

**SU**<sup>125</sup>  
SEATTLEU

# PROJECTS DAY 2017

CELEBRATING 30 YEARS

COLLEGE OF SCIENCE AND ENGINEERING

→→ PROJECT CENTER ←←

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## REAL WORK, REAL OUTCOMES



*ECE Team 17.1, with Andrew Choi, Khen Untalan and Peter Beery, tests their power quality monitor for Boeing.*



*Jennifer Cheung of ME Team 17.2 adjusts the particle flow system the team is testing for FLOW International.*



*Jonathan (JT) Robbins of INT Team 17.1 examines a wind turbine at the Wild Horse Wind and Solar Facility.*



*ENSC Team 17.2 with Alisha Piazza (ME), Luis Fernando Yescas (Universidad Centroamericana), Rachael Renkens (ENSC) and Jack Lasley (ENSC '15) setting up an emerging PVC pipe with a pressure sensor and turbidimeter to measure outflow to the Rio Ochomogo in Nicaragua.*

You are about to meet an impressive group of students. In September, each student team received a challenging assignment from a local industry sponsor. The students applied their theoretical knowledge, problem-solving abilities and considerable skill to deliver the solutions you'll learn about today.

The Seattle University Project Center partners with businesses, government agencies and nonprofit organizations who provide complex, real-world assignments for student design teams. The students you will meet today are one week away from graduating with degrees in civil engineering, computer science, software engineering, electrical engineering, environmental science and mechanical engineering.

The student teams have dedicated more than 1,000 hours of work to their projects. They have consulted weekly with their sponsor liaisons and have delivered quarterly status updates in person. Throughout the past nine months, they have gained meaningful experience, honing vital skills that make them competitive in today's job market.

Look through this booklet and identify some projects that interest you. Attend the team presentations and the poster session. Talk with the students and their sponsor liaisons. Ask lots of questions. We are confident you will be impressed with our students' ability to discuss technical issues and think on their feet.

**Learn more about sponsoring a project:** Contact Corporate Relations Manager Rachael Brown at 206-296-2822 or email [ProjectCenter@seattleu.edu](mailto:ProjectCenter@seattleu.edu).

# CELEBRATING 30 YEARS



*“From the beginning, we have enjoyed the support of leading external partners . . .”*

As the Puget Sound economy has diversified and grown over the past 30 years, the Project Center has grown, too. We now sponsor projects in civil and environmental engineering, computer science and software engineering, electrical and computer engineering, mechanical engineering and environmental science.

Although much has changed in the past three decades, many things have remained constant. From the beginning, we have enjoyed the support of leading external partners and we continue to witness tremendous professional growth among the students as they complete their projects each year.

As we look ahead to the next 30 years, the capabilities of the Project Center will continue to evolve. Design work has begun for a new STEM complex—the Center for Science and Innovation—that will connect Seattle U even more closely to the corporate, government and nonprofit organizations of our vibrant city.

# OF INNOVATION



*“Together, we are preparing a new generation of engineers and scientists . . .”*

Today, as we celebrate the Project Center’s 30th year, we also celebrate the accomplishments of our seniors and graduate students. We are grateful to the sponsoring liaisons and to our faculty advisers who have mentored the students throughout the past year. Together, we are preparing a new generation of engineers and scientists who will make an impact throughout the Puget Sound region and beyond.

Michael J. Quinn, PhD  
Dean  
College of Science and Engineering

Jean Jacoby, PhD  
Associate Dean and  
Project Center Director  
College of Science and Engineering

*“Whether I am building something from the ground up or improving an existing design, innovation becomes the manifestaton of my creativity.”*

CHRISTOPHER SALSURY, ME

*“Sponsoring a SU Senior Design project has been a valuable and rewarding experience for team members at Physio-Control. In addition to receiving a prototype designed and built by students, this experience fostered internal cross-functional networking and offered our team the satisfaction of engaging with and helping to train tomorrow’s engineers.”*

SCOTT MOSER, '14, ECE  
Embedded Software Engineer, Physio-Control

## UNDERGRADUATE ENGINEERING AND COMPUTER SCIENCE PRESENTATIONS

FRIDAY, JUNE 2, 11:30 A.M.

### SULLIVAN HALL WEST ENTRANCE

11:00 A.M.—Early Check-in and Registration

### PIGOTT AUDITORIUM, PIGOTT BUILDING 1ST FLOOR

11:30 A.M.—Welcome to Projects Day 2017

### SULLIVAN HALL WEST ENTRANCE

12:00 P.M.—Check-in and Registration

### 12:45–1:45 P.M., PRESENTATION SESSION 1

#### ROOM C5

**CEE 17.2 SEATTLE CITY LIGHT** Ross Dam Intake Access Bridge Load Evaluation and Repair

**CEE 17.3 SEATTLE CITY LIGHT** Seismic Evaluation and Retrofit of South Service Center Building A

**CEE 17.1 ALDERWOOD WATER & WASTEWATER DISTRICT** Picnic Point Wastewater Treatment Facility Effluent Reuse Feasibility

#### ROOM C6

**ME 17.2 FLOW INTERNATIONAL** Steady Feed of Fine Abrasives

**ME 17.1 SEATTLE UNIVERSITY** Collegiate Wind Competition: Mechanical Subsystems

**INT 17.1 SEATTLE UNIVERSITY** Collegiate Wind Competition: Wind Turbine Generator

#### ROOM 109

**CS 17.1 ASTRONICS ADVANCED ELECTRONIC SYSTEMS** SPECTRE 2.0

**CS 17.2 COMMERCEHUB** Cloud-based Data Collection for Repricing in Online Marketplaces

**CS 17.3 COSTCO WHOLESALE** Graph Advantage

#### ROOM 110

**ECE 17.1 BOEING** Power Quality Monitoring System for Aircraft

**ECE 17.2 DARRINGTON** Town of Darrington Street Lighting Project

**ECE 17.3 SEATTLE UNIVERSITY** Image Recognition & Video Recording for Autonomous Drones

### 1:45–2 P.M., BREAK

# SCHEDULE

## MASTER OF SOFTWARE ENGINEERING PRESENTATIONS

THURSDAY, JUNE 1, 6 P.M.

### ENGINEERING ATRIUM

6 P.M.—Social

### WYCKOFF AUDITORIUM

6:30 P.M.—Keynote speaker, Rob Jasper, MSE '94  
Manager at Pacific Northwest National Laboratory

7:30 P.M.—Student presentations

**MSE 17.1 Konnekti** Konnekti Mobile Application

**MSE 17.2 PACCAR** Global Repository of Plant Operations Data

**2-3 P.M., PRESENTATION SESSION 2**

**ROOM C5**

**CEE 17.4 SEATTLE PUBLIC UTILITIES** Delridge Combined Sewer Overflow Contingency Planning

**CEE 17.5 SNOHOMISH COUNTY PUBLIC WORKS** Type, Size and Analysis of Culvert Replacement to Provide Fish Passage

**ROOM C6**

**ME 17.3 THE LIGHTHOUSE FOR THE BLIND, INC.** Assembly Line Redesign

**ME 17.4 ROMAC INDUSTRIES, INC.** Romac Pipe Repair Clamp

**ME 17.5 LOW INCOME HOUSING INSTITUTE** Tiny House Heating, Lighting and Ventilation Systems

**ROOM 109**

**CS 17.4 EDGE SOLUTIONS & CONSULTING** CloudQube

**CS 17.6 GLOBALTOLOCAL** G2L Buddy for Android

**CS 17.8 THE LIGHTHOUSE FOR THE BLIND, INC.** Retreat Web Application and Admin Portal

**ROOM 110**

**ECE 17.4 KILOWATTS FOR HUMANITY** Improved Design of a Data Acquisition System to Monitor Microgrids in Less Economically Developed Countries

