaning or disposal of safety glasses. The finished product also needed to be constructed on a fixed budget of $300.
135 Prototype Exhaust System for Generator Testing

The current exhaust system Kohler uses while testing massive generators is time consuming, outdated, and a hassle to set up. Our proposed design would cut down setup time to less than thirty minutes, saving time and money. It utilizes an innovative swiveling bearing/telescopic pipe system that allows the technician to quickly and easily move the end of the exhaust pipe to wherever it’s needed in the testing room.

Team Member
Steven Ellingsen, Mechanical Engineering Technology

Advisor
Scott Wagner, School of Technology

Sponsor
Kohler Power Systems

Project Overview
The current exhaust system Kohler uses while testing massive generators is time consuming, outdated, and a hassle to set up. Our proposed design would cut down setup time to less than thirty minutes, saving time and money. It utilizes an innovative swiveling bearing/telescopic pipe system that allows the technician to quickly and easily move the end of the exhaust pipe to wherever it’s needed in the testing room.

136 Improved Brake Design for Brake Truck Applications

Magline current brake truck design

Team Members
Troy Podges, Mechanical Engineering Technology; Adam Jacobson, Mechanical Engineering; Alex McQuarter and Michel Knudsen, Materials Science and Engineering

Advisor
Paul Sanders, Materials Science and Engineering

Sponsor
Magline Inc.

Project Overview
In an effort to reduce the tire wear on hand brake trucks, a new braking solution was requested by Magline Inc. The primary purpose of the project is to eliminate the use of the tire tread as the braking friction surface. Numerous braking methods were investigated as possible solutions. Of the methods investigated, disc brakes were selected. Analysis of the braking system through theoretical engineering in the form of kinematic analysis will determine the forces present and subsequently the component stresses. Testing of the prototype will both validate the proposed design and benchmark the system against current brake offerings.

137 Transmission System Guidelines for Line Commutated Motor Starting

MATLAB graphical user interface (GUI) showing the torque speed curve for a 1250 HP motor

Team Members
Daniel Parent, Jon Hohol, Andrew Martin, and Connor Dziubinski, Electrical Engineering

Advisor
Trever Hassell, Electrical and Computer Engineering

Sponsor
American Transmission Co. (ATC)

Project Overview
ATC asked our team to assist in the development of improved guidelines and best practices for the starting of line commutated motors. For example, when a utility wants to connect a new load/large motor to the grid, ATC must specify the starting criteria based on the motor’s characteristics (inputs) and the need to maintain strict voltage and power quality criteria on the transmission grid (outputs). A single set of guidelines and standards will facilitate more efficient transmission planning activities within ATC. For the motor manufacturers and end users, the guidelines relate to improved safety and motor operation/life.
138
Pro-Healing Arterial Graft Scaffold Design

Team Members
Steve Trierweiler, David Joda, Danielle Ahrens, and Tyler Curtis, Biomedical Engineering; Chris Heiting and Peter Tropper, Materials Science and Engineering

Advisors
Feng Zhao and Jeremy Goldman, Biomedical Engineering

Sponsor
Boston Scientific

Project Overview
This project aims to construct a vascular graft specifically for use in small-diameter arteries. Narrower vasculature generally has harsher conditions, so viable grafts are more difficult to construct. This graft uses decellularized biologic tissue called elastic lamina to induce a nonimmunogenic and nonthrombogenic effect in the body. The elastic lamina layer is supported by a polymer scaffold around its exterior. A variety of polymers were analyzed for biocompatibility and sufficient structural properties. The resulting vessel has been tested for mechanical integrity and also implanted in a rat model to test for biological viability.

139
Inline Polymer Pellet Crystallization System

Team Members
Ethan Archambault, Collin Brown, Mark Nettell, Zhehao Ren, and Brent Thoune, Mechanical Engineering

Advisors
Gregory Odegard, Mechanical Engineering-Engineering Mechanics

Sponsor
Advanced Blending Solutions

Project Overview
Polyethylene terephthalate (PET) is one of the most commonly used materials for food packaging and beverage containers. The demand for PET is steadily growing and as the demand increases, so does the amount of recyclable material to be processed. One step in the recycling process of PET is to crystallize the material before it reaches the drying stage. Current market solutions for crystallizing PET are expensive to operate and are an inefficient use of space. Advanced Blending Solutions tasked our team with designing, prototyping, and testing a PET crystallizer capable of continuous crystallization of PET.

