CENTER FOR ENGINEERING DESIGN & ENTREPRENEURSHIP

MAY 2, 2018

DESIGN EXPOSITION DAY

GONZAGA UNIVERSITY | School of Engineering & Applied Science

Message from the Dean

To Our Seniors and Design Exposition Day Attendees:

On behalf of our School of Engineering and Applied Science, I would like to welcome you to Design Exhibition Day.

To our visitors, please know that this day represents the culmination of a year of creativity, team effort, and hard work for our seniors, their faculty, their project partners, our support staff, our Design Advisory Board and numerous others involved with the senior capstone experience. We hope that you have the opportunity to recognize the work of our seniors in transforming what were simple proposal ideas in September into the final designs and design presentations you see before you today.

To our seniors, I hope that you recognize that, through your detailed planning, challenges, frustrations, and accomplishments associated with these projects, you have gained real-world experience to carry forward into your professional and life experiences. Thank you for your dedication and efforts. In particular, I want to express my deep pride in the accomplishments of this class. Thank you for the honor of being your Dean throughout your Gonzaga experience.

I want to congratulate all of you for the effort that has brought you to this day, an effort that began not just last September, but when you first entered Gonzaga as freshmen or transfer students. Please know that all of the faculty and staff of our School welcome you to a profession in which you can find life-long excitement, continuing opportunities to challenge and improve your skills, and many opportunities to serve both humanity and nature as reflections of God's creation.

Stephen E. Silliman
Dean of Engineering & Applied Science

Message from the Academic Director

Congratulations to our Capstone Class of 2018! We proudly celebrate your success and accomplishments today! We wish you the best in the future and hope that you will keep us updated on your post-graduation engineering and computer science experiences.

Thank you to all the people who support the education of our students and help to foster the next generation of engineers and computer scientists. Your gifts and mentorship help sustain and grow our program. We especially thank the sponsors who supply the capstone projects and the liaisons to guide the students. Thank you to the faculty, staff, Design Advisory Board and Capstone Committee.

Go Zags!

Toni Boggan
Academic Director
Center for Engineering Design & Entrepreneurship

Welcome to Design Exposition Day 2018

Gonzaga University's Center for Engineering Design & Entrepreneurship was established in 1992 to enhance the design experience for senior engineering and computer science students. The Center organizes projects for the academic year and many are commissioned by sponsors in the private and public sectors. Prospective sponsors are sought throughout the year for projects involving all engineering and computer science programs. Many projects are interdisciplinary.

Participating sponsors provide a definition, resources, and funding for the projects. They also commit a liaison from the sponsoring company to guide and support the students throughout the academic year. Sponsors receive several benefits from the Senior Design Program including a project completed by students and faculty members. Additionally, the sponsoring company has the opportunity to work with bright and enthusiastic individuals with innovative ideas. This team experience is an opportunity to evaluate senior students as prospective employees.

Recently, another type of project developed which is the student proposed project. During their junior year, engineering and computer science students research and refine potential projects which are then reviewed by a faculty committee. If a project is accepted the students who proposed it work on the project. In the 2017-2018 school year, sixteen of the projects were developed by student teams.

All projects are periodically reviewed by faculty and the Center's Design Advisory Board (DAB). The DAB is comprised of engineering and computer science professionals in both the private and public sectors. They are instrumental constituents for the Center and a major factor in guiding the students. The review process brings an outside perspective to the teams and is a component required to meet design guidelines established by the Accreditation Board for Engineering and Technology (ABET).

Design Advisory Board Members

The Center for Engineering Design and Entrepreneurship is supported by a dedicated group of volunteers from the engineering community who lend their expertise to our students and our program by reviewing our student's presentations and reports. Thank you, Design Advisory Board!!

Adam Miles	City of Spokane
Alana Wallace	Wear-Tek
Andrew Matsumoto	Civil West Svcs
Alex Meyer	Hot-Start
Bill Fees	WA Dept. Of Ecology
Bill Galle	Spokane County
Bob Turner	City of Spokane
Brad Snow	MSI Engineers
Brennan Dunlap	Boeing
Chris Sharman	Soft Dev Systems
Colleen Little	Spokane County
Dan Lenz	Quad/Graphics
Dannielle Haraldson	Boeing
Dave Duncan	Dept. of Ecology
David Moss	Spokane County Utilities
Doug Pooler	Empire Lab Systems
Eric Ryan	SEL Inc
Ethan Murnin	Spokane County
Gary R. Weber	Boeing
Gary Holmesmith	Kaiser Aluminum
Greg Lahti	WSDOT
Henry Loehner	SEL Inc
Jake Saxon	Spokane County
Jeff Owen	Schweitzer Eng
Jerry Tombari	Tombari Structural Products
Jim McCall	Reiff Molding
Jim Roletto	Zanetti Brothers
Jim Simon	GU, Director of Sustainability
Jim Weston	Gonzaga University
Joel Lee	Metro Engineering
John Gibson	AVISTA
John Olsufka	Telect
Kaitlyn Helsing	AMX US– NW
Kathie Yerion	Gonzaga University
Katy Allen	City of Liberty Lake
Kevin Cary	David Evans & Assoc.
Les Bohush	Gibby Media
Lindsay Gilbert	CH2M
Luke Blanchart	MW Engineers
Matt Zarecor	Spokane County
Melissa Migliuri	Next It
Melissa Verwest	Coffman Engineers
Michael Maffeo	Boeing
Michael Herzog	Itron Corporation
Mike Mudge	Avista
Nick Questad	Boeing
Paul Robertson	Schweitzer Engineering
Phillip Pintor	Coffman Engineers
Rob Bryant	Gonzaga University
Ron Riel	Avista Utilities
Ryan Leahy	Haakon
Sam Shoemaker	MW Consulting
Scott Marshall	HDR Inc.
Scott Ratterman	Eclipse Engineering
Sushi Shenoy	Eclipse Engineering
Terra Donley	HDR Inc
Tim Graybeal	Lydig Construction
Tom Zysk	Boeing
Ty Weeks	Moss Adams
Zach Howard	Accenture Fed Services

CEDE Excellence Award: Melissa Verwest

The CEDE Excellence Award is presented to recognize an outstanding contribution to the Senior Design Program. The 2018 CEDE Excellence Award is proudly presented to **Melissa Verwest** for her dedicated commitment to the Senior Design Program.

Melissa Verwest is one of the hardest working people you will meet. Professionally, she designs commercial and industrial structures, utilizing various materials such as steel and manufactured steel products, sawn and engineered lumber, and formed concrete. Melissa performs site inspections and analysis of various cranes and decks for compliance with OSHA safety standards and compliance with building code requirements. Her projects are varied, ranging from buildings in Eastern Washington to working with the rebuild effort of Christchurch, New Zealand after the 2011 Canterbury Earthquakes.

Melissa joined the Senior Design faculty at Gonzaga University in 2009 and advised civil student teams on their structural projects. Her involvement with the seniors often helps launch their careers, as she becomes a friend and mentor to many. She currently serves on the Design Advisory Board and the DAB Executive Council. Never content to sit back and observe, Melissa takes an active role in encouraging fellow DAB members to participate more fully. She has excellent insight into Senior Design and provides thoughtful suggestions for improvement. Melissa can be counted on to lend her energy to improve things wherever you find her.