**ECE 17.5 MATANUSKA TELEPHONE ASSOCIATION** Wireless Broadband Last Mile

**ECE 17.7 PANTHERA** Project Spot Check

**3-3:15 P.M., BREAK**

**3:15-4:15 P.M., PRESENTATION SESSION 3**

**ROOM C5**

**ENSC 17.1 NORTHWEST AVALANCHE CENTER (NWAC)**

Decision-Aiding Maps for Travelling in Avalanche Terrain

**ENSC 17.2 SEATTLE UNIVERSITY** Watershed Hydrology Modeling of the Rio Ochomogo in Nicaragua

**INT 17.2 GLACIER PEAK INSTITUTE (GPI)** Low Cost Environmental Sensors

**ROOM C6**

**INT 17.3 INGERSOLL RAND COMPANY** Winch Simulation Analyzer

**INT 17.4 KENWORTH TRUCK COMPANY** Autonomous Tractor-Trailer Coupling System

**INT 17.5 T-MOBILE** Compact Robotic System

**ROOM 109**

**CS 17.9 PACCAR INC** PACCAR Sales Codes

**CS 17.10 PACCAR INC** PACCAR BOM Feedback

**ECE 17.6 PACCAR INC** Semi-Truck to Trailer Communication Phase II

**ROOM 110**

**ECE 17.8 PHYSIO-CONTROL** Solid-State Relay

**CS 17.11 PUGET SOUND ENERGY (PSE)** ServiceNow Mobile App

**CS 17.7 JUBILEE REACH** Jubilee REACH Online Retail Store

**4:15 P.M.-5 P.M., POSTER SESSION**

**5-6 P.M., RECEPTION**

**PROJECT CENTER STAFF**

<b>PROJECT CENTER DIRECTOR</b>	PROF. JEAN JACOBY, PhD
<b>CORPORATE RELATIONS MANAGER</b>	RACHAEL BROWN
<b>SENIOR ADMINISTRATIVE ASSISTANT</b>	LILY KING

**PROJECT DESIGN COORDINATORS**

**CIVIL & ENVIRONMENTAL ENGINEERING**

PROF. NIRMALA GNANAPRAGASAM, PhD, PE

**COMPUTER SCIENCE/ MASTER OF SOFTWARE ENGINEERING**

PROF. JASON WONG

**ELECTRICAL & COMPUTER ENGINEERING**

PROF. HENRY LOUIE, PhD

**ENVIRONMENTAL SCIENCE**

PROF. LYN GUALTIERI, PhD

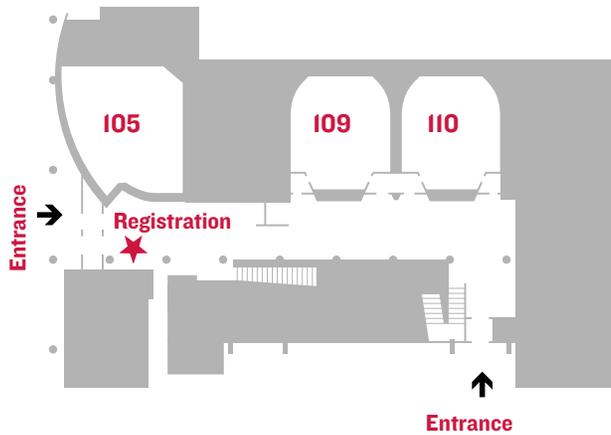
**MECHANICAL ENGINEERING**

PROF. YEN-LIN HAN, PhD (FQ, SQ)

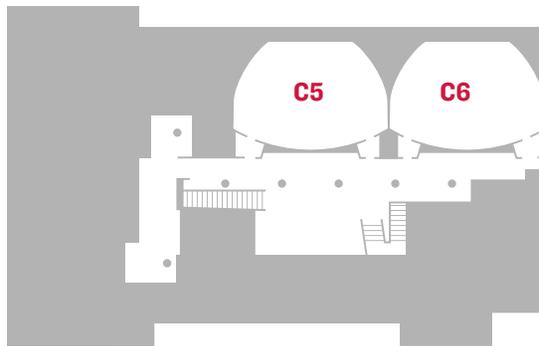
PROF. GREG MASON, PhD, PE (WQ)

# SULLIVAN HALL MAP

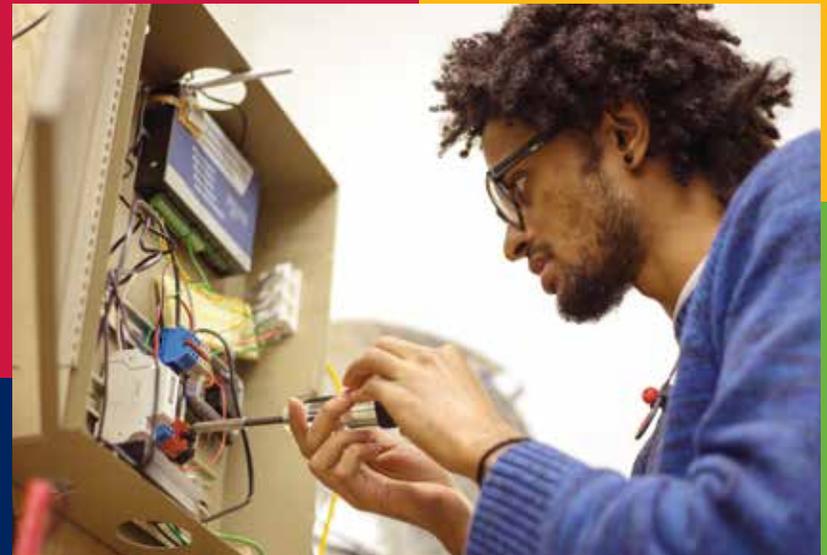
## MAIN LEVEL



## LOWER LEVEL



# PROJECTS



Abdul Kassamali of ECE Team 17, 4 puts together the improved Data Acquisition System used for collecting data about microgrids installed in less economically developed countries.

*“Projects like this one are a way to start building a community of subject matter experts. These young minds are not biased and we benefit from their fresh ideas.”*

DAVID SMETHURST  
President, Root Carbon

*“Our senior design project is teaching us how to approach a design problem, starting from the foundation and using resources in the best way in order to meet a deadline.”*

DEVON TERAYAMA  
ECE Team 17.5

# CIVIL ENGINEERING

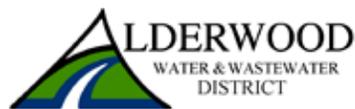
## CEE 17.1

### Picnic Point Wastewater Treatment Facility Effluent Reuse Feasibility

**SPONSOR LIAISONS:** Josiah Hartom, Paul Richart, PE  
**FACULTY ADVISER:** Michael Marsolek, PhD, PE  
**STUDENTS:** Melissa DiLoreto, Thida Nimkorn, Lam Nguyen, Narissa Tsuboi

Alderwood Water and Wastewater District requested a feasibility study for the reuse of their effluent from the Picnic Point Wastewater Treatment Facility (WWTF). This facility is already equipped with a membrane bioreactor that produces highly cleaned effluent. The team analyzed the Picnic Point WWTF effluent production and potential customer demands within the district's boundaries. A preliminary economic analysis was performed for each potential customer scenario including capital costs

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of pipe installation, tanks and pumping requirements from preliminary hydraulic analyses, maintenance costs, financing options and projected revenue. With this information the team and district selected a preferred customer. The preferred customer scenario was analyzed in detail with a specific pipe alignment, detailed hydraulic analysis, an AutoCAD package showing 30 percent details, as well as a sensitivity analysis and Monte Carlo simulation. The sensitivity analysis and Monte Carlo simulation factored the potential variability in demand and revenue from population growth, climate change and changing water consumption habits, allowing the team to project when it might become feasible for the district to begin reusing their water.