140
DTE Battery Monitoring

Team Members
Stephen Knudstrup, Connor Denman, Tyler Lemke, Anthony Swisz, and Anthony Chartrand, Electrical Engineering

Advisor
Trever Hassell, Electrical and Computer Engineering

Sponsor
DTE Energy

Project Overview
DTE Energy has a large number of DC Systems, over 200, which fall under NERC standards that were created as part of the Energy Policy Act of 2005. The new standard, PRC-005-2, will require more frequent inspections, which in turn will put a strain on the company’s DC systems work force. However, NERC also specifies a list of attributes a monitoring device must have to substitute inspections by personnel. The opportunity arises to find, test, and implement an appropriate monitoring device(s).
141 Air Force Research Laboratory Challenge: Heavy Lift System

Team Members
Timothy Cencir, John Groen, Andrew Janczy, Corey McKenzie, and Steven Saliga, Mechanical Engineering

Advisors
James DeClerck and William Endres, Mechanical Engineering-Engineering Mechanics

Sponsor
Air Force Research Laboratory (AFRL)

Project Overview
The challenge issued by the Air Force Research Laboratory was to create a lift system to rescue entrapped soldiers from damaged vehicles. The system needed to be capable of safely lifting a 55,000-pound vehicle up two feet while being small/light enough to be carried and operated by one person. The solution developed is a hydraulic spreader that optimizes size, weight, and power unlike anything currently on the market.

Hydraulic spreader prototype rendered using NX-8.5

142 Continuous Temperature Monitoring at Aspirus Keweenaw

Team Members
Brett Barker, John Cieslewicz, Matthew Clisch, Corinne Green, Joseph Kovach, and Jack Lubinski, Biomedical Engineering

Advisors
Keat Ghee Ong, Biomedical Engineering

Sponsor
Aspirus Keweenaw

Project Overview
Our team is working with Aspirus Keweenaw to implement a system to automatically and continuously monitor temperatures and humidity in hospital labs and equipment in order to decrease labor costs and the unnecessary loss of reagents and materials. The system must notify appropriate personnel when temperatures are too far out of range to limit the amount of reagents needing to be discarded.

Calibration with the team makes things run like a dream

143 Fixation of a Cardiac Leadless Pacemaker

Team Members
Jacob Bjorn, Ethan Holley, William Weiner, Alyssa Hartman, Laura Lynch, and Rachel Morrison, Biomedical Engineering

Advisors
Jingfeng Jiang, Biomedical Engineering

Sponsor
Boston Scientific

Project Overview
Boston Scientific tasked our team with designing, building, and testing a fixation mechanism for a leadless pacing device. This wireless pacemaker is to be attached on the interior endocardial surface of the right ventricle of the heart. The mechanism must stay fixated without risking device detachment, which could cause embolization and pulmonary infarction, and it must be removable at the end of the service life. The fixation mechanism can neither add to the diameter of the device nor take up vital space inside the pacemaker that could be used as battery space.

Design concept for fixation device
Limited Edition RAM Truck Tailgate—Structure

The team developed the initial fiberglass mold from a production tailgate.

**Project Overview**

Our team worked in collaboration with another Senior Design team to develop a special edition lightweight carbon fiber tailgate for use in the next generation RAM 1500 for Chrysler Group LLC. The prototype tailgate was expected to reduce current production weight by 25 percent while maintaining loading integrity and integrating a custom selling feature.

Team Members
Christian Vreeland, Thomas Gruber, Evan Rosemore, and Taylor Erva, Mechanical Engineering
Advisor
Gregory Odegard, Mechanical Engineering-Engineering Mechanics
Sponsor
Chrysler Group LLC

Cinetic Automation Database Development

Snapshot of UI in progress

**Project Overview**

Our goal is to create a database with an easy-to-use user interface for Cinetic Automation. The database contains various fields related to how Cinetic Automation works.

