

Proposed UG Thesis Topics – Fall 2025

Please review the list of topics provided below. In some instances, professors have identified specific thesis topics. In other instances, professors have indicated that they are willing to work with you to develop a topic that is related to one of the topic areas that is listed. You are encouraged to contact professors to learn more about the projects listed – and to secure the topic that most interests you as topics are typically assigned on a first-come basis.

Project ideas proposed by Biosystems Engineering Teaching Staff

J. Ackerman	(Strawbale Building) (204-261-0930) (Joe.Ackerman@umanitoba.ca) Dr. Ackerman is the Manager for our Sustainability-in-Action Facility (SiAF).
Topics:	<p>Plastic recycling: Problems with current recycling stream and alternative modes of collection, sorting, processing, and usage.</p> <p>Regenerative agriculture and carbon sequestration: Parameters in soil carbon storage. Techniques and methods of measurement and affecting change. Biochar as an amendment.</p> <p>Uses for post-consumer glass: From a recycling perspective, glass is cheap, heavy and boring. This could explain why there are no industries using glass cullet in Manitoba. What are potential uses for recycled glass in Manitoba?</p>
W. Blunt	(E1-310 EITC) (204-474-7144) (Warren.Blunt@umanitoba.ca)
Topics:	<p>Research focus: Industrial biotechnology for valorization of useful bio-products from waste materials. A high-level overview of the pillars of the research program is given below, specific projects will be designed on a case-by-case basis considering both student interests and program needs.</p> <p>CO₂ biorefinery: Application of hydrogenotrophic microorganisms for microbial carbon capture and conversion to biopolymers and single cell protein.</p> <p>Valorization agricultural by-products: (i) Microbial bioconversion of lignocellulosic crop residues to biosurfactants for application as bio-pesticides (ii) utilization of starchy by-products from field pea processing to support the plant-based protein sector;</p>
N. Cicek	(256 Agriculture) (204-474-6082) (Nazim.Cicek@umanitoba.ca)
Topics:	No specific topics suggested, but Dr. Cicek’s research program is focused on utilization of waste products and waste treatment (anaerobic digestion of dairy manure, engineered wetlands for wastewater treatment, removal of antibiotics from wastewater, value-added uses of waste streams from industrial and agricultural applications, bioenergy and renewable energy technologies).
U. Edet	(A204 AEB) (204-474-6859) (Uduak.Edet@umanitoba.ca) Dr. Edet is a Research Extension Engineer in the Department of Biosystems Engineering.
Topics:	1: Assessment of water application uniformity for a center pivot irrigation system
C. Erkinbaev	(E1-344 EITC) (204-474-6977) (Chyngyz.Erkinbaev@umanitoba.ca)
Topics:	1: Design of an IoT-based mini-spectrometer for prediction of fruit/vegetable ripeness in the field 2: Spectral imaging for grain quality control
N. Jacobson	(E1-358 EITC) (204-474-7917) (Natasha.Jacobson@umanitoba.ca)
Topics:	Dr. Jacobson is current on leave and will not be supervising projects for the 2025-2026 academic year.
F. Jian	(E1-532 EITC) (204-474-7965) (Fuji.Jian@umanitoba.ca)