*Team CEE 17.2 with Liaison, Dan O'Sullivan, adviser, Josh Pugh and team members Chris Belson, James Esteban, Delton Oki and Yashar Zafari on an evaluation visit to the Ross Dam Intake Access Bridge.*



## CEE 17.2

### Ross Dam Intake Access Bridge Load Evaluation and Repair

**SPONSOR LIAISONS:** Dan O'Sullivan, PE, David Rowan, PE  
**FACULTY ADVISER:** Joshua Pugh, PhD, PE  
**STUDENTS:** Chris Belson, James Esteban, Delton Oki, Yashar Zafari

Seattle City Light asked the design team to perform a load rating and design a repair solution for cracked girders on the Ross Dam Intake Access Bridge at the Skagit River Hydroelectric Facility. This facility generates 10 percent of the electricity used by the City of Seattle and this bridge is the only access point for conducting maintenance at the dam intake structure. The team conducted

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a visual inspection of the bridge and detailed evaluation of as-built drawings to provide safe working loads for the structure. The team evaluated multiple design alternatives for mitigation of identified deficiencies and selected the optimum solution considering cost, constructability, environmental and historical concerns. The team provided Seattle City Light with detailed plans for the selected repair option, including budget requirements, construction sequence and analysis of results. Seattle City Light will finalize and perform the repair upon identification and allocation of funding.

## CEE 17.3

### Seismic Evaluation and Retrofit of South Service Center Building A

**SPONSOR LIAISON:** Robert Cochran, PE, SE  
**FACULTY ADVISER:** Michael A. Wright, PE, SE  
**STUDENTS:** Alexander Pangelinan, Nicholas Welling, Dean Zimmermann

Seattle City Light requested the design team carry out an ASCE 41-13 Tier 1 seismic evaluation of the South Service Center Building A. The building is located in Seattle at the junction of 4th Ave. S. and S. Spokane Street and serves as one of two power service centers for the City of Seattle. The building was originally constructed in 1924 with building additions made in 1937, 1974 and 2000. It is a multi-use building that contains four

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seismically independent structures known as; the original structure, the un-tanking tower, warehouse offices and a new 2,000 office building addition. The Tier 1 analysis was condensed to a report that was given to Seattle City Light to notify them of all potentially non-compliant components in the building. Furthermore, Seattle City Light requested the team to perform a building deflection analysis to evaluate the risk of the buildings colliding against each other in the event of an earthquake. The team designed mitigation concepts to alleviate the collision of adjacent buildings and developed the associated cost estimates for the designs.

**CEE 17.4**

**Delridge Combined Sewer Overflow Contingency Planning**

**SPONSOR LIAISON:** Brent Robinson, PE  
**FACULTY ADVISER:** Phillip Thompson, PhD, PE  
**STUDENTS:** Batseba Fukur, Maiya Loucks, Tyler Winn

Seattle Public Utilities (SPU) has a Federal Consent Decree with the United States Environmental Protection Agency to reduce the frequency of combined sewer overflows (CSOs) at its National Pollution Discharge and Elimination System-permitted combined sewer outfalls to an average of no more than one per year over the previous 20 years by 2025. In the West Seattle neighborhood's Delridge basin, two CSO outfalls currently exceed this allowed number. The CSO is discharged into nearby Longfellow Creek during wet weather, which threatens public and aquatic

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**Seattle Public Utilities**

health. The purpose of this project was to identify alternative solutions that would bring the two outfalls into compliance. Furthermore, the system had to maintain a maximum combined downstream flow to King County's Delridge Trunk Interceptor Sewer of 9.5 MGD (millions of gallons per day) and minimize the risk of sewer back-ups to area residents. The team considered the following alternatives: increasing offline storage, infiltration and inflow rehabilitation, storm sewer separation, green storm water infrastructure and facility control optimization. The team evaluated these options using the PCSWMM model. The team recommended a solution to SPU based on social, economic and environmental impacts that would meet the CSO reduction requirements.



CEE Team 17.5, Paul Caswell, Mireille Fogang, Dorothea Hannah and John Faille on the Quad.

CEE Team 17.4, Batseba Fukur, Maiya Loucks and Tyler Winn on an assessment visit to Longfellow Creek.



**CEE 17.5**

**Type, Size and Analysis of Culvert Replacement to Provide Fish Passage**

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**Snohomish County Public Works**

**SPONSOR LIAISONS:** Nova Heaton, PE, Ted Parker, Michael Randall, PE  
**FACULTY ADVISER:** Mark Siegenthaler, PE, PLS  
**STUDENTS:** Paul Caswell, Mireille Fogang, Dorothea Hannah, John Faille

Snohomish County Public Works requested the team design a replacement for the failed culvert on Glade-Bekken Creek located at 3801 220th Street SW, Stanwood, Wash. The original culvert underneath this location consisted of multiple 10-foot long sections of 36" diameter precast concrete pipe. The downstream portion of the culvert failed in 2015 and

the failed portion was replaced with a 42" diameter HDPE (high-density polyethylene) pipe. Neither the original culvert nor the replaced portion meets the current fish passage regulations. The culvert in its current state has been deemed a blockage for the natural migration of juvenile fish. The design team completed a culvert design that provides fish passage while meeting the concerns of Snohomish County Public Works, the Stillaguamish Tribe and local property owners. This design package included a drawing set, supporting documents for permit application and a design report.

# COMPUTER SCIENCE



## CS 17.1 SPECTRE 2.0

**SPONSOR LIAISON:** Doug Brown  
**FACULTY ADVISER:** Aditya Mishra, PhD  
**STUDENTS:** Luke Gregor, Joseph Janecek, Keegan Patterson, Ian Sullivan

SPECTRE 2.0 is a tool used by aerospace systems engineers to simulate logical behaviors through sets of logical gates in a graphical user interface. It can be used to simulate many different aircraft electrical systems, allowing engineers to make changes to such systems and test

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 ADVANCED ELECTRONIC SYSTEMS

them without needing to redefine software requirements, thus streamlining the process. SPECTRE has already passed through the proof of concept phase and our project team expanded its functionality and implemented feedback from its first version. We also restructured its user interface, introducing the ability to work with numeric values in addition to only binary logic and added several new types of logic gates.

## CS 17.2 Cloud-based Data Collection for Repricing in Online Marketplaces

**SPONSOR LIAISONS:** Dan Eneberg, Marcel Englmaier, Jim Ohlund, Jared Stiff  
**FACULTY ADVISER:** Eric Larson, PhD  
**STUDENTS:** Abdulrahman Almadani, Nguyen Nguyen, Kevin Snyder, Sean Taing, Ishan Tiwathia

CommerceHub, Inc. provides various services for online marketplace vendors, one of which is a repricing service. The service currently tracks price changes on Amazon Marketplace and then updates the vendor's prices using a rule-based system. The objective of the service is to keep vendors competitive in Amazon's rapidly changing marketplace by giving them a better chance at being the primary seller for a product. The current implementation gathers price changes from the Amazon site by periodically polling the marketplace. This polling

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**CommerceHub**

often results in data gathering and processing for product prices that have not been changed. This implementation is very slow and can often leave up to 50,000 price changes unprocessed at any given time. Furthermore, this system only works with Amazon, overlooking the other online marketplaces that vendors do business in. Therefore, the goal of the project was threefold: 1) Remove the bottleneck from CommerceHub's repricing service: 2) Make it compatible with two other online marketplaces (Jet and Walmart) and 3) Design the system to be scalable such that other marketplaces can be easily added in the future. This involved a complete redesign of the architecture involved in gathering the data before it is sent for processing.



Whiteboard strategy session for CS 17.3 team members Mariah Arnold, James Barracca, Giang Nguyen, Jacob Lee and Conor Leeds.

## CS 17.3 Graph Advantage

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 WHOLESALE

**SPONSOR LIAISONS:** Valerie Keller, Matthew Morris, Shrikant Palkar  
**FACULTY ADVISER:** Roshanak Roshandel, PhD  
**STUDENTS:** Mariah Arnold, James Barracca, Giang Nguyen, Jacob Lee, Conor Leeds

Graph Advantage is a visual sales recommendation system for Costco Wholesale Corporation, currently designed to be used by wine purchasers internal to Costco. Graph Advantage provides an

interface for wine buyers to tailor what type of information to consider. Machine learning was used in conjunction with Allegrograph, a semantic graph database, to determine relationships between types of wines and warehouses. These relationships were then used to recommend the product categories and at what price points they are expected to do well in a given warehouse.