Team Members
Jakkapong Saksrisuwan, Computer Engineering; Justin Wright and Adam Wilkinson, Electrical Engineering
Advisor
Trever Hassell, Electrical and Computer Engineering
Sponsor
Cinetic Automation

Delivery Tool for a Leadless Pacemaker

Prepared for midterm presentation

**Project Overview**

The design problem presented by Medtronic consists of modifying a delivery tool currently used during the deployment of the Micra leadless pacemaker. The modified tool must satisfy two independent functional requirements: 1.) guide the device catheter through the atrium and ventricle and 2.) unsheath the pacemaker to expose the implantation tines.

Team Members
Emily Helminen, Samantha Hilliger, Daniel Leppek, Cody Mingo, Tyler Myers, and Anna Ylitalo, Biomedical Engineering
Advisor
Rupak Rajachar, Biomedical Engineering
Sponsor
Medtronic Inc.
147

RAM Tailgate Accessory

Team Members
Kraig Kadletz, Andrew Pospychala, Chad Dickenscheid, and Greg Reed, Mechanical Engineering

Advisor
Gregory Odegard, Mechanical Engineering-Engineering Mechanics

Sponsor
Chrysler Group LLC

Project Overview
The RAM’s current tailgate opens, closes, and secures cargo. This meets the basic functionality expected from end users and is standard in the industry. Chrysler feels there is an opportunity for their current tailgate on the RAM truck to incorporate a feature that they can highlight and market to a very specific target customer. This feature needs to be unique and is intended for a limited volume (2,000 units) high-performance vehicle or eco-fuel-efficient package. A unique tailgate will add value to the RAM line and add an additional selling point in order to expand their market share and generate revenue.

148

Personal Ultraviolet Radiation Monitor

Team Members
Neil Momsen, Nicole Westphal, Michael Ramalia, Joseph Frontera, and Bradley Cassiday, Biomedical Engineering

Advisors
Megan Frost and Sean Kirkpatrick, Biomedical Engineering

Sponsor
Department of Biomedical Engineering

Project Overview
A senior design team from last year developed a photosensitive patch that tells users when they’ve absorbed the amount of radiation that causes sunburn. Our team was tasked with finding a treatment for the patch, which would better simulate the behavior of skin. This treatment is meant to mimic the absorption of sunscreen into skin.

149

Wood Gasification for Operation of an Internal Combustion Engine

Team Members
Keyton Barrone, Kelsey Boyer, and Matt Gasco, Mechanical Engineering Technology

Advisor
David Wanless, School of Technology

Sponsor
ArcelorMittal

Project Overview
A need has arisen to reduce dependence on fossil fuels. A device has been created to produce a combustible syngas from the gasification of wood. The device supplies the syngas to an internal combustion engine as its only fuel source, allowing the engine to operate as it normally would burning gasoline.
Olathe Finger Re-Design

Team Members
Lydia M. Brame and Adam M. Morse, Mechanical Engineering Technology

Advisor
Mark Johnson, School of Technology

Sponsor
Argonics

Project Overview
For this project, we will design a replacement finger for the Olathe 48- and 54-inch sweepers that exceeds the current OEM models, which are expensive, break frequently, and are difficult to acquire. The new design must fit the sweepers’ current finger fixtures. The redesigned fingers will be improved in durability of material and performance, while making the product cost less than $2.75 per finger.
Mining is a high-tech world at Cliffs Natural Resources, and Cliffs Michigan Operations is dedicated to helping students learn about it. Cliffs recently made contributions totaling $2,000 in support of the robotics programs at local high schools.

These robotics programs incorporate Science, Technology, Engineering and Math (STEM) into their curriculum. The program helps prepares students for high-tech, high-demand jobs in the future.

Technology-based jobs are a priority at Cliffs, where technology plays a significant role in the mining operations on a daily basis, as well as in the areas of research and development of mining processes and procedures. We are proud to serve as a source of support for the educational and occupational advancement of the youth in our community.

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Team Leaders
Emmalee Bauer and Natalie Lambert, Civil Engineering
Christopher Wojick, Civil and Environmental Engineering
Sponsor
Michigan Tech

Project Overview
Our goal is to help the Michigan Tech administration effectively engage the University community in reducing our carbon footprint. The Carbon Neutral AQIP project was initiated to improve the integration of sustainability into Michigan Tech’s research and education.

