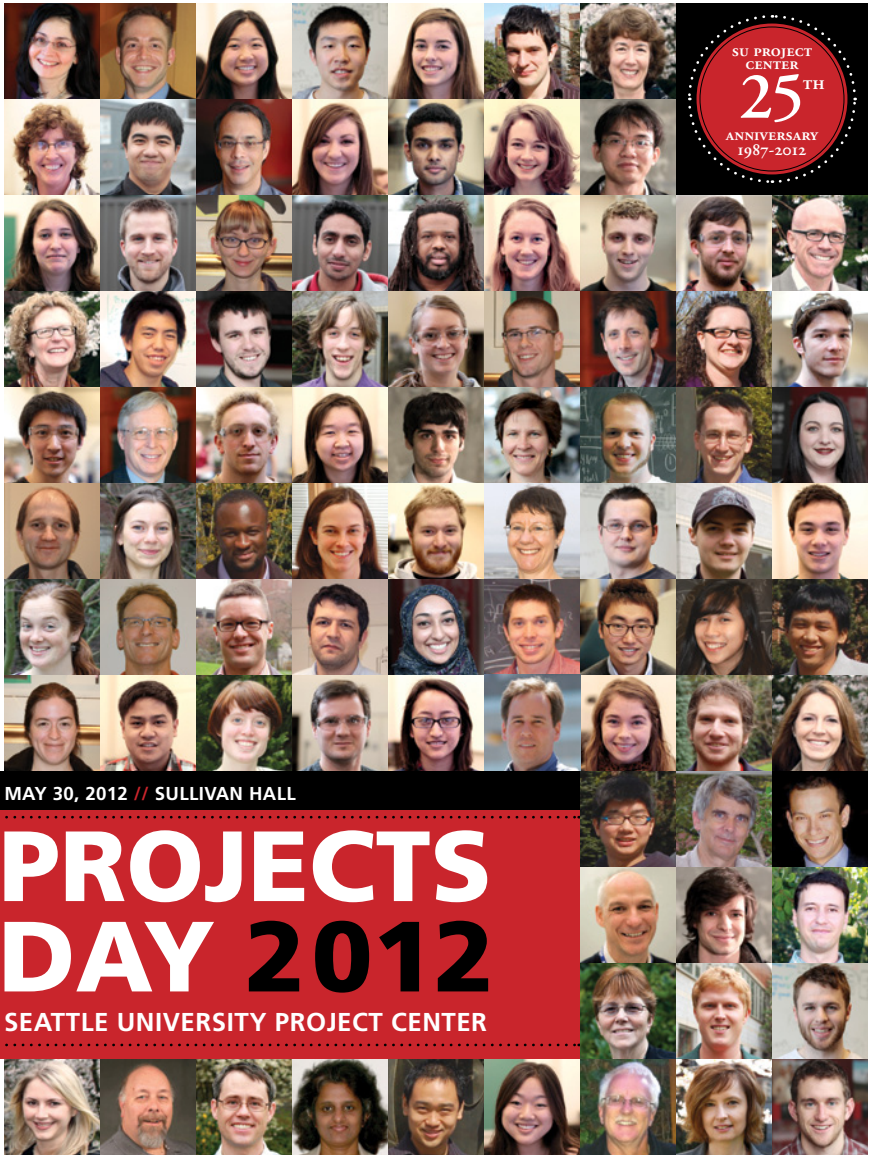


MAY 30, 2012 // SULLIVAN HALL

PROJECTS DAY 2012

SEATTLE UNIVERSITY PROJECT CENTER

SEATTLE UNIVERSITY
Founded 1891

WE ARE 25!

Seattle University Project Center is celebrating 25 Years of partnership with businesses, government agencies and nonprofit organizations regionally and nationally. Student teams from the College of Science and Engineering or Albers School of Business and Economics work on projects in the fields of computer science and software engineering, electrical and computer engineering, mechanical engineering, civil and environmental engineering, as well as marketing, management, financial analysis, economics, international business, sustainable business and new business ventures. Our students graduate with real-world experience in their fields along with invaluable teamwork and communication skills that place them ahead of their peers. Companies benefit from fresh student perspectives, community outreach, academic partnerships and targeted recruitment.

We are the Seattle University Project Center.

WELCOME MESSAGES

Welcome to Projects Day 2012! This year we have reached an important milestone: the 25th anniversary of the Project Center. We are glad that you are here to join the celebration. Today, you'll see for yourself what employers already know: our graduates have a strong understanding of fundamental principles and are excellent communicators. We are able to achieve these enviable results here at Seattle University because we keep our class sizes small, we give our students lots of rigorous homework, and we ask them to make presentations often. And then we cap it off with the Project Center experience, where our seniors work in teams, engage with external organizations, and apply the engineering skills they've learned to "real world" projects. It's clear that companies like what they see in Seattle University engineering and computer science students, because many of our graduates take full-time positions with the companies that sponsored their senior projects.

We are proud of our students and what they have accomplished. I encourage you to look through this program, identify some projects of interest, and attend the team presentations. If you have a question, fire away! I'm confident you'll be impressed with the ability of our graduates to think on their feet and talk about technical issues.

