ANNUAL RESEARCH REPORT

OntarioTech
Engineering
& Applied Science

2022-2023

Ontario Tech University (OTU) delivers a leading-edge learning environment that combines the pursuit of academic excellence, research opportunities, hands-on skills and vibrant student life.

Innovative programs within the Faculty of Engineering and Applied Science (FEAS) provide high-quality engineering education through teaching and research excellence. Each program is accredited by the Canadian Engineering Accreditation Board, the highest possible affirmation of a Canadian University's engineering programs.

Ontario Tech's undergraduate and graduate programs are responsive to students' educational needs and the market-driven requirements of employers, putting graduates one step ahead upon graduation. Groundbreaking research at the university allows students to participate in the newest technological advances and gain the valuable, hands-on experience needed by employers. Our expansive program options provide our engineering graduates with the skills required to succeed in a variety of industries.

Ontario Tech's professors are internationally renowned experts in their fields. They collaborate with students in the classroom, lab and field to turn innovative ideas into realities. Our researchers explore new solutions to local and global problems and take pride in educating our future leaders, who will turn engineers into a brighter world.

engineering.ontariotechu.ca

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Dean's Message

Our Research

Welcome to the Faculty of Engineering and Applied Science (FEAS), a beacon of engineering education and groundbreaking research that has garnered international acclaim. The Faculty is home to four Canada Research Chairs, specializing in fields as diverse as Adaptive Aerodynamics, Electric Energy Storage Systems for Transportation Electrification, the Internet of Things (IoT), and Nuclear Fuels and Materials. We are also privileged to house an NSERC-UNENE Industrial Research Chair (IRC) dedicated to Health Physics and Environmental Safety, as well as three university Research Chairs, two of which are at the forefront of renewable energy research and one on the structural integrity of nuclear components.

Our state-of-the-art research facilities provide a breeding ground for innovation and a conducive environment for faculty members and students to explore innovative and sustainable solutions for challenging issues. Several faculty members have been recognized for their impactful research contributions by national and international organizations, such as the Canadian Society for Mechanical Engineering (CSME), the American Society of Mechanical Engineers (ASME), the Institute of Electrical and Electronics Engineers (IEEE), the Engineering Institute of Canada (EIC), and the Royal Society of Canada (RSC).

This report provides a window into our faculty's remarkable accomplishments, activities, and scholarly contributions, offering a glimpse into how the Faculty is constantly challenging the status quo and redefining the boundaries of thinking and learning. I invite you to explore our Faculty, visit the campus and tour research laboratories, and meet our professors, staff, and students.

Sincerely,

H. A. Kishawy

Dr. Hossam Kishawy
Dean, Faculty of Engineering and Applied Science

Our state-of-the-art research facilities provide a breeding ground for innovation and a conducive environment for faculty members and students to explore innovative and sustainable solutions for challenging issues.

FACULTY ADMINISTRATION

Dean
Dr. Hossam Kishawy, BSc, MSc, PhD (McMaster University), PEng, FASME, FCSME, FEIC, Professor

Associate Dean, Academic
Dr. Scott Nokleby, BEng, MASc, PhD (University of Victoria), PEng, FCSME, FASME, Professor

Associate Dean, Experiential Learning and Engineering Outreach
Dr. Qusay Mahmoud, BSc, MCS, PhD (Middlesex, UK), PEng, Professor

Assistant Dean for Engineering Laboratories
Shahid Hidayat, BEng, MASc, PEng, Professor

Chair, Department of Automotive and Mechatronics Engineering
Dr. Greg Rohrauer, DEC, BEng, PhD (Concordia University), PEng, Associate Professor

**Chair, Department of Electrical, Computer and Software Engineering**
Dr. Mohamed El-Darieby, BSc, MSc, PhD, PEng, Associate Professor

Chair, Department of Energy and Nuclear Engineering
Dr. Markus Piro, BScEng, MScEng, PhD (Royal Military College of Canada), PEng, Associate Professor

Chair, Department of Mechanical and Manufacturing Engineering
Dr. Martin Agelin-Chaab, BSc, MEng, MSc, PhD, P.Eng, Associate Professor
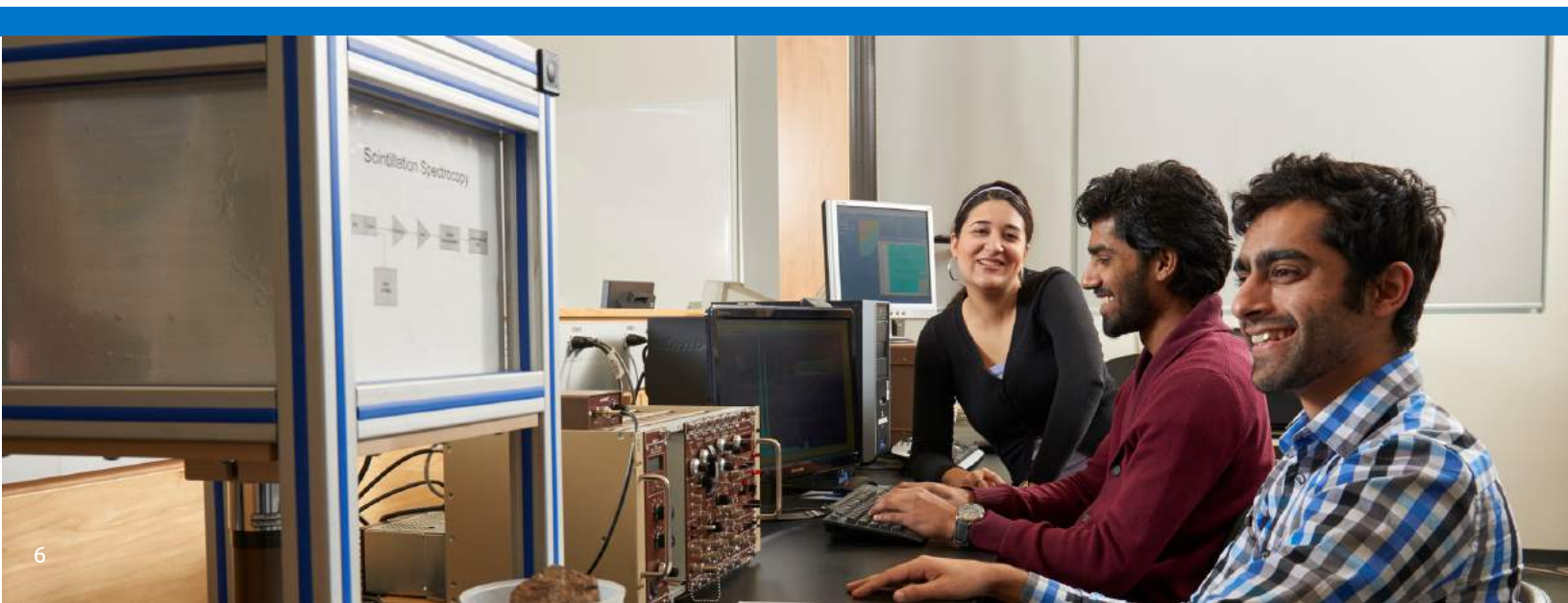
CORE FACULTY, AUTOMOTIVE

Dr. Moustafa El-Gindy, BSc, MSc, PhD (Technical University of Budapest), PEng, Professor

Dr. Zeinab El-Sayegh, BEng, MSc, PhD (Ontario Tech University), PEng, Assistant Professor

Dr. Yuping He, BASc. MASc, PhD (University of Waterloo), PEng, Professor

Dr. Xianke Lin, BEng, MSc. PhD (University of Michigan-Ann Arbor), PEng, Assistant Professor

Dr. Greg Rohrauer, DEC, BEng, PhD (Concordia University), PEng, Associate Professor

TEACHING FACULTY, AUTMOTIVE

Dr. Murat Aydin, BSc, MSc, MRes, DIC, PhD (University of London, UK), PEng, Associate Teaching Professor

CORE FACULTY, MECHATRONICS

Dr. Meaghan Charest-Finn, BSc, MSc, PhD (University of New Brunswick), Assistant Professor

Dr. Haoxiang Lang, BSc, MASc, PhD (University of British Columbia), PEng, Associate Professor

Dr. Scott Nokleby, BEng, MASc, PhD (University of Victoria), PEng, FCSME, FASME, Professor

**Dr. Shabnam Pejhan**, BSc, MSc, PhD (University of Manitoba), Assistant Professor

Dr. Mitchell Rushton, BASC, MASc, Certificate in University Teaching, PhD

Dr. Jaho Seo, BSc, MIng(MSc), PhD (University of Waterloo), PEng, Assistant Professor

Dr. Aaron Yurkewich, BESc, MESc, PhD, Assistant Professor

TEACHING FACULTY, MECHATRONICS

Dr. Nasim Moallemi, BEng, MSc, PhD (Ontario Tech University), PEng, Associate Teaching Professor
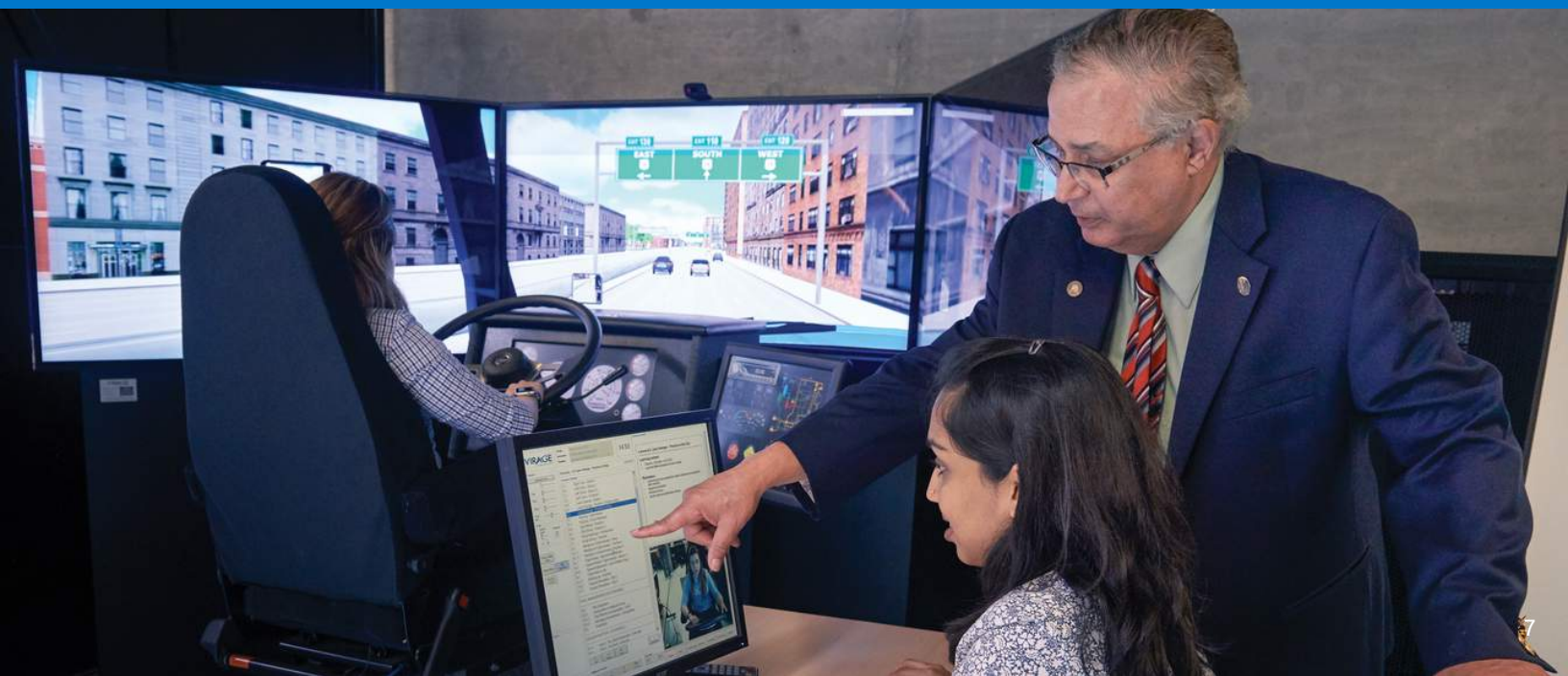
ELECTRICAL, COMPUTER AND SOFTWARE ENGINEERING

CORE FACULTY, SOFTWARE

Dr. Sanaa Alwidian, BSc, MSc, PhD (University of Ottawa), Assistant Professor

Dr. Akramul Azim, BSc, MSc, PhD (University of Waterloo), PEng, SMIEEE, Associate Professor

Dr. Mohamed El-Darieby, BSc, MSc, PhD (Carleton University), PEng, Associate Professor

Dr. Khalid Elgazzar, BSc, MSc. PhD (Queen's University), PEng, Canada Research Chair, Associate Professor

Dr. Ramiro Liscano, BScEng, MScEng, PhD (University of Waterloo), PEng, SMIEEE, Professor

Dr. Qusay Mahmoud, BSc, MCS, PhD (Middlesex University, UK), PENg, Professor

Dr. Masoud Makrehchi, BSc, MSc, PhD (University of Waterloo), PEng, Associate Professor

Dr. Mennatullah Siam, BSc, MSc, PhD (Alberta)

TEACHING FACULTY, SOFTWARE

Dr. Anwar Abdalbari, BEng, MSc. PhD (Ontario Tech University), PEng, Associate Teaching Professor

Dr. Khalid Hafeez, BEng, MASc, PhD (Ryerson University), PEng, IEEE Senior Member, VC of IEEE-VT, Associate Teaching Professor

CORE FACULTY, ELECTRICAL

Dr. Min Dong, Beng, PhD (Cornell University, NY, USA), PEng, SMIEEE, Professor

Dr. Mikael Eklund, BSc, MSc, PhD (Queen's University), PEng, Professor

Dr. Ali Grami, BSc, MEng, PhD (University of Toronto), PEng, SMIEEE, Associate Professor

Dr. Walid Morsi Ibrahim, BSc, MSc, PhD (Dalhousie University), PEng, SMIEEE, Professor

Dr. Ruth Milman, BASc, MASc, PhD (University of Toronto), PEng, Associate Professor

Dr. Jing Ren, BSc, MBA, PhD (Western University), PEng, Associate Professor

Dr. Langis Roy, BASc, MEng, PhD (Carleton University), PEng, Deputy Provost, Professor.