Topics:	<ol style="list-style-type: none"> 1. Atmospheric freeze drying of canola. 2. Mathematical modeling of airflow resistance through grain bulks. 3. Airflow resistance through grain bulks. 4. Grain respiration and CO₂ monitoring.
D. Levin	(E1-354 EITC) (204-474-7429) (David.Levin@umanitoba.ca)
Topics:	<ol style="list-style-type: none"> 1. Physical-mechanical-thermal properties, applications, and biodegradability of renewable biodegradable polymers, such as Polyhydroxyalkanoates (PHAs and PLA) 2. Development of compostable coffee cups using mycelium-biomass composite materials
J. Li	(E1-342 EITC) (204-474-8429) (Jiating.Li@umanitoba.ca)
Topics:	<ol style="list-style-type: none"> 1. Seeing the Unseen: How spectral imaging reveals crop health 2. Designing ground-based sensing arm to detect crop diseases
S. Liu	(W581 Duff Roblin Bldg) (204-474-9616) (Song.Liu@umanitoba.ca)
Topics:	<ol style="list-style-type: none"> 1. Multi-Material 3D Bioprinting of Vascularized Bioengineered Skin Substitutes for Accelerated Wound Regeneration; 2. Development of a Polymer-Based Biosensor for Rapid and Selective <i>In Situ</i> Detection of Pathogenic Bacteria in Wounds; 3. Intelligent Multi-Layered Food Packaging Films Derived from Biodegradable Polymers and Natural Antimicrobial Additives for Enhanced Shelf-Life and Sustainability.
D. Mann	(E2-376B EITC) (204-474-7149) (Danny.Mann@umanitoba.ca)
Topics:	<ol style="list-style-type: none"> 1. Design and evaluation of a potato storage system for a home gardener. 2. Design and evaluation of a non-verbal curling communication system. 3. Tractor egress modelling using HumanCAD software.
E. Morris	(E1-330 EITC) (204-474-7919) (Ella.Morris@umanitoba.ca)
Topics:	<ol style="list-style-type: none"> 1. Investigation of surface mounted cylinder in turbulent flow (literature review)
J. Morrison	(E1-356 EITC) (204-474-8496) (Jason.Morrison@umanitoba.ca)
Topics:	<ol style="list-style-type: none"> 1. In 3D printing, the process of Design, export to STL and Slice introduces changes of dimensions from the modelled part. This is predictable, measurable and involves basic geometry (e.g. circles and polygons) but is not currently accounted for. This is a suitable investigation for an undergraduate project. 2. 3D Scanning using photographs requires abundant cameras and appropriate lighting, background and controllable turntable. A setup that entomologists can use to study mounted samples is desirable to convert libraries of mounted specimens into a digital repository/collection. 3. In examining samples using light microscopy a non-reflective background holder is challenging to purchase and maintain. This project explores the variety of options that can be constructed and then used with the equipment from BIOE 3320 Labs.
M. Nadimi	(E1-339 EITC) (204-474-9819) (Mohammad.Nadimi@umanitoba.ca)
Topics:	<ol style="list-style-type: none"> 1. AI for agricultural imaging: feature selection and data augmentation 2. Automated detection of mechanical damage in grain using imaging techniques 3. Evaluating mechanical damage to seeds using mathematical models 4. Physical biostimulation for seed treatment (literature review) 5. Low-cost imaging and spectroscopy for grain quality monitoring
J. Paliwal	(E1-342 EITC) (204-474-8429) (J.Paliwal@umanitoba.ca)
Topics:	<ol style="list-style-type: none"> 1. Simulation of background inconsistencies in micro-CT imaging using Matlab

	<ul style="list-style-type: none"> 2. Near infrared hyperspectral imaging for detection of quality deficiencies in ag-bio samples 3. 3D micro-CT to study the structures of ag-bio samples 4. AI model development using large datasets.
M. Rahman	(W583 Duff Roblin Bldg) (204-474-8509) (Mashiur.Rahman@umanitoba.ca)
Topics:	<ul style="list-style-type: none"> 1. Near-Infrared (NIR) Dyed Fabrics for Defense Applications 2. Mycelium-Based Biocomposite Coffee Cups 3. Development of Lightweight Biofibres for Electric Vehicle Applications
R. Sri Ranjan	(E1-346 EITC) (204-474-9344) (Sri.Ranjan@umanitoba.ca)
Topics:	<ul style="list-style-type: none"> 1. Building and optimizing the operation of aeroponic systems for growing herbs/vegetables indoors. 2. Evaluation of a mechanism to control flow to a variable rate atmometer. 3. Building and evaluating a remotely controlled drainage system outlet. 4. Any soil and water engineering related topic of interest to you.
W. Zhong	(W579 Duff Roblin Bldg) (204-474-9913) (Wen.Zhong@umanitoba.ca)
Topics:	<ul style="list-style-type: none"> 1. Development of conductive hydrogels for biosensors. 2. Functional nanofibers for biomedical applications.
Reliable Tire Recycling (RTR)	Jardel Santos (204-914-9201) (jsantos@rtrrubber.ca)
Industry Project	<p>Development of a tire-derived pothole repair product</p> <p>The thesis project aims to develop a new, durable formula for fixing potholes using tire derivatives, including rubber crumb, and binders, with potential integration of concrete, asphalt or other materials. Currently, potholes in the city are repaired, but the fixes are temporary, often failing as soon as heavy rain occurs. This project involves testing and optimizing various material combinations to create a solution that enhances flexibility, crack resistance, and water repellency. The goal is to engineer a formula that can withstand environmental stressors, improve road longevity, and offer a more sustainable and long-lasting repair method. The project started in 2024 with a capstone team responsible for design and preliminary tests. However, there is much more to be done with thorough testing. Goal: Develop a durable, environmentally sustainable, and cost-effective road pothole repair product using tire derivatives such as crumb rubber.</p>