Melissa received a master's degree in civil engineering at Washington State University and is a licensed Professional Engineer at Coffman Engineers. She also plays hockey, is in a band, teaches Tai Chi at Gonzaga, builds furniture, plays softball and rock climbs. We are grateful that Melissa makes time for Gonzaga's Senior Design program.

Civil Engineering

ENSC 01, Design and Monitoring of Beaver Dam Analogs

Sarah Lund
Davis Phillips
Liz Brinkman
Ryan Fox

Advisor: Dr. Sue Niezgoda
Sponsor: The Lands Council
Liaison: Joe Cannon

Our team, Don't Leave it to Beavers Inc., is working with the Lands Council and US Fish and Wildlife Service to install and monitor beaver dam analogs (BDAs), which simulate natural beaver dam function in California Creek in the Hangman Creek Watershed. The goal of the project is to monitor the effectivness of BDAs at trapping sediment and reducing the intensity of water flow in attempt to reduce overall sediment loads watershed wide. Our team added a groundwater monitoring plan and performed a structural analysis on the BDAs to develop future construction requirements. The methods used in the monitoring plan include, repeat cross sectional surveys, pebble counts, RTK topographical surveys, and stream discharge measurements. We collected and compared data from a fall and spring survey to analyze BDAs effectiveness. Our team also created a GIS model to find additional sites in the watershed for possible future BDA implementation.

ENSC 02, Stormwater Treatment and Monitoring

Madeline Endris
Nathan Nelson
Ashley Osler

Advisor: Aimee Navickis-Brasch
Sponsor: Spokane County
Liaisons: Jake Saxon and Colleen Little

The ENSC02 Stormwater Treatment and Monitoring group spent the year monitoring a bioretention pond with newly installed, automated sampling equipment. The pond is located on campus near the Gonzaga Law School. Three storms were monitored to determine if the bioretention pond was successful in reducing the concentrations of selected pollutants, including copper, phosphorous, total suspended solids (TSS), and nitrates. The soil analyzed was a mix of 60% sand and 40% compost. This is the only approved bioretention soil media (BSM) mix in the state of Washington. There are two cells within the pond with depths of 12" and 18" of BSM. This BSM has been extensively tested in Western Washington and this study is one of the first to test this mix in Eastern Washington. Since the weather conditions in Eastern Washington vary from Western Washington, this study will help in determining the best suited BSM for Eastern Washington.

Civil Engineering

ENSC 03, Cross-Laminated Timber Characterization and Optimization

Faye Maddox
August Braun
Seth Hickman
Brian Thompson

Advisor: Dr. Joshua Schultz
Sponsor: Structurlam
Liaison: Kris Spickler

The Timber Research Group (TRG) has been investigating the structural properties of cross-laminated timber (CLT) beams. TRG developed a test apparatus and controlled test procedure to: determine the ultimate strength of 3-ply CLT, the stress distribution through the unique layup of CLT beams, and the probability of failure of CLT beams loaded in flexure. The team used experimental data to investigate ways CLT might be optimized based on structural, financial, and environmental criteria. Optimized CLT was used to re-design structural components of a benchmark concrete building. The alternative design shows that CLT is a structurally viable and sustainable alternative for mid to high rise constructions. TRG would like to thank its gracious sponsor, StructurLam, for their donations of CLT panels, as well as Dr. Joshua Schultz and Dr. Patrick Ferro for their support and guidance.

ENSC 04, Northern Idaho Collaborative Education Building

Michael Doquilo
Joseph Jesse
Victoria Vivinetto

Advisors: Aaron Zwanzig
Sponsor: Integrus Architecture
Liaison: Aaron Zwanzig

North Idaho College, Lewis-Clark State College, University of Idaho, and the Coeur d 'Alene Urban Renewal Agency (Ignite Cd'A) envision the creation of an education corridor along the Spokane River in Coeur d' Alene on the North Idaho campus. The collaboration of the colocated institutions increases local access to students at all levels of higher education. The approximately 25,000 to 30,000 square feet building will support a collaborative One-Stop-Shop for student services, sixteen classrooms for 30-40 students, computer labs, various breakout rooms and ancillary support spaces. The goal of this project is to create a schematic level structural design for the Northern Idaho Collaborative Education Building. This project included the development of schematic level structural framing plans. The design team developed gravity and lateral loads, selected a framing system, and designed a framing system and foundation for the structure. All of the team's work is supported by structural calculations

Civil Engineering

ENSC 05, Wyoming Connected Vehicle Project

Jennifer Delgado
Drew Fuller
Kyle Peltz

Advisor: Dr. Rhonda Young
Sponsor: McFarland Management
Liaison: Fred Kitchner

The US Department of Transportation Connected Vehicle Pilot Program is located in three locations: New York, Florida, and Wyoming. ENSC05 is tasked with assessing the effectiveness of Connected Vehicle Technology for freight trucks and passenger cars along the I-80 corridor in Wyoming. Through an onboard unit, the driver will receive warnings of upcoming forward collision warnings, work zones, changing speed limits, and weather conditions.

Our team has analyzed weather data, speed compliance data, and crash data to determine the effectiveness of the technology pre- and post-deployment. The goal of this project is to observe how speed and crash data changes based on driver's reactions to the Connected Vehicle Technology.

ENSC 07 Hold That Tray!

James Sulser
Meghan Lowry
Sarah Godbehere
Elizabeth Brown

Advisor: Dr. Alex Maxwell
Sponsor: Washington State DOE
Liaison: John Cleary

The issue of food loss and waste (FLW) at Gonzaga University is being addressed using a systems-based, holistic approach in keeping with the United States Environmental Protection Agency's Food Recovery Hierarchy (FRH). Using the FRH as a guiding framework, this project aims to reduce and divert FLW at the main dining facility by: (1) improving educational programming and coordinating with the University's food service provider to reduce post-consumer waste, surplus edible food, and unnecessary food preparation (Source Reduction), (2) making improvements to the food donation program operated by Campus Kitchens (Feeding People), and (3) exploring strategies to divert food waste from landfills by designing, building, and testing a pilot-scale anaerobic digester and in-vessel composter (Industrial Uses and Composting).

Civil Engineering

ENSC 08, Natural Fiber Reinforced Concrete

Madison Jurewicz
Zackary Schroder
Loren Colpo

Advisor: Lauren Heine
Sponsor: NW Green Chemistry, ZILA Works
Liaison: Jason Puracal

Our team was tasked with designing concrete that used hop vines as a sustainable replacement to aggregate for our sponsor ZILA Works. Hop vines were chosen because Yakima produces 70% of the nation's hops. Our project goals were to research similar fibers to hop vines, calculate mix designs and test our hopcrete. We found research with wood chips had already been incorporated into concrete. Our team used this as a baseline for our mix designs. We procured our hop vines from Yakima and harvested the usable material to be used in our mixes. In the designing of the concrete we replaced 7.5% and 15% of the aggregate. We poured test cylinders and flexural beams. After the samples had cured, each cylinder was tested in compression and beams were tested in flexural strength. Our team has prepared samples, mix calculations, and uses for hopcrete based off our test results.