Dr. Shahram ShahbazPanahi, BSc, MSc, PhD (Sharif University of Technology, Tehran, Iran), PEng, Professor

Dr. Tarlochan Sidhu, BE, MSc. PhD (University of Saskatchewan), PEng, Ceng, FIEEE, FEIC, FCAE, Professor

Dr. Vijay Sood, BSc, MASc, PhD (Bradford University, UK), PEng, FIEEE, FEIC, Associate Professor

Dr. Ying Wang, BEng, MASc, PhD (University of Waterloo), PEng, Professor

Dr. Sheldon Williamson, BE, MSc, PhD (Illinois Institute of Technology, Chicago, Il, USA), PEng, NSERC Canada Research Chair, Professor

Dr. Mohamed Youssef, BASc, MASc, PhD (Queen's University), PEng, SMIEEE, Associate Professor

TEACHING FACULTY, ELECTRICAL

Dr. Namdar Saniei, BSc. MSc, PhD (University of Toronto), PEng, SMIEEE, Associate Teaching Professor

ENERGY AND NUCLEAR ENGINEERING

CORE FACULTY, ENERGY & NUCLEAR

Dr. Kirk Atkinson, BSc, MSc, MRes, PhD (University of London, UK), Associate Industrial Research Chair, Associate Professor

Dr. George Bereznai, BEng, MEng, PhD (McMaster University), PEng, Professor Emeritus

Dr. Hossam Gaber, BSc, MSc, PhD, PEng (Okayama University, Japan), Professor

Dr. Glenn Harvel, BEng, MEng, PhD (McMaster University), PEng, Professor

Dr. Daniel Hoornweg, BSc, MSc, PhD (University of Toronto), PEng, Associate Professor

Dr. Brian Ikeda, BSc, MSc, PhD (University of Newcastle upon Tyne, UK), Associate Professor

Dr. Matthew Kaye, BASc, MSc, PhD (Queen's University), PEng, Associate Professor

Dr. Lixuan Lu, BES, MES, PhD (University of Western Ontario), PEng, Professor

Dr. Rachid Machrafi, BSc, MASc, PhD (Joint Institute for Nuclear Research, Dubna, Russia), Professor

Dr. Jennifer McKellar, BASc, MASc, PhD (University of Toronto), PEng, Associate Professor

Dr. Eleodor Nichita, BS, MS, PhD (Georgia Institute of Technology, USA), PEng, Associate Professor

Dr. Igor Pioro, BS, MASc. PhD (National Academy of Sciences, Kiev, Ukraine), PEng, Fellow of ASME, CSME and EIC, Foreign Fellow of the National Academy of Sciences of Ukraine, Professor

Dr. Markus Piro, BScEng, MScEng, PhD (Royal Military College of Canada), PEng. Associate Professor

Dr. Akira Tokuhiro, BS, MS, PhD (Purdue University, IN, USA), Professor

Dr. Anthony Walker, BS, PhD (London South Bank University, UK & European Joint Research Centre, Ispra, Italy), Professor Emeritus

Dr. Edward Waller, BS, MScE, PhD (Rensselaer Polytechnique Institute, Troy, New York, USA), Industrial Research Chair, PEng. NSERC/UNENE IRC, Professor

TEACHING FACULTY, ENERGY & NUCLEAR

Dr. Filippo Genco, BS, MS, MSNE, PhD (Purdue University, IN, USA), Director of Industry Training, Associate Teaching Professor

ACADEMIC ASSOCIATES AND NUCLEAR ENGINEERS IN RESIDENCE

John Froats, MASc. PEng
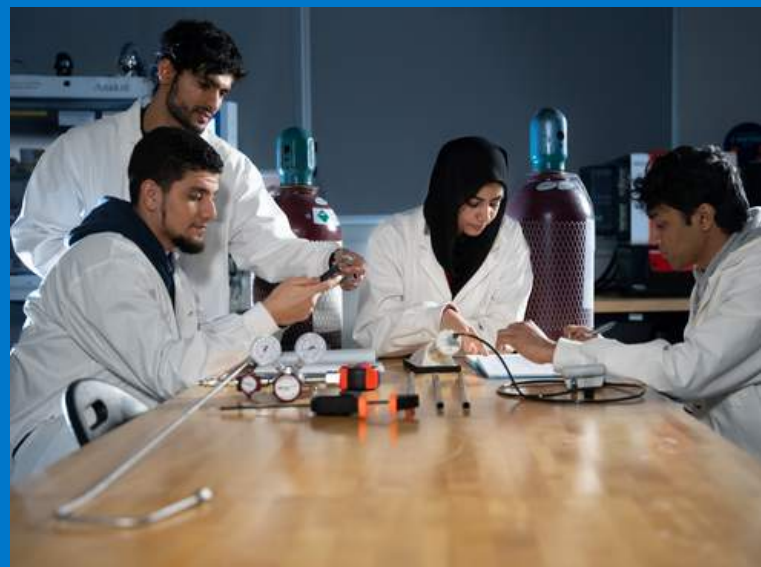
MECHANICAL AND MANUFACTURING ENGINEERING

CORE FACULTY, MECHANICAL

Dr. Martin Agelin-Chaab, BSc, MEng, MSc, PhD (University of Manitoba), PEng, Associate Professor

Dr. Ibrahim Dincer, BSc, MSc, PHD (Istanbul Technical University, Turkey), PEng, Professor

Dr. Ebrahim Esmailzadeh, BSc, MPhil, PhD (University of London, UK), CEng, PEng, FCAE, FEIC, FASME, FCSME, FIMechE, SMIEEE, Professor Emeritus

Dr. Kamiel Gabriel, BSc, MBA, MSc, PhD (University of Manitoba), PEng, Professor

Dr. Horia Hangan, Diplomate Engineer, PhD (Western University), PEng, FCSME, Professor

Dr. Brendan MacDonald, BASc, MASc, PhD (University of Toronto), PEng, Associate Professor

Dr. Atef Mohany, BSc, MSc. PhD (McMaster University), PEng, FCSME, FASME, Professor

Dr. Bale Reddy, BTEch, MTech, PhD (Indian Institute of Technology), PEng, Professor

Dr. Marc Rosen, BASc. MASc. PhD (University of Toronto), PEng, FASME, FCSME, FEIC, FIEF, FCAE, FCSSE, Professor

Dr. Zia Saadatnia, BSc, MSc, PhD, PEng

TEACHING FACULTY, MECHANICAL

Dr. Naglaa Elagamy, BSc, MASc, PhD (Carleton University), PEng, Associate Teaching Professor

CORE FACULTY, MANUFACTURING

Dr. Jana Abou-Ziki, BSc. PhD (Concordia University), PEng, Assistant Professor

Dr. Ahmad Barari, BSc, MSc, PhD (Western University), PEng, Professor

Dr. Ramona (Haniyeh) Fayazfar, BSc. MSc, PhD (Sharif University of Technology, Iran), PEng, Assistant Professor

Dr. Sayyed Ali Hosseini, BSc, MSc, PhD (Ontario Tech University), PEng, Assistant Professor

Dr. Amirkianoosh Kiani, BSc, MSc, PhD (Toronto Metropolitan University), PEng, Associate Professor
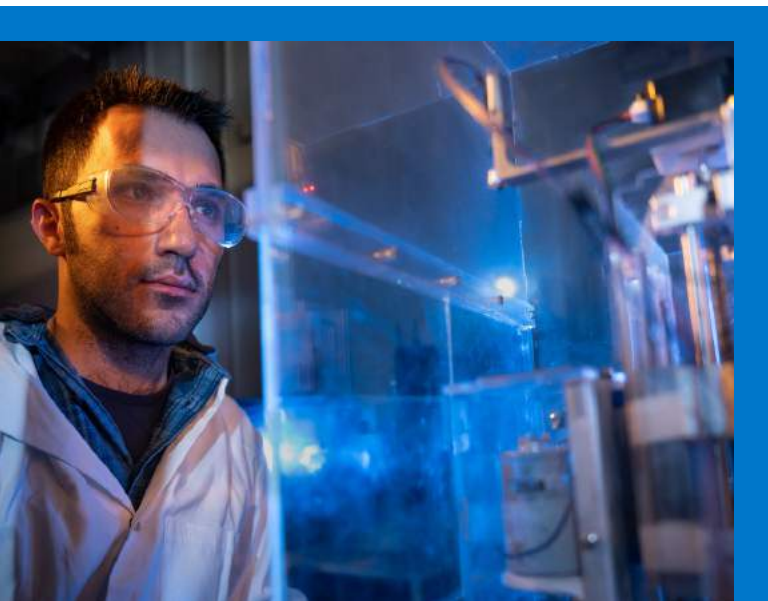
Dr. Hossam Kishawy, BSc, MSc, PhD (McMaster University), PEng, FASME, FCSME, Professor

Dr. Remon Pop-Iliev, BASc, MASc, PhD (Toronto), PEng, FCSME, Professor

Dr. Ghaus Rizvi, BE, MS, MASc, PhD (University of Toronto), PEng, Professor

TEACHING FACULTY, MANUFACTURING

Dr. Dima Jawad, BEng, MSUP,PMP, PhD (Rutgers University, New Jersey, USA), Associate Professor

AUTOMOTIVE AND MECHATRONICS ENGINEERING

Dr. Wei Huang

Dr. Shaghayegh (Zahra) Bagheri

Dr. Ismail Gultepe

Dr. Bekir Yilbas

Dr. Subhash Rakheja

ELECTRICAL, COMPUTER AND SOFTWARE ENGINEERING

Dr. Hatem Abou-Zeid

Dr. Omar Alam

Dr. Farhan Ghaffar

Dr. Mitalkumar Kanabar

Dr. Palak Parikh

Dr. Taufiq Rahman

Dr. Magdy Salama

Dr. Tizhoosh Hamid

Dr. Ming Yu

Dr. Alaa Khamis

ENERGY AND NUCLEAR ENGINEERING

Dr. Salam Ali

Dr. Jovica Atanackovic

Dr. Bernie Fitzpatrick

Dr. Reza Ghafouri

Dr. Louise Hastie

Dr. Ofelia Jianu

Dr. Benjamin Rouben

Dr. Claudia Xavier

MECHANICAL AND MANUFACTURING ENGINEERING

Dr. Shaghayegh Bagheri

Dr. Ibrahim Deiab

Dr. Ismail Gultepe
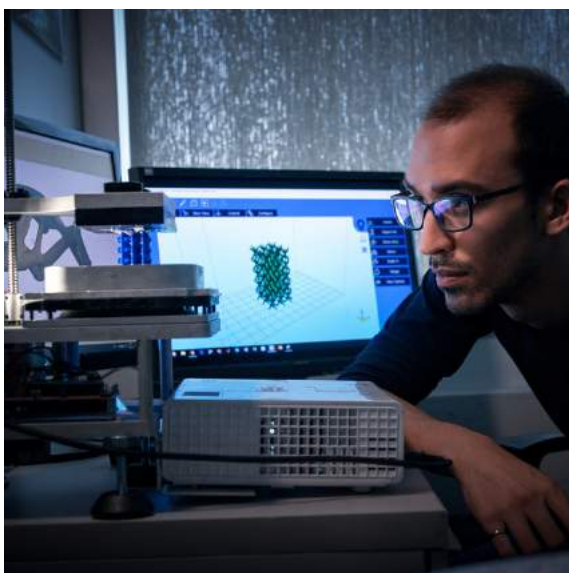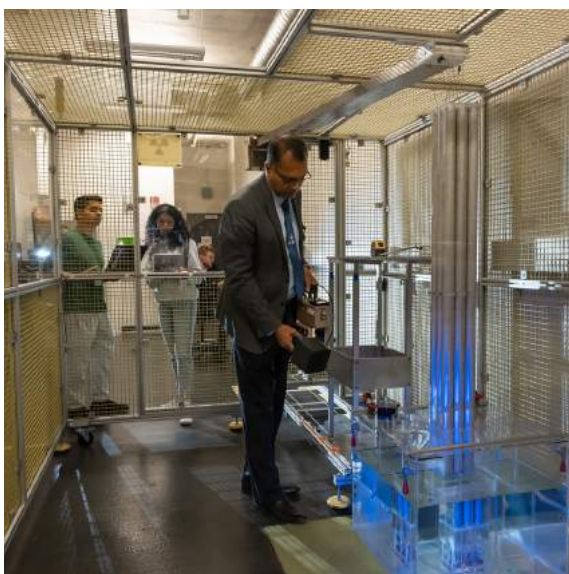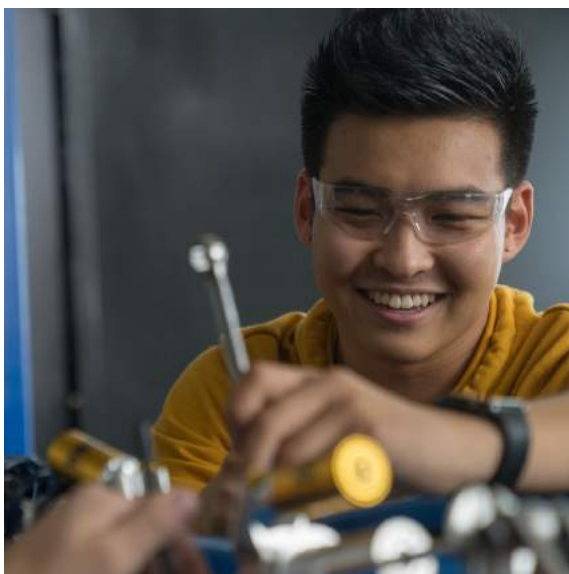
Dr. Marwan Hassan