## CS 17.4 CloudQube

**SPONSOR LIAISONS:** Robert Hedge, Kevin Luu  
**FACULTY ADVISER:** Mike Koenig  
**STUDENTS:** Colin Brinton, Jordan Callero, Alvin Jie, Nicholas Yates

IT consulting business Edge Solutions has coordinated a project for Seattle University team CS 17.4 in collaboration with T-Mobile. As T-Mobile transitions its software development and IT infrastructure to the cloud computing platform Pivotal Cloud Foundry, the team was tasked with implementing software testing into the application

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development and deployment pipeline at T-Mobile. Our team's solution leverages the open-source software testing platform SonarQube so that T-Mobile developers can apply its testing functionality to their continuous integration services. Implementation of the project will streamline the code testing process at T-Mobile and allow the company to maintain the overall quality of its codebase through testing, measurement and profiling of code performance against standard and custom rule sets across development teams within the organization.

CS Team 17.4, Colin Brinton, Jordan Callero, Alvin Jie and Nicholas Yates, work together on their Sonarqube application for EDGE Solutions & Consulting.



## CS 17.6 G2L Buddy for Android

**SPONSOR LIAISONS:** Gracious Gamiao, Fareeha Siddiqui  
**FACULTY ADVISER:** David Lillethun, PhD  
**STUDENTS:** Nolan Carlton, Taylor Graham, Max Hirata, Blake Hornung, Lie Evan Bendoro Kuntary

G2L Buddy, a diabetes management app for Android, is intended to enable diabetic people and their families to monitor their blood glucose, medication, food intake and physical activity all in one place. It is able to track the trends of each respective item over time and see their average monthly and yearly levels, so users will be empowered to manage their diabetes in a more proactive way when

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**G2L** GLOBALTOLOCAL

partnered with contemporary medicine. Global to Local is instrumental in assisting the people in need within the SeaTac/Tukwila community with their health care. Previously, Global to Local had launched culturally tailored physical activity programs, community health screenings and a diabetes management application for iOS. However, the vast majority of those in need of assistance with their diabetes care in the area own Android smartphones. To meet this need, Global to Local enlisted the help of Seattle University's Project Center to create an Android version of the diabetes management app, G2L Buddy.

## CS 17.7 Jubilee REACH Online Retail Store

**SPONSOR LIAISONS:** Jason Bryant, Randy Eng, Shawn Kim, Joe Rooney, Anthony Shen, Lois Yi  
**FACULTY ADVISER:** Richard LeBlanc, PhD  
**STUDENTS:** Anthony Absher, Dan Doan, Mohabat Gill, Jia Hui Li, Gabriel Ramos

Jubilee REACH is a nonprofit that collaborates with community organizations to build programs that serve those in need. A significant portion of their

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jubilee  
**REACH**

revenue comes from their physical thrift store based in Bellevue. With the growth of online markets, the task for team CS 17.7 was to create an online presence for the Jubilee REACH thrift store. CS 17.7 developed an online retail store as a solution to expand Jubilee REACH's market to a wider clientele. The application was developed using primarily Microsoft technology including Visual Studio and Azure.

**CS 17.8****Retreat Web Application and Admin Portal**

**SPONSOR LIAISONS:** Amy Koehl, Antonio Rosier, Raj Sidhu, Ian Stenseng

**FACULTY ADVISER:** Pejman Khadivi, PhD

**STUDENTS:** Frank Fuentes, Crystal Nguyen, Chris Trent, Alan Yu

The Lighthouse for the Blind is a nonprofit organization dedicated to the training and employment of people who are blind, deaf-blind and blind with other disabilities. Every year, there is a retreat in Seabeck, Wash. that hosts people who are deaf-blind from around the world. Currently, the entire application process is paper-based and is not efficient from different perspectives. The purpose of this project is to design and implement

**SPONSOR:**

**The Lighthouse for the Blind, Inc.**

a cloud-based web application to help create a fast, secure, convenient and accessible online system to replace the existing one. This involved an online database on SQL Server, an accessible web form and an easy-to-use admin portal for deaf-blind staff to manage the retreat. Our solution involved using ASP.Net MVC, C#, SQL, Azure and a variety of web development frameworks. Furthermore, the application has the capability of performing the required matching tasks for the campers and volunteers that will help the Lighthouse personnel and the campers during the annual retreat camp.

*Chris Trent and Alan Yu of CS Team 17.8 create a computer-based registration system for the international retreat at Seabeck for The Lighthouse for the Blind.*



*Site visit to PACCAR for Aaron Hoppe, Ho-I Lin, Ahren Young and Gemin Pak of CS 17.9. (Not pictured, Haoyang Li).*

**CS 17.9****PACCAR Sales Codes****SPONSOR:**

**PACCAR** Inc

**SPONSOR LIAISONS:** Kathy Meyers, Peter Paznokas, Jeff Swanson

**FACULTY ADVISER:** Yingwu Zhu, PhD

**STUDENTS:** Aaron Hoppe, Haoyang Li, Ho-I Lin, Gemin Pak, Ahren Young

PACCAR is one of the world's largest manufacturers of medium- and heavy-duty trucks. PACCAR trucks fall under three premium brands: Kenworth, Peterbilt and DAF. Along with offering premium quality trucks, PACCAR offers customers the ability to customize their truck in any way the customer sees fit. These options, which are represented

by sales codes, have a host of information associated with them. Our project focused on updating and redesigning PACCAR's sales code viewer so that PACCAR employees, from salespeople to engineers to order processors, can quickly and easily find an option that a customer has chosen and view information about that item. Our team has developed a web application using C# and ASP.Net that will allow PACCAR employees to do exactly that. Our application has updated and improved a significant and widely used tool at PACCAR.

## CS 17.10 PACCAR BOM Feedback

**SPONSOR LIAISONS:** Kathy Meyers, Reid Nabarette, Susanne Nickerson, Peter Paznokas  
**FACULTY ADVISER:** Mustafa Al-Lail  
**STUDENTS:** Yousef Alturaifi, David Hatt, Zean Rivera, Matthew Wenala

Kenworth and Peterbilt, subsidiary companies of PACCAR, previously used different processes for handling Bill of Material (BOM) feedback forms and change requests. The replaced system spanned multiple media including SharePoint, Outlook forms, and printed PDF files. The challenge was to provide a single standardized system for both divisions that would improve collaboration, increase efficiency and maintain consistency while being flexible,

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**PACCAR** Inc

reliable and ready to use. The new PACCAR BOM Feedback application creates and archives BOM form requests, Selection Feedback and Compatibility form requests for both PACCAR North American divisions. Key portions of the site include standardized forms, user tips, visual workflow and in-document searching that improve user experience. User interface is enhanced by the personalized group based views and a responsive design that increases mobility. Additionally, we developed solutions that allow administrators to easily customize portions of the form, alter form business logic, show and export reports and manage user roles and notifications.

## CS 17.11 ServiceNow Mobile App

**SPONSOR LIAISONS:** Obaid Khan, Christopher Laws, Ronald White Jr.  
**FACULTY ADVISER:** Jason Wong  
**STUDENTS:** Tyler Baker, Mason Kam, Bryson Shea, Anthony Wiratama

Puget Sound Energy is an energy company that provides electricity to over 1 million homes across Western Washington. Its Information Technology division is the backbone behind the day-to-day operation of its technological services, where

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**PSE** PUGET  
SOUND  
ENERGY

customers can get in touch with them. The CS 17.11 team created an incident management system mobile app that enables a manager to assign an employee or a group to rectify an incident that is about to breach or has breached a Service Level Agreement (SLA). It has a push notification that is tailored by urgency and an ability for the assignee to update the status of the incident from their smartphone so that the dispatcher can notify a customer quickly if it's resolved.

## ELECTRICAL AND COMPUTER ENGINEERING

### ECE 17.1 Power Quality Monitoring System for Aircraft

SPONSOR:

**BOEING**

**SPONSOR LIAISONS:** Dr. Kamiar Karimi, Evelyn Matheson, James Sennerth, Dr. Eugene Solodovnik  
**FACULTY ADVISER:** Paul Kostek  
**STUDENTS:** Rabi Asghar, Peter Beery, Andrew Choi, Justin Hoapili, Khen Untalan

The Boeing Company is a leader in aircraft development and manufacturing. They seek a solution to monitor the power quality of electrical systems on an aircraft. Team ECE 17.1 was tasked with creating a device that can read, calculate and store various power parameters such as voltages and currents for AC and DC electrical components and buses during

normal operating conditions. Boeing also requires that a transient in voltage or current be identified and recorded in high resolution. Similar systems that are currently available do not have the sensitivity or ability to identify transients that Boeing requires. A successful demonstration would be an advancement in this field. To accomplish Boeing's request, team ECE 17.1 designed a modular system. Modularizing the design allows users to adjust the number and type of signals being monitored. This creates flexibility in the choice of components and buses that can be monitored by a single system.