ENSC 09 Cincinnati Greenway

Makayla Bowdish
Cameron Unkel
Nick Petersen

Advisor: Dr. Rhonda Young
Sponsor: City of Spokane
Liaison: Brandon Blankenagel

The Cincinnati Greenway is a bicycle and pedestrian friendly transportation project proposed by the City of Spokane. The City of Spokane has been working to implement safe and efficient bicycle facilities in order to provide Spokane with an enhanced bicycle network that can be used by all community members. The Cincinnati Greenway will connect the Ben Burr Trail, Centennial Trail, and bike lanes on Addison Street as it runs from Euclid Avenue in the north to Spokane Falls Boulevard in the south. The design team has met with Neighborhood Councils affected by the project as well as city politicians in order to produce a final design charter that reflects the community and promotes safe active transportation.

Civil Engineering

ENSC 10
Medical Office Building

Zach Hartje
Megan Kramer
Shaun Buchman
Isaac Hood

Advisor: Tony Stenlund
Sponsor: TD&H Engineering
Liaison: James Boudreau

Our team of senior civil engineering students was tasked with providing a schematic level structural design for a 3-story medical office building located in Moscow, Idaho. This 53,000 square foot building meets the needs of Gritman Medical Center and the community of Moscow by providing additional office space near the heart of downtown. Over the course of this year, we had the privilege of communicating with the architect and the Engineer of Record for this project to calculate design loads, design the framework and foundation systems, and analyze the impacts of our design. We valued working as a team to see this project through from initial loading calculations to a final comprehensive report of our structural framework.

ENSC 11, Avista Underground Power Vault

Landon Lum
Trevor Vandecoevering
Sean Urann
Rachael Anderson

Advisor: Doug Forkner
Sponsor: Avista
Liaison: Doug Forkner

Our Senior Design team, ENSC 11, has worked throughout the year with Avista to go through the Design Bid -Build process of an underground power vault. An underground power vault is a structure that houses either transformers or power lines that run underground. Our goals for the project were to examine and identify the structural deficiencies found within the pre-existing vault. Next, we calculated the loads on the vault to create our own design. After this, we compared our calculations and design with the real vault created by Oldcastle Precast. We then went through the process of writing up a contract to hold a bid meeting with potential contractors and selected the one we saw as the best choice. The contractor then excavated the old vault and installed the new one delivered by Oldcastle Precast.

Civil and Electrical/Computer Engineering

ENSC 12
Zimmerman Trail

Ellie Libby
Monica Regan
Danielle Pitcher
Rachel Borja

Advisor: Scott Marshall
Sponsor: HDR Engineering
Liaison: Ryan Haddeland

Ladies in Technology (L.I.T) was tasked with redesigning Zimmerman Trail between State Highway 3 (MT-3) and Rimrock Road in Billings, Montana. Our project goals were to design and evaluate two alternatives for the roadway design, create accompanying designs for stormwater facilities, and develop conceptual roundabout geometries for the intersection of Zimmerman Trail and MT-3. We have accomplished designing and choosing a roadway alternative, designing a stormwater management facility in conformance with the City of Billings Stormwater Management Manual, and conceptually evaluating a roundabout. The chosen roadway alternative maintains the centerline and extends the edge of pavement by 3 feet on either side, increasing safety and mobility through the corridor. The stormwater management facility treats stormwater, includes drainage facilities, and two detention ponds. L.I.T Engineering has prepared a sheet set, including plan and profile sheets, drainage sheets, summary quantities, and detail sheets.

ENSC 14
Polarized Helical Antenna Array

Aaron Day
Anthony Weinand

Advisor: Bob Conley
Sponsor: LHC2
Liaison: Dr. Steven Schennum

The goal of this project was to create an array out of four omni-directional helical antennas using two pairs of right-hand and left hand circularly polarized elements. The antennas used were constructed based on a design created by Gonzaga students in 2015-2016, and altered to match the specific needs of the project. The completed array serves the purpose of increasing gain when compared to a single element, thereby improving signal strength and effective range. It also allows for the reception and transmission of all polarization types through manipulation of phase-angle. The array is centered at 915 MHz, a portion of the ISM band used for mobile communications, specifically amateur and low-powered transmissions, and could be scaled to match any desired operating frequency.

Electrical and Computer Engineering

ENSC 15, Protective Schemes Lab

Rylie Van Court
Katherine Gibbs
George Herner

Advisor: Kevin Damron
Sponsor: Avista
Liaison: Elizabeth Andrews

ENSC 15 Protective Schemes Lab implemented a fast trip blocking scheme using two SEL-351 protective relays and one SEL-2730M ethernet switch utilizing IEC 61850 in the Gonzaga relay lab. Originally, the goal was to also implement a current differential and a lockout relay, but the scope was later limited to the fast trip blocking scheme. The project goals were to reduce cost in building a substation, increase reliability of the protection system, and allow ease of future expansion. Training material and design documentation were created to help Avista implement IEC 61850 into future substation designs.

ENSC 16 Smart Pole Sensor II

Mareval Ortiz-Camacho
Ryan Healy
Sophie Pavletich

Advisor: Matthew McCauley
Sponsor: Avista
Liaison: Matthew McCauley

The sponsor of the Smart Pole Sensor II project is Avista Utilities. The goal of the Smart Pole Sensor Project II was to build a prototype from the research that was completed in the Smart Pole Sensor Project I that can then be manufactured and installed on over 100,000 Avista owned poles. The prototype should be able to be mass produced for under $20 each, and is about the size of a hockey puck. The smart pole sensor detects the exact location of the fault (the location that causes the outage), which eliminates the need to patrol the power line to find the cause of a fault. Installing smart pole sensors on all poles could reduce outage times, thus improving the reliability and safety of Avista's system.

Mechanical Engineering

ENSC 17
Apex Trekking Axe

Aziza Radwan
Collin Calhoon
Matthew Saunders
Hunter Bingham

Advisor: Art Miller
Sponsor: Smart Alex Product Development
Liaison: Alex Korteum

The main goal for our apex trekking axe was to design and build a handle that could compete with the other trekking pole/axe combinations currently on the market with the improvement that the “axe” blade would fold into the handle for safety and ease of use when not needed. Throughout this year our team has accomplished designing and testing one prototype, designing another that used the feedback from out first test to make improvements and a third prototype that encompasses all of the feedback we have received from various members of the engineering community as well as our sponsor as well as the test results from our infield and machine tests.

ENSC 18
Micro-Hydropower

Alyssa Saad
Kanyon Powers
Karly McCauley
Ethan Evans

Advisor: Dr. Patrick Ferro
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Gabe Achenbach

The goal of this project was to design and prototype a micro hydrokinetic turbine system. The design caters to consumers who would like to utilize hydropower on a small scale. It allows for environmentally conscious users to generate power from a river or stream near their home. This project focused on creating a system that analyzed different small-scale hydropower components to create a portable, cost effective system. The final prototype is made from 3D printed parts. It generates power using a water-lubricated, brushless DC motor. Water is channeled through the inlet to focus the flow into the turbine blades. Water exits through the outlet, reducing the pressure without causing cavitation. If brought to a manufacturing level, this easily installable system may allow for affordable and noninvasive infrastructure as an alternative to the traditional dam. This could bring green energy down to a much more personal level.

