2025
Project Day

April 5, 2025
8:30 am – 3:00 pm
Education Building

FACULTY OF
ENGINEERING &
APPLIED SCIENCE

Welcome to PROJECT DAY 2025!

The Faculty of Engineering and Applied Science is proud to present PROJECT DAY 2025!

This conference-style event includes concurrent sessions where 4th year Engineering students present their final year design projects, and a Trade Show & Poster Session where projects will be on display.

The Trade Show & Poster Session gives you the opportunity to speak to students directly about the projects that interest you and/or your organization.

To learn more about each project, feel free to attend any presentation.

The University of Regina is situated on the territories of the nêhiyawak, Anihšināpēk, Dakota, Lakota, and Nakoda, and the homeland of the Métis/Michif Nation.

The University of Regina is on Treaty 4 lands with a presence in Treaty 6.

Table of Contents

"Failure will never overtake me if my determination to succeed is strong enough."

- Og Mandino

Sponsorships

Platinum

The Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS)

Gold

City of Regina
IEEE South Saskatchewan Section
Regina Police Service

Silver

Brownlee Beaton Kreke
Clifton Engineering Group Inc.
Ritenburg & Associates Ltd.
SaskWater
Shermco
StanTec
University of Regina Alumni Association
WSP

Bronze

Alfa Engineering Ltd.
Ministry of Highways

Long Term Donors

The U of R Engineering Project Day event would not be the success it is without the continued support of the engineering community in Southern Saskatchewan. This community supports us through project mentoring, evaluation feedback during the day, and also through direct financial and in kind support. Donors that have supported us over many years include:

ALFA Engineering Ltd.
Consulting Electrical Engineers

APEGS
Association of Professional Engineers & Geoscientists of Saskatchewan

CSCE CGC 1887

Saskatchewan

SaskTel

Shermco

Stantec

To these long time supporters, and to all who help make Project Day a success we say Thank You!

Sponsors

Platinum

Project Day 2025
is sponsored in part by:

A P E G S

Association of Professional Engineers & Geoscientists of Saskatchewan

The Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS) licenses and regulates approximately 15,000 engineering and geoscience professionals in the public interest in accordance with The Engineering and Geoscience Professions Act. Self-regulation recognizes that those in the engineering and geoscience professions are in the best position to assess the qualifications, competence, and conduct of those who practice engineering and geoscience in Saskatchewan.

APEGS sets admission standards for qualified engineers and geoscientists to become licensed professionals in Saskatchewan. To remain proficient in protecting the public, geoscience and engineering registrants are committed to ongoing professional development and guided by the geoscience and engineering Code of Ethics.

APEGS also investigates allegations of professional incompetence or professional misconduct of registrants and takes appropriate disciplinary action. In addition to regulating the professions, APEGS prevents the illegal practice of engineering and geoscience by unlicensed individuals.

Sponsors

Gold

Project Day 2025
is sponsored in part by:

REGINA

Often known as the Queen City, Regina is the second largest city in the province and is located on Treaty 4 territory, and homeland of the Métis.

Regina is rich in history and heritage and is one of Canada's fastest growing major cities. With plenty of amenities such as shopping malls, grocery stores, libraries, recreation complexes, movie theatres, parks and easy access to health care facilities, Regina has everything.

Sponsors

Gold

Project Day 2025
is sponsored in part by:

IEEE

Institute of Electrical and Electronics Engineers (IEEE) is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity. IEEE and its members inspire a global community through its highly cited publications, conferences, technology standards, and professional and educational activities.

Sponsors

Gold

Project Day 2025
is sponsored in part by:

REGINA POLICE SERVICE

The Regina Police Service is home to over 650 sworn and civilian employees. The Regina Police Service is dedicated to working together with the community to keep Regina safe, while demonstrating the values of respectful and professional service.

Thank You!

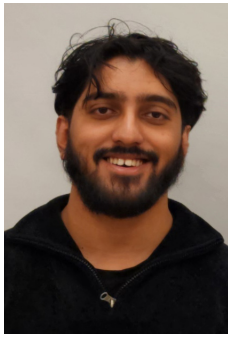
A big thank you to the people who help make Project Day possible:

- **Sponsors**
- **Industry Evaluators**
- **Student Volunteers**

Thank You from the Dean of Engineering & Applied Science!

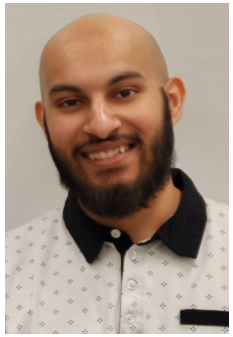
Electronic Systems Engineering

ESE 1: Re-LiFe Project



Shafkat Alam

Joshua Mae Bacor



Shaheer Hasan

The Re-LiFe Project addresses the growing environmental concern of recycling used electric vehicle (EV) batteries by giving them a second life as portable battery banks. Proposed by Sublime Solutions is a company passionate about promoting sustainability, supporting a circular economy and reducing waste by giving a second life to used batteries. This initiative aims to model sustainable energy solutions while ensuring safety and functionality. To meet university safety regulations, new batteries were used to prototype the design. The system employs a Battery Management System (BMS) to monitor and regulate cell performance, ensuring safety and efficiency. Battery status is displayed on integrated screens and on an online database providing an intuitive user interface. The Re-Life Project demonstrates a viable approach to extending the life cycle of EV batteries and thereby contributing to a more sustainable and energy-efficient future.

