OntarioTech
Engineering
& Applied Science

2023
2024

ANNUAL RESEARCH REPORT

Ontario Tech University 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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"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."

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 three Canada Research Chairs, specializing in fields as diverse as Adaptive Aerodynamics, Electric Energy Storage Systems for Transportation Electrification, and the Internet of Things (IoT). We are also privileged to house an NSERC-UNENE Industrial Research Chair (IRC) dedicated to Health Physics and Environmental Safety, as well as two university Research Chairs, one of which is 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.

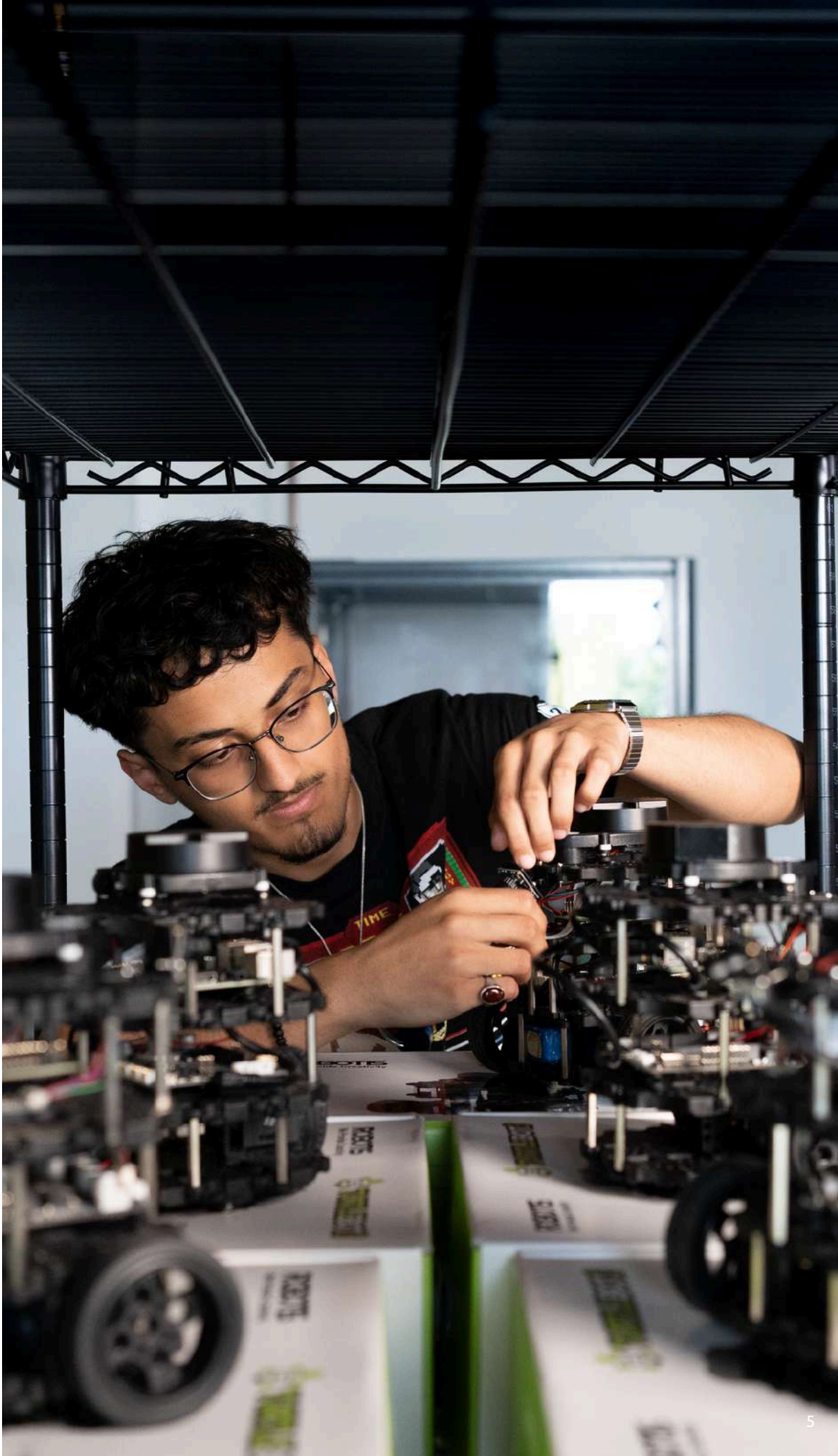
Several faculty members have been recognized for their impactful research contributions by national and international organizations, such as the Canadian Society for Mechanical Engineering (CSME), the American Society of Mechanical Engineers (ASME), the Institute of Electrical and Electronics Engineers (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



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, Engineering Laboratories
Shahid Hidayat, BEng, MASc, PEng, Associate Teaching Professor

Chair, Department of Automotive and Mechatronics Engineering
Dr. Greg Rohrauer, DEC, BEng, PhD, 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 (Acting)
Dr. Jennifer McKellar, BASc, MASc, PhD, PEng, Associate Professor