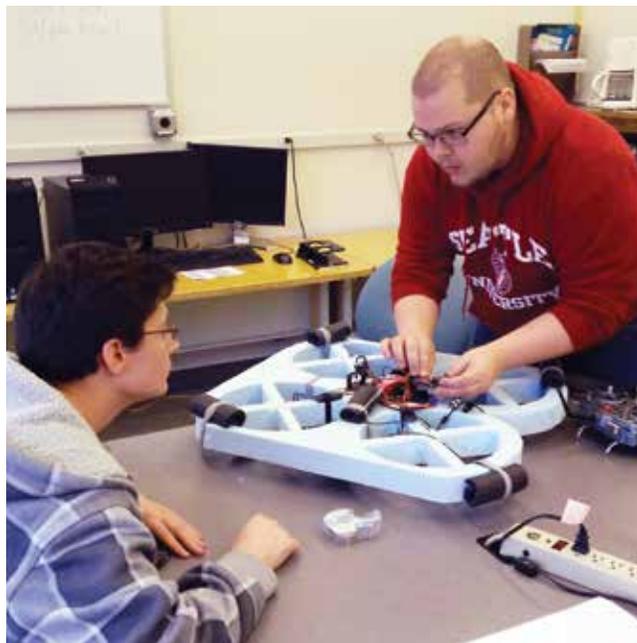
*Peter Beery of ECE 17.1 soldering the power system monitoring device the team designed for Boeing.*

**ECE 17.2****Town of Darrington Street Lighting Project**

**SPONSOR LIAISON:** Mayor Dan Rankin  
**FACULTY ADVISER:** Mehmet Vurkaç, PhD  
**STUDENTS:** Jay Butler, Adnane Ettayeb, Armand Shahbazian, Bryan Shaw

The town of Darrington asked team ECE 17.2 to design an energy-efficient, low-cost and visually pleasing lighting system for two main streets, Darrington and Seeman, that will serve as an aesthetic addition to these newly revitalized areas. The town of Darrington is a community of less than 1,500 residents located in the western foothills of the Cascade Mountains. Darrington serves as the entry point to the numerous recreation areas in the Mt. Baker-Snoqualmie National Forest. The project's ultimate goal is to contribute to a more appealing environment for both

*Joshua Ogden and Erik van Ginneken of ECE 17.3 salvage hardware from a quadcopter built by a previous team. They used the parts on the hexacopter they are 3-D printing and building this year that will autonomously follow and video record a moving object.*



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visitors and residents while providing the benefits of environmentally conscious and minimal-glare lighting. Our design incorporates fixtures and components that are readily available on the market. The lighting plan provides a detailed breakdown of the opening capital and labor costs, recurring costs, studies on light pollution and approaches to offsetting the environmental impact of the energy used to power the lights. Additionally, we have provided AutoCAD drawings that detail the location and load of the street lights, which will be necessary for the construction of the system. This lighting plan is comprehensive in the information provided and it can be used for the future implementation of the lighting system.

**ECE 17.3****Image Recognition & Video Recording for Autonomous Drones**

**SPONSOR LIAISON:** Richard Bankhead  
**FACULTY ADVISER:** Alvin Moser, PhD  
**STUDENTS:** Matthew Kunimoto, Joshua Ogden, Michael Pascua, Erik van Ginneken

The Seattle University Electrical & Computer Engineering Department asked us to create and develop a project to showcase the capabilities of the newly built Francis Wood, SJ, Nick Arvanitis, PhD, Innovation Lab. The team chose to create a flying hexacopter drone that

**ECE 17.4****Improved Design of a Data Acquisition System to Monitor Microgrids in Less Economically Developed Countries**

**SPONSOR LIAISONS:** Dave Goldsmith, Alex Kvenvolden, Steve Szablya, PE  
**FACULTY ADVISER:** Henry Louie, PhD  
**STUDENTS:** Braden Anderson, Linda Karout, Abdul Kassamali, Gloria Rianne Spath

KiloWatts for Humanity (KWH) is a nonprofit organization that designs and implements electrification projects to improve people's lives by providing access to electricity and fostering the development of sustainable business in less economically developed countries. Such projects include microgrids, which provide reliable electrical energy utilizing either solar or hybrid renewable energy systems. With each microgrid installation, KWH also installs a Data Acquisition System (DAS) that collects and transmits real-time technical data to a cloud server.

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uses image recognition to autonomously track and video record skateboarding events. Image recognition and flight control are facilitated by the open source softwares OpenCV and ArduPilot respectively, while high-definition video is captured by a GoPro HERO3. The mounts, arms and legs of the drone were created using state-of-the-art 3D printing and laser cutting tools featured within the new Innovation Lab.

SPONSOR: Kilowatts for Humanity



The data collected is used to monitor the status of the microgrid and study what works and what does not in order to improve future projects. KWH has identified several ways that the DAS can be improved. Team ECE 17.4 has enhanced the DAS by (1) Updating the DAS to use the latest data logger technology, (2) Enabling the data collected by the DAS to be written locally on a SD card in case of poor or lack of internet connectivity, (3) Miniaturizing the size of the DAS, (4) Creating a diagnostic system using cloud server technology to communicate alerts about potential failures in the overall system through the use of text message and/or email and (5) Creating a manual for the construction and operation of the device for standardization, easy replication and future implementation of the DAS design.

**ECE 17.5****Wireless Broadband  
Last Mile**

**SPONSOR LIAISONS:** Eric Anderson, Ruvin Lerman  
**FACULTY ADVISER:** Alan Johnston, PhD  
**STUDENTS:** Arden Leo, Chuong Nguyen, Taylor Roozen, Devon Terayama

Matanuska Telephone Association (MTA) is a telephone and Internet Service Provider based in Wasilla, Alaska. MTA offers internet service to the bulk of their subscribers through twisted copper pair connection. They also offer connection through fiber optic cable for residents of new housing developments. MTA would like to be able to provide all of their customers with high speed internet, while

**SPONSOR:** Matanuska Telephone Association



avoiding the high cost of running fiber to the home for all of their subscribers. MTA asked the team to research the possibility completing the last mile of the subscriber's network connection using a wireless technology. The team researched available wireless technologies, subscriber usage information, frequency spectrum availability, physical layout characteristics of the Wasilla region and available wireless equipment options. Using this research, the team has been able to recommend the best next step for MTA regarding implementing a fixed wireless network.

**ECE 17.6****Semi-Truck to Trailer  
Communication Phase II**

**SPONSOR LIAISONS:** Danny Baldwin, Jerry Ross  
**FACULTY ADVISER:** Shiny Abraham, PhD  
**STUDENTS:** Keoni Akina, Oshian Coates, Dai Nguyen, Kayz Nguyen, Ashley White

PACCAR is a global leader in semi-truck design and production. As technology continues to grow, PACCAR is interested in developing solutions that increase driver awareness of the trailer and cargo being transported. This enhanced awareness may lead to faster driver response times to critical situations while

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the vehicle is in transit. At the request of PACCAR, ECE 17.6 continued and improved team ECE 16.6's previous work on creating a system that displays sensor data from the semi-trailer to the driver through an Android application. Sensor data are collected and processed by a central data hub installed in the truck cabin. The Android application displays information relevant to trailer and cargo conditions in compliance with federal regulations for road safety.