Electronic Systems Engineering

ESE 2: Care Track

Sami Alkassab

Farhan Chowdhury

Care Track is designed to enhance patient care and monitoring. The system consists of various modules that integrate advanced health-monitoring features, including heart rate measurement, ECG signal display, fall detection, medication dispenser, emergency alert functionalities, sleep monitoring, smart bed control and more.

Electronic Systems Engineering

ESE 3: Automated Power Factor Corrector (APFC)

Akhila Asokan

Tam Nguyen

Power factor correction is a crucial aspect of efficient power management, particularly for industrial operations where poor power factor can result in increased energy costs and penalties from utility providers. This project focuses on designing a small-scale prototype of an Automated Power Factor Corrector (APFC) system to meet a local business's requirements and serve the educational purpose of lab equipment. The system dynamically adjusts the power factor based on load variations by applying capacitor banks, ensuring optimal energy usage and reducing operational costs.

Electronic Systems Engineering

ESE 4: R.O.A.M. (Real-time Obstacle Avoidance & Mobility)

Sanzed Akbor Khan Tanveer Pahlobi Bahar Kyle Ziegler

R.O.A.M. (Real-time Obstacle Avoidance & Mobility) is a smart wheelchair designed to improve mobility and safety for individuals with movement impairments. It autonomously follows a path while staying centered in an alleyway, using LIDAR and ultrasonic sensors to detect and avoid obstacles. Users can also switch to manual control via a joystick. A built-in display provides real-time updates on battery percentage, control mode and obstacle status. By combining automation with user-friendly controls, R.O.A.M. offers a reliable and safe mobility solution.

Electronic Systems Engineering

ESE 5: YAPPER (Yet Another Point 2 Point Encrypted Radio)

Matthew Ross Jiashuo Zhang Jack Claude

The YAPPER is intended to implement ultra secure, point-to-point messaging on a handheld device. With quantum computing on the rise, many forms of encryption are now susceptible to being decrypted by unintended recipients. The YAPPER device is designed specifically to prevent such scenarios by using one-time pad encryption and true random number generators.

The device being engineered is intended to be a stand-alone device consisting of its own rechargeable power supply, LoRa transceiver, keypad, e-paper screen, true random number generator and key storage (for encryption purposes). To allow for communication, two identical devices will be developed to create a private point-to-point network.

Electronic Systems Engineering

ESE 6: BioKey

Divine-Favour Omogbemeh Ibiso Ekine

This project aims to develop a secure and efficient door access control system utilizing fingerprint authentication, facial recognition and remote unlocking functionality. The system will use a Raspberry Pico W and arduino wifi module for wireless connectivity. A fingerprint scanner and a camera will be implemented to authenticate users based on pre-registered fingerprints and images.

Upon successful authentication, the system will unlock the door, allowing access. Additionally, remote unlocking will be possible via a mobile application or an interactive screen. The system will store and manage fingerprint data locally, ensuring security and minimizing external dependencies. Facial recognition and image storage will take place in the cloud. The system will provide real-time alerts for unauthorized access attempts.

Environmental Systems Engineering

EVSE 1: Moose Jaw Crescent Park Serpentine Remediation

Sarah Morhart Lakshmi Mukesh Madasson Smith

Moose Jaw's Crescent Park is a public recreational area rich in culture and history. The Crescent Park Serpentine is a creek spanning the western length of the park. The Serpentine faces challenges including significant growth of duckweed and algae, reduced water depth and sediment buildup resulting from stagnation. These issues have led to unpleasant odours and a decline in the aesthetic appeal of the park. The objective of this project is to develop a permanent and effective capital works design that addresses the water quality, depth and stagnation. The designs had to take into account the history of flooding in Moose Jaw, the existing water quality of the Serpentine and the water quality at Plaxton Lake, as well as the existing hydraulic system from the Moose Jaw berm to the Moose Jaw River. Three designs have been developed: fully dredging the Serpentine to remove accumulated sediment and any plant material attached to the channel bed, installing a water treatment shed equipped with a centrifugal algae removal system to manage the algae and duckweed, and installing a pump station to flush the Serpentine, pumping water from the CPR dam back to the creek, increasing water depth and flow while reducing stagnation and ultimately curbing the growth of duckweed and algae. Design comparisons will consider water quality improvement, cost analysis, longevity and sustainability, flow control, regulatory compliance, and construction requirements and impact. The chosen design must successfully and permanently resolve the presented issues, improving the functionality and beauty of the park