Dr. Wei Huang

Dr. Greg Naterer

Dr. Dipal Patel
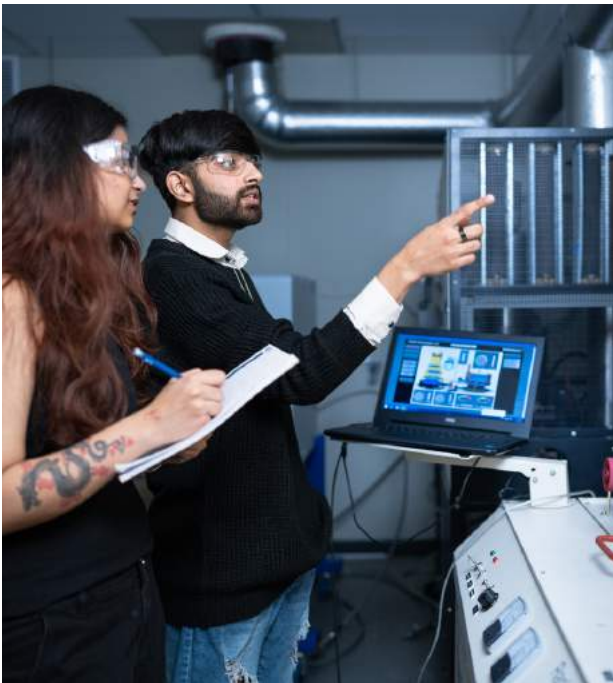
Dr. Kevin Pope

Dr. Subhasho Rakheja

Dr. Bekir Yilbas

ACADEMIC PROGRAMS

The Faculty of Engineering and Applied Science strives to provide the highest quality of undergraduate and graduate education.

UNDERGRADUATE PROGRAMS

Designed to meet the needs of industry and society, we offer undergraduate degree programs leading to a Bachelor of Engineering (BEng) or Bachelor of Science (BSc) in the following areas:

- Automotive Engineering (BEng)
- Electrical Engineering (BEng)
- Energy Engineering (BEng)
- Health Physics and Radiation Science (BSc)
- Industrial Engineering (BEng)
- Manufacturing Engineering (BEng)
- Mechanical Engineering (BEng)
- Mechatronics Engineering (BEng)
- Nuclear Engineering (BEng)
- Software Engineering (BEng)

Our innovative undergraduate programs include:

- The only accredited Automotive Engineering, Nuclear Engineering and Manufacturing Engineering programs of their kind in Canada;
- Broad programs in Mechanical, Software and Electrical Engineering;
- Unique Mechatronics and Energy options in Mechanical Engineering;
- Engineering Management programs to meet the rapidly increasing need for engineers with leadership skills to succeed in business and management; and
- A comprehensive co-op education program that provides experiential learning and integrates academic studies with paid work experience

GRADUATE PROGRAMS

We offer graduate programs leading to a graduate diploma, as well as the degrees of Master of Applied Science (MASc), Master of Engineering (MEng) and Doctor of Philosophy (PhD) in the following areas:

- Automotive Engineering (MASc, MEng)
- Electrical and Computer Engineering (MASc, MEng)
- Electrical and Computer Engineering (PhD)
- Engineering Management (Graduate Diploma)
- Engineering Management (MEngM)
- Mechanical Engineering ((MASc, MEng)
- Mechanical Engineering (PhD)
- Nuclear Design Engineering (Graduate Diploma)
- Nuclear Technology (Graduate Diploma)
- Nuclear Engineering (MASc, MEng)
- Nuclear Engineering (PhD)
- Software Engineering (MASc, MEng)
- UNENE in Nuclear Engineering (Graduate Diploma)
- UNENE Nuclear Engineering (MEng)
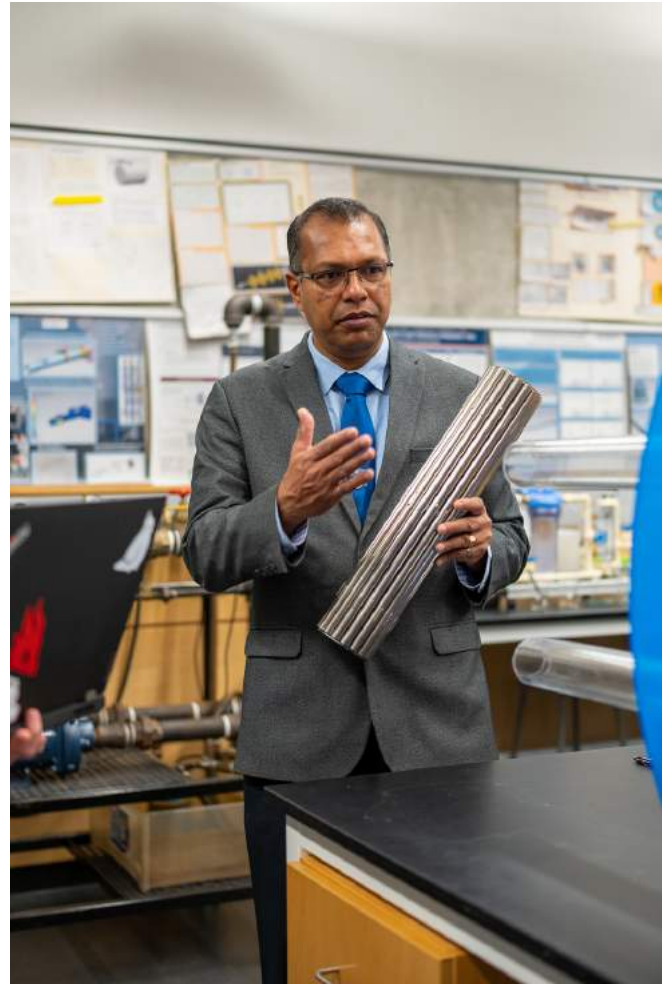
The MASc Program is research-oriented and entails a combination of course-based learning and a thesis that involves original research. The MEng program is a professional master's program for upgrading technical skills and knowledge, with an emphasis on course-based learning that can be accompanied by a major project. The PhD program leads to the highest academic degree. It involves a combination of academic coursework and a dissertation, which requires a significant and detailed body of original research that leads to new and innovative research outcomes.

RESEARCH FUNDING

$6,249,106.42

Secured in research funding for 2022–2023

The Faculty of Engineering and Applied Science conducts leading-edge, value-added research in focused, strategic areas. Faculty members are internationally renowned and award-winning professors in their respective fields of study. They have a wide range of expertise and experience in teaching, research and graduate supervision. Their research activities attract funding through grants and other support from various sources, including industry, government agencies and other organizations. These include the Natural Sciences and Engineering Research Council of Canada (NSERC), the Canada Foundation for Innovation (CFI), and the Canada Research Chairs (CRC) program. These programs award funds on a competitive basis to university researchers across Canada.

The Faculty of Engineering and Applied Science has numerous research programs and activities that secured $6,249,106.42 of research funding for 2022-23. When ranked by criteria such as research impact and productivity of journal and conference articles published, Ontario Tech University has one of the top engineering faculties in Canada. In various specific areas, we are an international leader, with developments that have led to patents and prestigious recognitions worldwide. The research activities are conducted in state-of-the-art research centres and buildings.

PARTNERS

An extensive number of research projects in our faculty involve industrial partners. There are over 45 industrial and funding institutions that are part of research projects with our faculty members. The Faculty of Engineering and Applied Science gratefully acknowledge the support given to its research programs by its partners:

- Air Lab, Inc.
- BEA
- Betterfrost Technologies
- Body-Bed Interface
- Cascara Energy
- Canadian Broadcasting Corporation (CBC) Marketplace Program
- Corporate Finance Institute Infrastructure Program
- Cherkam Industrial Systems
- City of Oshawa
- Canadian Nuclear Laboratories (CNL)
- Candu Owners Group (COG)
- Canadian Research Chair (CRC) Program
- Innovation for Defence Excellence and Security (IDEaS)
- EHC Canada
- Enbridge
- Fibos Inc.
- GlassHouse Systems
- I-INC Lab2Market
- IBM Center of Advanced Studies (CAS)
- IC-IMPACTS
- Kasetsart University
- Korean Institute of Machinery & Materials (KIMM)
- Magna International Inc.
- MDA Ltd.

RESEARCH AREAS

AUTOMOTIVE AND MECHATRONICS ENGINEERING

AUTOMOTIVE ENGINEERING

Our Faculty is a leader in automotive research and engineering. With innovative research programs, we find new solutions to automotive problems and educate future engineers who will turn great new ideas into commercial products in the automotive and other industries.

Specific areas of current faculty research include:

- Vehicle dynamics, control and driver-vehicle-environment interactions;
- Active vehicle safety;
- Hybrid electric vehicle design and control;
- Vehicle structure and chassis design;
- Vehicle thermal aerodynamics and thermal management;
- Battery charge and storage;
- Autonomous and semiautonomous driving and autonomous e-mobility;
- Vehicle modelling, simulation and optimization;
- Tire mechanics;
- Driver behaviour modelling and simulation;
- Transportation electrification and intelligent transportation;
- Acoustics and aeroacoustics;
- Advanced thermofluids;
- Aerodynamic optimization, climatic aerodynamics, development of aerodynamic devices and active vehicle aerodynamic control; and
- Wind engineering, defrosting, and sensor cleaning in adverse weather.

MECHATRONICS ENGINEERING

Ontario Tech University is one of only a handful of universities in Canada that offers a dedicated program in Mechatronics Engineering, which integrates mechanical and electrical systems with real-time control, combining hardware with software to produce new devices such as consumer products, medical devices, high- tech automobile systems and robots.

Specific areas of current faculty research include:

- Mobile manipulator systems;
- Crewless ground/aerial vehicles;
- Inverse problems in mechatronics, robotics and automation engineering;
- Amphibious robots;
- Machine vision, monitoring and fault diagnosis;
- Interactive autonomous robotic manipulation;
- Automated mechatronic design;
- Automated construction equipment;
- Predictive safety control;
- Haptic devices for robotic surgery; and
- Autonomous medical robotic devices.

ELECTRICAL, COMPUTER AND SOFTWARE ENGINEERING

SOFTWARE ENGINEERING

Software systems engineering is the core component of the growing software sector, and the Internet of Things (IoT) will be the foundation of our critical infrastructure and the basis for emerging and future smart services. FEAS researchers are addressing many of the unique challenges in engineering resilient software systems that enable the vision of IoT.

Specific areas of current faculty research include:

- Cyber-physical systems;
- E-Health and medical image processing;
- Embedded and real-time systems;
- Security, privacy and trust;
- Smart cities;
- Emerging technologies;
- Software analytics;
- Software quality and testing; and
- Model-based software engineering.

ELECTRICAL ENGINEERING

Our faculty conducts innovative research in the study, design and application of equipment, devices, and systems which use electricity. This research addresses various technological challenges, such as providing more capable telecommunications networks (wireless and the Internet), intelligent control systems (with higher speed, better precision and lower cost), and power smart grids.

Specific areas of current faculty research include:

- Automatic/ intelligent sensing and control;
- Biomedical engineering;
- Networked and distributed control systems;
- Network security;
- Power systems and smart grid engineering;
- Satellite communications;
- Sensor networks;
- Telecommunications networks; and
- Wireless communications and signal processing.