There are professors from other academic departments on campus who are willing to supervise Biosystems thesis projects. The project ideas are listed below.

F. Delijani	(E3-374 EITC) (204-474-8613) (farhoud.delijani@umanitoba.ca)
Topics:	<ul style="list-style-type: none"> 1. Green and sustainable buildings 2. Structural insulated panels 3. Alternative building materials 4. Fabric formwork for concrete 5. Prefabricated building components 6. Modular homes

S. Hladik	(326 Stanley Pauley) (204-474-6972) (stephanie.hladik@umanitoba.ca) Dr. Hladik is on leave for the 2025-2025 academic year and will not be supervising any projects.
Topics:	Dr. Hladik conducts qualitative and design-based research into engineering education in a variety of settings (K-12 schools, post-secondary institutions, museums, library makerspaces, after-school technology clubs, etc.). She is particularly interested in projects that address historical and existing inequities in STEM education. Potential topics include but are not limited to: <ol style="list-style-type: none"> 1. Engineering education in K-12 education 2. Informal engineering education (e.g., outreach programs, museum programs) 3. EDI in engineering education 4. Experiences of graduate teaching assistants in engineering Engineering identity
F. Koksel	Associate Professor of Food Processing, Department of Food & Human Nutritional Sciences. (Filiz.Koksel@umanitoba.ca)
Topics:	Dr. Filiz Koksel's research integrates food engineering and material science to advance processing of plant-based and hybrid (animal-plant) protein foods. Her work combines electromagnetic and mechanical analyses with empirical and fundamental rheology to understand material behavior during processes such as extrusion. She focuses on linking microstructure to texture and functionality in aerated, puffed, and next-generation meat and dairy alternatives. Using tools like X-ray micro-CT and ultrasonics, her research supports the design of high-quality, structured protein foods. For biosystems engineering students, this work connects engineering fundamentals with innovation in sustainable food systems. Potential research topics include, but are not limited to: <p>- Developing next-generation plant-based and hybrid meat products using extrusion, with a focus on improving texture, structure, and protein functionality</p> <p>- Valorizing agri-food by-products (e.g., pulses, cereals, brewer's spent grain) into functional, high-value food ingredients</p>
J. Seniuk Cicek	(333 Stanley Pauley) (204-474-9698) (Jillian.SeniukCicek@umanitoba.ca)
Topics:	Dr. Seniuk Cicek is a qualitative researcher in engineering education. She asks questions about engineering ways of knowing and learning, diversity and inclusiveness, and assessment, to inform the training of future engineers. She uses theories and methods from a variety of disciplines, including the humanities, education, and social sciences. Research topics include, but are not limited to: <ol style="list-style-type: none"> 1. Indigenous knowledges and worldviews in engineering education and how students learn Indigenized and decolonized curricula 2. Sociotechnical thinking, education & practices 3. Engineering identity and culture 4. Teaching, learning & competency development in engineering education 5. The development of the field of EER in Canada
K. Zacharias	(334 Stanley Pauley) (kari.zacharias@umanitoba.ca)
Topics:	Dr. Zacharias is a qualitative researcher who studies the ways that engineers and engineering students learn, think, do, and make. She is open to supervising a variety of projects in this area. Potential topics include but are not limited to: <ol style="list-style-type: none"> 1. Technological stewardship for engineers

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| | <ol style="list-style-type: none">2. Indigenous pedagogies in engineering (e.g. land-based learning)3. STEAM / engineering, technology, and the arts4. Inter- / transdisciplinarity and engineering5. Symbols and structures of colonialism within Canadian engineering |
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