Team Leaders
Kealy Smith, Electrical Engineering; Samuel Slade, Computer Engineering
Aleksandr Sergeyev, School of Technology
Sponsors
Great Lakes Research Center, ArcelorMittal

Project Overview
From the time you wake up in the morning to the time you go to sleep at night, electronic devices are all around you. However, none of these devices compare to the advanced robotic systems used in the Robotics Systems Enterprise (RSE). With projects ranging from a vision system that triangulates the location of a molten steel nozzle to an intelligent power management system that powers the Great Lakes Research Weather Buoys, we have projects that everyone can be interested in with real-world results.

Team Leaders
Justin Alcorn, Mechanical Engineering Technology; Stephanie Haselhuhn, Materials Science and Engineering
Ibrahim Miskioglu, Mechanical Engineering-Engineering Mechanics
Sponsor
ArcelorMittal

Project Overview
The BoardSport Technologies Enterprise (BST) at Michigan Tech is a student-created and student-run organization. We focus on the engineering, design, and manufacturing of skis, snowboards, skateboards, longboards, wakeboards, and other products related to the board sports industry.

One of our wind turbine team members working on calculating the efficiency of a turbine on top of Mont Ripley

Robotics project for First Robotics Mentoring program

BST President, Justin, milling a motor mount
204
Husky Game Development

Team Leader
Ryan George, Computer Science
Advisor
Scott Kuhl, Computer Science
Sponsor
Chrysler Group LLC

Project Overview
Our mission is to design and develop games for business, education, and fun. We work as an interdisciplinary, student-run Enterprise that fosters productivity, creativity, and effective business practices. Our members work in small teams of four to six people, exploring a wide variety of video game engines and platforms, including Windows, Android, Xbox, and an experimental Display Wall and three-dimensional motion-tracking system.

The Immersive Visualization Studio is one of many technologies HGD uses to develop video games

205
Velovations

Team Leaders
Jay Woodbeck and Derek Turner, Mechanical Engineering
Advisor
Paulus Van Susante, Mechanical Engineering-Engineering Mechanics
Sponsors
Specialized Bicycles, Cane Creek Cycling Components, Thomson Bike Products

Project Overview
We are dedicated to collaborating with the bicycle industry to develop new products and processes. For the 2013–2014 academic year, Velovations is proud to have more than twenty-five students working on three engineering projects with Specialized, Cane Creek, and Thomson, all influential companies in the bike industry. We strive to educate students in the fundamentals of product development for customer need. Opportunities for students cover all aspects of product and process design, including research and development, testing, manufacturing, supply chain management, marketing, and distribution.

User testing our mobile application

206
Humane Interface Design

Team Leaders
Katrina Ellis, Applied Cognitive Science and Human Factors; Jordon Dornbos, Computer Science
Advisor
Robert Pastel, Computer Science
Sponsor
Chrysler Group LLC

Project Overview
Our team provides students with an opportunity to design, develop, and evaluate interfaces to make daily work more efficient and easier to manage. As a whole, HIDE works together to design and test different applications for our industry partners that can be used on Android, iPhone, and other devices. We accomplish these projects by combining knowledge in multiple disciplines (e.g., computer science, psychology, and human factors). Students can get involved in various stages of the design process—from developing an app by programming to evaluation by designing usability tests and analyzing data.

The Immersive Visualization Studio is one of many technologies HGD uses to develop video games

Velovations member Derek Turner puts the final touches on a frame-testing setup

User testing our mobile application
ITOxygen focuses on developing information system and information technology solutions. Our areas of expertise include systems and information analysis, software development, database design, and web-based application development. We are a cross-disciplinary group, drawing from multiple fields of study. Current projects include Target Cloud, mobile, and wireless, as well as Android development, malware research, and hardware. Our goal is to provide real-world projects that allow our members to build leading-edge software development and information technology skills that will make them more marketable when looking for jobs after graduation.

**Team Leaders**

Tyler Inman, Computer Network and System Administration; Kris Gauthier, Computer Science Advisor
Russell Louks, School of Business and Economics

**Project Overview**

ITOxygen is a student organization dedicated to the use and development of open source technology. Our goal is to provide fast, affordable, and sustainable solutions to our customers, primarily through the use of our open source 3-D printers. As a new Enterprise, the team is small right now, but we are currently looking for motivated new members to expand our capabilities.