Mechanical Engineering

ENSC 19, Automated Trailer Control

Jacqueline Griesser-Secrest
Noah Kobayashi
Jonah Guerrero
Everett Fellger

Advisor: Andy Johnson
Sponsor: Gary Stadtmueller
Liaison: Gary Stadtmueller

ENSC Group 19 was tasked by Gary Stadtmueller to design an independent system that can be implemented on any trailer-type and connect to the towing vehicle as it executed a variety of maneuvers in an attempt to reduce the strain on the tow vehicle. ENSC 19 designed and created a functioning sub-scaled prototype by utilizing a garden wagon, batteries, a load cell, motorized wheels, a microcontroller, and speed controllers. The designed sub-scale prototype is capable of simulating a loaded trailer and reacting to the given input through the handle of the cart by the user, which is designed to resemble the tow vehicle performing various actions (i.e. stopping, starting, and turning). Through the design, a larger-sized system utilizing correctly-scaled components can be implemented on any trailer and Increase the fuel efficiency of the tow vehicle while under load.

ENSC 20 Honeycomb Core

Cesar Ortiz Rios
Jesslyn Bierman
Bridget Kiley
Dillon Peisson

Advisor: Jacob Laete
Sponsor: Boeing
Liaison: Michael Plahuta

The Boeing Honeycomb Core team analyzed the strength of Hexel's Fiberglass and Aluminum honeycomb material when under compressive load. Mike Plahuta, an engineer in the jet propulsion division at Boeing, proposed this project because it is beneficial for Boeing to have multiple tests showing consistency and agreement with their honeycomb material vendor, Hexel. This project was a continuation of the 2016-2017 Boeing Honeycomb Core team. The 2017- 2018 team analyzed the previous team's data and delivered pre-test analysis with predicted failures. Tests were run both at the Boeing facility in Everett, WA and in the Gonzaga Lab. Using Boeing's data, the team was able to validate the results obtained at Gonzaga. A test matrix including test data from 2016-2018 was delivered. Once testing was complete, the 2017-2018 team published a correlation curve with a correlation coefficient that correlates cell wall orientation to strength. The team also delivered documentation covering the testing procedures.

Mechanical Engineering

ENSC 21
Clip Installation Tool

Kyle Bowman
Sam Kendree
Todd Guse
Patrick Tjandra

Advisor: Ryan Leahy
Sponsor: Boeing
Liaison: Craig Ungerecht

Boeing, our sponsor, came to us with a problem they currently have with installing nut clips in the fuselage of their airplane. When installing by hand, the nut clips often fall into the lower deck of the airplane, becoming FOD, foreign object debris. When FOD occurs, it takes time and resources to clean before the next step in production. Our goal, which we have obtained, was to design, develop, and test a hand held tool for ergonomically installing nut clips, with the main function of preventing FOD. We have developed a tool that is durable, ergonomic, and easy to use, while providing the function of FOD prevention.

ENSC 22
Shock Absorber for Human-Powered Tools

Connor Arend
Kinsly Smith
Bryan Yu
Matthew Palodichuk

Advisor: J. McCall
Sponsor: Buck Knives
Liaison: Mark McLean

The goal of this project was to mitigate the shock and vibrations felt throughout a person's hand, wrist, elbow, and shoulder when they used a tool such as an axe or a hatchet. To achieve this goal, the group cut different geometries into the metal of axes and tested them to see if a certain geometry could reduce the shock the user felt. Another avenue of over-molding was explored. For this, urethane was cast over the different handles of axes and tested to see how urethane would dampen the shock felt.

Mechanical Engineering

ENSC 23
Electro-Mechanical Faucet

Sam Olson
Megan Millward
Charles Mielke
Ryan Hungate

Advisor: Bob Reed
Sponsor: Ryan Kellogg
Liaison: Bob Reed

Senior Design Group 23 was tasked with development and prototyping of an ElectroMechanical Faucet device. There is a growing market for the automating of simple tasks for the improvement of user experience and efficiency. The infrastructure behind common objects lends them to be operated most efficiently in a certain way, but human operators tend to make this difficult or impossible. By integrating some basic technology and hardware, it is possible to drastically improve the efficiency of these devices and to improve the user experience. Thus, a system that can be retrofitted onto a preexisting single-handle shower valve that can actively control the temperature of the shower stream has been developed. Additional design specifications require it to remain non-invasive and relatively low cost compared to existing market competition, and provide preheat functionality.

ENSC 24
Concrete Delivery ID

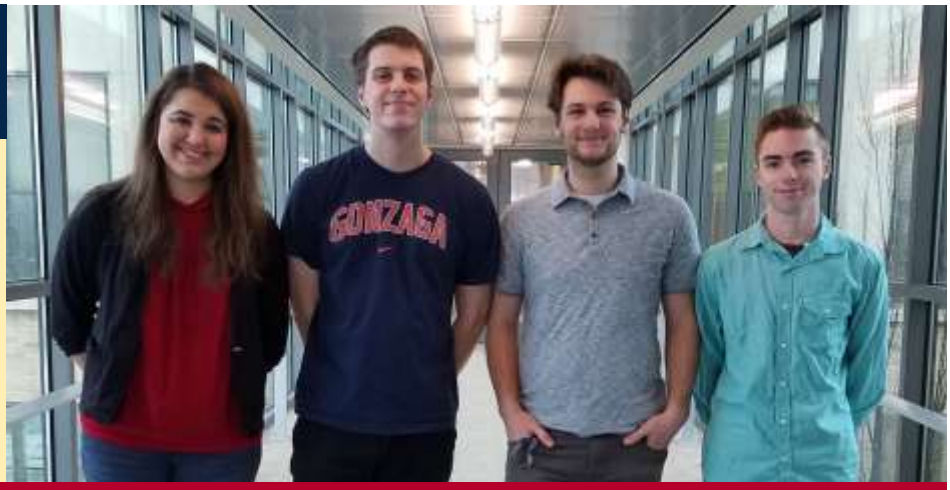
Nicholas Reasoner
Hans VanderWel
Jack Zielinski
Bianca Burton
Christopher Clark

Advisor: Mason VanLith
Sponsor: ACME
Liaison: Robert Seghetti

The Electronic Concrete Delivery Team working with ACME Concrete based here in Spokane was tasked with embedding RFID chips into the concrete manufacturing process. Each chip has a unique identification number that correlates to the specific concrete batch specification which will now be stored in the company cloud database, making way for ease of location finding and data retrieval. This Multidisciplinary project consisted of teams of Computer Science, Mechanical, and Electrical Engineering majors. The team of four Computer Science majors (CPSC 09) created a cloud database for the storage of batch specific information and employee interface for the data retrieval. The team of three Mechanical Engineers were tasked with the dispensing of the RFID chips at the batch plant and the creation of a manufacturing process to do so. The team of two Electrical Engineers were responsible of the writing of the RFID chips and data transfer to the Computer Science team. Stop by the Design Expo to see how ACME Concrete goes digital with batch specific identification.

Mechanical Engineering

ENSC 25, Sensors for Body Vibration



Olivia Bridston
Gaelen Murray
Zachary Oldham
Jacob Laurent

Advisor: Art Miller
Sponsor: NIOSH
Liaison: Art Miller

The goal of this project was to develop a prototype and data acquisition system for the measurement of vibrations as they travel from the hand through the arm and to the ear, with a focus on how body vibrations can contribute to hearing loss. The team designed and developed a prototype of multiple accelerometers for NIOSH to refine and use in research going forward to analyze the connection between exposure to vibration of mining equipment and occupational hearing loss.