Environmental Systems Engineering

EVSE 2: Foundation Design for Urban Neighborhoods on a Reclaimed Mine Site


Rudrasinh Thakor


Tirth Patel


Preston Williamson


Hardik Sharma

Developing urban infrastructure on reclaimed mine sites poses serious challenges due to ground instability, subsurface voids and unpredictable soil conditions. These factors can lead to structural failure if not properly addressed. This project aims to solve these issues by designing safe and sustainable foundations for multiple planned buildings on a reclaimed mine site in Canmore, Alberta. A hydrological assessment was conducted to evaluate groundwater conditions and flood risks, ensuring that water accumulation does not compromise foundation stability. Additionally, geotechnical investigations, including borehole testing, lab analysis, and geophysical surveys, were performed to assess soil strength, load-bearing capacity and settlement risks. To mitigate potential ground movement and ensure structural integrity, load and deformation modeling using SIGMA/W (GeoStudio) was carried out, allowing us to predict how different foundation designs would perform under various conditions. Based on these findings, optimized foundations were designed for each building, addressing site-specific challenges while ensuring safety, durability and economic feasibility. The final outcome is a comprehensive foundation and mitigation package that provides engineering solutions to counteract instability, reduce settlement risks, and support long-term structural resilience. By integrating hydrological, geotechnical, and structural analyses, this project presents an innovative and adaptable approach to tackling the risks of building on reclaimed mine land. The results offer a scalable framework for future sustainable urban development, ensuring that reclaimed sites can be safely repurposed while maintaining structural integrity and environmental responsibility.

Environmental Systems Engineering

EVSE 3: Design of a Green Infrastructure Pilot Project for the City of Regina


Emma Grimsrud


Nicole Kistanov

Green infrastructure combines engineered elements with naturalized areas and vegetation to restore hydrological cycles that have been disrupted. This project produced a conceptual design for a green infrastructure pilot project for the City of Regina. The primary objectives were to reduce the quantity and improve the quality of stormwater runoff from the Al Ritchie Recreation site. The site is 31520 m2, 52% of which is impervious. Three design alternatives were developed. A basic alternative considered a Phase 1 approach for the subsequent design, followed by Phase 2 with varying focuses of reducing impervious area and maximizing bioretention. These alternatives, along with a 'Do Nothing' alternative, were evaluated based on the following criteria: Runoff Reduction, Runoff Quality Improvement, Community Benefit, Initial Investment, Alignment with the City's Parks Master Plan and Maintenance Requirements. Results indicated that the bioretention focused design scored the highest overall with a score of 4.1 (out of 5) compared to 3.6 for the impervious area focused and 3.1 for the basic design. Notably, performance metrics were estimated to yield a 91% runoff reduction and a potential quality improvement, 70-90% total suspended solids removal and 40-60% phosphorus and nitrogen removal. The bioretention focused design also had a lower initial investment estimation (approx. $570,000) than the impervious area focused design (approx. $720,000). This design has the potential to greatly reduce the runoff and pollutants entering the storm system, incorporate traditional ecological knowledge of local indigenous groups through planting choices, and importantly, educate the public on sustainability and climate adaptation using educational signage.

Environmental Systems Engineering

EVSE 4: Soil Permeability Analysis and Mitigation for Agricultural Dugout Systems

Yongsu Kim Vlad Rontu Devin Kenny Adesola Adewuyi

The project addresses water retention failure in an agricultural dugout that has prevented it from being used as a livestock water source despite its favorable site conditions. Located northeast of Regina, the dugout captures surface water effectively but loses it rapidly through seepage, having maintained adequate levels for only one summer since construction. Our investigation combined field measurements, soil sampling, laboratory testing and topographical analysis to characterize both the dugout's physical properties as well as the underlying causes of water loss. The structure features an inverted truncated pyramid shape with measurements confirming substantial volume capacity. Technical analysis confirmed that while the dugout's strategic position optimizes water collection, the predominantly silty clay soil with fine sand areas permits excessive seepage.

Environmental Systems Engineering

EVSE 5: Geotechnical Review and Retrofit Design of Mount Polley Tailing Storage Facility in the Context of Climate Change

Emily Dietrich Aseel Abdulkareem Hannah Pederson Aedrian Valdez

This project examines concerns regarding the geotechnical safety of Tailings Storage Facilities (TSF) as they are subjected to the impacts of climate change. Increasingly extreme precipitation patterns pose a threat to the geotechnical stability of these complex facilities. To predict the impacts of extreme precipitation on TSFs, a climate change-scaling process was used to develop a precipitation dataset that reflects possible future precipitation patterns under a worst-case greenhouse gas emissions scenario. This dataset was entered into a GeoStudio model of the Mount Polley TSF in British Columbia, Canada. Traditionally, TSFs have been geotechnically modeled using a steady-state seepage approach. To more accurately predict the impacts that future precipitation could have on the facility, a transient-state seepage modeling approach was employed. This approach determines how the phreatic surface and resulting pore water pressure within the facility vary over time. When this modeling approach was employed, changes in phreatic surface and resulting pore water pressure were observed. These results suggest that the steady-state modeling methods currently employed to predict the geotechnical safety of TSFs may not fully capture the impacts climate change could have on these facilities. As such, it is recommended that possible future precipitation patterns be considered in TSF design modeling going forward.