The Project Center is one of the jewels in the crown of the College of Science and Engineering. I want to thank the project mentors and the faculty advisors who have worked with the teams throughout the academic year. Most especially, I want to acknowledge the corporate sponsors who make it possible for us to provide our students with this terrific educational experience. Thanks to generous corporate support, we've created a strong tradition of excellence that will continue another 25 years and beyond!

Michael J. Quinn, Ph.D.
Dean, College of Science and Engineering

On behalf of the Albers School of Business and Economics, I want to welcome you to Seattle University's Projects Day 2012.

Similar to the Science and Engineering students, Albers business students undertake real world projects as part of their programs. Their experiential learning comes in the form of consulting, market research, and various other business projects for corporations such as Boeing, Microsoft, PATH, and many more. Sponsors want to solve problems, identify new processes, and target opportunities for growth. Albers MBA students, working in teams with faculty oversight, deliver top-notch findings and recommendations to the company.

While these projects have been part of the Albers MBA curriculum for many years, the Albers connection to the Project Center began in 2008 when the two schools agreed to collaborate as one central point for building partnerships linking Seattle University with businesses, government agencies, and nonprofit organizations throughout the Puget Sound region. We look forward to continuing cooperation between the schools and our community partners.

The business projects you will be seeing were undertaken in our International Business and New Ventures and Consulting classes. These projects represent over 25 that have been completed at Albers during this academic year.

Thank you for your support for these projects. Enjoy learning about them and getting to know the students involved.

Joseph M. Phillips, Ph.D.
Dean, Albers School of Business and Economics

PROJECTS DAY SCHEDULE

1:00 – 1:30 PM

Opening Ceremony
Pigott Auditorium, Albers School of Business and Economics

PRESENTATION SESSION 1 // 2:00 – 3:00 PM // SULLIVAN HALL, SU LAW SCHOOL

ROOM C5

CEE 12.2 **Seattle City Light** Newhalem Sickler Building Structural Evaluation
CEE 12.3 **Seattle City Light** Babcock Creek Crossing
CEE 12.4 **SU/King County** Real-Time Control in Stormwater Management

ROOM C6

ME 12.4 **PSF Mechanical** Hybrid Waste-to-Energy System Design and Feasibility Analysis
ME 12.3 **Photon Machines** Portable Laser-Induced Breakdown Spectroscopy (LIBS) System
ME 12.5 **St. James Cathedral** St. James Cathedral Energy Audit and Retrofit

ROOM 109

CSSE 12.3 **PACCAR** SmartSearch v2.0
CSSE 12.4 **SignalSet** SignalSet Mobile App
CSSE 12.1 **Alstom Grid** openPDC Historian Data Visualizer
CSSE 12.2 **Microsoft** Kinect Fun Labs Gadget Site

ROOM 110

ECE 12.6 **Seattle City Light** Large Scale Adoption of Electric Vehicles
ECE 12.2 **Kenworth** Truck Noise Cancellation
ECE 12.3 **MicroMouse** Micromouse Competition

3:00 – 3:15 PM

Break

PRESENTATION SESSION 2 // 3:15 – 4:15 PM // SULLIVAN HALL, SU LAW SCHOOL

ROOM C5

CEE 12.1 **Pierce County** Performance of Porous Pavement
CEE 12.5 **Snohomish County** Pavement Management Report
CEE 12.6 **US Bureau of Reclamation** Hydrologic Modeling for Dam Removal on the Elwha River
CEE 12.7 **US Bureau of Reclamation** Elwha Sedimentation Impact Project

ROOM C6

ME 12.6 **SU** Cooking Exhaust Fan Systems Project
ME 12.2 **Kenworth** Energy Efficient Lighting for Manufacturing Facility
ME 12.1 **Boeing** Composite Hydraulic Tubes

ROOM 109

MSE 12.1 **REI** REI IT Business Intelligence
MSE 12.2 **Washington Publishing Company** Publishing Automation Project

ROOM 110

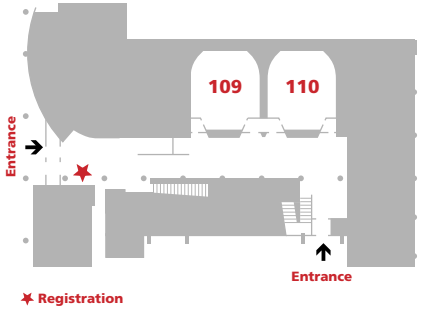
ECE 12.1 **IEEE** Appropriate Technology Wind Turbine
ECE 12.5 **SU** SU Broadway Garage Count System Design/Redesign Project
ECE 12.4 **PATH** Pulse Oximeter Probe Adapter