ENSC 26
Paint Boom Protector

Peter Bugos
Brian Scott
Sara Berry-Maraist
Gaby Sevilla

Advisor: Bob Reed
Sponsor: EZ Loader
Liaisons: Jim Boone & Bruce Sundahl

Group ENSC 26 was assigned by EZ Loader Boat Trailer's to provide recommendations on factory reconstruction to prevent product damage and make a more efficient process. With EZ Loader's new expansion to 25ft parts, such as a boom (side parts for the trailer's frame), they have received damage from bumping into factory walls and structural beams. We have outlined minimum dimensions that they must redesign certain rooms in their factory. This will not only prevent damaged products but also free skilled labor from guiding such parts. From simple solutions like rehanging a carrying hook to providing new room dimensions and realigning process chains, we will solve any hang-ups that these extended parts will cause.

Mechanical Engineering

ENSC 27
Hydrogen Fuel Cell Testing

Chris Peterson
Nicolas Carbonell
Sean Sweeney
Keenan Stephens

Advisor: Jeff Nolting
Sponsor: Plug Power
Liaison: Scott Spink

As stated above, we are ENSC 27. Working with the company Plug Power, our goal was to design an airflow test bench for Plug Power's air cooled hydrogen fuel cells. One of the most critical aspects of controlling an Air Cooled Fuel Cell (ACFC) is to maintain the optimum operating temperature for the membrane. In doing this, the water is sufficiently balanced to maintain a high level of conductivity and thus maximum output power. This is done by the use of a fan, and in order to choose an appropriate fan we need to know this mass flow rate and the pressure required to achieve said mass flow rate. Our test bench measures flow rate and the pressure that the said flow rate needs to overcome. From this data, the team generates impedance curves that Plug Power uses to easily choose the best fans for each fuel cell. This project taught the team a lot about working as a group on long projects and kept us on our toes with topics such as fluid mechanics and design.

ENSC 28
Engine Test Skid

Andrew Petrillo
Ben Froehlich
Jon Holt
Zach Gustlin

Advisor: Jim Weston
Sponsor: Gonzaga University;
Student Proposed Project
Liaison: Dr. Marc Baumgardner

We designed an engine test skid to increase research and laboratory opportunities for the Mechanical Engineering Department. This research includes, but is not limited to, research on biodiesel fuel performance, and fuel consumption. The skid will allow for laboratory experiments in fluid mechanics, heat transfer or thermodynamics classes. Our test skid is an adjustable stand to support an engine ranging from 25-100 horsepower and designed to support a dynamometer at a later date. A cooling system on a transportable cart houses a radiator, fan, pump, and temperature and pressure gauges to monitor the state of the engine. A high temperature exhaust system transports the engine gases safely out of the room. We have manufactured the skid and it is ready for use.

Mechanical Engineering

ENSC 29
Hardness Test Fixture

David Stepovich
Brady Garcea
Bolen Brown
Isaia Tiangston

Advisor: Colleen Nolting
Sponsor: UTC
Liaison: Roy Wortman

For our senior design project, we worked with UTC Aerospace Systems. UTC runs a variety of tests on their large commercial and military airline brake discs, including hardness testing. However, most, if not all hardness testers are not made to test large objects because the work holding fixture is so small. The fixture that they have on site has caused a variety of problems, including balancing errors resulting in inaccurate measurements, a long testing process per disc and strenuous technician movements per test. We set out to redesign a new test fixture that will resolve these current problems. Our goal, which we have obtained, was to deliver a proof of concept which includes a complete drawing package, CAD model, operation manual and assembly instructions. Although a completely machined prototype wasn't far out of reach, we simply didn't have enough time to get all the parts machined, delivered and assembled.

ENSC 30
Silicone Injection Fixture

John Tatka
Nathan Bearup
Collin Jurenka

Advisor: Sam Shoemaker
Sponsor: Nano Precision Medical
Liaison: Antwan Gibson

The objective of this project is to develop, test, and verify the functionality of an automated silicone injection molding fixture. This will be used to quickly and precisely manufacture components for prototype medical devices to be used for research and development purposes. The fixture will increase the speed, efficiency, and control of the silicone septum forming process for the prototype medical implants while freeing up valuable human resources. The fixture will utilize the highly capable 3-axis properties of a 3D Printer combined with a custom-designed plunger assembly that will dispense a silicone compound to accomplish the task described above. The plunger assembly then depresses the cartridge and injects a precise amount of silicone into an array of molds of a predetermined geometry that can be scaled according to Nano-Precision Medical's prototyping requirements. This allows for a controlled, highly accurate final product that marks an improvement over current techniques and technologies.

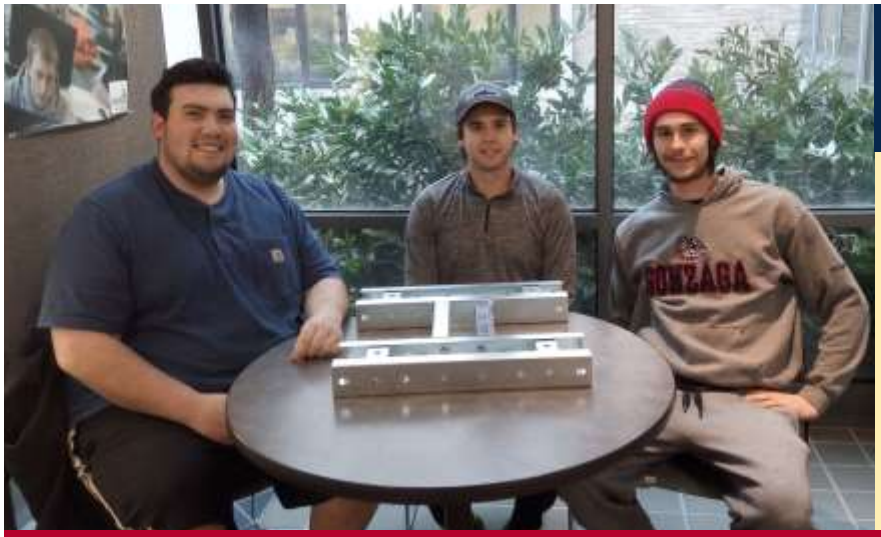
Mechanical Engineering

ENSC 31
Probably a Pendulum

Andrew D'alba
Alex Grudovik
Tony Sisco

Advisor: Jim Weston
Sponsor: Gonzaga University
Liaison: Dr. Timothy Fitzgerald

Our goal this year was to develop a pendulum that can measure the mass moment of inertia of any arbitrarily shaped body in the range of two to five pounds. We had some difficulties with multiple aspects such as securing the randomly shaped object, so it wouldn't move, programming the different inputs and outputs, and the overall fabrication within our tolerances. However, we accomplished managing to deal with all of these issues and devised a product that will allow us to achieve our original goal.