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

AUTOMOTIVE AND MECHATRONICS ENGINEERING

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, Associate Professor

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

TEACHING FOCUS FACULTY, AUTOMOTIVE

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

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

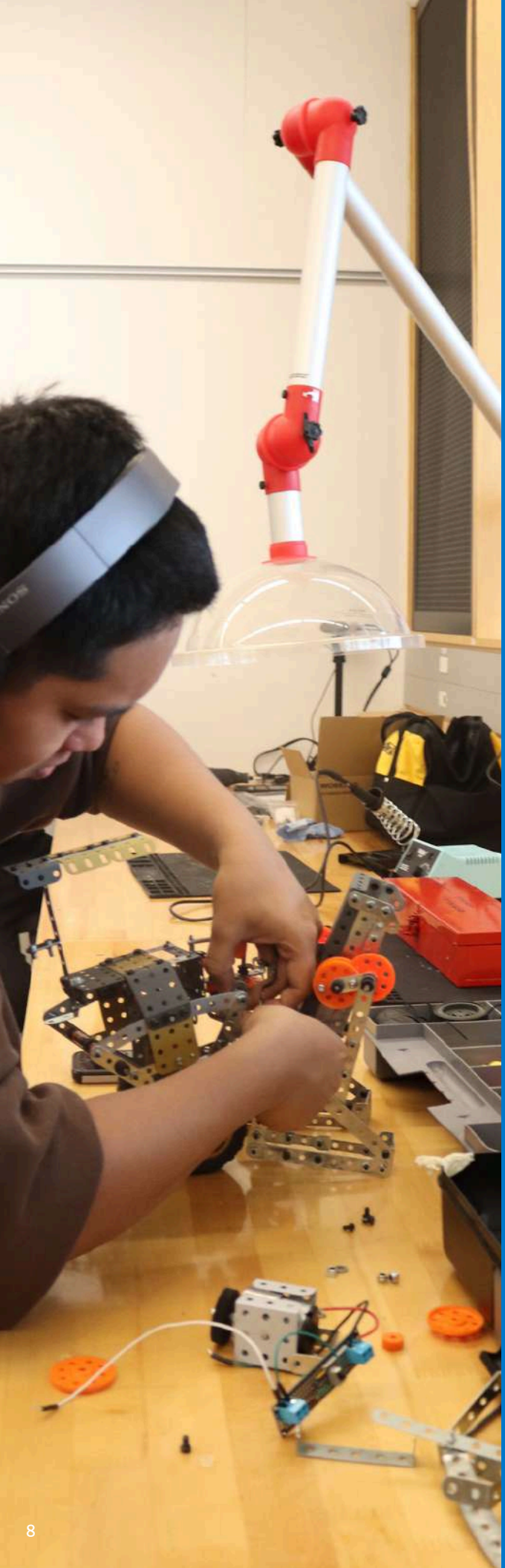
Dr. Mitchell Rushton, BASC, MASc, Certificate in University Teaching, PhD, Associate Professor

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

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

TEACHING FOCUS FACULTY, MECHATRONICS

Dr. Nasim Moallemi, BEng, MSc, PhD (Ontario Tech University), PEng, Associate Teaching Professor



ELECTRICAL, COMPUTER AND SOFTWARE ENGINEERING

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), Assistant Professor

TEACHING FOCUS 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

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, 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

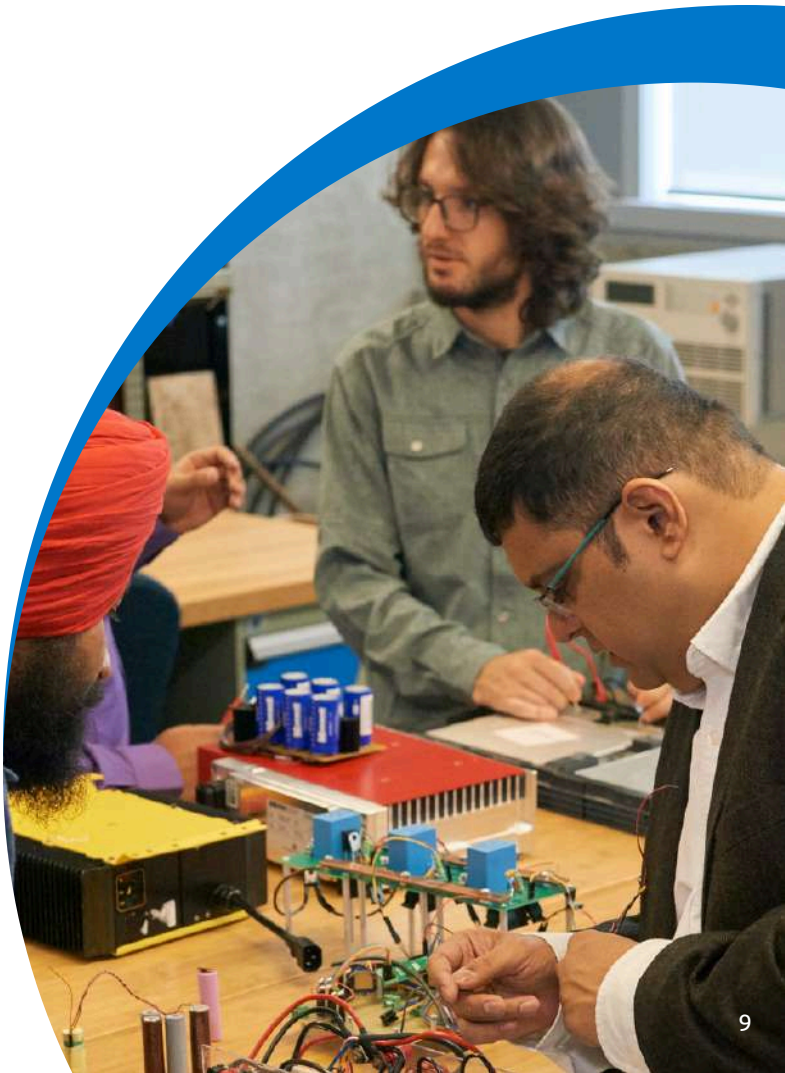
Dr. Ying Wang, BEng, MASc, PhD (University of Waterloo), PEng, Professor