Environmental Systems Engineering

EVSE 6: Remediation and Moose Jaw River Water Quality Analysis of Southeastern Moose Jaw

Connor Johnson Cole Steiner

The City of Moose Jaw faces the problem of historical contamination at environmentally impacted sites, as do many modern cities in Canada. Our project's primary objective is to identify an effective and feasible remediation plan for contamination at notable sites within the southeastern region of Moose Jaw. The Moose Jaw River flows through this area towards the Qu'Appelle River as its largest tributary. During high spring freshets and flood events, this water is occasionally diverted to backflow into the Buffalo Pound Lake, the primary drinking water source for a quarter of the province's population. To assess the safety of this water supply, water sampling and analysis was performed, including BTEX (Benzene, Toluene, Ethylbenzene, Xylene) and nutrients, along the Moose Jaw River as well as an investigation into potential impacts. Two sites were identified in the region with historical spills; the Former Husky Refinery Site and the Moose Jaw Asphalt Plant. Each site poses unique challenges, therefore individual remediation goals were created for each site based on the area's use and the potential risks of each were evaluated. Contaminants present primarily include BTEX and other hydrocarbons within the subsurface. Three alternatives were investigated for each site based on criteria established for remediation. Evaluation through a weighted comparison matrix yielded the selection of our remediation technologies; phytoremediation with amended sediment barriers for the Asphalt Plant and soil vapour extraction for the Former Refinery. The plans created consider related Saskatchewan Ministry of Environment approvals and assessments for proper management of these impacted sites.

Environmental Systems Engineering

EVSE 7: Corridor analysis and intersection improvements of Great Plains Road in Emerald Park

Logan Tarr Luke Bonnet Aaron John

The primary goal of this capstone project is to propose two solutions for two intersections that will fail operationally due to increased demand and volumes. The intersections are in the Town of White City and the Regional Municipality (RM) of Edenwold. The intersections are at S Plains Road & SK-6245 and Great Plains Road & Emerald Park Road. Both intersections are along the Great Plains Road Corridor which services the Trans-Canada Highway. Due to surrounding developments, with the Royal Park development being the largest, the Saskatchewan Ministry of Highways has predicted the intersections will fail in the coming years. Using resources and data collected from physical studies conducted, solutions will be proposed that we believe will best serve the requirements. A major challenge that comes with this project is estimating the exact extent of additional vehicle traffic that will result from this project due to the ambiguity of the project information presented to the public. Another challenge is to keep from infringing on the boundaries of existing businesses and buildings, such as the RCMP depot office directly adjacent to one of the intersections.

Environmental Systems Engineering

EVSE 8: Remedial Design Action Plan for an Abandoned Oil Well and Battery Site

Benjamin Taypotat Tyler Bosley Izaak Sitter Nathan Moore

Historical operation of an oil well and battery site has produced a plume of sodium chloride (salt) within the subsurface soil, primarily caused by waste disposal into two unlined flare pits. Post abandonment, the site is of particular concern due to its proximity to a river crossing an international border, large extent, high plume concentration and presence of overlying native prairie vegetation. Therefore, a remedial design action plan is required to mitigate potential impacts to the surrounding environment and allow for possible future land usage. Focus was put on remediating the northern area of the plume, as it presents a manageable, realistic scope; while any remedial efforts to the southern waterfront area of the plume would pose significant safety risks to the water body, on-site personnel and downstream users. After extensive research into possible remediation strategies, followed by two rounds of design screening, excavation was ultimately determined to be the most effective course of action. The excavation plan will include the physical removal of salt impacted soil, followed by transportation to an approved industrial landfill site capable of proper containment. Clean fill material will then be used to restore the excavation pit, ensuring industry acceptable remediation standards and requirements are met. In its totality, the plan demonstrates how excavation can be used as a viable remediation technique to mitigate environmental impacts that are common within the oil and gas industry.

Industrial Systems Engineering

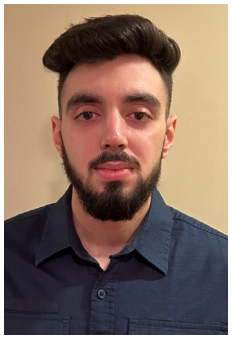
ISE 1: Natural Gas Recovery- Sustainable Solutions for Compressor Station Emissions

Gazalpreet Kaur Alexandra Thwaites Avin Almosallem

Natural gas is one of the main contributors to climate change. Emissions from natural gas compressor stations pose a serious environmental concern. During compressor station shutdowns, the methane gas from the pipelines is vented directly into the atmosphere. This project, in collaboration with SaskEnergy, intends to capture methane that is vented out and repurpose that gas for generating electricity. In line with Canada's pledge to cut methane emissions by at least 75% by the year 2030 as compared to the 2012 levels, the proposed solution collects and redirects the methane through a piping network into a storage tank to fuel a generator. The generator uses the methane to produce electricity to power various operations at the compressor station. This reduces the dependency on other power sources, aiding in cost saving and reducing the overall emissions. Some key considerations for this innovative approach include maximizing power generation, ensuring reliable piping and storage, and providing environmental and economic benefits. It aligns with Canada's Emission Reduction Plan and provides a feasible solution to reduce the overall greenhouse gas emissions by reworking otherwise wasted natural gas.