**Team Leaders**

Lucas Wilder, Electrical Engineering Advisor
Joshua Pearce, Materials Science and Engineering

**Team Leader**

Krista Blumberg and Kayla Warsko, Chemical Engineering

**Advisors**

Wenzhen Li, Chemical Engineering; Jay Meldrum, Keweenaw Research Center

**Sponsors**

Keweenaw Research Center

**Project Overview**

AEE focuses on researching, designing, analyzing, and implementing alternative energy solutions. Our projects this year include district geothermal heating in Calumet, using water from abandoned mineshafts; solar power analysis in the Keweenaw, using current photovoltaic installations; and a biofuels project for a new pyrolysis pilot plant.
Aerospace Enterprise

Team Leaders
Andrew Conley and Nathan Ford, Mechanical Engineering

Advisor
L. Brad King, Mechanical Engineering-Engineering Mechanics

Sponsors

Project Overview
Our goal is to provide undergraduate students with a hands-on learning environment for aerospace technologies through design, construction, and analysis of viable space systems. Currently, the Aerospace Enterprise is assembling and testing the Oculus-ASR nanosatellite in conjunction with the Air Force Research Lab. Oculus-ASR advances space situational awareness by allowing ground-based observers the opportunity to anchor algorithms capable of determining spacecraft altitude using unresolved optical imagery. In 2011, the Enterprise participated in the University Nanosatellite Program competition with MIT, Georgia Tech, Cornell, and other notable engineering schools and took first place, earning a launch position on a SpaceX Falcon Heavy in 2015. Final testing and integration will be completed this semester.

Blue Marble Security

Team Leader
Philip Wolschendorf, Computer Engineering

Advisor
Glen Archer, Electrical and Computer Engineering

Sponsors
Fives Dyag, ArcelorMittal, NCIIA, Dr. Adrienne Minerick

Project Overview
Blue Marble Security is a virtual company of undergraduate students focused on securing the future through thoughtful use of technology. Our student-led company combines a rich educational experience in engineering design, team building, project management, and original product development. Blue Marble Security currently runs six diverse teams. Some notable projects include an autonomous robot built to compete in the Intelligent Ground Vehicle Competition, a simple heart rate monitor for education and community outreach, and a portable blood typing device. Additionally, the enterprise has two industry-sponsored projects. ArcelorMittal’s project involves metal fracture analysis. Fives DyAG sponsored an employee resource scheduling database.

International Business Ventures

Team Leaders
Kyle Troutt and Derek Mazur, Biomedical Engineering

Advisors
Michael Neuman, Biomedical Engineering; Robert Warrington, Institute for Leadership and Innovation

Project Overview
The Infant Heart Annunciator is a small, Band-Aid-shaped device that detects an infant’s electrocardiogram, producing a visible flash and an audible tone. Oftentimes in developing countries, those present at birth do not have the training or equipment necessary to determine if an unresponsive infant is alive. Our goal is to eliminate this unnecessary loss of life. Our team is also designing a simple yet reliable ventilator that can be stockpiled by hospitals. Typically, hospitals maintain sufficient numbers of ventilators. However, an increase of patients resulting from a pandemic could create a shortage of ventilators. Currently, the high cost of most ICU ventilators prevents hospitals from stockpiling these machines.
**213 Cin/Optic Communication and Media**

Cin/Optic team members shoot an interview for the Rail Transportation Program

**Team Leaders**
Vienna Chapin and Armando Flores, Marketing Advisor

**Advisor**
Erin Smith, Humanities

**Sponsor**
Michigan Tech Rail Transportation Program

**Project Overview**
As a student-driven, multidisciplinary team, Cin/Optic delivers high-quality multimedia products while offering students the opportunity to learn and develop through their work. We specialize in promotional materials including video, audio and print, as well as training and technical communication solutions. Our team brings a fresh perspective to your media production challenges and needs. Recent clients have included the Rail Transportation Program, filmmaker Suzanne Jurva, Mind Trekkers, and the Lake Superior Stewardship Initiative. The team is currently developing multimedia materials for a US Department of Transportation grant studying geotechnical asset management, and an informational video on PAWS (Preventing Accidents with Safety), a student-run safety program in the Department of Chemical Engineering.