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 FOCUS FACULTY, ELECTRICAL

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



ENERGY AND NUCLEAR ENGINEERING

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

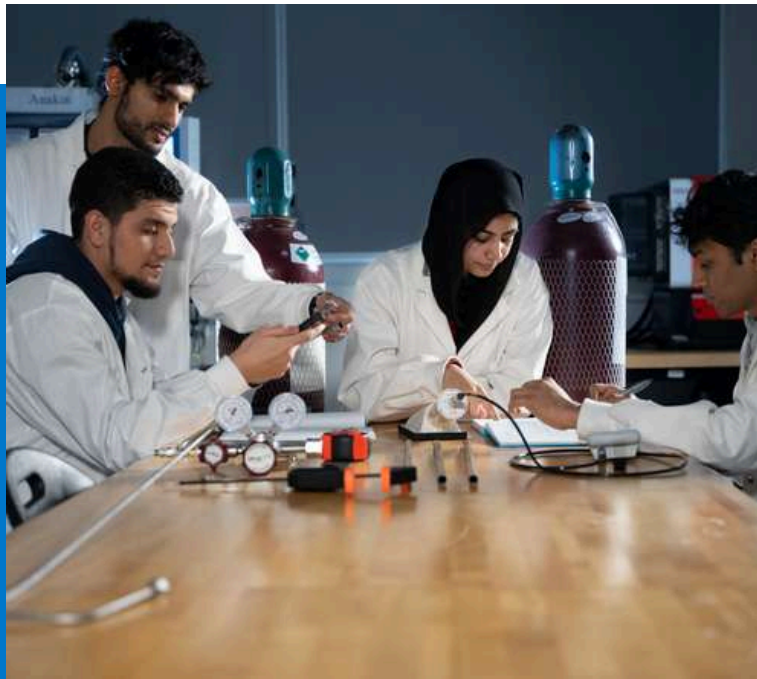
Dr. Anthony Waker, BS, PhD (London South Bank University, UK & European Joint Research Centre, Ispra, Italy), Professor Emeritus

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

TEACHING FOCUS FACULTY, ENERGY & NUCLEAR

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

John Froats, MASc. PEng



MECHANICAL AND MANUFACTURING ENGINEERING

FACULTY, MECHANICAL

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

TEACHING FOCUS FACULTY, MECHANICAL

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

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, Associate 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 (University of Toronto), PEng, FCSME, Professor

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

TEACHING FOCUS FACULTY, MANUFACTURING

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

ADJUNCT FACULTY

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

Dr. Markus Piro

MECHANICAL AND MANUFACTURING ENGINEERING

Dr. Shaghayegh Bagheri

Dr. Ibrahim Deiab

Dr. Ismail Gultepe

Dr. Marwan Hassan

Dr. Wei Huang

Dr. Greg Naterer

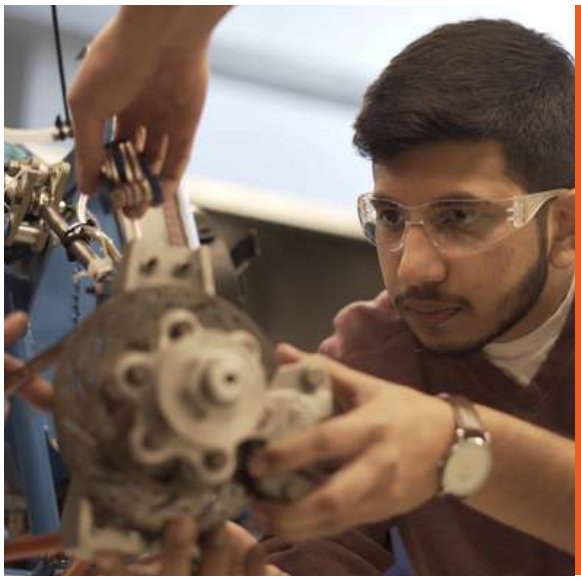
Dr. Dipal Patel

Dr. Kevin Pope

Dr. Subhasho Rakheja

Dr. Bekir Yilbas

Dr. Kamiel Gabriel



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:

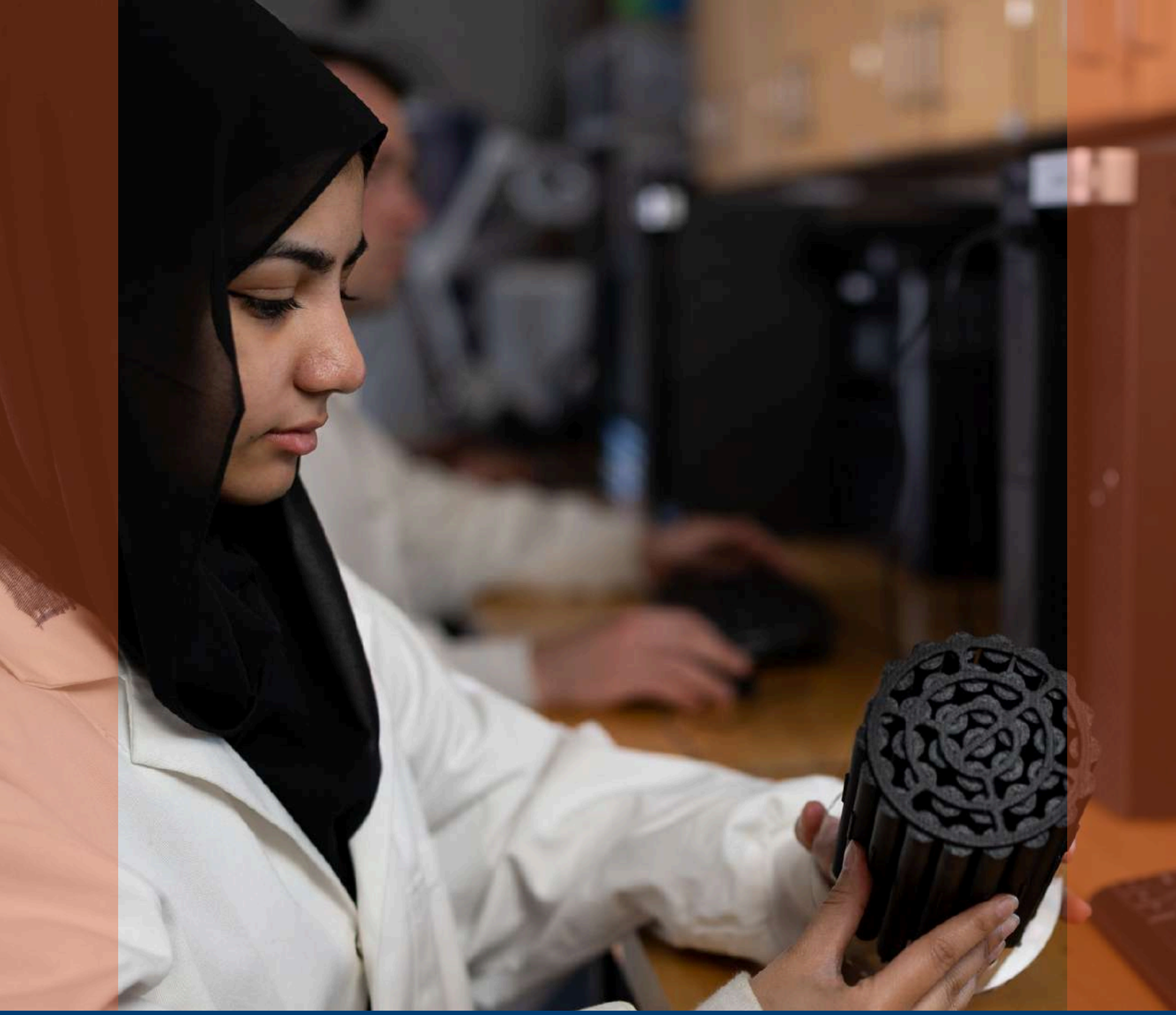
- The only accredited Automotive Engineering, Nuclear Engineering and Manufacturing Engineering programs of their kind in Canada;
- Broad programs in Mechanical, Software and Electrical Engineering;
- Unique Mechatronics and Energy options in Mechanical Engineering;
- Engineering Management programs 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

$5,900,000

Secured in research funding for 2023-2024

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 nanocomposite;
- 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; 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; and 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; and 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.

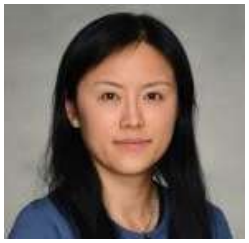
Dr. Ramiro Liscano
Pervasive and mobile computing (service discovery and security management); Distributed computing (peer-to-peer, web services, service-oriented architectures, GRID services); and Sensor networks (interoperability between wireless and Internet-based sensing).

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; and 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. 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 Waker (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 AND MANUFACTURING ENGINEERING

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. 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; and 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

MECHATRONIC AND ROBOTIC SYSTEMS

The Mechatronic and Robotic Systems (MARS) Laboratory at Ontario Tech University performs research in the areas of mechatronics, robotics, and autonomous systems. In particular, the lab focuses on the application of advanced kinematics for the control of redundant manipulator systems including joint redundant arms, redundantly-actuated parallel manipulators, and mobile-manipulator systems. The MARS Lab has attracted extensive funding for its research from both government and industry.