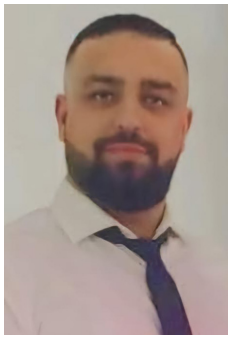
Industrial Systems Engineering

ISE 2: Air Cart Auger and Conveyor Assembly Stall



Owais Anwar

Hamza Abdalla



Qusai Taha

Through collaboration with CNH Industrial, the main purpose behind this project is to optimize and enhance subassembly operations for the Manual/Deluxe Auger and Large/Small Conveyor products by improving efficiency, ergonomics and safety. Each subassembly comes with specific features and dimensions to accommodate the respective product it is correlated to. The current process utilized for assembly in the workstation is dependent on a flat work surface for the main subassembly table and transport cart. This leads to excessive manual handling, less optimal workflows and awkward positioning. In order to address these concerns, the newly designed subassembly stall includes fixtures, clamps, and rotational units to securely hold each part in place. This ensures operator satisfaction and ease of accessibility during installation of components. Fixtures and holders are adequately designed and positioned with careful consideration to be able to withstand loads generated from directional forces, exerted by an impact gun and mallet for hardware installation in regards to bushings and component placements. Overall dimensions of the subassembly table and transport cart were assessed through load distributions amongst placed parts and proper ergonomic principles based on standard operator height and reach distances. A new Standard Operating Procedure has been implemented within the proposed subassembly stall design to ensure a more precise, consistent and repeatable assembly process. Overall workflow mapping is routed based on the number of trips, time taken and exact number of tools/hardware required. Lean manufacturing and error proofing methods are followed to reduce subassembly time alongside non-value-added movements and operational costs, aligning with the overall goals of CNH Industrial for continuous improvements. Implementation from this project may serve as a framework for future workstation changes within manufacturing operations and lead to more streamlined productivity in the facility.

Industrial Systems Engineering

ISE 3: Energy Optimization of Canola Oil Deodorization

Tegan Flegg Cassandra Schmidt

In 2007, Bunge Canada commissioned two canola oil deodorizers with ice condensing vacuum systems in Nipawin, Saskatchewan and Hamilton, Ontario. It was determined that the energy usage at the Nipawin facility was 332% higher than the Hamilton facility. A significant portion of this energy intensity difference is due to the lower capacity utilization of the Nipawin facility. Through improvements in energy consumption, the economic drivers that dictate business decisions around capacity utilization will be impacted with the potential to significantly increase utilization of the Nipawin facility. It will also ensure the sustainable development of society for the future generations by reducing the environmental impact of the value-added process. A large-scale retrofit of the conventional refrigeration cycle at the Nipawin facility was designed by changing it to an absorption refrigeration system. This will help to decrease the energy consumed by the refrigeration equipment. In addition, several small-scale solutions have been developed to aid in the reduction of the energy used which increases energy efficiency and heat transfer rates for the deodorization process. A current-state model was developed in Aspen Plus utilizing data gathered from the existing refrigeration cycle at the plant to identify high-energy-consuming equipment. The model achieved an acceptable deviation of 2%, indicating a high degree of accuracy in simulation. The large-scale solution was also modelled in Aspen Plus to validate its feasibility, equipment sizing and projected energy savings. The small-scale solutions will also help optimize the system operation and further reduce energy consumption. It is recommended that these small-scale solutions be implemented prior to the large-scale retrofit, as they have minimal impact on the operation of the system and can provide immediate energy efficiency gains.

Industrial Systems Engineering

ISE 4: Variable Gripper Design for a Pneumatic Bendcell

Jake Thompson Jaxon Fuchs

The purpose of this capstone project is to create a new robotic bend cell gripper for Brandt Industries Ltd. Currently Brandt's bend cell is limited by its gripper's maximum payload, as well as the variability of the current gripper's suction cup layout, therefore impacting the utilization rate. Our goal has been set out to create a new gripper that provides high repeatability, ease of use and variability, while creating a safe design. As Brandt is involved in many different industries, there are a large variety of parts used throughout the company. Metal profiles were studied through a frequency table to determine the trends of profiles created at Brandt. The trends analysis led to development of generic suction cup layouts to achieve the largest variety of parts possible. The robotic bend cell gripper operates through pneumatic suction cups to pick up, transport and form metal profiles. It is attached to a 5-axis robotic arm consisting of one translational and four rotational axes. The robotic arm can support up to 150 kg, including the gripper and the metal profile. The movement of the robot subjects the gripper to different types of dynamic loading as it transforms the metal profiles into formed parts. The physical gripper design selected meets all the requirements needed to improve the utilization rate of the bend cell.

Industrial Systems Engineering

ISE 5: Geothermal Heat Pump Design for Cold Climate Commercial Applications

Kaleb Swann Blake Angus

Federal Climate initiatives within Canada are a driving force for many companies in exploring both higher efficiency and greener technologies within their respective industries across the country. Through partnering with SaskPower, which recognizes the importance of this shifting view of technologies, the implementation of greener heat pump technologies throughout their wide portfolio of buildings and facilities is being explored. The purpose of this project is to determine the feasibility of implementing heat pump technology into SaskPower's larger scale buildings for the purpose of delivering their heating and cooling needs. Analysis into the appropriate source and configuration of heat pumps for a SaskPower property based on its site conditions and load requirements was conducted. A design solution was subsequently developed using an automated model allowing for iterative designs to be tested. The overall performance of the design solution was analyzed including observations into capital and operating costs, environmental impact and overall heating capability of the system to reliably meet SaskPower's heating and cooling needs.