4:15 – 4:45 PM // SULLIVAN HALL

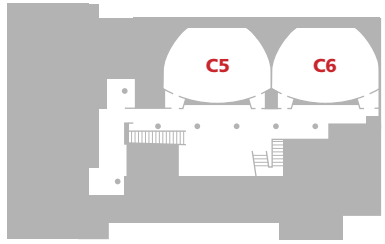
Poster Session
Reception

SULLIVAN HALL MAP

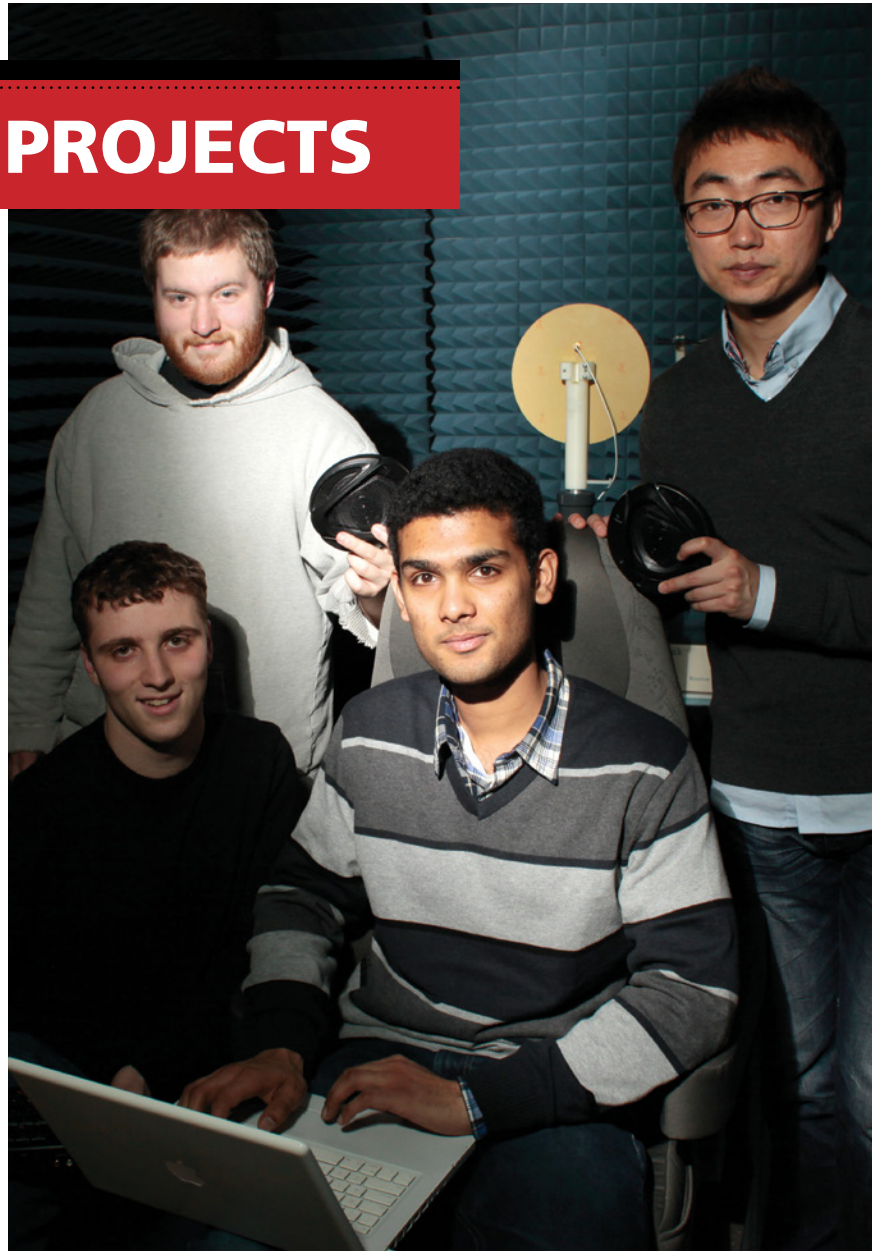
Main Level



Lower Level



PROJECTS



CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 12.1 // PERFORMANCE OF POROUS PAVEMENT

SPONSOR: Pierce County Public Works Road Operations Division
SPONSOR LIAISONS: Bryan Chappell, Jeff Rudolph
FACULTY ADVISOR: Prof. Carlos Herrera
STUDENTS: Kyler Flores, Fasika Gutema, Pratistha Kansakar, Lisa Stenberg

As part of Pierce County Public Work's (PCPW) commitment to sustainable development, PCPW is interested in learning more about porous pavement as an alternative to traditional impervious pavement. Porous pavement is a relatively new Low Impact Development technique that is becoming increasingly popular because it allows precipitation to infiltrate where it lands and thus reduces storm water runoff, provides local flood control, and recharges groundwater. Despite the numerous benefits of porous pavement, long-term performance and maintenance costs have not been extensively evaluated. Therefore, PCPW asked the team to examine and compile information on the different aspects of porous pavement. To address PCPW's request, the team performed four key tasks: (1) prepared a literature review examining the infiltrated water quality, water quantity, pavement durability, best maintenance practices, and the overall cost of porous pavement; (2) evaluated the long-term wear characteristics of existing porous pavements; (3) determined the best maintenance practices for porous pavement through infiltration rate testing; and (4) designed a monitoring system that can be used for future porous pavement installations.