ENSC 33
Sheet Metal Fan Base

Kyle Wilkinson
Ian Wilber
Mica Carriere-Hickox

Advisor: Bryan Woodbury
Sponsor: Haakon Industries
Liaison: Ryan Leahy

The goal of this project was to design, prototype, and test an alternative fan base for Haakon Industries, a leading manufacturer and designer of custom air handling units and HVAC equipment. A key component of Haakon's air handling systems is the design of the fan assembly's structural base, which supports all loads placed on the fan housing while providing vibration isolation and earthquake restraints. Haakon's current fan base design is constructed out of welded angle iron, which results in a process that is labor intensive and time consuming. With our design, we utilized Haakon's extensive sheet metal manufacturing capabilities to construct a fan base that is fastener-based and weld-free. Our design also accommodates fan sizes from 1224 inches in diameter with integrated earthquake isolation and restraints. We have cut manufacturing time from 4 hours, to just under 15 minutes, and have reduced the cost per base of approximately 70%.

Mechanical Engineering

ENSC 34
Hydrogen Fuel Cell Fitting

Connor Colestock
Chris Ultican
Connor Nation
Danny Barnhart

Advisor: Dr. Patrick Ferro
Sponsor: Dynacraft and PACCAR
Liaisons: Steve Weirlo, Andy Erickson

Our team set out to provide a material selection for a hydrogen fuel cell fitting for Dynacraft, A PACCAR Company. Utilizing literature and research, we first narrowed down our selection of materials. We then proceeded into intensive testing of our selected materials. After compiling and analyzing our test data, we provided our sponsor with the appropriate material for use in a hydrogen fuel cell fitting for a concept hydrogen powered vehicle.

ENSC 35
Mechanical CPR Device

Bryce Dumais
Laura Miller
Connor Nash
Matthew Stanley

Advisor: Renee LaRocca
Sponsor: Gonzaga University;
Student Proposed Project
Liaison: Les Bohush

Our team set out to design a mechanical CPR device that can be used during emergency situations in ambulances when it is not safe for medical personnel to perform CPR on a patient, especially while the ambulance is moving. Our design helps perform compressions on the patient's chest by using pressurized pistons to contract and release a band and sculpted plate over the chest. An operator can safely operate the device using a foot pedal while sitting in the ambulance. With the help of Sacred Heart Medical Center, our team was able to test our device on advanced CPR mannequins to ensure proper CPR standards, such as compression rate and compression depth, were met.

Mechanical Engineering

ENSC 36
Power Cycle Efficiency

Bryce Anderson
Nathaniel Leone
James McManus
Julien Hajjar

Advisor: Christopher Nicol
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Patrick Dempsey

The goal of our project is to analyze and optimize the efficiency of an Avista power plant by harnessing its waste heat energy and converting it to usable power. During the project we analyzed three different heat recovery systems at multiple Avista power generation sites. From the three heat recovery systems: Liquid Air Energy Storage (LAES), Organic Rankine Cycle (ORC), and Stirling Engine; our team chose the most effective system (LAES) and location (Boulder Park). This was justified by simulating heat flow models using Thermoflow and putting the data into a comparison matrix. Furthermore, we constructed a proposal plan to present to Avista on the viability of the chosen system. This proposal plan includes a cost estimate, construction design, and in depth research on the performance of the Liquid Air System combine with the Boulder Park site.

ENSC 37, Linear Agricultural Irrigation System

Mark Driver
Garrett Uhling
Boyd Knopp
Hailey Hunt

Advisor: Debra Offill
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Greg Wieck

We built a prototype that provides a proof of concept for Greg Wieck's idea of a continuous-feed linear agricultural irrigation system. The proof of concept is a sleeve component sliding over a pipe full of water that continuously extracts water from the pipe and distributes it to sprinklers. We made a scale model that demonstrates and tests this concept. This included making a set of engineering drawings for each subassembly (the mainline, sleeve, water baths, and chain and sprocket system). This prototype can then be used to market the idea and eventually implement it on farms across the country.

Mechanical Engineering

ENSC 38
Electromagnetic Diesel Engine

Ivan Cliff
Eli Dawson
Makenzie Ware
Devan Sauerbrey
Luis DeArtola

Advisor: Debra Offill
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Jim Weston

The Electromagnetic Diesel Engine represents the next generation of the internal combustion engine. Our group is exploring the benefits and costs of this type of system using a mock engine which is used for demonstration purposes. The benefits of this engine system is reduced emissions, more power, improved efficiency, and longer engine life. The core of the system is a redesign of a modern engine cylinder head and replacing it with a cylinder head that opens and closes its valves using electromagnetic solenoids rather than a traditional camshaft. The group contains five mechanical engineers who build off their mechanical knowledge by adding in electrical engineering and programing components.

ENSC 39
Flaring Crack Protection

Erin Weinbender
Sarah Abercrombie
Kylie Muntean
Paul Joseph Bickel

Advisor: Anthony Shoen
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Anthony Shoen

The goal of our project is to create a piece of protective gear for outdoor rock climbers. A flaring crack is a rock formation which is wider at the surface and narrows deeper into the rock. Climbers will place the device inside flaring cracks to help protect them if they were to fall while climbing. The scope of the project includes the detailed analysis and production of multiple prototyped models that satisfy the safety standards for protective climbing gear. We have tackled this problem through magnetorheological fluid research, geometric solutions, and machine design theory. Rock climbers often encounter flaring crack formations. Protective gear has not been designed for flaring cracks, which forces climbers to seek other gear placements or climb longer distances without adequate protection. This device will create a safer climbing environment and allow climbers to have more versatile options when selecting a rock face to climb.

Mechanical Engineering

ENSC 40
Fish Fighting Simulator

Bradley Price
Jake Sahli
Kyle Van Wyck
Spencer Hill

Advisor: Debra Offill
Sponsor: Sage Fly Fishing
Liaison: Kurt Van Wyck

Sage asked us to design, build, and test a prototype fish fighting simulator that would allow their R&D engineers to properly test the whole fly fishing setup: rod, reel, and line. Our goal for this project was to create a mechanically functioning prototype and program in several different "fish scenarios" that can be selected by the user. We accomplished our goal by using a motor and clutch combination to rotate a shaft that powers a spool. This spool pulls the line from the user into the machine, simulating the feeling of a fish swimming away from the user once hooked. Built into the programming are small variations in the swimming pattern, as well as different levels of force and drag that are applied by the machine. These patterns simulate different sized fish and levels of fighting.

ENSC 41
Heat Transfer from Finned Surfaces

Rutger Thiele
Joe Aiello
Brian Okazaki

Advisor: Jim Weston
Sponsor: Gonzaga University
Liaison: Dr. Talian Chen

The team was tasked with the job of developing a laboratory experiment that demonstrated the difference in heat transfer for various configurations of fin design (e.g., material, length, shape, spacing, surface finish, surface color) in both free and forced convection (including both shrouded and unshrouded configurations), enabling students of MENG 411/412 to determine the optimal configuration to maximize heat transfer. This year the team has completed research, created a working apparatus, and written a lab for students to perform, to get a better understanding of how different fin configurations can affect heat transfer. The experience the students will gain in this lab will be applicable to different kinds of heat transfer designs, such as a cooling system for a combustion engine.