ENERGY AND NUCLEAR ENGINEERING

The energy sector is evolving at a rapid pace, and our researchers work to understand the safe, reliable and efficient generation of environmentally-conscious energy. Our researchers study different forms of energy, including fossil fuels, hydro, geothermal, nuclear, solar and wind, as well as emerging technologies, such as energy storage, and they seek to develop and improve environmentally responsible energy technologies.

Specific areas of current faculty research include:

- Advanced safety and control systems for nuclear power plants;
- Renewable energy systems;
- Sustainable energy systems and communities;
- District energy systems;
- Energy storage systems;
- Hydrogen energy and fuel cells;
- Net-zero buildings;
- Fluid-structure interaction;
- Nuclear instrumentation and control;
- Fluid mechanics;
- Advanced nuclear reactor systems;
- Advanced nuclear fuels/materials;
- Decommissioning nuclear facilities;
- Environmental protection and health physics;
- Maintenance and refurbishment;
- Small modular reactors;
- Nuclear security;
- Nuclear modelling and simulation;
- Radiation detection and visualization;
- Radioactive waste management; and
- Plasma systems for energy and nuclear applications.

MECHANICAL AND MANUFACTURING ENGINEERING

MANUFACTURING ENGINEERING

Manufacturing has a vital role in the Ontario economy, and active research is conducted in the development of advanced processes and methodologies for manufacturing in areas such as materials and composites, robotics, automation and intelligent controls.

Specific areas of current faculty research include:

- Additive manufacturing and 3D printing;
- Dynamics, vibration and noise;
- Engineering design;
- Advanced manufacturing;
- Digital and precision manufacturing;
- High-speed machining;
- Biomaterials;
- Energy materials;
- Ceramics and hybrid materials;
- Smart materials;
- Nano-materials;
- Non-linear dynamics;
- Green and nano composite;
- Functional coating;
- Modelling, simulation and optimization;
- Nano/Micro-manufacturing and microfluid devices;
- Subtractive manufacturing and high-speed machining;
- Surface functionalization and surface integrity;
- Mechanics of solids and structures; and
- Robotics, automation and controls.

MECHANICAL ENGINEERING

Mechanical engineering is a focus area of active faculty research. Our researchers design mechanical, thermal and fluid systems and components that are environmentally sustainable. They also research and design effective, efficient and competitive energy technologies, as well as robotics and automation solutions.

Specific areas of current faculty research include:

- Vehicle aerodynamics;
- Energy conversion and management;
- Heat and mass transfer;
- Fuel cell systems;
- Vibrations;
- Structural dynamics;
- Modelling and simulation;
- Risk management;
- Sustainable energy;
- Microfluids;
- Fluid mechanics;
- Thermodynamics;
- Acoustics and aeroacoustics;
- Thermal design and optimization; and
- Renewable energy.

FACULTY RESEARCH AREAS

AUTOMOTIVE AND MECHATRONICS ENGINEERING

AUTOMOTIVE ENGINEERING

Dr. Moustafa El-Gindy
Aircraft landing dynamics; Articulated heavy vehicles; Bus testing and simulation; Crash testing and simulations; High-velocity impact and ballistics simulation; Multi wheels military vehicles dynamics; Self-steering axles simulation; Tire mechanics; Tire-soft and hard soils interaction; Vehicle dynamics; and Virtual human modelling.

Dr. Zeinab El-Sayegh
Vehicle system dynamics; Autonomous vehicles; Ride comfort; Stability control; Modelling and simulation; Tire mechanics; Soil dynamics; and Off-road vehicle design.

Dr. Yuping He
Autonomous driving; Vehicle system dynamics; Vehicle chassis design; Vehicle active safety systems; Automated design synthesis; Modelling and simulation; Driver-hardware-in-the-loop real-time simulations; Application of multidisciplinary design optimization; and mechatronic systems.

Dr. Xianke Lin
Energy storage systems; Renewable energies; Hybrid electric vehicle design and control; Multiscale/multiphysics modelling and optimization; Power electronics control and AC motor optimal control; and Vehicle active safety/automated driving.

Dr. Greg Rohrauer
Advanced composite materials; Analysis and design of composite pressure vessels; Materials testing; Alternate fuelled and hybrid vehicles development; Vehicle dynamics; and manufacturing technology and application.

MECHATRONICS ENGINEERING

Dr. Meaghan Charest-Finn
Advanced automation of complex systems; Model Predictive Control algorithms, Intelligent architectures to automate multi-physics processes; Mathematical modeling, optimization, and applied artificial learning methodologies

Dr. Haoxiang Lang
Mechatronics; Autonomous robotics; Visual servoing and advanced controls; and Machine learning.

Dr. Scott Nokleby
Robotics; Mechatronics; Mechanisms; Automation; Advanced kinematics of robots and mechanisms; Redundant manipulator systems; Mobile-manipulator systems; Mechanism and robot design; and Optimal design.

Dr. Shabnam Pejhan
Design and evaluation of biomechatronic mobility assistive devices; Design of smart wearables for rehabilitation or prevention of musculoskeletal disorders; Evaluation and integration of advanced and intelligent active urban mobility alternatives; Human mobility and motion analysis; and Biomedical technologies.

Dr. Mitchell Rushton
Robotics, Vibration Control, Cable-Driven Parallel Robots, Continuum Robots

Dr. Jaho Seo

Mechatronics; Autonomous mobile machine; Intelligent construction equipment; Intelligent agriculture machinery; Safety-control; Electro-hydraulic systems; Hardware-in-the-loop simulation; and System reliability.

Dr. Aaron Yurkewich

Design and Control of Wearable Robots and Exoskeletons; Biomedical Engineering for Rehabilitation and Surgery; Engineering Entrepreneurship; Human-Robot Interaction; AI and Robotics

ELECTRICAL, COMPUTER AND SOFTWARE ENGINEERING

SOFTWARE ENGINEERING

Dr. Sanaa Alwidian

Software engineering; Goal-oriented requirements engineering; Model-based system engineering; Software evolution and analysis; AI and its application to software engineering; Mobile ad hoc networks; and Natural language processing.

Dr. Akramul Azim

Real-time systems; Embedded software; Safety-critical systems; Internet of things; Software verification and validation; Software quality and testing; and Applied machine learning.

Dr. Mohamed El-Darieby

Software systems engineering; Software process management; Software analysis; Design; Computer systems; Cloud computing; Internet of things; Pervasive computing; Data engineering; Big data; Artificial intelligence; Applications areas; Connected and autonomous vehicles; Smart agriculture; Intelligent transportation systems; and Smart city and infrastructure.

Dr. Khalid Elgazzar

Internet of things; Ubiquitous computing; Real-time data analytics; Distributed systems; Intelligent software systems; Mobile computing; and Cloud and edge computing.

Dr. Ramiro Liscano

Pervasive and mobile computing (service discovery and security management); Distributed computing (peer-to-peer, web services, service-oriented architectures, GRID services); and Sensor networks (interoperability between wireless and Internet-based sensing).

Dr. Qusay Mahmoud
Software systems; Web engineering; Mobile computing; and Engineering education.

Dr. Masoud Makrehchi
Natural language processing; Artificial intelligence; Machine learning; Text and data mining; Social computing; Mining social networks and complex systems; Network science, and Moral AI.

Dr. Mennatullah Siam
Computer Vision; Deep Learning; Video Object Segmentation; Video Understanding; Few-shot Learning; Interpretability

ELECTRICAL ENGINEERING
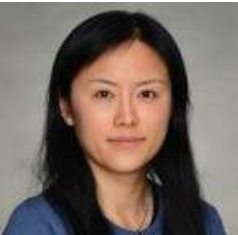
Dr. Min Dong
Statistical signal processing for communications; Communication systems and networks; Learning, optimization, and control applications in cyber-physical systems.

Dr. Mikael Eklund
Autonomous systems (robotic vehicles, smart sensors for assisted living); Nonlinear system identification and control; Health informatics; and Pervasive and mobile computing.

Dr. Ali Grami
Satellite communications and systems design; Digital transmission systems; and Wireless communications and networks.

Dr. Walid Morsi Ibrahim
Smart grid: Design, analysis, operation management and control; Signal processing and data analytics of power systems; and Automation, protection and management of power systems.

Dr. Ruth Milman
Systems control theory; Model predictive control systems; Optimization; Nonlinear control; Constrained systems; and Control systems.

Dr. Jing Ren
Haptics and virtual reality; Robotics and control; Image processing; and Soft computing.

Dr. Langis Roy
International wireless sensor technology; Biotechnology; Electrical Engineering; Higher education; Semiconductors; and Wireless Technology.

Dr. Shahram ShahbazPanahi
Array processing; Co-operative communications; Detection and estimation; Dynamic spectrum access; Smart antennas; Statistical signal processing; and Wireless communications.

Dr. Tarlochan Sidhu
Smart grid; Power system protection and automation; and Renewable energy systems.

Dr. Vijay Sood

HVDC and FACTS controllers for power transmission systems; Modelling of power electronics converters; and Control and protection of power systems.

Dr. Ying Wang

RF/Microwave circuits and Systems; Millimeter-wave technology; Antennas and antenna arrays; Microwave filters and multiplexers; and Computer-aided design of RF circuits.

Dr. Sheldon Williamson

Autonomous mobility/transportation; Batteries; Charging electric energy storage systems; Electric machines; Motor drives; Power electronics; Renewable energy systems; and Transportation electrification.

Dr. Mohamed Youssef

Propulsion Systems for the automotive and innovative technologies like hyperloop; Power train for new drives like water pumps; Railway electromagnetic compatibility (EMC); Railways traction substation design planning, and commissioning; Power electronics applications for the information technology (IoT); Power electronics applications in the innovative renewable energy resources; Power supply design for the oil/gas; and Power systems operation and stability.

ENERGY AND NUCLEAR ENGINEERING

Dr. Kirk Atkinson
Nuclear engineering; Reactor physics; Small modular reactors (SMRs); Radiation science; Radiation biophysics; Radiation risk assessment; Microfocus x-ray spectroscopy; and High-performance computing.

Dr. George Bereznai (Professor Emeritus)
Computer control of nuclear power plants; Educational technology; and Real-time simulation.

Dr. Hossam Gaber
Resilient smart energy grids and micro energy grids planning, control, and protection; Advanced plasma generation and application on fusion energy; Advanced safety and control systems for nuclear power plants; Safety engineering, fault diagnosis & real time simulation; Risk-based energy conservation, smart green buildings; Process systems; and Engineering of energy and nuclear facilities, and oil & gas production plants.

Dr. Glenn Harvel
Diagnostic techniques; Energy systems; Instrumentation and multiphase flow; Nuclear plant aging and design; Small reactor technology; Neutron radiography, ultrasonics, capacitance-based techniques; ElectroHydroDynamics (EHD) techniques; and Radiography.

Dr. Daniel Hoornweg
Natural gas as a transportation fuel; Energy systems; and Sustainable cities.

Dr. Brian Ikeda

Corrosion of materials in molten fluoride salts; Corrosion of nuclear waste container materials; Electrochemical and physical degradation of fluorine anodes; Localized corrosion of metals at elevated temperatures; Stress-assisted corrosion cracking of metals; Long-term performance assessment of materials; and Radioactive waste management.

Dr. Matthew Kaye

Applied thermodynamics; Nuclear materials; High-temperature materials chemistry; Aqueous chemistry; and Physical metallurgy and welding issues.

Dr. Lixuan Lu

Nuclear power plant instrumentation and control; Reliability and safety assessment; Networked control systems; Risk-informed applications; and Safety systems.

Dr. Rachid Machrafi

Applied radiation science; Radiation detection for nuclear security and non proliferation; ADS systems for energy production and nuclear waste transmutation; Monte Carlo simulation and modelling; Space radiation (radiation environment aboard space crafts); and Educational technology.

Dr. Jennifer McKellar

Life cycle assessment; Life cycle costing; Real options analysis; and Expert elicitation.

Dr. Eleodor Nichita

Mathematical modelling and numerical methods; Neutron and radiation transport; Neutronic design and analysis methods for advanced nuclear reactors; Nuclear reactor kinetics and control; and Production of radionuclides.

Dr. Igor Pioro
Nuclear engineering (thermalhydraulics of nuclear reactors and Generation IV nuclear-reactor concepts); Thermal sciences (boiling, forced convection including supercritical pressures, etc.); and Heat engineering (heat exchangers, two-phase thermosyphons, heat-recovery systems, etc.).

Dr. Markus Piro
Nuclear fuel performance and safety; Spent nuclear fuel; Emerging nuclear technologies (i.e., GenIV, SMRs, etc.); Energy systems and manufacturing; Computational thermodynamics; Experimental and computational fluid dynamics; Multi-physics modelling and simulation; and Applied mathematics (i.e., optimization, linear algebra, etc.).

Dr. Akira Tokuhiro
Nuclear systems design; nuclear engineering; Nuclear reactor safety; Energy and resource issues; Big data analytics; Computational fluid dynamics; Convective heat transfer; Experiments and measurement; Modelling of complex systems; Thermal hydraulics; and Ultrasonic and particle velocimetry.