**214 Efficiency through Engineering and Construction**

ETEC members Brian Johnson and Alex Summers demonstrate to middle school students how to install an insulating jacket on a water heater

**Team Leaders**
Nathaniel Jurmu and Jack Kleiber, Civil Engineering Advisor

**Advisor**
Lynn Artman, School of Technology

**Sponsors**
Ford Forestry Center, MDOT

**Project Overview**
Our mission is to work with communities to implement energy-efficient designs into new and existing construction projects. MDOT sponsored a study to evaluate the performance of crossing surface materials in railroad crossings. The team collected and analyzed data, and came up with solutions based on the information available. Extensive research was done with other state transportation departments and literature sources to help find significant data on the subject. Our notable accomplishments include second place in the West Michigan Emerging Green Builders Design Competition in 2007, and partnering with New Power Tour and high at-risk high school students to winterize area homes for low-income elderly residents.

**215 Formula SAE**

Fall 2013 Drive Day

**Team Leaders**
Alisha Clark and Chais Eliason, Mechanical Engineering Advisor

**Advisors**
James DeClerck, Mechanical Engineering- Engineering Mechanics

**Sponsors**
Autodesk, Polaris, GM, 3M, Ford, DENSO, Meritor, Cummins, John Deere, Alcoa, Chrysler, A&P Technology, ArcelorMittal, TeamTech, Mitsubishi Electric, Plascore, Continental

**Project Overview**
Formula SAE is a student competition where more than 100 teams from universities around the world build a formula-style race car to compete in both static and dynamic events at the annual Formula SAE world competition held in Michigan. The concept is to build an affordable race car geared towards the weekend auto-crosser where the static engineering innovations and dynamic racing capabilities are judged and ranked. Michigan Tech has a long history of top-performing cars. Each year we push the racing envelope to develop cutting-edge innovations that will create the future of racing!
216

Clean Snowmobile Enterprise

Building a fresh engine for competition

Team Leaders
Devin Loeks and Nathan Wolak, Mechanical Engineering
Advisor
Jason Blough, Mechanical Engineering-Engineering Mechanics
Sponsors
Camoplast, John Deere, DENSOS, Cummins, Vconverter, 3M, HMK, TIAL Sport, E3, ArcelorMittal, Oshkosh, Autodesk, Ford Motor Company, Polaris, Chrysler, Woody’s, ArcticFX, IceAge, NGK, AMSOIL

Project Overview
The Clean Snowmobile Enterprise is creating a clean-burning snowmobile that runs on isobutanol and a full electric snowmobile. Some of the major projects include an exhaust system, an intake system, and a new fuel calibration for the internal combustion snowmobile, as well as a new rear drive system for the electric snowmobile.

217

Mini Baja Enterprise

Finishing up technical inspection with a brake check

Team Leaders
Bethanie Wojey, Mechanical Engineering; Kyle Cooper, Mechanical Engineering Technology
Advisor
Brett Hamlin, Engineering Fundamentals
Sponsors

Project Overview
The Michigan Tech Blizzard Baja Enterprise is a student-led organization that designs, builds, and tests a single-seat off-road vehicle to compete in a national competition. Blizzard Baja students use modern engineering and manufacturing processes to enhance vehicle performance by focusing on reduction of vehicle mass, maximization of drive-train efficiency, improvement of driver visibility and comfort, and optimization of off-road vehicle handling and maneuverability.

218

Advanced Metalworks Enterprise

Pouring in the foundry

Team Leader
Henry Brewer, Mechanical Engineering
Advisor
Paul Sanders, Materials Science and Engineering
Sponsors

Project Overview
AME is composed of a diverse team of undergraduate students who execute contract research and development projects for industrial sponsors. It is a diverse group of business majors and mechanical, chemical, and materials science engineers who are always looking for new members. Interdisciplinary teams of four to five students model (e.g. CAD/CAM, MAGMASOFT, ThermoCalc), fabricate, and characterize metallic systems, such as aluminum, iron, zinc, titanium, and nickel-based alloys.
Hybrid Electric Vehicle Enterprise

The team works on a new body for the Chevy truck

Team Leaders
Rebecca Farrer, Computer Engineering; Cameron Smith, Electrical Engineering

Advisors

Sponsors
General Motors, LG Chem Power Inc.

Project Overview
The Hybrid Electric Vehicle (HEV) Enterprise is a three-year program to research, design, build, and test a state-of-the-art hybrid electric vehicle, based on a 1950 Chevrolet truck. Students work on projects such as designing and implementing power distribution, component mounting, and thermal management solutions. HEV Enterprise also incorporates Senior Design projects as well. This year’s projects included a touch screen driver interface, an active suspension system, and an active grill shutter.