CEE 12.2 // NEWHALEM SICKLER BUILDING STRUCTURAL EVALUATION

SPONSOR: Seattle City Light
SPONSOR LIAISONS: Robert Cochran, Owen Kohashi, Tom Pulford
FACULTY ADVISOR: Prof. Katherine Kuder
STUDENTS: Aimee Corn, T.J. Lynam, Maureen O'Sullivan, Rachel Vranizan

The Sickler Building is a steel warehouse owned by Seattle City Light (SCL), located in Newhalem, WA. The warehouse currently functions as an office, gymnasium, and storage facility of key replacement parts for the three dams SCL operates along the Skagit River. Originally constructed in northeastern Washington, the warehouse was later moved to its current location. During reconstruction, the warehouse underwent multiple modifications, without adequate structural analysis. Considering that loads in Whatcom County are approximately four times greater than the building was designed for, SCL asked CEE 12.2 to confirm whether or not the structure meets codes for snow, wind, and seismic loading. The team analyzed the structure on the basis of the county's codes, using both hand calculations and computer modeling in SAP 2000. The results of this analysis revealed the capacity of multiple structural

elements — such as interior columns, frame joints, and wind girts — to be deficient. To address these deficiencies, the team designed a structural retrofit. The final deliverables to SCL include analysis and design calculations, retrofit design concepts, a cost evaluation, and an executive summary.

CEE 12.3 // BABCOCK CREEK CROSSING

SPONSOR: Seattle City Light
SPONSOR LIAISONS: Dan O'Sullivan, Wanda Schultz
FACULTY ADVISOR: Prof. Jhon Paul Smith
STUDENTS: Collin Cabatbat, Rachel Dang, Cole Franklin, Daniel Richings

Seattle City Light (SCL) owns communication towers as part of the Newhalem Power Complex located in the North Cascades National Park. A temporary modular one-lane steel bridge over Babcock Creek currently provides access to these communication towers. Previous attempts at making a crossing failed due to heavy winter debris flow and spring runoff. Team CEE 12.3 was asked to develop two designs for permanent crossings—one consisting of abutments for the existing modular bridge and the other consisting of a new vented-ford crossing. The team has provided designs for both structures along with cost estimates and construction plans. SCL will assess the team's recommendations on structural longevity and cost-benefit and decide which option will serve as a viable crossing.

CEE 12.4 // REAL-TIME CONTROL IN STORMWATER MANAGEMENT

SPONSOR: King County, Seattle University
SPONSOR LIAISON: John Phillips
FACULTY ADVISOR: Prof. David Jacobs
FACULTY LIAISON: Prof. Wes Lauer
STUDENTS: Emily Berg, Cindy Halim, Nicole Nakaoka, Anneliese Sytsma

King County and Seattle University's shared interest in the improvement to stormwater management tools has led to the investigation of real-time control in stormwater management for combined sewer overflow (CSO) control. OptiRTC, a new real-time control technology developed by GeoSyntec Consultants, Inc., presents the ground-breaking possibility of operating a detention tank and a rainwater harvesting cistern in the same tank structure. The focus of the project was to evaluate the performance of an OptiRTC valve on the detention tank at Sullivan Hall Law Building on the Seattle University Campus. This retrofit will serve as a means for further research and implementation of OptiRTC technology in King County and presents a stormwater harvesting opportunity for Seattle University. The team developed an EPA SWMM5 hydraulic model of the existing conditions of the Seattle University campus to evaluate the effect of OptiRTC control on system performance. The team also developed construction documents for the proposed valve installation. The student design supported the acquisition of a grant from the Water Environment Research Foundation (WERF) that will allow Seattle University, in partnership with GeoSyntec, to install the valve during summer 2012. The team also evaluated two rainwater harvesting options that would allow Seattle University to use the new on-campus cistern created by the installation of the OptiRTC valve.

CEE 12.5 // SNOHOMISH COUNTY PAVEMENT MANAGEMENT REPORT

SPONSOR: Snohomish County Public Works
SPONSOR LIAISONS: Joyce Barnes, Max Phan
FACULTY ADVISOR: Prof. Ryan Avery
STUDENTS: Ryan Adachi, Ethan Belen, Daniel Pichardo, Hannah Rolston

Snohomish County Public Works requested a pavement management report to effectively prioritize repairs and manage funds. Prior to the completion of the project, the Airport, Parks and Facilities departments did not have an inventory of documented pavement distress data for the existing conditions of low volume roads, trails and parking lots under their jurisdiction. Through walking surveys of the designated paved areas, Team CEE 12.5 has constructed a comprehensive pavement management report, which includes distress data, pavement condition scores,

preservation methods, prioritization recommendations, and a cost analysis for improvements at each location. In addition, a detailed reconstruction was designed for the site requiring the most extensive repairs. All rehabilitation designs are compliant with Washington State Department of Transportation and other relevant guidelines, as well as existing site constraints and appropriate performance goals.

CEE 12.6 // HYDROLOGIC MODELING FOR DAM REMOVAL ON THE ELWHA RIVER

SPONSOR: U.S. Bureau of Reclamation (USBR)
SPONSOR LIAISONS: Jennifer Bountry, Tim Randle
FACULTY ADVISOR: Prof. Wes Lauer
STUDENTS: Kevin Cook, Justin Milne, Kristin Pesman, Katrina Schwab, Jim Shannon

The Glines Canyon and Elwha Dams, located on the Elwha River on Washington State's Olympic Peninsula, are being removed as part of the largest dam decommissioning project in United States history. To support the project, the U.S. Bureau of Reclamation (USBR) requested that Team CEE 12.6 develop a tool to quickly evaluate changes in discharge and reservoir water levels associated with potential modifications to the dam removal and reservoir drawdown schedule. In response, the team developed a computer model that routes flow through each reservoir. The program accounts for potential changes in the geometry of the overflow structures and predicted changes in reservoir geometry caused by sediment redistribution. It also links with flow forecasts published by the National Weather Service's Advanced Hydrologic Prediction Service. The tool allows USBR to ensure that drawdown rates remain within safe limits that minimize downstream impacts, reduce landslide risk, and track how redistribution of sediment within the reservoirs affects reservoir routing.