Industrial Systems Engineering

ISE 6: Automated Production System Facility Plan and Safety Design For Estvan Plastic Production

Zhihao Zhang Victor Ray Sacedor Riyad Ul Islam Shuvo

The objective of this project is to design a facility layout and automate the existing PET bottle production line for the company Estevan Plastic Production(EPP). This project aims to address the underlying issues the company is currently facing regarding productivity, safety and efficiency as they move their production line from Estevan to Saskatoon. As it stands, EPP is not able to meet their customers' demand due to the inefficiency in their current production system where manual labour is required between each process, ultimately reducing their productivity to an estimated 60% to 70%. To propose a feasible solution, the team collaborates with EPP to design a new facility layout that utilizes the allocated space, is cost-efficient, opens itself for future expansion and operates with a 95% productivity. The design was created using simulation and addressed the potential hazards of working in a warehouse.

Industrial Systems Engineering

ISE 7: Regina Police Equipment Design and Fleet Management

Shuhao Zhang Archil Patel Wilson Deans

This project investigates both ergonomic and economic issues encountered by the Regina Police Services (RPS). Based on data from an in-house ergonomic study, surveys, and data collected during ride-alongs, it became clear that the current equipment configuration has been causing musculoskeletal disorders among the officers. The leading cause of these disorders was determined to be the location and mounting of the centralized laptop unit inside the patrol vehicles. To combat these issues, this project has explored multiple commercially available alternatives to improve ergonomics and promote officer safety. A Panasonic tablet paired with a detached keyboard has been identified as the optimal commercially available solution. To further improve the ergonomics, this project recommends a conceptually designed drop-down monitor to replace the driver-side sun visor. This will act as an additional monitor in collaboration with the tablet, to be used while the vehicle is stationary. The economic issues faced by RPS involve both fleet management and shop scheduling. The current vehicle replacement system uses a flat mileage limit of 170,000 km for all vehicles. While similar models are appropriate for other fleet management applications, this overly simplistic model does not sufficiently suit the needs of a policing fleet due to the long idle times and the intense driving experienced by the vehicles. This project introduces a point-based vehicle evaluation sheet to assist workshop personnel in determining vehicle replacement needs. The sheet incorporates multiple factors beyond mileage, enabling a more comprehensive assessment and prioritization of vehicle maintenance and assignments. To optimize the fleet replacement cycle, the project recommends a mathematical model to assess the projected lifespan of police vehicles based on factors including intensity, mileage and idle time.

Industrial Systems Engineering

ISE 8: Manually Folding Lance for Eliminating Potash Stockpile Hazards

Tyler Palmer Cameron Sasyniuk Carter McFie

A potash company has requested a more optimal potash probe design for their material handling operations. The purpose of the design is to allow workers to use a front-end loader to intentionally disrupt encrusted potash thirty feet away from the stockpile to prevent possible falling and crushing hazards to workers and assets. This hazard is due to potash's tendency to harden over time. The company currently uses a telescoping design for collapsibility and maneuverability in their facility, but stresses in the design have warped numerous components during operation due to being undersized, leaving the telescoping feature unusable. The proposed method was to design an optimized tool by changing the collapsing function from a telescoping method to a hinged folding method while paying close attention to the dimensions of the potash storage facility. This was to ensure it would still be usable for the company within their building. Rectangular Hollow Structural Section (HSS) tubing was selected for the main construction to minimize weight, and was sized based on the bending moment and stresses generated vertically due to the lack of hydraulic advantages for lateral movements.

Petroleum Systems Engineering

PSE 1: Hydraulic Fracturing Effects on Cement Sheath Integrity: A Study in Montney Reservoirs

Karan Gumber Gonzalo Osorio Abdulaziz Abdi

Hydraulic fracturing is a widely used technique for enhancing hydrocarbon recovery in unconventional reservoirs, such as the Montney Formation. However, the high-pressure injection of fluids during hydraulic fracturing operations, such as the plug and perf method, may compromise the integrity of the cement sheath which plays a crucial role in preventing fluid migration to the surface and in protecting groundwater resources. This project employs software modelling to investigate the effects of hydraulic fracturing on cement sheath integrity in the Montney reservoir. Key factors, such as cement mechanical properties, are evaluated to determine potential failure mechanisms during the hydraulic fracturing operations. The findings provide insights into optimizing cement slurry design and well completion strategies to enhance long-term well integrity and minimize environmental risks associated with fluid leakage in unconventional reservoirs.