Wireless Communication Enterprise

Troubleshooting a circuit in the WCE lab

Team Leaders
Maria Damiani and Nicholas Shaieb, Electrical Engineering

Advisor
Christopher Cischke, Electrical and Computer Engineering

Sponsors
Chrysler, HGST, Kyocera, Technical Expert Network, Concept 2, IRHC Broomball, MTS Systems Corporation

Project Overview
Wireless Communication Enterprise is a student-run organization that functions as a model of an engineering company with a variety of different project teams. Small teams allow students to be very involved in project work and give students the opportunity to gain technical skills, business presentation skills, and leadership experience. WCE offers a variety of projects involving wireless technologies, such as RFID and Bluetooth, as well as many other projects well suited for electrical, computer, and mechanical engineering students. Past projects include design of a mobile printing application, a GPS-guided robot, an arcade game, a mobile application for vehicle HVAC control, and design of a supplemental solar-power system for a school.

Supermileage Systems Enterprise

SSE competition vehicle

Team Leaders
Patrick Loew and Matt Schlueter, Mechanical Engineering

Advisor
Rick Berkey, Institute for Leadership and Innovation

Sponsors
3M, DENSO, GM, Meritor, Chrysler, Alcoa, ArcelorMittal, Cummins, John Deere, Ford, Polaris, A&P Technology, Mahle, Plascore, Mitsubishi Electric, TEAMTECH, Continental

Project Overview
Supermileage Systems Enterprise (SSE) is a group of students working as a design team with a current mission to redesign the super-high-mileage vehicle that will challenge other engineering schools at the 2015 competition. A new body has been redesigned using computer-aided engineering to minimize drag forces on the body. A new process has been developed for manufacturing the body to reduce overall vehicle mass by 20 percent. The engine team has developed a new fuel injection system and optimized the efficiency testing program to achieve greater engine efficiency. Finally SSE will soon start work on a second car that is battery-powered.
Chemical engineering junior Cameron Hempel fills tank two with water before the start of the team’s biochar rapid small-scale column test.

Team Members
Andrea Bal and Matthew Manning, Chemical Engineering

Advisors
Tony Rogers and Sean Clancey, Chemical Engineering

Sponsors
Cinetic Automation, nanoMAG, Pavlis Institute, Sustainable Futures Institute, Kimberly-Clark, Dr. Robert Carnahan

Project Overview
In CPM, multidisciplinary student teams create innovative product and process solutions that address the needs of commercial and university sponsors. Current projects include optimizing manufacturing processes, developing improved drying methods for commercial part washers, optimizing and designing a sustainable aquaponics system, improving watershed models to provide advanced flood warning, integrating high-tech materials into athletic equipment, tailoring biochar production to meet the needs of developing countries, and working with a commercial partner to produce charcoal fuel for cook stoves in West Africa.
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April 17, 2014

On behalf of everyone at ITC Holdings Corp., welcome to Design Expo 2014!

If this is your first visit to Michigan Tech’s Design Expo (formerly Undergraduate Expo), you will be astounded at the creativity and sophistication of the demonstrations and displays at this event. These Enterprise and Senior Design Student Projects are more than the products of student imagination. They reflect everything that goes into an engineer’s education and preparation at MTU – a dedicated and involved faculty and staff, a laser-focused administration and tremendously supportive alumni, donors and corporate benefactors. It all adds up to an environment that produces top-tier engineers who are fully prepared to take on and master the most difficult real-world challenges.

At ITC, we’re always pleased with the quality of job candidates from Michigan Tech. Huskies comprise a substantial portion of our Engineering workforce, and I’m proud to count myself among them. They are an integral part of the ITC team that is working hard to design, build and maintain a robust and reliable 21st century high-voltage electrical grid. MTU’s Power Engineering program is justifiably respected as one of the top programs in the country, and its reputation is enhanced every day by the successes its graduates achieve in business and industry.

Please join me in congratulating these 600 hard-working and deserving students as they showcase the skills and determination that will enable them to help make the world a better place for us all.

Sincerely,

Jon E. Jipping, PE
Executive Vice President and Chief Operating Officer
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