**ECE 17.7****Project Spot Check**

**SPONSOR LIAISONS:** Rana Bayrakçismith, Agnieszka Miguel, PhD  
**FACULTY ADVISER:** Eddy Ferré, MSEE  
**STUDENTS:** Chleo Bales-Heisterkamp, Joshua Beard, Matthew Dioso, Noah Weller

Panthera Corporation is a 501(c)(3) non-profit organization dedicated to the conservation of all wild cat species. The organization's Snow Leopard Program conducts camera trap studies to estimate snow leopard population in the wild. Currently, hundreds of hours of labor are required per study to manually sort snow leopard images into sets of

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distinct individuals. Panthera asked the team to develop open-source software capable of performing this classification task automatically, potentially saving Panthera biologists considerable time. The team improved and automated existing recognition software known as HotSpotter. Improvements to the software include a redesigned graphical user interface and automation of tedious, time-consuming processes, such as selecting regions of interest within each photo and grouping different images into clusters of individual cats.

**ECE 17.8****Solid-State Relay**

**SPONSOR LIAISONS:** Matt Bielstein, Ken Holmes, Scott Moser, Craig Windish  
**FACULTY ADVISER:** Maren Nelson  
**STUDENTS:** Alfredo Juarez Galeana, Nabin Pariyar, Michelle Peck, Nick Prak, Liam Wiese

Physio-Control, Inc. develops and manufactures LIFEPAK® defibrillator/monitors that treat life-threatening physiological conditions such as sudden cardiac arrest. LIFEPAK TOUGH™ devices are some of the most durable, reliable and trusted lifesaving products

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on the market today. In an effort to continually improve device reliability, the company has asked team ECE 17.8 to design a solid-state relay (SSR) to replace an electro-mechanical patient isolation relay used in their devices. The intent of the SSR is to improve overall device robustness and ultimately help ensure the best patient outcome possible. The design uses semiconductor parts and considers electromagnetic compatibility as well as thermal and volume constraints.

# ENVIRONMENTAL SCIENCE

## ENSC 17.1

### Decision-Aiding Maps for Travelling in Avalanche Terrain

**SPONSOR LIAISONS:** Forest McBrian, Scott Schell  
**FACULTY ADVISER:** Lyn Gualtieri, PhD  
**STUDENTS:** Katherine Chanwiratana, Troy Chen, Kevin Coble, Cameron Strauss

The Northwest Avalanche Center (NWAC) currently has information on their website regarding avalanche danger and weather conditions in the Western Washington mountain regions. However, there is not much information available that highlights trails within the Snoqualmie Pass region that are in hazardous avalanche terrain. Snoqualmie Pass is in close proximity to Seattle, a major metropolitan area, making it a popular place for winter recreation. Using ArcGIS and Google Earth, team ENSC 17.1 produced maps incorporating the use of the Avalanche Terrain Exposure Scale (ATES) by outlining avalanche terrain in

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the backcountry of the Snoqualmie Pass region. ATES is used to evaluate the complexities of avalanche terrain. Team ENSC 17.1 used ATES by combining avalanche start zones, slopes, pathways and runout zones that intersect with commonly used trails. The final maps, displayed on NWAC's website, are aimed toward people who lack avalanche training and education but want to enter popular trails within this region. The interactive maps are used in conjunction with the information readily available on NWAC's website to increase winter backcountry safety for snowshoers and other backcountry enthusiasts. In addition to the maps, Team ENSC 17.1 surveyed and collected demographic information on snowshoers that will be used on NWAC's website in hopes to tailor future education programs to a wider audience.



Josephine Archibald, faculty adviser for ENSC 17.2 and Maria Jose Corder Fernandez, a student from University of Central America, install stage gauges for collection of data on the Rio Ochomogo in Nicaragua.

## ENSC 17.2

### Watershed Hydrology Modeling of the Rio Ochomogo in Nicaragua

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**SPONSOR LIAISON:** Chris Konrad, PhD, U.S. Geological Survey  
**FACULTY ADVISER:** Josephine Archibald, PhD  
**STUDENTS:** Spencer Burns, Katelynn Mulrooney, Rachael Renkens, Brendan Spohn

In 2008, the World Bank conducted a study assessing the degradation of Lake Nicaragua, the largest freshwater lake in Central America. This study highlighted the severe lack of data surrounding the hydrology and water quality of this lake despite its importance in providing drinking water, water for irrigational purposes and hosting a large variety of biodiversity. In 2014, the National Assembly of Nicaragua approved a plan to build a 172-mile canal that would transect Lake Nicaragua. The Environmental Impact Statement (EIA) associated with the canal project included a comprehensive review of the potential impacts resulting

from the construction of the canal. Team ENSC 17.2 was tasked with adding and analyzing hydrologic information about a major tributary to Lake Nicaragua by collaborating with students at the University of Central America (UCA). The UCA students collected data on the Rio Ochomogo, which was identified by the World Bank Study as a major sediment contributor to the lake. The team used the Soil and Water Assessment Tool (SWAT), combined with data collected by UCA students, to model the hydrologic properties of this river. The team created an online and accessible data repository with corresponding metadata, sensor calibration curves and the framework for conversion of raw sensor-gathered data to hydrologically relevant measurements, which will enhance and refine future scientific research with respect to this system in Nicaragua.

Troy Chen and Cameron Strauss of ENSC 17.1 survey and collect demographic information from snowshoers on Snoqualmie Pass.



# INTERDISCIPLINARY



## INT 17.1

### Collegiate Wind Competition: Wind Turbine Generator

**SPONSOR LIAISONS:** Alex Byrne, Matt Malkin

**FACULTY ADVISER:** Kevin Lybarger, MSEE

**STUDENTS:** Reuben Buehler (ME), Ricky Deng (ME), Jonathan (JT) Robbins (ME), Nick Root (ECE), Vitali Siumbeli (ECE), Kenny Weaver (ME)

Interdisciplinary team 17.1 designed, built and tested a prototype wind turbine generator in preparation for the Department of Energy's Collegiate Wind Competition (CWC), which will be held in 2018. The CWC is focused on promoting renewable energy and educating the next generation of wind energy engineers. Based on the CWC requirements, INT 17.1 designed

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and prototyped a permanent magnet generator with a passive rectifier. The generator was built from scratch using raw materials. In addition, the team designed an adaptable test bench capable of testing generators with a broad range of size, power and speeds. The test bench was utilized to test the generator and determine generator torque, power and efficiency curves. Testing data were used to make recommendations for improvement and to inform future design iterations for next year's team.



INT 17.1 and ME 17.1 on a visit to the Wild Horse Wind and Solar Facility. Both teams designed wind Turbine Generators to be entered in the 2018 Collegiate Wind Competition. Students (l-r) are: Vitali Siumbeli (ECE), Patrick Duffy (ME), Tan Dinh (ME), Kenneth Weaver (ME), Ricky Deng (ME), Vi Phan (ME), Reuben Buehler (ME), Nicholeus Root (ECE) and Jonathon Robbins (ME).



Stephen Pratty of INT Team 17.2 places a weather sensor for testing the team's Environmental Curricula for middle schoolers.

## INT 17.2

### Low Cost Environmental Sensors

**SPONSOR:** Glacier Peak Institute



**SPONSOR LIAISON:** Oak Rankin

**FACULTY ADVISER:** Rebecca Westby, PhD

**STUDENTS:** Austin Hansen (ENSC), Justin Ho (ENSC), Ivan Lapchakov (ECE), Stephen Pratty (ENSC), Michelle Tijja (ENSC), Stephanie Yip (ECE)

Glacier Peak Institute aims to provide hands-on, outdoor STEM educational programs using the Next Generation Science Standards (NGSS) for students in Darrington, Wash. They have asked the team to create an environmental sensor curriculum for a middle school audience that will be low cost, interesting to the students and relevant to the Darrington environment. The sensor design must also be streamlined and simplified through the design of Printed Circuit Boards (PCBs) to allow students to construct the sensors

themselves during a relatively short class time. The team designed three sensors and corresponding curricula, which include a soil contamination simulator, a weather station and a stream gauge. The sensors are interfaced with the Arduino Nano and ESP8266 microcontroller and programmed using the Arduino IDE. Each sensor has been paired with a NGSS-based curriculum that will include instructions and resources for teachers to lead the activities. These curricula contain a suite of activity worksheets that students can complete before, while and after building each sensor. One specific focus of each curriculum is to have the students analyze how their measured data and results reflect upon the town of Darrington.