Petroleum Systems Engineering

PSE 2: Applicability of FG materials in Petroleum Industry for Transportation Sector

Arth Patel

Functionally graded materials (FGMs) can be revolutionary in the oil and gas transportation sector, due to their increased strength and efficiency as pipelines. Conventional pipelines frequently face serious problems such as extreme weather, pressure changes, corrosion and stress-induced pipe bursts. By analyzing the mechanical and thermal performance of FGM-based pipes under various operating conditions, this project investigates the possibility of using them as a more reliable substitute. The mechanical behavior of these pipes is being evaluated, and equations of motion are being derived using MATLAB simulations. They offer a thorough analysis of fluid-structure interactions.

Economic and environmental analysis is then performed to evaluate the long-term use of FGM-based pipelines. Compared with the pipelines made from the conventional materials, the FGM-based pipelines not only have superior thermal resistance, mechanical strength and corrosion resistance, but they also minimize the environmental impact.

Software Systems Engineering

SSE 1: Rakshak: A Real-Time Weapon Detection System

Tirth V Patel

Yi Xu

Rakshak, meaning protector in Hindi, is a real-time weapon detection system designed to enhance safety in public spaces. Using AI and machine learning, it analyzes live surveillance footage to identify weapons and sends instant alerts to security teams. This ensures faster response times and reduces reliance on human-only monitoring. With safety concerns growing in schools, universities, shopping malls and other public spaces, Rakshak provides a reliable, proactive solution to prevent incidents before they escalate. Its real-time alerts, accurate detection and easy integration into existing systems help reduce risks and make environments safer for everyone.

Software Systems Engineering

SSE 2: Dead, Living, and Dying

Cameron Oehler Jacob Meyer Quinn Maloney

Dead, Living, and Dying is a horror game with roguelike elements where you play as The Caretaker of an elderly family member in a haunted mansion where taking damage exposes you to the dangers of the spirit world.

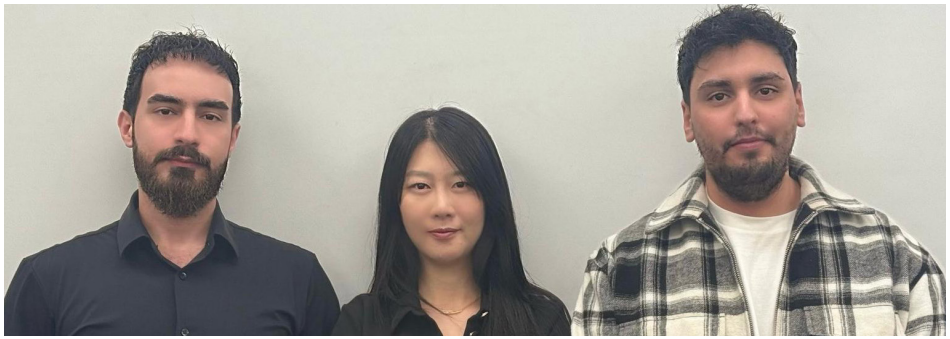
The game revolves around the player moving through three states as they take damage: Living, Dying, and Dead. Each state allows different possibilities, choices and risks the player can take to interact with the world and the ghosts haunting the mansion. The player must watch out for objects possessed by the ghosts that may suddenly and violently attack them. Weighing these risks, the player is rewarded for exploration by finding items they can use to help them stay alive. The player must make careful choices about the path they take to fulfill the requests of the family member they are taking care of.

When the Caretaker is hurt and moves from the Living to Dying, they can begin to see the ghosts that lurk in the mansion and make more informed decisions to protect themselves from their attacks. However, the next time they are hurt will prove fatal; the Caretaker dies – but the game is not over yet! As a spirit, the Caretaker must venture across the mansion to reunite with their physical body and return to the Living state. Then, with no physical form to shield them, they must frantically escape the clutches of the spirits chasing after them who are hungry to capture the remaining life force of the Caretaker.

Through this cycle of health, harm, and rebirth, the game explores the personal and emotional sacrifices made in complicated familial caretaker relationships as the player must put themselves at risk to meet the needs of the one they love.

Software Systems Engineering

SSE 3: IFS DriverAlert



Feras Aljoudi Seonyu Park Ihab Mohamad

Drowsy driving is a serious problem that can lead to dangerous accidents. Our project, Intelligent Focus System (IFS) DriverAlert, is designed to keep drivers safe by detecting when they are feeling drowsy. The system uses a small camera to monitor the driver's face and check if closed eyes, yawning or looking away is detected. The detection system works automatically when the car speed is over 20 km/h. When drowsy signs are detected, an audio alert is sent through a speaker to warn the driver.

The system runs on a Raspberry Pi, a small and affordable microcontroller, and works without needing the internet. It can be installed in any car and is powered by the car's battery. If the system fails to detect the car speed, which is rare, an alert will play every 10 minutes to inform the driver that automatic detection is off and recommend turning the system on manually. The project is easy to use and affordable, so more people can have access to this important safety feature.

Software Systems Engineering

SSE 4: CovaCare

David Kim Brydon Herauf

CovaCare (Computer Vision Accident Care) is an intelligent safety system that uses in-home cameras to detect slips, falls and prolonged inactivity. When an incident occurs, the system instantly identifies it and alerts emergency contacts, ensuring a fast response and reducing the risk of serious injury.