Dr. Anthony Walker (Professor Emeritus)
Nuclear instruments and methods; Experimental microdosimetry and its applications; Neutron monitoring, spectrometry and dosimetry; Low energy X-ray and beta particle dosimetry and microdosimetry; and Radiation effects on cellular, subcellular and organized tissue.

Dr. Edward Waller
Applied health physics; Environmental impact of radionuclides; Internal and external dosimetry; Non-intrusive investigation; Nuclear security and CBRN counter-terrorism; Radiation detection; Risk analysis; and Threat detection.

MECHANICAL ENGINEERING

Dr. Martin Agelin-Chaab
Bluff body/ground vehicle aerodynamics; Turbulent flows and jets; Vehicle and battery thermal analyses; and Sustainable energy systems.

Dr. Ibrahim Dincer
Drying; Energy and exergy analyses; Energy conversion and management; Heat and mass transfer; Hydrogen and fuel cell systems; Refrigeration; Renewable energies; Thermal energy storage; and Thermodynamics.

Dr. Ebrahim Esmailzadeh (Professor Emeritus)
Mechanical vibration; Active vibration control; Nonlinear vibrations; Vehicle dynamics; Structural dynamics; Nonlinear and discrete control systems; and Dynamics and vibration of MEMS and NEMS.

Dr. Kamiel Gabriel
Boiling and two-phase flows; Energy conservation; Fluid physics and heat transfer at reduced gravity (microgravity space sciences); Heat-recovery systems; and Thermofluids in power plants.

Dr. Horia Hangan
Fluid mechanics; and Turbulence with applications in wind engineering, automotive and aerospace.

Dr. Brendan MacDonald
Fluid mechanics; Thermodynamics; Sustainable energy; Stirling engines; External heat engines; Microfluidics; and Capillary-driven Flows.

Dr. Atef Mohany
Aeroacoustics; Acoustics and noise control; Fluid-structure interaction; Flow-induced vibration and noise; Turbulent flows; Vibration and structural dynamics; and Acoustics and noise control.

Dr. Bale Reddy
Biomass combustion and gasification; Fluidized bed combustors; Combined cycle power generation; Exergy analysis; Thermal design and optimization; Cogeneration; Waste heat recovery; Heat transfer;
Advanced energy systems; Advanced power plant cycles; Gas-solid flows in advanced combustors; Energy conservation; and Solar energy.

Dr. Marc Rosen
Polygeneration (cogeneration, trigeneration, etc.); District energy; Efficiency improvement; Electricity generation; Energy; Environmental impact assessment and reduction; Exergy analysis; Geothermal energy; Heat transfer; Hydrogen energy and fuel cells; Integrated energy systems; Modelling and simulation of energy systems; Renewable energy; Solar energy; Sustainable energy and sustainability; Wind energy; Thermal energy storage; and Thermodynamics.

Dr. Zia Saadnatnia
Smart Structures and Materials, Nonlinear Vibration and Structural Dynamics, Energy Harvesting, Sensors and Actuators, Biomedical Devices

MANUFACTURING ENGINEERING

Dr. Jana Abou-Ziki
Spark assisted chemical engraving (SACE); Hybrid additive-subtractive micro-manufacturing; Surface functionalization; Microfluidic devices; Advanced manufacturing; and Electroplating and electroforming of 3D printed parts.

Dr. Ahmad Barari
Advanced manufacturing technologies; Digital Manufacturing; Precision manufacturing; Measurement uncertainty; 3D coordinate metrology; Additive manufacturing and rapid prototyping of sculptured surfaces; Manufacturing surface integrity; Surface quality; Surface tribology; Reverse engineering; Surface reconstruction; Structural design optimization; Topology optimization; and FEA-Based design optimization.

Dr. Ramona (Haniyeh) Fayazfar
Advanced manufacturing (additive manufacturing, micro and nano fabrication); Smart materials (Nanostructured composites/hybrid materials, multifunctional composites); Advanced coatings and surface engineering; Electrochemical synthesis of nanostructured materials; Electro catalysts and energy storage devices (batteries, supercapacitors); and Biosensors and wearables for point-of-care diagnostics and health monitoring.

Dr. Sayyed Ali Hosseini
Manufacturing and metal cutting; Design and optimization; Modelling and simulation of machining operations; Machining difficult-to-cut materials; Surface integrity; and Material behavior.

Dr. Amirkianoosh Kiani
Laser materials processing; Micro/nano manufacturing; Nano energy materials; Nano opto-electronic materials; and Nano sensing materials.

Dr. Hossam Kishawy
Manufacturing; High-speed machining; Modelling and optimization; Finite element modelling; and Residual stresses and stress analysis.

Dr. Remon Pop-Iliev
Processing functionally graded polymeric composites and nanocomposites; Fabrication of biodegradable nanocomposites for bone tissue regeneration; Manufacturing multifunctional nanocomposite fibers; Rapid rotational foam molding; and Innovative design engineering education.

Dr. Ghaus Rizvi
Polymers and composites processing and characterization; Smart and advanced materials; Compounding of colours in plastics; Wood-plastic composites; "Green" composites; Nano-composites; Processes and materials for tissue scaffolds and skeletal structures; and Corrosion of ceramic coatings.

FACULTY NEWS HIGHLIGHTS

NTERNET OF THINGS (IoT)

Dr. Khalid Elgazzar is the Canada Research Chair (CRC) in the Internet of Things (IoT). As a leading IoT expert in Canada, Dr. Elgazzar uncovers new information on the expansion of Internet-enabled computing devices and explores applications for the seamless interaction of 'smart' services in areas such as healthcare, intelligent transportation, industrial automation, emergency response and law enforcement. His research explores innovative opportunities in different domains of application for IoT through the design, development and implementation of cutting-edge technologies in multiple real-life applications to revolutionize the way people carry out their daily business. Dr. Elgazzar's research is currently focusing on four core research directions:

- Transforming the future of healthcare with real-time data access and patient-oriented data analytics to support remote monitoring and diagnosis.
- Enabling public sensing (collection and analysis of information about the environment, infrastructure, health, or other aspects of public interest) and making it a mainstream everyday standard for ubiquitous data access and crowdsensing.
- Bringing 'smart cities' into reality with advanced technology to collect, analyze, and share data to improve the efficiency and effectiveness of city services.
- Stretching the boundaries of industrial IoT by embracing interoperability, leveraging 'edge computing', and utilizing AI to improve operational efficiency, predictive maintenance, and more-effective decision-making.

ENERGY SYSTEMS ANALYSIS

Dr. Jennifer McKellar leads the Energy Systems Analysis research group, with the goal of contributing to the development of sustainable energy systems. She is currently working on two primary projects. The first is a life cycle analysis of solar, wind, small modular reactor and battery technologies, in collaboration with Dr. Kirk Atkinson and Dr. Xianke Lin. This project is supported by Ontario Power Generation and Mitacs through the Mitacs Accelerate Program. The analysis examines the environmental impacts and costs of the various energy technologies from the point of resource extraction through to final waste management, with a focus on Ontario-specific operations. Dr. McKellar is also examining the sustainability of the emerging SMR supply chain with the support of an Ontario Tech Research Excellence Chair. This work seeks to support the development of a supply chain that will make net positive contributions to the environment, economy and society. As our energy system continues to grow and change, it is important that we have a thorough understanding of the positive and negative impacts of different technologies so that we can make informed decisions on how best to deploy them.

THE NUCLEAR DESIGN LABORATORY

Dr. Glenn Harvel leads the the Nuclear Design Laboratory. The Nuclear Design Laboratory is developing new designs to support the nuclear industry in support of the current CANDU fleet as well as the emerging world of SMRs. Our efforts are considering more efficient ways of using data to provide operational support as well as new designs that are easier to maintain and decommission, and address non-electrical applications. Our Nuclear Decommissioning laboratory is examining new detectors for low energy radiation, and the capture of radioactive species to reduce the impacts on workers and the environment. Our nuclear decommissioning test rig allows us to prepare plant configurations for testing of equipment in advance of field use.

MACHINING RESEARCH LABORATORY (MRL)

Dr. Hosseini is currently one of the directors of Machining Research Laboratory (MRL) with research focus on the combination of additive and subtractive manufacturing. This topic is of particular interest to the manufacturing industry because additive manufacturing (AM) of metals for end-use applications has recently become significantly popular. With the current state of the art in metal AM, additively manufactured metals are currently used in various applications including automotive, aerospace, power generation, and biomedical industry. However, comparing to their wrought counterparts, AM metallic parts usually suffer from lack of dimensional accuracy and surface quality. As a result, they must be post-processed by more accurate machining operations in which material is removed (subtractive manufacturing) to achieve the desired shape. Dr. Hosseini's research contributes a thorough combined understanding of material behavior and cutting mechanics which is an imminent need to achieve a high-quality product. As a principal investigator or co-applicant, he has been awarded several research grants including NSERC Discovery Grant, NSERC Research Tools and Instruments, NSERC Innovation Link Grant, Canada Foundation for Innovation John R. Evans Leaders Fund, and Ontario Tech Student Success Innovation Fund.

In 2021, Dr. Hosseini was interviewed about his expertise in the science series Colossal Machines, a program produced by Toronto's Go Button Media and Autentic Media of Munich, Germany. He appeared in Episode 6 ('Mammoth Manufacturing') in which he talked about the world's largest 3D printer that prints a full vehicle and an enormous Computer Numerical Control (CNC) machine that creates parts with ultra-precision.

Dr. Hosseini is currently serving the Canadian Society for Mechanical Engineering (CSME) as the vice-chair of the Manufacturing Technical Committee. He is a registered member of the Professional Engineers Ontario (PEO) and has been actively engaged in voluntarily outreach activities with PEO Lake Ontario Chapter and helped them organizing Mathletics, a competition designed to create a passion in the application of mathematics in solving day-to-day scientific and engineering problems for high school students.
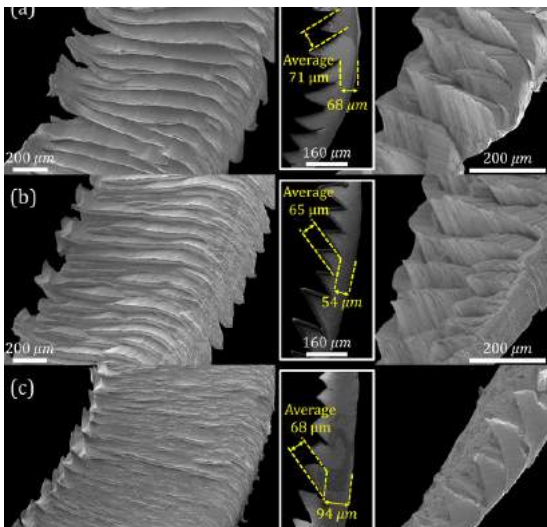
Intelligent Query and Learning System for Logistics

Dr. Hossam Gaber is currently working on the Intelligent Query and Learning System for Logistics project. The research project aims to develop an Intelligent Query and Learning System (IQLS) that will enable the integration of multiple knowledge packages and provide a platform that will leverage diverse existing data sources to answer questions about logistics and transportation networks using natural language processing, learning, and reasoning techniques. The system will enable the transition to green and sustainable logistics and transportation networks with reduced routes and GHG emissions, while maintaining decreased operating costs.

Implementation of Hybrid Automated Autonomous Assisted Inspection Solution for Highway Infrastructure

Dr. Hossam Gaber is working alongside Dr. Khalid Elgazzar on the Implementation of Hybrid Automated Autonomous Assisted Inspection Solution for Highway Infrastructure project. Highways will become digitalized, allowing real-time data collection, sharing, surveillance of the infrastructure condition such as bridges and tunnels, and traffic monitoring and management. The digitalization will prepare the needed digital capabilities to integrate and assist the transition to fully connected and automated vehicles (CAV). This project is aiming to develop an automated highway inspection system enabling real-time hybrid inspection and monitoring with data-sharing using cloud platform. The solution includes an integrated and interactive web-interface for monitoring highways conditions such as cracks, lane markers, and road surface conditions. Also, the solution can monitor snow accumulation in roads to plan corrective actions to ensure road safety.
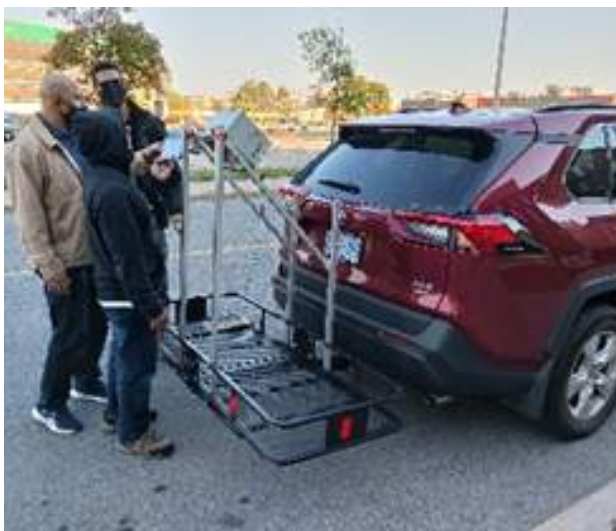
RESEARCH FACILITIES AND LABORATORIES

ONTARIO POWER GENERATION ENGINEERING BUILDING

This 40,000-square-foot, three-storey OPG Engineering Building has 17 laboratories, including state-of-the-art facilities and equipment for teaching and research. The advanced learning areas include a rapid prototyping and manufacturing lab, a combustion and engines lab, a mechatronics and robotics lab, and an emerging energy systems lab with solar, wind, hydrogen and fuel-cell technology.