### INT 17.3

#### Winch Simulation Analyzer

**SPONSOR LIAISONS:** Andrew Clagett, Anthony Jones, Eric Lentz, Wayne Osborn  
**FACULTY ADVISER:** Matthew Shields, PhD  
**STUDENTS:** Henry Co (ECE), Katie Hills (ME), Kerry Lane (ME), Kelly Pang (ME), Kesang Sherpa (ECE), Erin Youell (ME)

Ingersoll Rand is a global corporation that designs and manufactures industrial winches. When selecting a winch, the sales and engineering departments use a computer program named Winch Analyzer, which is outdated and difficult to use. The program uses a theoretical model to produce plots of motor power and torque versus rotational speed (RPMs), known as performance curves. To improve upon this, the INT 17.3 team

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Ingersoll Rand.

created a database-driven, web application now called WinchSim that uses new test data obtained from IR winches. The program can store these collected data and generate new, more accurate performance curves. Motor power and torque are calculated from test data and are used to generate a best fit curve. User feedback was incorporated into subsequent program iterations as part of an agile development design process used to improve the user experience. The application has an intuitive user interface with a clear instruction manual. Additionally, an administration page allows for the entry of new data points for existing winches, the addition of new winches and control of user permissions.

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and developed a fully automated and integrated system to improve the coupling process. The system detects the trailer using a stereo camera and two LIDAR sensors. A microcontroller is used for image processing, path calculation, and vehicle network communication. The camera, sensors and vehicle network provide constant feedback to ensure that the tractor stays on path and couples successfully. This feedback also allows for constant obstacle detection during the tractor's movement, satisfying the safety requirements. Overall, this system will save time, reduce risk and bring Kenworth one step closer to a completely automated truck industry.

### INT 17.4

#### Autonomous Tractor-Trailer Coupling System

**SPONSOR LIAISONS:** Stan DeLizo, Ted Scherzinger  
**FACULTY ADVISER:** Yen-Lin Han, PhD  
**STUDENTS:** Austin Chong (ECE), Christian Huessy (ME), Caroline Hofgaard (ME), Oleksiy Khomenko (ECE), Kirstin Schauble (ECE), Pauline Shammami (ME)

Kenworth, a heavy-duty tractor manufacturer, desires a product that fully automates the tractor-trailer coupling process. Currently, drivers must back up the tractor with limited visibility to align and couple, as well as manually adjust the tractor's suspension height to match that of the trailer. The manual coupling process poses risk of damage via collision with the trailer or obstacles along the path. INT 17.4 has designed

### INT 17.5

#### Compact Robotic System

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**SPONSOR LIAISONS:** Toaha Ahmad, Zachary Powers  
**FACULTY ADVISER:** Yen-Lin Han, PhD  
**STUDENTS:** Bradley Chew (ME), Eric Christie (ME), Derek Klaas (ME), Marguerite Eaton (ME), William Ah Tou (ECE), Natasha Petrus (ECE)

As the third largest cellular carrier in the United States, T-Mobile requires a robust validation process for new technologies including next-generation communication protocols and emerging mobile device hardware. Their current implementation leverages a robotic testing platform to

simulate user input to their network. However, this current solution is more expensive than necessary, occupies a great deal of laboratory space and requires a significant amount of technician labor. Team INT 17.5 was approached to design a compact system that will reduce the costs associated with handset testing by promoting mobility, durability and flexibility. The team has developed, designed and built a robotic testing system based on existing, open-source 3D printing technology that greatly improves T-Mobile's handset validation workflow.



*Kirstin Schauble (ECE) and Pauline Shammami (ME) command the cab of a Kenworth truck. Their team, INT 17.4, designed and developed an autonomous tractor-trailer coupling system.*

# MECHANICAL ENGINEERING

## ME 17.1

### Collegiate Wind Competition: Mechanical Subsystems

**SPONSOR LIAISONS:** Alex Byrne, Matt Malkin, DNV GL

**FACULTY ADVISER:** Matthew Shields, PhD

**STUDENTS:** Tan Dinh, Patrick Duffy, Kyle Kanuk, Vi Phan

The United States Department of Energy sponsors the Collegiate Wind Competition (CWC), a biannual competition in which teams of university students design and build wind turbines for the markets of their choice. ME 17.1 developed the theoretical framework for designing the blades and tower of a small wind turbine to be entered in the 2018 CWC. Field data from the Office of the Washington State Climatologist was analyzed and

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scaled to define the Weibull distribution for the wind regime at a desired turbine location. This analysis informed aerodynamic simulations conducted with Q-Blade, a publicly available software package, to assess performance, power and energy production of the blade design. The turbine tower was designed based on SolidWorks' deflection and buckling simulations. The blade design was scaled and tested in the SU wind tunnel to experimentally validate the computational aerodynamic performance predictions produced with Q-blade. This design framework will be applicable to future Seattle University CWC teams' wind turbine designs.



Connor Webb, Ali Tro, Bruce Beauchamp, Medo Youssef and Wyatt Arledge of ME 17.3 designed and constructed tooling to increase overall efficiency and ease strain caused by repetitive motions in the office easel assembly line for The Lighthouse for the Blind.

## ME 17.2

### Steady Feed of Fine Abrasives

**SPONSOR LIAISONS:** Max Cerami, Mohamed Hashish

**FACULTY ADVISER:** Greg Mason, PhD, PE

**STUDENTS:** Ariel Alcantara, Michael Barrett, Jennifer Cheung, Lucas Ware

Flow International Corporation designs and manufactures abrasive waterjet cutting machines (AWJ). Flow has interest in making thinner cuts (kerfs) with their AWJ. A major factor limiting the kerf width is the size of the abrasive particles. However, small abrasive particles are generally hard to feed in a consistent manner due to high frictional forces between the particles, causing the particles to clump together. Flow's current feeding systems

**SPONSOR:** Flow International Corporation



are not designed to address these issues and consequently cannot reliably feed these particles. Flow asked team ME 17.2 to research possible strategies and design and test hardware that can potentially address the issues associated with feeding fine abrasive particles. The team explored two approaches that focused on using vibration to induce powder flow. These approaches were evaluated based on the resultant flow rate and its consistency when a series of parameters were varied. The team analyzed and compiled the test data into a report that offers recommendations for further research and product development to be carried out at Flow International.

## ME 17.3

### Assembly Line Redesign

**SPONSOR LIAISON:** Brent Weichers

**FACULTY ADVISER:** Robert Cornwell, PhD, PE

**STUDENTS:** Wyatt Arledge, Bruce Beauchamp, Ali Tro, Connor Webb, Medo Youssef

The Lighthouse for the Blind is a nonprofit organization that provides manufacturing employment for the visually impaired. To improve productivity, maintain safety and make more manufacturing tasks available to employees without sight, many of the processes must be altered and improved. The Lighthouse for the Blind requested that team ME

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17.3 assess the assembly processes and design tooling to make assembly of office easels more efficient. Three lines of office easels were analyzed by the team. Assembly issues were identified and tooling was designed and constructed to increase overall efficiency as well as ease strain caused by repetitive motions. Some of the assembly issues addressed by the team include handling of small nuts and bolts, sharp springs and interlocking parts that have tight tolerances.

**ME 17.4****Romac Pipe Repair Clamp****SPONSOR LIAISON:** Delbert Eaton**FACULTY ADVISER:** Frank Shih, PhD**STUDENTS:** Kyle Bjornethun, Alex Bouck, Ana Davis, Zane Isim

Romac Industries, Inc. designs a wide range of pipe products including pipe repair clamps and end caps. The company asked the team to redesign their SS series pipe repair clamp. The clamp was originally designed in the 1960s and has since remained unchanged. Specifically, the new design needed to have a wider pipe diameter range, higher pressure rating and easier installation. To address

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these specifications, ME 17.4 redesigned the clamp features to include a simple wire latch system, hydrostatic gasket and adjustable shell. The three toggle latches spanning the width of the clamp are able to close using a range of common tools. Furthermore, the hydrostatic gasket allows for a lower pre-tensioning clamping force and uses the working fluid pressure to strengthen the seal against the pipe. The team machined a prototype of the new clamp and tested its functionality with a test apparatus supplied by Romac.