CEE 12.7 // ELWHA SEDIMENTATION IMPACT PROJECT

SPONSOR: U.S. Bureau of Reclamation (USBR)
SPONSOR LIAISONS: Jennifer Bountry, Tim Randle
FACULTY ADVISOR: Prof. Wes Lauer
STUDENTS: Mark Beggs, Marshall Kosaka, Anna Sigel, Renee Vandermause

The Elwha and Glines Canyon Dams, located on the Elwha River near Port Angeles, WA, are currently being deconstructed as part of a plan to restore the Elwha River ecosystem. When the dams are removed, a portion of the 24 million cubic yards of sediment presently trapped within the reservoirs will begin moving downstream. The U.S. Bureau of Reclamation (USBR) has developed an adaptive management plan to address unexpected responses to the sediment pulse. To support the plan, USBR requested that the team analyze the potential hydraulic effects of a range of sedimentation scenarios on the Lower Elwha River. The team performed a preliminary analysis using an existing one-dimensional hydraulic model (HEC-RAS) and then created a two-dimensional hydraulic model (SRH-2D) that incorporated recent geographic, bathymetric and surveying data. The team's final deliverables include one and two- dimensional models, as well as design recommendations for using water level measurements at several sites along the lower river to update the USBR's adaptive management plan.

COMPUTER SCIENCE

CSSE 12.1 // OPENPDC HISTORIAN DATA VISUALIZER

SPONSOR: Alstom Grid
SPONSOR LIAISONS: Barbara Motteler, Manu Parashar
FACULTY ADVISOR: Prof. Lirong (Annie) Dai
STUDENTS: Brandon Hamer, Eric Makino, Everett Sullivan, Vinh Tran

Alstom Grid provides advanced electrical grid solutions used to meet electricity demands around the world. Their technologies and expertise ensure higher safety, reliability and capacity of power grids. The company currently has a rudimentary file-based historian that collects real-time data from an open-source software program, openPDC. The company asked the team to redevelop their historian with a more user-friendly interface, including data retrieval and visualization tool capabilities. Ultimately, the end-user should be able to (1) identify data available within the openPDC Historian; (2) offer the user the ability to select and view trends of available data; and (3) export subsets of the data into a human-readable format.

CSSE 12.2 // KINECT FUN LABS GADGET SITE

SPONSOR: Microsoft
SPONSOR LIAISONS: Kent Foster, Dan Waters
FACULTY ADVISOR: Prof. Eric Larson
STUDENTS: Aaron Brown, Daniel Hines, Pin-Tsung (Peter) Pan, Marie VerMurlen

Team CSSE 12.2 was tasked with creating a platform for Kinect Fun Labs and Microsoft that will allow the company to easily add and manage contests. Different groups within Microsoft host a number of various contests throughout the year. Typically, the platform for each of these contests ends up being created from scratch

and Microsoft would benefit from a reusable solution. The platform manages contest submissions and provides a public rating system for the submitted contest entries, to help promote creativity and submission to the contest. Kinect Fun Labs will use this project to host Kinect gadget development contests, with the intention of having the platform later used by other groups within Microsoft.

CSSE 12.3 // SMARTSEARCH V2.0

SPONSOR: PACCAR
SPONSOR LIAISONS: Mark Fredrickson, Jerry Ross
FACULTY ADVISOR: Prof. Jerry Williams
STUDENTS: Victor Halim, Saurav Kakshapati, Paola Ladino, Cyrille Mailley, John Soreño

PACCAR Parts has a parts catalog containing over 10,000 individual components. Finding the appropriate part for a given vehicle can be extremely daunting to anyone who does not have a deep understanding of how to search the existing catalog. PACCAR Parts asked the team to find and implement a better way to visually search through the parts catalog using Microsoft tools. PACCAR Parts provided a sub-section of the existing product catalog and the team designed and implemented an application to integrate the data of the given sub-section and expose it via a user-friendly, graphical interface.

CSSE 12.4 // SIGNALSET MOBILE APP

SPONSOR: SignalSet
SPONSOR LIAISON: Grady Karp
FACULTY ADVISOR: Prof. Adair Dingle
STUDENTS: Roger Bumgarner, Aaron Katz, Hudson Sadlier, James Siri

SignalSet plans to expand their market share of online tools for truckers by porting their TruckerLink application to the mobile platform. The team was assigned the task of porting basic functionality and expanding features using tools provided by the mobile environment. The team built the application to run on Legacy and newer versions of Android phones. Using GPS and camera features, the team was able to improve the overall experience and usability of the original TruckerLink application.