ENERGY SYSTEMS AND NUCLEAR SCIENCE RESEARCH CENTRE (ERC)

ERC is a 9,290 square-metre building with unique capabilities and facilities in geothermal, hydraulic, hydrogen, natural gas, nuclear, radiation, solar and wind energy technologies. The centre has space and offices for faculty, staff and graduate students, as well as research labs for computational simulations in various engineering disciplines, including facilities for electrical power systems and "smart grid" research. The building features a glass-covered four-storey Atrium, a 72-seat lecture theatre, three 50-seat classrooms, two 30-seat tutorial rooms with flexible seating, as well as numerous other labs and student-study breakout rooms.

GENERAL MOTORS OF CANADA AUTOMOTIVE CENTRE OF EXCELLENCE (ACE)

ACE is the first climatic testing and research centre of its kind in Canada and, in many respects, the world. This multi-purpose, 16,300-square-metre facility is owned and operated by Ontario Tech University and is an independent, commercial operation. ACE is divided into two distinct areas: a core research facility and an integrated research and training facility. The core research facility offers a range of full-sized test chambers that allow for full climatic, structural durability and lifecycle testing. The signature test chamber is one of the world's largest and most sophisticated climatic wind tunnels. The wind tunnel has a sizeable yawing chassis dynamometer (road simulator) that can, for the first time anywhere, test properties in crosswinds. Among the other chambers is a climatic four-post shaker that can test a vehicle's ability to handle a wide range of road conditions in the Arctic or high desert.

CLEAN ENERGY RESEARCH LABORATORY (CERL)

CERL is a cutting-edge laboratory that pioneers clean energy research and discovers major new energy solutions to the problem of climate change. CERL's mission is to develop clean energy technologies and move them from the laboratory to commercial and industrial application. Researchers are working on the world's first lab-scale demonstration of a copper-chlorine cycle for thermochemical water splitting and nuclear hydrogen production. Using nuclear, solar or other heat sources (such as waste heat from industrial plant emissions), the Cu_CI cycle promises to achieve higher efficiencies, lower environmental impact and lower cost of hydrogen production than any other existing technology.

ASSOCIATED LABORATORIES BY DEPARTMENT

AUTOMOTIVE AND MECHATRONICS ENGINEERING

Associated research laboratories include:
- Autonomous Vehicle and Electro-Hydraulic Control (AVEC) laboratory;
- BioMechaTronics Medical Robotics Research Laboratory;
- General Robotics and Autonomous Systems and Processes (GRASP Laboratory;
- Mechatronics and Robotics Systems (MARS) Laboratory; and
- Automotive Centre of Excellence (ACE).
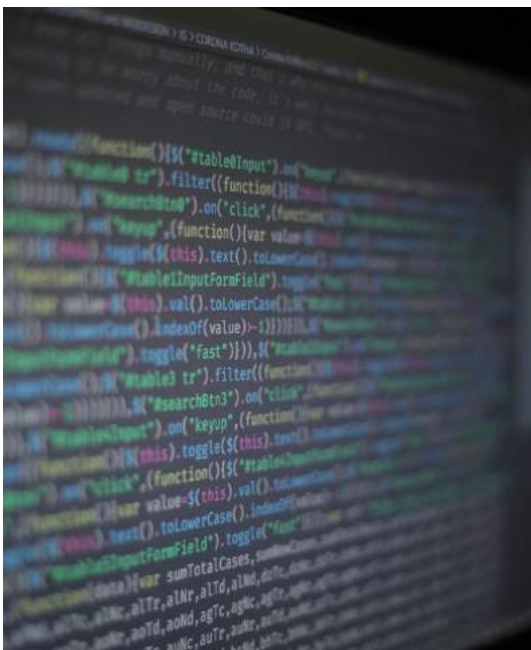
ELECTRICAL, COMPUTER AND SOFTWARE ENGINEERING

Associated research laboratories include:
- Energy Safety and Control (ESCL) Laboratory;
- Energy Research Centre (ERC);
- Internet of Things (IoT) Research Laboratory;
- Real-Time Embedded Software (RTEMSOFT) Research Laboratory;
- Borehole Thermal Energy Storage System; and
- Power Electronics and Drives Applications Laboratory (PEDAL).

ENERGY AND NUCLEAR ENGINEERING

Associated research laboratories include:
- Health Physics and Environmental Safety Research Group;
- Nuclear Fuels and Materials Group;
- Smart Energy Systems Laboratory (SELS);
- Advanced Nuclear Computation Laboratory;
- Aerosol and Radiation Research Laboratory;
- Corrosion and Waste Management Laboratory;
- Energy Safety and Control Laboratory;
- Nuclear Instruments and Methods; Research and Non-Destructive Testing Lab; and
- Special Imaging Techniques Laboratory

MECHANICAL AND MANUFACTURING ENGINEERING

Associated research laboratories include:
- Advanced Digital Design, Manufacturing and Metrology (AD2M) Laboratories;
- Clean Energy Research Laboratory; (CERL);
- Macdonald Laboratory for Sustainable Energy, FLuidics and Phase Change;
- Machining Research Laboratory (MRL); and
- Silicon Hall Laser, Micro/Nano Fabrication Laboratory

SELECTED PUBLICATIONS

AUTOMOTIVE AND MECHATRONICS ENGINEERING

AUTOMOTIVE ENGINEERING

Dr. Moustafa El-Gindy

M. Peiris, M. El-Gindy, Z. El-Sayegh, and H. Lang, "State of Mapping and Path Planning Research for Multi-Wheeled, Multi-Steered Vehicles: A Literature Review", Int. Journal of Robotics and Automation Technology, Vol. 1, No. 4, DOI 10.33552/OJRAT.2022.01.000517, 2022.

Collings, W., El-Sayegh, Z., Ren, J., and El-Gindy, M., "Modelling of Off-Road Truck Tire-Rim Slip Using Finite Element Analysis," SAE Int. J. Adv. & Curr. Prac. in Mobility 4(6):2335-2341, 2022,https://doi.org/10.4271/2022-01-0882.

Hossam Ragheb, Moustafa El-Gindy. "Rear wing spoiler effects on vehicle stability and aerodynamic performance" Int. J. Vehicle Systems Modelling and Testing, No. 4, Vol 15, pp 289-307, 2022.

Aaron Hao Tan, Michael Peiris, Moustafa El-Gindy and Haoxiang Lang, "Design and development of a novel autonomous scaled multiwheeled vehicle", Robotica (2022), 40, pp. 1475–1500 doi:10.1017/S0263574721001223

Alireza Saberironaghi, Jing Ren and Moustafa El-Gindy, "Defect Detection Methods for Industrial Products Using Deep Learning Techniques: A Review", Int Journal of Algorithms, MDPI, Vol. 16, Issue 2, 95, February 2023, DOI: 10.3390/a16020095

Dr. Zeinab El-Sayegh

Michael Peiris, Moustafa El-Gindy, Zeinab El-Sayegh, and Haoxiang Lang." State of Mapping and Path Planning Research for Multi-Wheeled a Literature Review". Online Journal of Robotics & Automation Technology, 1(4): 2022. OJRAT.MS.ID.000517.

William Collings, Zeinab El-Sayegh, Jing Ren, and Moustafa El-Gindy. "Modelling of Off-Road Truck Tire-Rim Slip Using Finite Element Analysis." SAE International Journal of Advances and Current Practices in Mobility 4, no. 2022-01-0882 (2022): 2335-2341.

Charanpreet Singh, Alfonse Ly and Zeinab El-Sayegh. Non-Pneumatic Tire-Mars Soil Interaction Using Advanced Computational Techniques. No. 2023-01-0022. WCX SAE World Congress Experience, April 5-7, 2023, Detroit, Michigan, USA, 2023.

Alfonse Ly, Zeinab El-Sayegh, Moustafa El-Gindy, Fredrik Oijer, and Inge Johansson. A Comprehensive Study of the Impact of Tread Design on the Tire-Terrain Interaction using Advanced Computational Techniques. No. 2023-01-0018. WCX SAE World Congress Experience, April 5-7, 2023, Detroit, Michigan, USA, 2023.

Junwoo Kim, Moustafa El-Gindy, and Zeinab El-Sayegh. Development of Novel Steering Scenarios for an 8X8 Scaled Electric Combat Vehicle. No. 2023-01-0106. WCX SAE World Congress Experience, April 5-7, 2023, Detroit, Michigan, USA, 2023.

Dr. Yuping He

Zhou, Q.H., Qiu, Y.H., Liu, H.S., and He, Y., "A Performance Study on Structural Parameters of Centre-Axle-Trailer Combinations", International Journal of Simulation Modelling, Vol. 22, No. 1, pp. 168-179, 2023.
http://www.ijsimm.com/Full_Papers/Fulltext2023/text22-1_CO5.pdf

Zhou, Q., Zhang, C., He, Y., and Huang, J., "A Visual SLAM Algorithm based on Fuzzy Clustering for Removing Dynamic Features", Transactions of the Canadian Society for Mechanical Engineering, in press, 2023.
https://cdnsciencepub.com/doi/abs/10.1139/tcsme-2022-0090?journalCode=tcsme

Qureshi, K., Liscano, R., and He, Y., "Optimization of Gain Scheduled Controller for an Active Trailer Steering System Using an Evolutionary Algorithm", Machines, Vol. 10, Paper #: 1019, 2022 (21 pages).
https://www.mdpi.com/2075-1702/10/11/1019

Sharma, T., He, Y., and Huang, W., "An Autonomous Steering Control Scheme for Articulated Heavy Vehicles Using Model Predictive Control Technique", SAE Technical Paper 2023-01-0658,
https://www.sae.org/publications/technical-papers/content/2023-01-0658/

Zhou, Q., Zhang, H., Huang, Y., and He, Y., "A Comparison of Directional Performance of Articulated Heavy Vehicles", accepted by CSME Congress 2023, May 28-31, 2023, Sherbrooke, QC, Canada,
https://event.fourwaves.com/csme2023/abstracts/4042f78b-86cb-4643-9aaf-ab26653ac21c

Dr. Xianke Lin

Couture, J., Lin, X., "Novel Image-Based Rapid RUL Prediction for Li-Ion Batteries Using a Capsule Network and Transfer Learning," *IEEE Transactions on Transportation Electrification,* May 10, 2022.

Ojo, O.J., Lin, X., Lang, H., "An online health-conscious enhanced charging and active balancing strategy for lithium-ion battery packs," *Journal of Energy Storage*, 44, 103368, December 1, 2021.

Tang, X., Huang, B., Liu, T., Lin, X., "Highway Decision-Making and Motion Planning for Autonomous Driving via Soft Actor-Critic," *IEEE Transactions on Vehicular Technology,* 71(5), 4706-17, February 22, 2022.

MECHATRONICS ENGINEERING

Dr. Meaghan Charest-Finn

Komarsofla, Amin k., Meaghan Charest-Finn, and Scott Nokleby. "Autonomous Inspection of Steel Pipe Weld Lines Implementing Frequency Analysis Combined with YOLOv5", Canadian Society of Mechanical Engineers (CSME). Sherbrook, Canada, 2023.

Charest-Finn, Meaghan, and Rickey Dubay. "General Industrial Process Optimization Method to Leverage Machine Learning Applied to Injection Molding" Authorea Preprints (2023). Under Review with Willey- Expert Systems

Charest-Finn, Meaghan, Rickey Dubay, and Ryan Finn. "Model Predictive Control Systems and Methods." U.S. Patent Application No. 17/907,787.(filed 2021, published 2023)

Dr. Haoxiang Lang

Z. Bao, S. Hossain, H. Lang and X. Lin, "A Review of High-definition Map Creation Methods for Autonomous Driving," Engineering Applications of Artificial Intelligence, Vol. 122, June 2023.

A. Tan, A. Al-Shanoon, H. Lang and Y. Wang, "Mobile Robot Docking with Obstacle Avoidance and Visual Servoing," International Journal of Robotics and Automation, Vol. 38, No. 2, 2022.

A. Al-Shanoon and H. Lang, "Learn to Grasp Unknown-Adjacent Objects for Sequential Robotic Manipulation," Journal of Intelligent & Robotic Systems, Vol. 105, No. 83, 2022.

E. McCormick, H. Lang and C. W. De Silva, "Dynamic Modeling and Simulation of a Four-wheel Skid-Steer Mobile," Electronics, Vol. 11, No. 15, 2022.

A. Al-Shanoon, Y. Wang and H. Lang, "DeepNet-Based 3D Visual Servoing Robotic Manipulation," Journal of Sensors, 2022.

Dr. Scott Nokleby

Goodwin, L. and Nokleby, S. B., 2022, "A K-Means Clustering Approach to Segmentation of Maps for Task Allocation in Multi-robot Systems Exploration of Unknown Environments," in Proceedings of the 2022 USCToMM Symposium on Mechanical Systems and Robotics - Mechanisms and Machine Science, Vol. 118, edited by Larochelle, P. and McCarthy, J. M., Springer: Berlin, Germany, pp. 198–211.