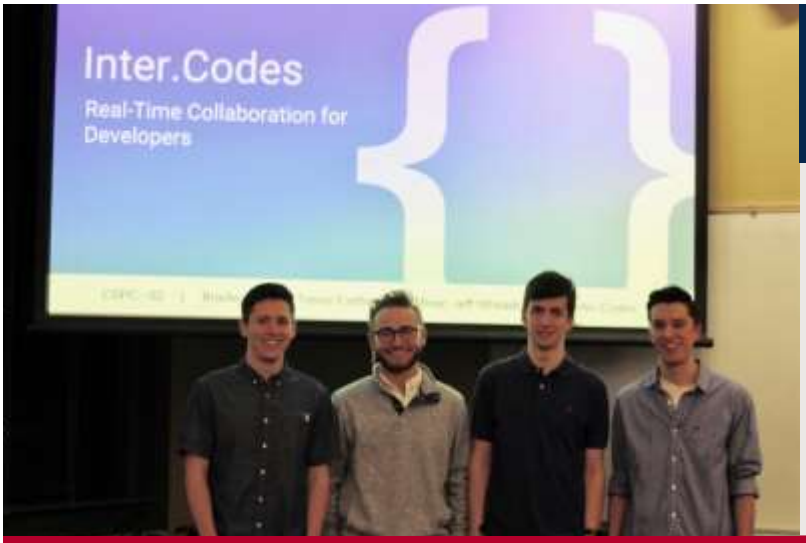
Computer Science

CPSC 01
Aurora

Kyle McCrohan
Scott Rein
Evan Conrad
Ethan Mahintorabi

Advisor: Gina Sprint
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Jason Schnagl

Aurora is an extendable note taking application that allows users to customize their note-taking experience. Aurora is built with an extension system so users can write code to add specific functionality and other users can download these extensions and integrate them into their Aurora experience. Our goal is to create a platform that gives note takers the flexibility to take notes in their personal style. We also intend on writing many extensions ourselves to support specific niche audiences such as programmers, debaters, engineers, and history students. We hope Aurora will bring value to many different market segments that have very specific note taking styles that are not suited by conventional note taking applications.



CPSC 02
Inter.Codes

Jeff Wheadon
Bradley Carrion
Will Miner
Trevor Farthing

Advisor: Riley Dillon
Sponsor: Trevor Flynn
Liaison: Trevor Flynn

Inter.Codes is a cloud based development environment for enterprise, education, and open source development. While we will be focusing on a small part of the platform, the finished product will be well equipped for both project management and development by introducing a well-designed file sharing system, a project management toolset, and a powerful code-editor for teams to collectively work together in real time. The scope of our project was specifically to focus on the development environment (IDE) and basic project management tools to build a baseline product for the larger Inter.Codes system. We have successfully built a completely collaborative file-sharing system into Inter.Codes along with basic project management tools such as the ability to create projects and manage users that can work on the project. This year, we have taken Inter.Codes from idea to a great foundation for Liquid Crystal Studios to build off.

Computer Science

CPSC 03
Loci (Mind Palace)

Katie Phillips
Max Baker
Julie Prichard
Ross Brandt

Advisor: Dr. David Schroeder
Sponsor: Gonzaga University
Student-Proposed Project
Liaison: Dr. Mike Nelson

As a team with no prior experience in virtual reality (VR) programming, we set out to learn something new! We wanted to use VR to create an immersive learning experience for curious minds. The Method of Loci is a common memorization technique used in competition, in which the user organizes the information into an imaginary "palace." This palace later acts as a visual representation of the topic and can be walked through mentally. With our program, people can build these palaces and explore them without the immense amount of concentration this technique normally requires! We have made this realm of learning discoverable and accessible to a larger community. We hope that VR continues to allow ordinary people participate in extraordinary experiences.

CPSC 04
Credential Security API with Facial Recognition

Elijah Michaelson
Brian Mackessy
Sebastian Vargas

Advisor: Dr. Nadra Guizani
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Chris Sharman

Currently, most websites use a combination of username and password to give their users access to their accounts. However, this method is prone to security issues since many users use duplicate passwords and/or common phrases for passwords. Our solution to this problem is that we are developing an API for web developers to implement a facial recognition log-in system for their website. We accomplished this by having using JavaScript for the front end while using Flask to run the facial recognition and classification for the back end, and we implemented various processing algorithms in addition to our facial recognition classifiers to help us accomplish our goal. Finally, after receiving initial feedback on our work, we had another senior design group implement our API into their website for their users to improve the security of their personal accounts.

Computer Science

CPSC 05
SpareSpace

David Hanany
George Kunthara
Evan Arends
Devin Roche

Advisor: Dr. Gina Sprint
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Dr, Daniel Stewart

Sparespace is a web-application that serves as a peer-to-peer marketplace for storage. Our goal is to provide a more affordable and alternative storage solution, in comparison to traditional "big-box" commercial storage solutions. To accomplish this, we created a platform that will enable Gonzaga University students to find and connect with off-campus students who lease off-campus houses, and members of the Spokane community to connect with nearby households that have unutilized extra space that they can offer for lease. Our platform allows users to post and offer their storage space for lease, search for nearby storage spaces, and message each other to discuss terms and pricing using our in-app communication system. In the end, people seeking storage will find storage options at a discounted rate, and households with unutilized space can offer their space for lease, earning them income.

CPSC 06
Tempo

Ryan Rozema
Alexander Susee
Britta Smith
Rudolph Bermudez

Advisor: Nadra Guizani
Sponsor: Gonzaga University
Student Proposed Project
Liaison: Dan Lenz

There are large amounts of unused health and accelerometer data left on phones and many fitness apps are solely focused on running. The Tempo app seeks to create a fitness experience based on a user's music preferences and fitness level which can pace them through a workout of their choice via music. Using our application, a user can match music to exercises of all kinds using our different methods of tempo generation, as well as using the types of music they enjoy most. All of these elements combined into one convenient product makes for a great addition to anyone's exercise routine.

Computer Science

CPSC 07
3D Timeline App

Owen Patera
Carter Riley
Nash Wuthrich
Wesley Arrington

Advisor: Rob Bryant
Sponsor: Gonzaga English Department
Liaison: Mike Mudge

Our goal was to create a 3D Timeline which displays multiple, intersecting timelines at once while also being interactive. This 3D Timeline application is dedicated to Myrtle Woldson and will be put on display in the Myrtle Woldson Performing Arts Center located at Gonzaga University. In collaboration with humanities students, we have created a program containing three paths corresponding to highlight different story-lines. Users can navigate through time looking for intersecting artifacts and view the media associated with each themed story line. There is also the ability to click on an artifact to learn more about it, play videos and view pictures. Finally, users navigate through the timeline in a first-person view to provide an interactive feeling.

CPSC 08
Gonzaga Campus Walking Tour

Harvey Hartwell
Holly Schwartz
Danielle Forrest

Advisor: Rob Bryant
Sponsor: Gonzaga History Department;
Veta Schlimgen
Liaison: Dan Lenz

The goal of this project was to design an augmented reality guided walking tour of Gonzaga University's campus. Through augmented reality, the user is able to see historical photographs superimposed on their screen with access to historical facts and stories relevant to specific location. The tours are able to adjust according to which buildings are nearest the user or the user can choose to view specific buildings. This application allows for adaptability and in-depth details about Gonzaga University that a visitor would normally not have access to.