Recent work has focussed on the application of quadraped robots for long-term inspection and fire response. As well, work has been conducted on coordinated control of mixed Unmanned (UAV) - Unmanned Ground Vehicle (UGV) Systems where the UAV's provide input on obstacle location to the UGVs to enhance multi-robot systems' autonomy in hazardous environments.

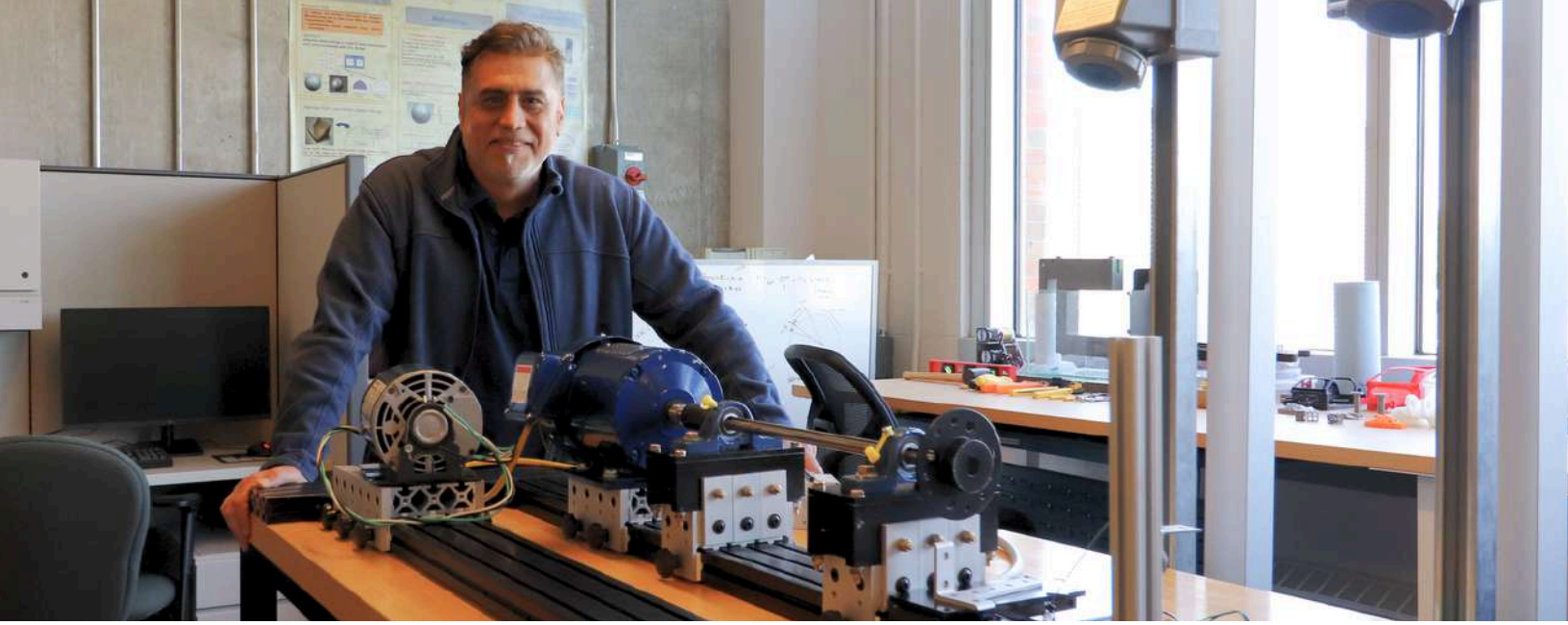
The MARS Lab is directed by Dr. Scott Nokleby, Professor in the Department of Automotive and Mechatronics Engineering.

TIRE-TERRAIN INTERACTION SIMULATION LABORATORY

Dr. Zeinab El-Sayegh is currently co-director of the Tire-Terrain Interaction Simulation (TTIS) Laboratory, where she aims to enhance the understanding of tire behaviour. The TTIS Laboratory is focused on developing advanced finite element tire-terrain models that simulate tire wear and predict tire temperature. Additionally, Dr. El-Sayegh is investigating the performance of passenger car and truck tires on contaminated surfaces. Her research is concentrated on three main areas:

1. Transforming the future of autonomous vehicles by analyzing the performance of passenger car tires on contaminated surfaces under extreme weather conditions.
2. Reducing tire wear emissions through experimental and simulation analyses of racing car tires using the ACE LLC Chamber and Dyno.
3. Enhancing the performance of non-pneumatic tires through nano-material deposition and mechanical analysis of tire spokes.

As a principal and co-principal investigator, Dr. El-Sayegh has secured several research grants, including the NSERC Discovery Grant, the NSERC Research Tools and Instruments Grant, and Volvo Group Trucks Technology. She is also co-organizing the American Society of Mechanical Engineers (ASME) AVT-02 Advances in Modelling and Testing of Tires and Tire-Terrain Interaction session at the IDETC. In addition, she serves on the ASME Vehicle Design Executive Committee and is an assistant editor for the International Journal of Heavy Vehicle Systems.