ELECTRICAL AND COMPUTER ENGINEERING

ECE 12.1 // APPROPRIATE TECHNOLOGY WIND TURBINE

SPONSOR: Institute of Electrical and Electronics Engineers (IEEE) Power and Energy Society Community Solutions Initiative
SPONSOR LIAISONS: Andrew Lybarger, Steve Szablya
FACULTY ADVISOR: Prof. Henry Louie
STUDENTS: Jordan Maier, Josh Peavler, Ayesha Pirbhai, Nichole Porter

The IEEE Power and Energy Society (PES) Community Solutions Initiative's (CSI) core philosophy is addressing issues related to accessibility of reliable electricity for developing communities. The CSI assigned Team ECE 12.1 with the task of developing a 100 watt appropriate technology wind turbine, that is able to charge a 12 volt battery and has a final price tag under $500 (USD). The final project goal is to provide a small wind turbine design and prototype to the CSI working group. The team designed a turbine that can be assembled in many developing communities using locally available tools, materials, and labor. To keep costs under the budget of $500, the team is using bicycle parts because of their accessibility in developing communities. The team constructed a simple wind turbine that met all design specifications required by CSI.

ECE 12.2 // TRUCK NOISE CANCELLATION

SPONSOR: Kenworth Truck Company
SPONSOR LIAISON: Alec Wong
FACULTY ADVISOR: Prof. Agnieszka Miguel
STUDENTS: Arihant Jain, Joseph McIntosh, Cheol Soon Park, Michael Parks

Kenworth Truck Company is a leading manufacturer of medium- and heavy-duty trucks, as well as an industry leader in providing fuel-efficient trucks. The team was asked to create a proof-of-concept active noise cancellation system that has the ability to be highly selective of wind, road, and engine noise. The prototype features three switches, which the driver can use to select between each noise source inside the truck. Adaptive filtering, in conjunction with microphones to produce noise references, was used to reduce each noise source.

ECE 12.3 // MICROMOUSE COMPETITION

SPONSOR: Seattle University
FACULTY ADVISOR: Prof. Al Moser
STUDENTS: Shannon Hitchen, Chris McDougall, Bobby Seidensticker, Hoang Tran

The Institute of Electrical and Electronics Engineers Micromouse competition challenges contestants to build a robot capable of autonomously mapping a maze, determining the fastest route from start to the center, and running that route as fast as possible. Seattle University had no solid infrastructure for competing, so it was the team's task to create a viable entry for the competition. The team was also tasked with creating a second robot so that more students can work on the project in the future. The robot is based around a microcontroller that gathers information of its surroundings using infrared sensors. It processes the data and sends the appropriate Pulse Width Modulated signals to a motor controller board, which amplifies those signals to drive the motors. The robot uses a Flood Fill algorithm to fully explore the maze, and a weighted version to find the fastest route to the center. The team's robot took 1st place at the competition, with a speed run time of 27.5 seconds.

ECE 12.4 // PULSE OXIMETER PROBE ADAPTER

SPONSOR: PATH
SPONSOR LIAISON: Paul LaBarre
FACULTY ADVISOR: Prof. Paul Neudorfer
STUDENTS: Ali Alaoui, Ferdy Kwee, Justin Shimasaki, Soroath Viseth

The mission of PATH is the application of technology to provide and improve healthcare in underdeveloped countries around the world. This project focuses on pulse oximetry, the measurement of a patient's blood oxygen levels. Hospitals and clinics in underdeveloped countries often receive donated equipment, including pulse oximeters. After long periods of use the equipment will naturally fail. This can result in a diverse assortment of incompatible and unused equipment. In the case of a pulse oximeter, the failure can be with either the oximeter itself or the probe, which is fastened to the patient's finger. The team was tasked with developing an adapter that will allow the usage of one probe (from the GE Tuffsat) with up to three different pulse oximeters from different manufacturers. This interface allows probe and machine to communicate with one another. The success of this project will enable developing countries to make full use of their mixed and matched pulse oximetry equipment.

ECE 12.5 // SU BROADWAY GARAGE COUNT SYSTEM DESIGN/REDESIGN PROJECT

SPONSOR: Seattle University
SPONSOR LIAISONS: Jay Heitman, Byron Lynch, Mike Sletten
FACULTY ADVISOR: Prof. Margarita Takach
STUDENTS: Adhanom Debas, Daniel Leng, Long Ly, Aziz Yuldashev

Seattle University's Broadway Garage is heavily used by students, staff and guests. To monitor the use of the garage and display the estimated number of vacant parking spaces, the Department of Public Safety incorporated a vehicle count system. The count system proved to be flawed, as it would miscount the number of vehicles in the garage, thus misinforming motorists of its vacancies. Seattle University has asked the team to redesign the vehicle count system to make it more convenient for motorists to access the garage, as well as to monitor activities in the garage. The team has redesigned the count system using parts from the previous system, inductive loops in the floor and the addition of photoelectric light sensors to enhance the proficiency and accuracy of the system. The newly designed system produces a count of vehicles with a combination of two sensors.