Baird, C. and Nokleby, S. B., 2023, "Manipulation for Mobile Robots to Autonomously Use Elevators and Open Doors," in Proceedings of the 2023 CCToMM Symposium on Mechanisms, Machines, and Mechatronics, June 19-20, Quebec City, Canada, 13 pages.

Khabbaz, N. and Nokleby, S. B., 2023, "ArUco-Based Global Map Initialization for Multi-Robot Exploration," in Proceedings of the 2023 CCToMM Symposium on Mechanisms, Machines, and Mechatronics, June 19-20, Quebec City, Canada, 10 pages.

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Dr. Mitchell Rushton

M. Rushton and A. Khajepour, "An Atlas-Based Approach to Planar Variable-Structure Cable-Driven Parallel Robot Configuration-Space Representation," in IEEE Transactions on Robotics, vol. 39, no. 2, pp. 1594-1606, April 2023, doi: 10.1109/TRO.2022.3218996.

Dr. Jaho Seo

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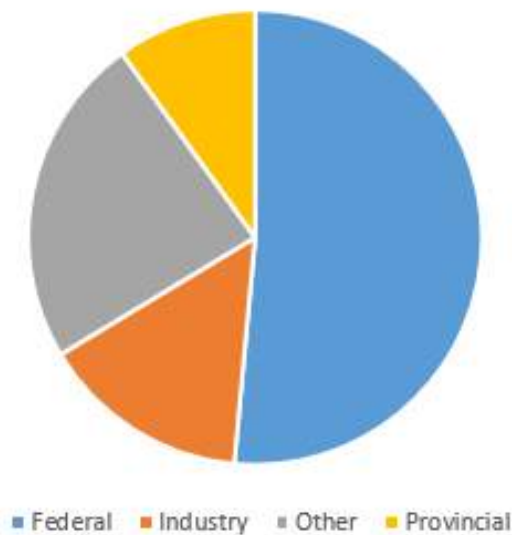
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Fault Detection Engine Extension and Enhancement - Pulse Industrial Partnership **($4,600)**

Fault Detection Engine Extension and Enhancement - Eye Hospital of Wenzhou Medical University **($4,600)**

Multi-Physics Modeling and Simulation of Fluid Dynamics - Eye Hospital of Wenzhou Medical University Partnership **($3,000)**

High Drain and Low Drain Testing of Certain AA and AAA Batteries - Staples Contract **($3,500)**

Visual-based Autonomous Homing System for Electrical Scooters - Mitacs Accelerate Entrepreneur **($255,000)**

MECHATRONICS

Dr. Meaghan Charest-Finn

Multi-Point Mobile Autonomous Visual Inspection System - Eigen Innovations Grant **($120,000)**

Dr. Haoxiang Lang

Research and Development of Visual Perception and Manipulation in an Interactive Autonomous Robotic System - University of Ontario Institute of Technology Start-Up Funds **($156,360)**

Safe and Low-cost Robot Grasping through Impedance Control and Deep Learning - Mitacs Accelerate **($495,000)**

Design Optimization and Development of a MRI Enabled Autonomous Surgical Robotic System - AescuRobot Inc. Partnership **($80,250)**

Dr. Scott Nokleby

(co-applicant) Effective Human-Machine Cooperation with Intelligent Adaptive Autonomous Systems - Department of National Defence Innovation for Defense Excellence and Security (IDEaS) **($189,750)**

Investigating the use of the Boston Dynamics SPOT robot for inspection tasks - RMUS Canada Inc. Partnership **($70,000)**

Autonomous Robotic Aerial Manipulation - University of Ontario Institute of Technology Internal - NSERC Discovery Grant Support Program **($35,000)**

Robotic Inspection of CANDU Fuel Channels - Macdonald, Dettwiler, and Associates Inc. Partnership **($60,000)**

Dr. Jaho Seo

Integrated Technical Solutions for Urban Construction Using Autonomous Excavators - NSERC Discovery Grant **($127,500)**

Waste Collection / Street Sweeping / Snowplow Route Optimization - City of Oshawa Partnership **($40,000)**

Development of de-noise filtering algorithms for mobile machines in industrial sectors under dust environments using AI methods - Korea Institute of Machinery and Materials **($20,485)**

Exploring and augmenting automation in smart textile manufacturing and testing - Mitacs Business Strategy Internship **($15,000)**

Development of Simulation Technologies for Redundant Braking Systems - Hyundai Motor Company Partnership **($133,200)**

Development of advanced path planning algorithms for autonomous tillage with tractors - Korea Institute of Industrial Technology Sponsored Research Program **($20,995.84)**

AKCSE Funding for "Development of advanced path planning algorithms for autonomous tillage with tractors" - Association of Korean-Canadian Scientists and Engineers Partnership **($5,000)**

Advancement of dust filtering algorithms - Korea Institute of Machinery and Materials Partnership **($20,353.12)**

Development of algorithms for real-time scheduling and optimal path generation for autonomously operating platforms - Korea Institute of Industrial Technology Sponsored Research Program **($36,950)**

Dr. Aaron Yurkewich

Co-Creating Smart Clothing with Older Adults - Age-Well ECR Grants **($7,500)**

SOFTWARE ENGINEERING

Dr. Akramul Azim

A novel framework for design and analysis of embedded software with variable constraints - NSERC **($154,180)**

Test Case Prioritization with ML - IBM Center of Advanced Studies University Research **($188,000)**

Intelligent Traffic Monitoring: Turning Movements - NSERC Alliance **($20,540)**

Design and Development of Next-Generation Electronic Pocket Notebook for Law Enforcement Agencies - Mitacs Accelerate **($75,000)**

Automated Quality Assurance and Optimization in Incremental Industrial Software Systems Development - GlassHouse Systems Partnership **($558,600)**

Dr. Mohamed El-Darieby

A Study of CAV Technological Ecosystem Characterizing and Predicting Traffic Operations using CAV data - Ministry of Transportation Highway Infastructure Innovation Funding Program **($28,750)**

Toward Seamless coordination of cyber physical resources - NSERC Discovery Grant **($103,863.08)**

Experiential Discovery of Safe and Smart Autonomous Vehicle Software: An Interplay of Software Engineering Technologies - University of Ontario Institute of Technology Contribution **($489,800)**

Dr. Khalid Elgazzar

Building open and inter-operable user-oriented internet of things - University of Ontario Institute of Technology Contribution **($615,000)**

Towards privacy preserving Internet of Things - NSERC **($131,180)**

Intelligent Real-time Traffic Analysis from Live Video Streams - Natural Sciences and Engineering Research Council Alliance **($27,044)**

(Renewal) Internet of Things - Canada Research Chairs Secretariat Chair, NSERC Tier 2 **($500,000)**

Statistical Analysis of the Effectiveness of Automated Speed Enforcement - Regional Municipality of Durham Durham City Studio **($5,000)**

(co-PI) 3-Implementation of Hybrid Automated Autonomous Assisted Inspection Solution for Highway Infrastructure **($25,000)**

Dr. Ramiro Liscano

Intent-based network management of software defined wireless sensor networks - NSERC Discovery Grant **($115,000)**

Quality and Developer Productivity Enhancements for Cloud-Native Applications via Fault Analysis & Localization with Machine Learning - IBM Center of Advanced Studies University Research **($55,000)**

Developer Recommender for Cloud-Native Applications for Fault Analysis & Localization - IBM Center of Advanced Studies University Research **($34,000)**

Dr. Qusay Mahmoud

Design and Development of an AI-Enabled - NSERC Discovery Grant **($120,000)**

Framework for Internet-of-Things Applications Ontario Tech University Engineering Outreach Programs - NSERC Promo Science **($600,000)**

After School STEM Workshops for Students in Grades 1 - 8 - NSERC Promo Science **($5,000)**

Dr. Masoud Makrehchi

Algorithms and application of Link Mining: Making Sense of Network Data - NSERC Discovery Grant **($120,000)**

ELECTRICAL ENGINEERING

Dr. Min Dong

Integrated transmission and resource optimization for massive content distribution in future wireless network - NSERC **($403,800)**

Dr. Mikael Eklund

(co-applicant) SENTRYNET: Developing trust between soldiers, civilians and robots - Department of National Defence Innovation for Defense Excellence and Security (IDEaS) **($281,175)**

Dr. Ali Grami

Integration of Satellites in 5G and Fixed Broadband Access Networks - University of Ontario Institute of Technology GRF (VPRII) **($50,000)**

Dr. Walid Morsi Ibrahim

Energy Automation and Management Infrastructure for Smart Resilient and Self-Healing Grid Research Laboratory - University of Ontario Institute of Technology Start-up Funds **($96,600)**

Integrating transportation electrification into smart distribution systems with large-scale high-power fast charging stations - NSERC **($203,280)**

CyberPhysical Smart Energy Internet Automation and Management Research Laboratory - University of Ontario Institute of Technology Contribution **($60,277)**

Dr. Jing Ren

Applying Deep Learning to the Safety of Autonomous Ground Vehicles - NSERC Discovery Grant **($140,000)**

EEG - Based Integrated Solution for High Performance Human Activities in Critical Applications in Industrial Facilities - Mitacs Business Strategy Internship **($30,000)**

(co-applicant) Impacts of physical processes on water quality in urban ponds: Development of a monitoring framework - University of Ontario Institute of Technology CRCP EaRTH Initiative **($12,500)**

Dr. Langis Roy

IANR-Reconfigurable Wireless Components Using Field Programmable Microwave Subtrates (FPMS) - NSERC **($503,300)**

Investigation of lidar performance in adverse weather conditions - Magna International Inc Partnership **($418,000)**

Microwave and Millimeter-Wave Active Antennas for IOT Applications - NSERC Discovery Grant **($165,000)**

Dr. Shahram ShahbazPanahi

Resource Allocation for Active Channels Asynchronous Massive MIMO Base Station - NSERC **($227,920)**

Cooperation for 5G Networks and Beyond - Ericsson Canada Inc. Partnership **($140,885.28)**

Spectrally Efficient Massive MIMO Communications - NSERC Discovery Grant **($210,000)**

Dr. Tarlochan Sidhu

Power System Protection, Automation and Monitoring - NSERC **($211,560)**

Dr. Vijay Sood

Grid Integration of Renewables - NSERC Discovery Grant **($165,000)**

Dr. Ying Wang

Intelligent Modeling and Design of Medium to Large Scale Microwave and Millimeter-Wave Circuits for Communication Systems - NSERC **($172,480)**

Dr. Sheldon Williamson

Design and Development of a High-Efficiency Wireless Fast Charging System for Urban Modes of Autonomous Electric Mobility and Transportation - NSERC **($456,520)**

(Renewal) Electric Energy Storage Systems for Transportation Electrification - University of Ontario Institute of Technology Institutional Matching **($500,000)**

Design, Development, and Testing of a Solar/PV-Grid-integrated EV Charger/Converter for a Pick-up Truck Tonneau - Mitacs Accelerate **($32,500)**

Design and Development of a Non-Parasitic DC Fast Charging Station for E-Transportation - Mitacs Accelerate **($200,000)**

Development of Wireless Power Transfer charging system for Commercial Electric Vehicles using a Model Based Design process - Mitacs Globalink Award **($3,000)**

Next-gen EV Battery Safety Framework using a Digital Twin-based Smart Battery Management System (BMS) - NSERC Idea to Innovation **($20,000)**

Modeling, design, analysis, and control of a parallel hybrid electric vehicle drivetrain including optimal drive mode operation - Customachinery Partnership **($30,000)**

Dr. Mohamed Youssef

Innovative Power Electronics Components, Control Systems, and Motor Design Techniques for Future Smart Power Drive Systems - NSERC **($172,480)**

The inGear transmission integration in electric vehicles: drives, signal analysis and interface management - inMotive Partnership **($90,200)**

Data Mining Application In Remote Diagnosis Of Failures In Gas Production Substations - Imperial Oil of Canada, Ltd. Research Grant **($25,000)**

Modeling, design, analysis, and control of a parallel hybrid electric vehicle drivetrain including optimal drive mode operation **($30,000)**

ENERGY AND NUCLEAR ENGINEERING
Dr. Kirk Atkinson

Assessment of small modular reactor core performance using antineutrinos - NSERC Discovery Grant **($160,000)**

NSERC/UNENE Associate IRC in Health Physics and Environmental Safety - University of Ontario Institute of Technology Faculty Funding **($1,051,750)**

Yeast-based impedance biodosimetry for retrospective assessment of low dose exposure - CANDU Owners Group Inc. Partnership **($145,600)**

Centre for Small Module Reactors - University of Ontario Institute of Technology Research Entity Award 2023 **($40,000)**

Feasibility of in-vivo measurement of radiation exposures to the eye and the potential for occupational ocular biodosimetry - CANDU Owners Group Inc. Partnership **($175,000)**

Dr. Hossam Gaber

Intelligent Experience Retention System (IERS) - NSERC Collaborative Research & Development Grant **($75,503.52)**