ADVANCED DIGITAL DESIGN, MANUFACTURING, AND METROLOGY LABORATORIES

Dr. Ahmad Barari is a professor it the department of mechanical and manufacturing engineering, the director of Advanced Digital Design, Manufacturing, and Metrology Laboratories (AD2MLabs), and Research Excellence Chair in LIVE Digital Twin. He developed methodologies for various industrial applications in product development, process control, prognostics and health monitoring, and prescriptive and predictive maintenance. His contributions include over 200 publications in highly-ranked journals and conference proceedings.

Dr. Barari has closely collaborated in many industrial projects funded by various national and international programs. Dr. Barari has been the member in international scientific committees for various organizations including the American Society of Mechanical Engineering (ASME) and the International Federation of Automatic Control (IFAC). He has been on the editorial board of various high-prestige journals and proceedings. He organized, chaired, or administrated over 25 academic national and international events, conference topics, invited sessions, and seminars. Dr. Barari serves currently as the vice-chair academic Technical Committee on Manufacturing Plant Control and the chair of the Intelligent Manufacturing Systems Working Group in IFAC.

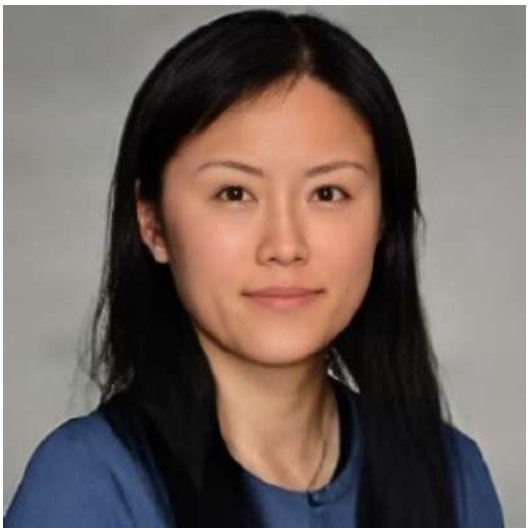
AD2M Labs' research is in three directions engineering design, manufacturing, and metrology with a common approach of "digitalization". These branches encompass a variety of research programs, focusing on major streams such as Industry 4.0: Cyber-physical Components, Digital Twin for predictive maintenance, Digital Design Optimization, Digital Manufacturing, and Digital Inspection. The AD2MLabs are dedicated to advancing the future of digitalization in product life cycle and their applications across multiple industries.

A few significant highlights of the lab's recent contribution have been their involvement in Project Arrow, Canada's first domestically developed electric vehicle, developing LIVE digital twins for predictive maintenance of rotary machines, and additive manufacturing -based repair of large and complex parts in power generation industries. These projects exemplify the lab's innovative approaches to digital manufacturing, design, and maintenance reflecting their commitment to pushing the boundaries of what's possible through digitalization. With a strong focus and commitment to EDI AD2MLabs continuously developing its resources and expertise to drive forward the integration of digital technologies in design, manufacturing, and maintenance, positioning themselves at the forefront of the Industry 4.0 revolution.

NEXT-GENERATION WIRELESS COMMUNICATIONS AND NETWORKING

Dr. Min Dong currently leads her research group on developing wireless technologies for the 6th generation (6G) wireless networks and beyond. Her expertise lies in wireless communication and signal processing, Dr. Dong's research explores both revolutionary and evolutionary technologies to enable massive data distribution and access expected in future wireless networks at terabit data rates, with ultra-low latency, high reliability and energy efficiency. One key focus of Dr. Dong's research is on advanced transmission technologies and data storage opportunities at the network edge to enable ultra-high-speed massive content sharing and access. Her project aims at integrating data transmission and storage management to optimize the system operation by designing efficient multi-antenna beamforming techniques and edge caching techniques. Her research efforts also focus on developing scalable and efficient transmission and network-wide cooperation techniques with ultra-large-scale antenna array systems, in order to enable real-time immersive and massive communication in enhanced mobile broadband and the Internet of Things applications. Additionally, as data-intensive distributed machine learning applications are rapidly growing, Dr. Dong's research investigates computation-communication efficient wireless techniques to effectively support distributed machine learning over wireless networks.

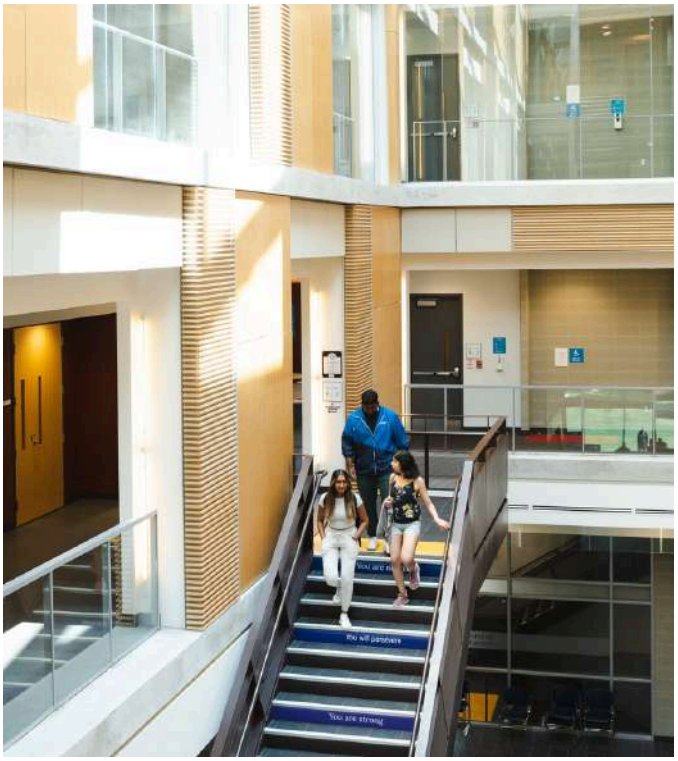
Dr. Dong is a Fellow of IEEE for her contributions to transmission design and resource optimization for wireless communications and a Fellow of the Asia-Pacific Artificial Intelligence Association.