ECE 12.6 // LARGE SCALE ADOPTION OF ELECTRIC VEHICLES

SPONSOR: Seattle City Light
SPONSOR LIAISON: Dan Langdon
FACULTY ADVISOR: Prof. Xu-Sheng Chen
STUDENTS: Robert De Asis, Xin Geng, Justin Goar, Zhenbin Yang

Seattle City Light (SCL) is the public utility providing electrical power to the City of Seattle, Washington and parts of its metropolitan area, serving approximately 740,000 residents. SCL is trying to improve and develop facilities to accommodate the recent growth of pure electric vehicles (EVs). SCL asked the team to research the impact of a massive adoption of electric vehicles. They were given the task to work on two regions, a SCL facility in Newhalem, WA and the downtown Seattle area. The team was given following tasks; (1) estimate the potential electrical vehicle market in the next decades, (2) recommend locations for charging stations, and (3) provide alternative methods of charging the EVs. The students produced a design for charging stations at Newhalem and devised detailed recommendations for SCL to proactively encourage and manage EV usage with strategic placement of charging stations at parking garages and popular destinations. The use of Smart Grid technology in conjunction with charging stations can help SCL manage its overall service load.

MECHANICAL ENGINEERING

ME 12.1 // COMPOSITE HYDRAULIC TUBES

SPONSOR: The Boeing Company
SPONSOR LIAISON: Raj Sondhi
FACULTY ADVISOR: Prof. Frank J. Shih
STUDENTS: John Paul Dally, Sarah DeSanto, Yizhou Lin, Caitlin McCleary

The Boeing Company, established in 1916, is the world's largest manufacturer of both commercial and military aircrafts. In recent years, Boeing has begun using composite materials to replace traditional metallic components in its commercial airliners to reduce weight and improve efficiency. Team ME 12.1 was asked to research, design, fabricate and test hydraulic tubes made of composite material. The composite hydraulic tubes designed and fabricated by the team are 20 inches in length, 1 inch in diameter, and can hold an internal pressure of about 2000 psi. The tube prototypes use (1) conventional woven carbon fiber epoxy and (2) carbon fiber interlaced with carbon nanotubes. Testing on nanotube prototypes supports recommendations concerning the use of composite materials for hydraulic tubes in Boeing aircraft.

ME 12.2 // ENERGY EFFICIENT LIGHTING FOR MANUFACTURING FACILITY

SPONSOR: Kenworth Truck Company
SPONSOR LIAISON: Vincent Brown
FACULTY ADVISOR: Prof. Bob Cornwell
STUDENTS: Adrian Kirn, Theodore Lyons, Joshua Sandy

Kenworth Truck Company, a division of PACCAR Inc., operates a truck assembly plant in Renton, Washington. Kenworth asked ME 12.2 to develop a system to both reduce the energy consumed by the lighting system and supplement the existing power with renewable energy. The team studied current and development-stage technologies in solar power generation, motion sensing lighting controls, and high-efficiency light sources. The study indicated that the most cost-effective solution would be a combination of all three approaches. The team designed an adjustable frame for the solar panels to maximize the overall efficiency by increasing the total incident light on the panels. A motion sensing system was designed for the factory warehouse to limit the overhead lighting when possible. A number of energy-efficient lighting fixtures were studied with the goal of reducing the lighting load by up to 40%. The modular design of the proposed system meets Renton's industrial building codes, reduces lighting costs, and can be selectively implemented to maximize the return on investment.

ME 12.3 // PORTABLE LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS) SYSTEM

SPONSOR: Photon Machines
SPONSOR LIAISON: Steven Buckley
FACULTY ADVISOR: Prof. Christopher Stipe
STUDENTS: Chad Bartlett, Jonathan Brown, Lukasz Kutek, Kyle Ringstad

Photon Machines, Inc. designs and builds laser-based instruments for performing chemical composition measurements. The company's current product line consists of two desktop systems that use a technique known as Laser-Induced Breakdown Spectroscopy (LIBS). LIBS uses a high intensity laser to generate a plasma on the surface of an analyzed material. The plasma emits light that is collected and used to identify composition based on characteristic wavelengths. Photon Machines requested that Team ME 12.3 design, prototype, and test a portable instrument that fits into a backpack and can be operated by individuals with minimal training. The team assembled a 32-pound prototype using only the essential components required to perform accurate and repeatable measurements, including a computer, high-intensity laser, 1-channel spectrometer, heavy-duty backpack, lithium-ion battery, digital camera, and LCD touch screen. The functioning prototype correctly discriminates between common metal samples based on chemical composition.

ME 12.4 // HYBRID WASTE-TO-ENERGY SYSTEM DESIGN AND FEASIBILITY ANALYSIS

SPONSOR: PSF Mechanical, Inc.
SPONSOR LIAISONS: Jim Reynolds, Randy Tuminello
FACULTY ADVISOR: Prof. Kevin Chadwick
STUDENTS: Brian Johnson, Taylor Matsui, Benjamin Watson

Every day, more than 1,500 tons of wastes are disposed of in landfills across the Pacific Northwest. Each ton of waste contains the potential for approximately 2930 kWHr of energy. Team ME 12.4, in conjunction with PSF Mechanical Inc., researched and developed a prototype system to generate energy from landfill waste. The team analyzed and compared the cost of the prototype system to the cost of existing technology. The prototype system will convert waste into ethanol and electricity via a combined process of gasification, biochemical decomposition, and steam expansion through a turbine. The prototype system uses technology from several different companies, which PSF will integrate into a hybrid system to build waste-to-energy plants at several transfer stations. INEOS Bio, a petrochemical production company, has expressed interest in pursuing development of a local plant using their proprietary technology. It has been determined that an existing plant design from INEOS Bio will be more feasible for PSF than investing in the development and implementation of a system of their own.