Computer Science

CPSC 09
Concrete Delivery ID

Mark Old
August Murphy-Beach
Nick Vitha
Taylor Jones

Advisor: Dr. Yanping Zhang
Sponsor: ACME Concrete Paving, Inc
Liaison: Robert Seghetti

The Electronic Concrete Delivery Team working with ACME Concrete was tasked with dispersing RFID chips embedded with a unique identification number during the concrete manufacturing process. This identification number correlates to the specific concrete batch specification stored in the company cloud database, making way for ease of data retrieval. This multidisciplinary project consisted of teams of Computer Science, Mechanical, and Electrical Engineering majors (ENSC 24). The team of four Computer Science majors created a cloud database for the storage of batch specific information and an employee interface for data retrieval. The team of three Mechanical Engineers was tasked with the dispensing of the RFID chips at the batch plant and the creation of a manufacturing process to do so. The team of two Electrical Engineers was responsible for the writing of the RFID chips and data transfer to the Computer Science team. Stop by the Design Expo to see how ACME Concrete goes digital with batch specific identification.

CPSC 10
I-Con Monitoring

Benjamin Rieckers
Brandon Kelly
Joseph Loftus
Evan Srock

Advisor: Dr. Yanping Zhang
Sponsor: NIOSH
Liaison: Dr. David Parks

Injury and death occurring during maintenance is a real issue plaguing the surface mine industry. A total 83% of injuries are happening during maintenance and 29% of all injuries could have been prevented by following the lockout-tagout (LOTO) procedure. We plan to have a product that takes the first steps to updating the old-fashioned and paper-based LOTO. Our project is a web application that allows miners to electronically plan their maintenance instead of using the old paper-based method. By utilizing sensors on the mine we can determine if a machine is running or not and display this info to the miners. Our application will determine if the machines are off due to planned maintenance being performed. If it unplanned then foremen will be notified of the dangerous situation. Our application also features full login functionality and administrators that can manage employees on the system.

CEDE Senior Design, Final Presentations
Wednesday, May 2, 2018

Location & DAB Members	Project	Time	Faculty
Paccar 105 -ME			
DAB: John Olsufka	ENSC 22 Shock Absorber-Hmn Pwrd Tools	3:10pm	J McCall
Luke Blanchart	ENSC 25 Sensors for Body Vibration	3:40pm	Art Miller
John Olsufka	ENSC 17 Apex Trekking Axe	4:10pm	Art Miller
Jepson 017-ME			
DAB: Pat Ferro	ENSC 18 Micro Hydropower	3:10pm	Gabe Achenbach
Les Bohush	ENSC 35 Mechanical CPR	3:40pm	Renee LaRocca
Pat Ferro	ENSC 34 Hydrogen Fuel Cell Fitting	4:10pm	Pat Ferro
Les Bohush	ENSC 39 Flaring Crack Protection	4:40pm	Anthony Schoen
Jepson 109-ME			
DAB: Gary Weber	ENSC 37 Agricultural Irrigation System	3:10pm	Debra Offill
Henry Loehner	ENSC 38 Electromagnetic Diesel Engine	3:40pm	Debra Offill
Jim McCall	ENSC 40 Fly Fishing Simulator	4:10pm	Debra Offill
Eric Ryan	ENSC 41 Heat Transfer from Finned Surface	4:40pm	Jim Weston
Paccar 107 - ME			
DAB: Nick Questad	ENSC 21 Clip Installation	3:10pm	Ryan Leahy
Michael Maffeo	ENSC 19 Trailer Auto Control	3:40pm	Andy Johnston
Tom Zysk	ENSC 20 HoneyComb Core	4:10pm	Jake Laete
Brad Snow	ENSC 27 Hydrogen Fuel Cell Testing	4:40pm	Jeff Nolting
Herak 301-ME			
DAB: Phil Pintor	ENSC 23 Electro-Mechanical Faucet	3:10pm	Bob Reed
Phil Pintor	ENSC 26 Paint Boom Protection	3:40pm	Bob Reed
Alex Meyer	ENSC 30 Nano-Precision Medical	4:10pm	Sam Shoemaker
Ryan Leahy	ENSC 33 Sheet Metal Fan Base	4:40pm	Bryan Woodbury
Herak 123 –ME			
DAB: Doug Pooler	ENSC 28 Engine Test Skid	3:10pm	Jim Weston
Alana Wallace	ENSC 31 Probably a Pendulum	3:40pm	Tim Fitzgerald
Doug Pooler	ENSC 29 Hardness Test Fixture	4:10pm	Colleen Nolting
Alana Wallace	ENSC 24 Concrete Delivery	4:40pm	Mason VanLith
Herak 237- Civil			
DAB: Bob Turner	ENSC 05 WY Connected Vehicle Project	3:10pm	Rhonda Young
Adam Miles, Joel Lee	ENSC 09 Cincinnati Greenway	3:40pm	Rhonda Young
Jim Rolletto	ENSC 12 Zimmerman Trail	4:10pm	Scott Marshall
Herak 244- Civil			
DAB: Gilbert, Matsumoto	ENSC 01 Beaver Dam Analogs	3:10pm	Sue Niezgoda
Duncan, Little, Saxon	ENSC 02 Stormwater Treatment Monitoring	3:40pm	Aimee Navickis-Brasch
Simon, Moss, Matsumoto	ENSC 07 Hold that Tray!	4:10pm	Alex Maxwell
Moss, Fees	ENSC 08 Natural Fiber Enhanced Concrete	4:40pm	Lauren Heine

Presentation Schedule, Continued

Location & DAB Members	Project	Time	Faculty
Herak 245- Civil			
DAB: Jerry Tombari	ENSC 03 Cross Laminated Timber	3:10pm	Joshua Schultz
Scott Ratterman, Dannielle Haraldson	ENSC 04 N. Idaho Collaborative Ed	3:40pm	Aaron Zwanzig
Katy Allen, Sushil Shenoy	ENSC 10 Medical Office Building	4:10pm	Tony Stenlund
Melissa Verwest	ENSC 11 Underground Power Vault	4:40pm	Doug Forkner
Tilford 108- EE/CPEN			
DAB: Kaitlyn Helsing, Jeff Owen	ENSC 14 Polarized Helical Antenna	3:10pm	Bob Conley
Terra Donley, Paul Robertson	ENSC 15 Protective Schemes Lab	3:40pm	Kevin Damron
John Gibson	ENSC 16 Smart Pole Sensor II	4:10pm	Matthew McCauley
Gary Holmesmith	ENSC 36 Power Cycle Efficiency	4:40pm	Christopher Nicol
Tilford 105– Computer Science			
DAB: Dan Lenz	CPSC 06 Tempo	3:40pm	Nadra Guizani
Dan Lenz	CPSC 08 GU Campus Walking Tour	4:10pm	Rob Bryant
Michael Herzog	CPSC 01 Aurora	4:40pm	Gina Sprint
Mike Mudge	CPSC 07 3D Timeline App	5:10pm	Rob Bryant
Mike Mudge	CPSC 03 Mind Palace	5:40pm	David Schroeder
Tilford 107–Computer Science			
DAB: Melissa Migliuri	CPSC 09 ECDID	3:40pm	Yanping Zhang
Chris Sharman, Scott Broder	CPSC 10 NIOSH I-Con Monitoring	4:10pm	Yanping Zhang
Chris Sharman	CPSC 04 Neural Net Face Recognition	4:40pm	Nadra Guizani
Zach Howard	CPSC 02 Inter.Codes	5:10pm	Riley Dillon
Zach Howard	CPSC 05 SpareSpace	5:40pm	Gina Sprint

Thank you to our Sponsors!

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