RESEARCH FACILITIES AND LABORATORIES

ONTARIO POWER GENERATION ENGINEERING BUILDING (OPG)

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 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 applications. 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_Cl 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

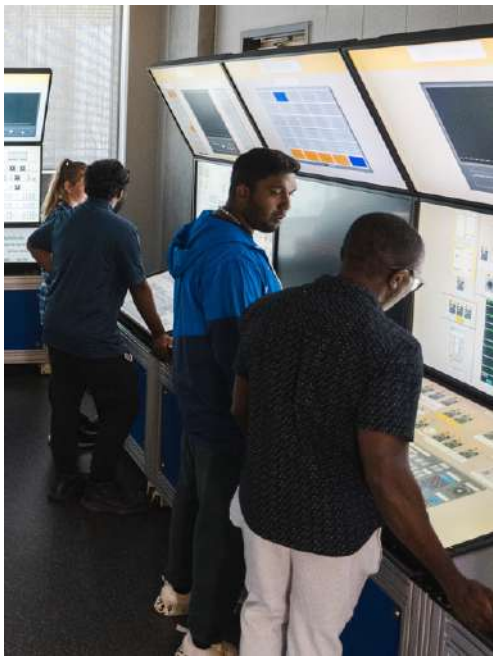
Associated research laboratories include:

- 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

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, DOI: 10.3390/a16020095, 2023.

Mohamed Omar, Moustafa El-Gindy. "Vehicles Yaw Stability Control: Literature Review” Int. J. Vehicle Systems Modelling and Testing, Vol 16, No. 4, pp 259–289, 2023.

Fatemeh Gheshlaghi; Zeinab El-Sayegh; Moustafa El-Gindy; Fredrik Öijer;Inge Johansson, “Analysis of Off-Road Tire Cornering Characteristics by Using Advanced Analytical Techniques”, I.J. of Tire Science and Technology , TST-21-021, Vol. 52, No. 2, https://doi.org/10.1111/TST-21-021, 2024.

Michael P., Hoaxing, M. El-Gindy “Kalman Filter-Based Sensor Fusion for Ackermann Steering Mobile Robots”, AMME-21, Paper#71, Military Technical College, Cairo, Egypt, May 21-24, 2024.

1.Alfonse Ly, Zeinab El-Sayegh, Moustafa El-Gindy, Fredrik Oijer, Inge Johansson “Investigation of a Truck Tire Rubber Material Definitions using Finite Element Analysis”, WCE 2024, April 16-18, Detroit, USA. (2024)

Dr. Zeinab El-Sayegh

Sidhu, Charanpreet, and Zeinab El-Sayegh. "Comparative Analysis of Non-Pneumatic Tire Spoke Designs for Off-Road Applications: A Smoothed Particle Hydrodynamics Perspective." Geotechnics 4, no. 2 (2024): 549-563.

Fathi, Haniyeh, Alfonse Ly, Tej Pathak, and Zeinab El-Sayegh. "Sensitivity analysis of truck tire tread material properties for on-road applications." Transactions of the Canadian Society for Mechanical Engineering (2024).

Fathi, Haniyeh, Zeinab El-Sayegh, Jing Ren, and Moustafa El-Gindy. "Modeling and Validation of a Passenger Car Tire Using Finite Element Analysis." Vehicles 6, no. 1 (2024): 384-402.

Fathi, Haniyeh, Zeinab El-Sayegh, and Mir Hamid Reza Ghoreishy. "Prediction of rolling resistance and wheel force for a passenger car tire: A comparative study on the use of different material models and numerical approaches." Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering (2024).

El-Sayegh, Zeinab. "Influence of sand moisture content on mixed service truck tire performance using advanced hybrid techniques." Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering (2023).

Dr. Yuping He

Zhou, Q.H., Qiu, Y.H., and He, Y., “Lateral stability control of truck and centre-axle-trailer combinations under crosswind disturbances”, International Journal of Heavy Vehicle Systems, 2024, Vol. 31, No. 3, pp. 348-370.

Zhao, H., Cai, S., Liu, K., He, Y., and Wang, B., “Current control for a supercapacitor-based battery equalization system”, Transactions of the Canadian Society for Mechanical Engineering, in press (TCSME-2023-0129), 2024.