ME 12.5 // ST. JAMES CATHEDRAL ENERGY AUDIT AND RETROFIT

SPONSOR: St. James Cathedral
SPONSOR LIAISONS: Larry Brouse, Dave Perozek, Jack Southall
ADDITIONAL ENGINEERING SUPPORT: Dick Alescio, Ed Bright, Keith Elder, Greg Koontz, Joe Llona
FACULTY ADVISOR: Prof. Teodora Shuman
STUDENTS: Ellen Ruotsala, Katherine Stinson, Madona Youssef, Sylvana Youssef

St. James Cathedral, built in 1907, is a historic landmark in the urban center of Seattle. The cathedral is looking to reduce its energy costs as well as improve its carbon footprint. The cathedral spends $60,000 per year on energy, with 60% going to steam and 40% to electricity. To address these high-energy costs, Team ME 12.5 conducted an energy audit. The audit analyzed the building's lighting and heating systems, as well as areas of heat loss through the structure. Using the results of the audit, several energy conservation measures were proposed, including: adding solar panels, switching the heating system to either a condensing boiler or ground source heat pump, and adding insulation. The energy savings of each measure were found

using computer models developed by the team from billing, structural and annual weather data. Each solution was analyzed based on equipment, installation and operational costs, efficiency, reliability, and carbon footprint.

ME 12.6 // COOKING EXHAUST FAN SYSTEMS PROJECT

SPONSOR: Seattle University Facilities
SPONSOR LIAISON: David Brugman
FACULTY ADVISOR: Prof. Mike Larson
STUDENTS: Bikramjit Bhangoo, Rodney Dwyer, Edward Guevara, Daniel Tunay

Seattle University Facilities Services is responsible for the maintenance and improvement of the university's campus. They have found that the kitchen exhaust systems of the Casey building, Chardin Hall, and Cherry Street Market are not energy- and cost-efficient. Of the three systems, the Cherry Street Market kitchen consumes the most energy every year. Facilities Services has requested that Team ME 12.6 perform an energy analysis of the system in the Cherry Street Market and propose improvements to reduce the energy costs. The improved system proposed by Team ME 12.6 includes: adding side panels to the hoods, lowering the makeup air temperature by 10 degrees F, installing variable frequency drives on the fan motors, and modulating the gas burners. These improvements will increase the efficiency of the original system and reduce the energy consumption, resulting in a payback period of much less than the stated target of 10 years.

MASTER OF SOFTWARE ENGINEERING

MSE 12.1 // REI IT BUSINESS INTELLIGENCE

SPONSOR: REI
SPONSOR LIAISONS: Geoffrey Lowney, Jeff McCutchan, Samantha Reed, Michael Schneider, Todd Wilson, Imran Yunis
FACULTY ADVISOR: Prof. Jeff Gilles
STUDENTS: Sandeep Abhyankar, Monirul Chowdhury, Doohyun Chung, Darren Julao, Sunny Le, Sarrah Mohamed

REI (Recreational Equipment, Inc.) IT has an existing system to manage problem reports and resolutions, time tracking, and other IT activities. This system does not provide an ability to analyze correlations and trends between problem incidents and corporate changes, operational efficiency or resource estimation. Team MSE 12.1 built RIBI — a centralized data warehouse that allows REI to see how IT changes during a specific timeframe impact other business areas leading to improved operational efficiency.

MSE 12.2 // PUBLISHING AUTOMATION PROJECT

SPONSOR: Washington Publishing Company
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FACULTY ADVISOR: Prof. Mike Koenig
STUDENTS: Ryan Johnson, Win Li, Heather Nakama, Juan Oviedo, Subhash Prajapati

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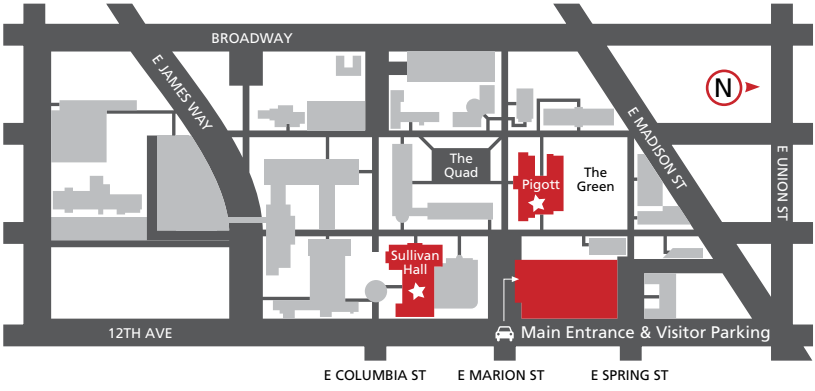

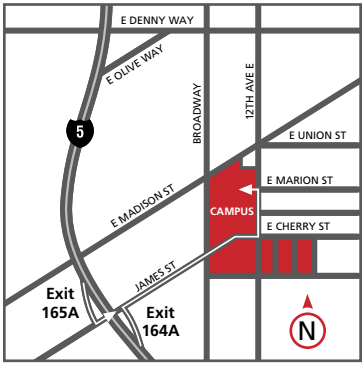

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