Kyle Bjornethun, Alex Bouck, Ana Davis and Zane Isim of ME Team 17.4 work on redesigning the pipe repair clamps for ROMAC Industries.



Sarah Brown, Chen Dong, Connor Leahy and Triet Tran from ME Team 17.5 take measurements of the Tiny House for the homeless for which they optimized the heating, lighting and ventilation systems.

**ME 17.5****Tiny House Heating, Lighting and Ventilation Systems****SPONSOR:****SPONSOR LIASONS:** Bradford Gerber,

John Syverson

**FACULTY ADVISER:** Keith Elder, PE**STUDENTS:** Sarah Brown, Chen Dong, Connor Leahy, Triet Tran

The Low Income Housing Institute (LIHI) is the leading provider of housing for homeless and low-income residents in the Seattle area. LIHI owns and operates villages of 96 square foot tiny houses for those who were previously homeless and provides them with resources to find jobs and stable housing. ME 17.5 was tasked with optimizing the heating, lighting and

ventilation in the tiny houses to minimize energy consumption and cost and to make the houses more comfortable for residents. Through the use of physical tests, building energy performance simulation and analytical computations, the team evaluated the benefits of changing the house orientation, enhancing window performance and placement and the impact of various insulation levels. LIHI was then provided with recommendations for improving tiny house energy performance and an economic analysis of the benefits that would result.

# MASTER OF SOFTWARE ENGINEERING

## MSE 17.1 Konnekti Mobile Application

**SPONSOR LIAISONS:** Shawn Fallah, Misha Fallah, Dr. Bill Poole

**FACULTY ADVISER:** Mike Koenig

**STUDENTS:** Temourshah Ahmady, Kellie Fontes, Nitika Goyal, Kyle McNutt, Scott Shipp

Konnekti is a mobile social marketplace platform in its funding stage. The team designed and built a mobile application to connect consumers seeking services with service providers. Anyone, including the underemployed or unemployed, can become a service provider and advertise

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**Konnekti**

their skills. Consumers can find and connect with a provider within a service and pricing range that appeals to their needs and means. Users are able to create, search and bid on posts and provide feedback on a provider and their completed service. Other features include in-app messaging and payment between provider and consumer. The team has built this mobile application using cross platform framework Ionic 2, and Google Firebase as data storage and is integrated with Braintree payment service.



Working with Konnekti, Temourshah Ahmady, Kellie Fontes, Nitika Goyal, Kyle McNutt and Scott Shipp of MSE 17.1 designed and built a mobile application to connect customers with service providers.



MSE Team 17.2, Hatoon Almoajel, Hesham Alsaeedi, Gayathri Pingali, Bakkiyalakshmi Ramanjulu and Nanya Ugwuh, created a system to revolutionize the data collection process for PACCAR's truck production factories.

## MSE 17.2 Global Repository of Plant Operations Data

**SPONSOR:**

**PACCAR** Inc

**SPONSOR LIAISONS:** Peter Paznokas, Dave Stevens  
**FACULTY ADVISER:** Israel Hilerio, PhD  
**STUDENTS:** Hatoon Almoajel, Hesham Alsaeedi, Gayathri Pingali, Bakkiyalakshmi Ramanjulu, Nanya Ugwuh

The Global Repository of Plant Operations Data (GRoPOD) is a system that will revolutionize the data collection process from PACCAR's truck production factories. PACCAR's operations division heavily relies on metrics that include truck production status, facility status, quality status and efficiency status. Today, the data gathering practice involves extensive coordination and communication between various roles and a subject matter expert from the operations

division. To help mitigate the complexities of data input, MSE team 17.2 envisioned a system that homogenizes the data collection process. This system provides a mechanism for a selective number of metrics to propagate in an automated manner to PACCAR's operations division for reporting the company's truck production status without delay. Overall, the system automates and parallelizes the collection of plant operation metrics coming from various sources and locations. The system's core functionality establishes a dependency on PACCAR's operations division as the single source of truth on metrics representing the company's truck manufacturing business.

# A LOOK BACK AT WHAT MOVES US FORWARD

## THE SEATTLE UNIVERSITY PROJECT CENTER WAS CONCEIVED IN 1986

when three forward-thinking engineering chairs envisioned an industry-sponsored design center to serve as the hub of the new engineering building.

Fast forward to 2017. The Project Center provides challenging engineering design projects that help students develop the skills employers are looking for: problem-solving, leadership, project management and communication. Through the Project Center, Seattle U forges strong bonds with leading Seattle companies, many of whom sponsor projects year after year.

1986

The Engineering Chairs' concept for a design center is pitched to the university.



1987

New engineering building opens and Engineering Design Center approved.

1987-88

Seniors participate in first sponsored projects with leading companies including Boeing, PACCAR and Puget Sound Energy.

1995

"Engineering Design Center" changes name to "Project Center."



1997

Computer Science and Software Engineering join the Project Center.



1998

100 unique sponsors and 250 projects

2017

2,922 student graduates  
221 unique sponsors  
700 projects

2021

Grand Opening of Center for Science and Innovation.

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- ★ **Kenworth**
- ★ **Kilowatts for Humanity**
- King County
- King Street Cooperative Preschool
- ★ **Konnekti, Inc.**
- La Ferme de Metras, LLC
- Leadership Advancement International
- ★ **Low Income Housing Institute**
- Masada
- Magnusson Klemencic Associates
- Management Assistance and Concepts Corporation
- ★ **Matanuska Telephone Association**
- MC Electric Vehicles
- McKinstry
- Mercent
- Microscan Systems Incorporated
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- Mike Larson
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- Port of Seattle
- Potters for Peace
- Pratt & Whitney Seattle
- Aerosciences Center
- PSF Mechanical
- Public Radio International
- ★ **Puget Sound Energy**
- Puyallup Integrated
- Circuit Company
- R Plus Consulting
- Rabanco
- Ralph C. Schlichtig
- REDC Energy
- Regence BlueShield
- REI
- RKM Holdings
- ★ **Robbins Company**

- Robert J. Kruse
- ★ **Romac Industries, Inc.**
- Root Carbon
- Rosebud Rebuilds
- Rotary International
- Sage Bionetworks
- Saint James Cathedral
- Schweitzer Engineering Laboratories
- Scout Analytics
- SDL
- ★ **Seattle City Light**
- ★ **Seattle Public Utilities**
- Seattle Silicon
- ★ **Seattle University**
- Semantium
- ServALot
- Siemens Healthineers
- Siemens Medical Systems
- SignalSet
- Sisters of Mary, Mother of the Church
- SNC Lavalin
- Snohomish County Public Utility District
- ★ **Snohomish County Public Works**
- Solution Recovery Services
- Sound Transit
- SRAM Corporation
- SRS Energy LLC
- SSE Group LLC
- St. Charles Catholic Church
- Society of Automotive Engineers
- ★ **Sundstrand Data Control Group**
- Svr Design Company
- ★ **T-Mobile**
- Tacoma Power
- Teledyne Photon Machines
- Terabeam Corporation
- Tetra Tech
- ★ **The Lighthouse for the Blind, Inc.**
- The Nesting Bird Yurt Company
- The Other Roadside Attraction
- Tinnea & Associates
- ★ **Town of Darrington**
- Triad Associates
- TSI Incorporated
- Two Degrees Consulting Services
- United States Public Health Service
- Universal Avionics System
- US Army Corps of Engineers
- US Bureau of Reclamation
- US Coast Guard
- USDA Forest Service
- U.S. Department of Energy
- University of Washington
- Valberg Corporation
- Vietnam Veterans of America Foundation
- Volunteers for Outdoor Washington
- Vopack USA Inc.
- WA Department of Transportation
- Washington Mutual
- Washington Publishing Company
- Washington State Department of Licensing
- Waste Management, Inc.
- Waterfront Construction
- Wave Consulting Group
- Wellness by Design
- Westinghouse Hanford Company
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