In Canada, falls are the leading cause of injury-related hospitalizations and deaths among individuals aged 65 and older. AT times, a fallen elder may go unnoticed for hours. While traditional alerting systems help, they rely on users pressing a button or wearing a device, which can be impractical or easily forgotten.

CovaCare eliminates these limitations by providing continuous, AI-driven monitoring that detects emergencies in real-time. It operates entirely in the background and automatically sends SMS alerts when needed. Additionally, the system runs entirely on a local server, ensuring all video data is kept private.

Designed for the elderly and disabled, CovaCare enhances safety while preserving independence and offering peace of mind for both those it protects and their loved ones.

Software Systems Engineering

SSE 5: Neon Requiem

Nathan Cameron Sebastian Lopez Melendrez

Our group is composed of two experienced gamers who enjoy playing couch co-op multiplayer with our friends. When tasked with picking a topic for capstone, a video game was the natural choice. With our video game, Neon Requiem, we set a goal of making a 2D Multiplayer Cyberpunk Roguelike Shooter inspired by games like The Binding of Isaac and Enter the Gungeon. In Neon Requiem, brave the dungeon with a group of up to four players or as a single player; face hordes of enemies, collect upgrades, and clear progressively harder rooms as you climb your way to the top. Neon Requiem is built on the Godot Engine and written in GDScript, a programming language that is native to Godot, with art and animations created by our group.

Software Systems Engineering

SSE 6: FreshGuard

Taiwo Akinwale Meklit Alemu Shahzil Siddiqui

Food waste remains a critical issue. According to the National Zero Waste Council, Canadian households discard 63% of edible food, amounting to 140 kilograms and over $1,300 in annual lost value per household. Beyond the financial cost, food waste contributes to significant environmental harm, producing millions of metric tonnes of CO2 emissions and adding unnecessary strain on landfills. A major contributor to this issue is the difficulty in tracking perishable items, often leading to forgotten or mismanaged expiration dates.

FreshGuard tackles these challenges head-on by leveraging Artificial Intelligence to transform how households track and manage food. With a quick scan, the app automatically extracts detailed product information, including expiration and 'best before' dates. It features a shared digital pantry, sends real-time alerts as items near expiration, and provides smart insights. Designed for accessibility and ease of use, the app offers a seamless experience on both iOS and Android platforms. By combining efficiency with sustainability, FreshGuard empowers households to save money, reduce food waste and take control of their food management like never before.

Software Systems Engineering

SSE 7: Fleet: The Fair and Transparent Ride-share

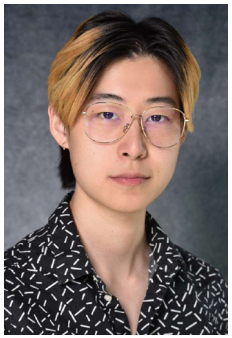
Muhammad Zaman Maksim Sharoika Simran Brar

The ride-sharing market is currently dominated by monopolies with corporations exerting full control over pricing. This results in ethical, legal and transparency issues for both drivers and riders. Fleet seeks to address these concerns by developing a ride-sharing platform that allows drivers to set their rates and ensures they retain most of the fare. The platform will foster an ethical environment for riders by offering greater transparency, enabling them to understand how much drivers earn and allowing them to select preferred drivers for a more personalized, long-term experience.

The project uses MongoDB, Express.js, React, ReactNative, Node.js and third-party APIs to build a mobile application compatible with iOS and Android. Fleet aims to deliver a seamless, user-friendly experience for both riders and drivers. The application features a simple interface that allows users to book rides with a few clicks and to manage their profiles and payment methods. The app's dynamic configuration-based backend ensures efficient performance, even under heavy loads. Fleet provides a promising solution to the challenges of the current ride-sharing market, offering a more equitable experience for both drivers and riders while maintaining high performance and a delightful user experience.

Software Systems Engineering

SSE 8: Academy of Legends



Kevin Huang

Conner Williams

Academy of Legends is a web-based application designed to enhance classroom engagement by delivering a gamified, interactive learning experience tailored for elementary school students. By integrating gaming elements, our application encourages a dynamic and immersive environment where students can participate individually or as part of a team, making learning more enjoyable while providing real-time feedback on student progress.

Traditional classroom settings often struggle to maintain student engagement, particularly for younger learners who may find it challenging to stay focused or motivated. Educators require innovative solutions to encourage active participation and teamwork. Academy of Legends addresses these challenges by transforming the classroom into an interactive and engaging space through gamification.

Software Systems Engineering

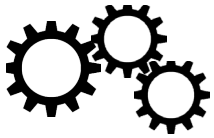
SSE 9: EduTrack: A Digital Solution for Effective Time Management in Education

Bilal Alissa

EduTrack helps students improve time management, reduce stress and boost academic performance.

The Project Day 2025 Program is sponsored by:

REGINA POLICE SERVICE

Feedback 

This is the 26th Annual Project Day.

We would greatly appreciate your feedback on how things went.

Please send an email to engg@uregina.ca with your feedback

Thank you for helping us ensure next year is even better!

FACULTY OF
ENGINEERING &
APPLIED SCIENCE

"You don't have to be great to start, but you have to start to be great."

- Zig Ziglar