Energy Storage Integration Analysis with 450 kW+ charger / Analysis and Design of Fast Charging System with Flywheel Energy Storage Platform / Design of a Mobile Charging Station for EVs - Canadian Urban Transit Research and Innovation Consortium Partnership **($384,000.00)**

Automated CT Data Analysis for Nuclear Reactor Maintenance - Mitacs Accelerate **($200,000)**

Development of Enhanced RF-ICP thermal torch for waste to energy and radioactive waste material treatment - Mitacs Accelerate **($150,000)**

Applications of Fiber Bragg Gating (FBG) Sensing Technologies on Power Utility Systems - Fibos Inc. Partnership **($45,000)**

Development of plasma-based plastic to oil process technology for industrial applications - NSERC Alliance **($80,250)**

Intelligent Energy Management for Production Facilities with Robotics Automation [IEMPRA] - Cherkam Industrial Systems Ltd. Partnership **($90,000)**

Implementation of Hybrid Automated Autonomous Assisted Inspection Solutoin for Highway - Ministry of Transportation Highway Infastructure Innovation Funding Program **($126,375)**

Demonstration of smart water systems for sustainable cities - University of Ontario Institute of Technology CRCP EaRTH Initiative **($12,500)**

Development of Mobile and Fixed Models of Hybrid Energy Charging Station for Marine Applications and Waterfront Infrastructures - Mitacs Accelerate Entrepreneur **($15,000)**

Smart Scan with AI and Data Analytics for Industrial Applications - NSERC Alliance International Catalyst **($25,000)**

Study of New Designs of Digital Control Room for SMR Deployments with Human Performance Considerations - NSERCCNSC Small Modular Reactors Research Grant Initiative **($343,000)**

PI: Design and Experiment of Resilient Hybrid Energy Systems for Interconnected and Smart Infrastructures (Awarded**)** - NSERC Discovery Grant **($217,000)**

Co-PI: Quantifying the benefits and risks of using hydrogen for sectoral integration in Canadian municipalities towards net-zero emissions (Awarded) - Government of Canada - Environment and Climate Change Canada (ECCC), Climate Action and Awareness Fund, **($650,000)**

PI: Intelligent Query and Learning System for logistics (Awarded) - Mitacs **($12,000)**

Dr. Glenn Harvel

Digitization and Modernization - Alithya Digital Technology Corporation Partnership **($46,950)**

Radionuclide Capture Techniques for Nuclear Operations and Decommissioning - NSERC Discovery Grant **($195,000)**

Development of Advanced Techniques for the Detection and Capture of Low Energy/Low Range Radioactive Species - Ontario Power Generation Partnership **($138,000)**

Balancing Digital Technologies and Cyber risks for Small Modular Reactors in Remote Environments - NSERC CNSC Small Modular Reactors Research Grant Initiative **($360,000)**

On-line Monitoring and Condition-based Maintenance - Macdonald, Dettwiler, and Associates Inc. Partnership **($28,999)**

Dr. Daniel Hoornweg

Sustainability: An Urban Approach - Tri-Agency Institutional Programs Secretariat New Frontiers in Research Fund - Exploration **($212,500)**

(co-applicant) Greenhouse Project - University of Ontario Institute of Technology CRCP EaRTH Initiative **($12,500)**

Dr. Matthew Kaye

Materials Chemistry Applications that Support the Nuclear Industry - NSERC Discovery Grant **($144,000)**

Dr. Lixuan Lu

Safety Assessment and Risk-informed Design of Networked Control Systems - NSERC Discovery Grant **($184,000)**

Dr. Rachid Machrafi

Study of Alternative Radiation Detectors and Shielding Materials for Complex and Mixed Radiation Fields - University of Ontario Institute of Technology Contribution **($45,000)**

Dr. Jennifer McKellar

BEI Research Excellence Chair in Techno-Economic and Environmental Assessment of Energy Systems - University of Ontario Institute of Technology Contribution **($50,000)**

Life Cycle Analysis of Electricity Generation and Battery Technologies for use in Ontario - Mitacs Accelerate **($195,000)**

Dr. Eleodor Nichita

Computational Methods and Tools for Neutronics Calculations for Molten-Salt Nuclear Reactors - NSERC Discovery Grant **($162,000)**

Modelling of COVID-19 Transmission in the Regional Municipality of Durham, Ontario - NSERC Alliance **($50,000)**

Dr. Markus Piro

CRC In Nuclear Fuels and Materials/Applied Thermodynamics Laboratory - University of Ontario Institute of Technology Contribution **($1,598,630)**

Thermodynamic Investigations to Enhance Materials Performance for Manufacturing and Energy Systems Applications - NSERC **($172,480)**

A project to develop an international database of phase diagrams and thermodynamic properties of advanced nuclear fuels (TAF-ID Phase II) - Organisation for Economic Co-operation and Development Partnership **($243,648)**

Development of Yellowjacket - Battelle Energy Alliance, LLC Partnership **($429,138)**

(Renewal) Nuclear Fuels and Materials - University of Ontario Institute of Technology Contribution **($500,000)**

Coupling MELCOR and Thermochimica - Sandia National Laboratories Partnership **($56,051.97)**

Experimental and Computational Research of TRISO Fuels for Small and Micro-Modular Reactors - NSERC Discovery Grant **($210,000)**

Dr. Akira Tokuhiro

(co-applicant) Small Modular Advanced Reactor Training (SMART) - NSERC Collaborative Research and Training Experience Program Grant **($58,529)**

Investigating the heuristics of complex, multi-parameter dynamic phenomena via consideration of next generation small reactors and waste installations - University of Ontario Institute of Technology Contribution **($35,000)**

Augmented Reality and Virtual Reality and Simulation - Alithya Digital Technology Corporation Partnership **($41,560)**

Establishing an open, systems level technical basis in determining the SMR emergency planning zone (EPZ) - NSERC CNSC Small Modular Reactors Research Grant Initiative **($233,400)**

Dr. Edward Waller

Radiation Environment Characterization for Emergency Preparedness and Response - NSERC **($308,000)**

Estimation of lifetime doses to the public living close to NPPs using ESR measurements on extracted tooth enamel - CANDU Owners Group Inc. Partnership **($157,500)**

NSERC-UNENE IRC in Health Physics and Environmental Safety - University of Ontario Institute of Technology Contribution **($1,469,505.12)**

Novel Techniques for Characterizing Complex Radiation Environments in Radiological Emergencies - NSERC Discovery Grant **($295,000)**

MECHANICAL ENGINEERING

Dr. Martin Agelin-Chaab

Investigation of Turbulent Flow Separation and the Development of Flow Control Strategies for Bluff Bodies in Ground Proximity - NSERC **($197,120)**

Improving the Safety and Movement of the Blind When Interacting with Emerging Vehicles in Urban Environments - University of Ontario Institute of Technology Contribution **($57,235.02)**

Development of a Drive-through Climate Tunnel for Autonomous Vehicle Development - GlassHouse Systems Partnership **($15,000)**

Design, development, and manufacturing of an ultra-efficient heat pump for cold climates - Mitacs Accelerate **($50,000)**

Dr. Ibrahim Dincer

Novel Integrated Solar Energy Systems for Multigeneration - NSERC **($203,280)**

Development and Assessment of Alternative Fuel Choices for Clean Transportation Sectors - University of Ontario Institute of Technology Contribution **($94,500)**

Carbon neutrality through combined CO2 capture and novel H2 technology with production of non-conventional fuels for smart cities - India-Canada Centre for Innovative Multidisciplinary Partnerships to Accelerate Community Transformation & Sustainability Collaborative Research Grant **($175,900)**

(sub-award) Development of novel and sustainable cooling technologies for self-sufficient greenhouses and buildings - Qatar National Research Fund NPRP Proposal **($70,350)**

Sectoral use of ammonia as a clean solution - Hydrofuel Inc. Partnership **($90,000)**

New Techniques for Continuous Biohydrogen Production from Poplar Biomass - Mitacs Accelerate **($150,000)**

Development of Sustainable Energy Plan for a School Site - Mitacs Accelerate **($30,000)**

BEI Research Excellence Chair in Clean Hydrogen Energy Technologies - University of Ontario Institute of Technology Contribution **($50,000)**

Development, Modelling and Prototyping of a Novel Hydrogen Generation System H2Generation Inc Partnership **($255,000)**

Development, analysis and experimental testing of new pneumatic powertrains - Air Lab, Inc. Partnership **($30,000)**

Renewable Energy Based Integrated Systems with Hydrogen Production for Indigenous Communities - NSERC Discovery Grant **($295,000)**

Clean Energy Research Lab - University of Ontario Institute of Technology Research Entity Award 2023 **($40,000)**

Dr. Kamiel Gabriel

System Integration of the Cu-Cl Cycle of Thermochemical Hydrogen Production - Canadian Nuclear Laboratories Partnership **($702,703.68)**

Dr. Horia Hangan

CRC in Adaptive Aerodynamics - University of Ontario Institute of Technology Contribution **($1,621,280)**

Unsteady Flows with applications to Wind Resilience and Sustainability - NSERC Discovery Grant **($120,501.63)**

(co-applicant) Improved multi-scale GHG emissions modeling from urban environments to enhance mitigation strategies - University of Ontario Institute of Technology Contribution **($474,570)**

Weather Adaptive Aerodynamics - NSERC Discovery Grant **($250,000)**

Dr. Brendan MacDonald

Flow control in textile-based capillary-driven microfluidic platforms - NSERC **($139,320)**

Dr. Atef Mohany

Investigation of the Dynamic Characteristics of CANDU Fuel Bundle - CANDU Owners Group Inc. Partnership **($299,910)**

Investigation and Implementation of Pulse-Electro Thermal De-Icing in Commercial Electric Vehicles - Betterfrost Technologies Partnership with Grant **($134,000)**

Flow-Sound Interaction Mechanisms with Application to Bluff Body Wakes and Separated Shear Flows - NSERC Discovery Grant **($160,000)**

Damping of Pressure Pulsations in CANDU Fuel Bundles - CANDU Owners Group Inc. Partnership **($312,667)**

Dr. Marc Rosen

Enhancing polygeneration energy systems and their applications - NSERC **($237,360)**

Advancement of a Novel Phase Change Material-Based Thermal Caisson System for Geothermal Heating and Cooling - McClymont and Rak Engineers Inc. Partnership **($261,010)**

MANUFACTURING ENGINEERING

Dr. Jana Abou-Ziki

Rapid Prototyping Methods for Precision Glass Components - NSERC **($151,820)**

Dr. Ahmad Barari

Integrated Inspection System for Digital Manufacturing - NSERC **($165,120)**

Structural Smart Sensors for LIVE Digital Twins of pipelines in Power Generation and Oil and Gas Industries (3S for LIVE Digital Twins) - Arshon Silicon Technology Inc. Partnership **($80,250)**

Adaptive Hybrid Manufacturing of Reactive Metals - University of Ontario Institute of Technology Faculty Funding **($247,607)**

Creation of LIVE Digital Twin for Prognostics and Predictive Maintenance of Rotating Machineries (LIVE for 2PM) - NSERC Alliance Mission **($353,700)**

Developing An Additive Manufacturing Method for Replace or Repair of the Defected Parts in Power Generation Industry (RoR Machine) - Ontario Power Generation Partnership **($270,000)**

Dr. Ramona Fayazfar

Direct and Selective Electroless Metallization of low-cost 3D Printed Composite Filaments Loaded with Metals to Enhance Surface Properties - Mitacs Accelerate **($15,000)**

Recyclable and Sustainable Composite Materials for Low-Cost Additive Manufacturing - NSERC Discovery Grant **($147,500)**

Surface modification of metal and plastic 3D printed parts - Burloak Technologies Inc. Contract **($1,300)**

Dr. Sayyed Ali Hosseini

Finish Machining of Additive Manufactured Metals - NSERC Discovery Grant **($147,500)**

Design, Simulation and Testing of Novel Wing-Integrated Electrical Vertical Take-off and Landing (eVTOL) System - Fleming College Partnership **($375,000)**

MultiMode Scanning Electron Microscopy (SEM) for Morphological and Microstructural Analysis of Advanced Materials - University of Ontario Institute of Technology Contribution **($149,999)**

Dr. Amirkianoosh Kiani

Advanced 3D Nanonetwork Materials Induced by Ultrashort Plasma Ionization - NSERC Discovery Grant **($135,000)**

Dr. Hossam Kishawy

Machining of Composite Materials: Mechanics, Quality and Coolant Strategies - NSERC Discovery Grant **($195,000)**

Dr. Ghaus Rizvi

Innovative Production of Composites with Through Plane Alignment of Fibers - NSERC **($135,520)**

Development of novel composite materials for Escalator Handrails with improved properties - EHC Canada Partnership **($138,640)**

Material Formulation and Sheet Extrusion of Thermoplastic-Graphite Composites for Compression Molding of PEMFC Bipolar Plates - Hydrogenics Corporation Partnership **($90,000)**

Design and Implementation of a Measurement System for Determining Bedsores-related Shear Stress at the Body-Bed Interface - 5 Minds Mobility Inc. Partnership **($81,836)**

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