Sharma, T., and He, Y., “Design of a tracking controller for autonomous articulated heavy vehicles using a nonlinear model predictive control technique”, Proceedings of the Institution of Mechanical Engineers, Part K: Journal of Multibody Dynamics, First published on March 6, 2024, 1-29.

Yu, J., and He, Y., “A model-based design synthesis method for autonomous articulated vehicles”, Applied Mathematical Modelling, 2024, Vol. 127, pp.803-822.

Gautam, A., He, Y., and Lin, X., “An overview of motion-planning algorithms for autonomous ground vehicles with various applications”, SAE International Journal of Vehicle Dynamics, Stability, and NVH, 2024, Vol. 8, No. 2, pp.1-35, doi:10.4271/10-08-02-0011.

Dr. Xianke Lin

Ahmadi Khiyavi, Omid, Jaho Seo, and Xianke Lin. "New Design of an Electrical Excavator and Its Path Generation for Energy Saving and Obstacle Avoidance." Vehicles 6, no. 2 (2024): 832-849.

Lahiri, Somnath, Jing Ren, and Xianke Lin. "Deep learning-based stereopsis and monocular depth estimation techniques: a review." Vehicles 6, no. 1 (2024): 305-351.

Singh, Ramanjeet, Jing Ren, and Xianke Lin. "A review of deep reinforcement learning algorithms for mobile robot path planning." Vehicles 5, no. 4 (2023): 1423-1451.

Khiyavi, Omid Ahmadi, Jaho Seo, and Xianke Lin. "Three-Dimensional Metal Pipe Detection for Autonomous Excavators Using Inexpensive Magnetometer Sensors." IEEE Sensors Journal (2023).

Bao, Zhibin, Sabir Hossain, Haoxiang Lang, and Xianke Lin. "A review of high-definition map creation methods for autonomous driving." Engineering Applications of Artificial Intelligence 122 (2023): 106125.

MECHATRONICS ENGINEERING

Dr. Meaghan Charest-Finn

Komarsofla A.K., Charest-Finn M., Nokleby S., & Pickard J.. A practical method for realistic simulation of non-point light sources in commonly used computer graphics software. IEEE International Systems Conference (SysCon), (2024)

Atherton J., Barber A., Cazes C., Grewal H., Vine A., & Charest-Finn M., Omni-directional conveyor system. Canadian Society of Mechanical Engineers (CSME) - International Congress, (2024)

Mohsini, S., Landori-Hoffmann D., Komarsofla A.K., Charest-Finn M., & Dubay R., Control of a Self Balancing Bicycle Robot using PID control tuned with linear regression. Canadian Society of Mechanical Engineers (CSME) - International Congress, (2024)

Dr. Haoxiang Lang

M. Peiris, H. Lang and M. El-Gindy, “Kalman Filter-Based Sensor Fusion for Ackermann Steering Mobile Robots”, 21st International Conference on Applied Mechanics & Mechanical Engineering, MTC, Cairo, Egypt, May 21-23, 2024.

X. Liu, H. Lang and J. Ren, "Cross-Platform Kinematics Solver Architecture- A Matlab-Centric Approach in a ROS Ecosystem”, CSME Congress, Toronto, Canada, May 26-29, 2024.

M. Peiris, M. El-Gindy and H. Lang, “Filtering Based Sensor Fusion Positioning Methods: Literature Review”, International Journal of Vehicle Systems Modelling and Testing, Vol. 17, No. 3/4, pp. 311-325, 2023.

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, pp. 97-108, 2023.

Dr. Scott Nokleby

Khabbaz, N. and Nokleby, S. B., 2024, “UAV Obstacle Mapping for Multi-UGV Exploration and Mapping,” in Proceedings of MSR-RoManSy 2024 - Combined IFToMM Symposium of RoManSy and USCToMM Symposium on Mechanical Systems and Robotics - Mechanisms and Machine Science, Vol. 159, edited by Larochelle, P., McCarthy, J. M., and Lusk, C.P. , Springer: Berlin, Germany, pp. 155–166.

Baird, C. and Nokleby, S. B., 2024, “Optimal Frontier Exploration for Maximum Information Gain,” in Proceedings of the 2024 Canadian Society for Mechanical Engineering International Congress, May 26-29, Toronto, Canada, 5 pages.

Khakpour Komarsofla, A., Charest-Finn, M., and Nokleby, S. B., 2024, “A Practical Method for Realistic Simulation of Non-Point Light Sources in Commonly Used Computer Graphics Softwares,” in Proceedings of the 18th Annual International Systems Conference, April 15-18, Montreal, Canada, 6 pages.

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. Akira Tokuhiro

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Dr. Edward Waller

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MECHANICAL AND MANUFACTURING ENGINEERING

MECHANICAL ENGINEERING

Dr. Martin Agelin-Chaab

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Dr. Ibrahim Dincer

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Dr. Horia Hangan

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Dr. Brendan MacDonald

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Dr. Atef Mohany

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Dr. Bale Reddy

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Dr. Marc Rosen

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Dr. Zia Saadatnia

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MANUFACTURING ENGINEERING

Dr. Jana Abou-Ziki

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Dr. Sayyed Ali-Hosseini

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Dr. Remon Pop-Iliev

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Dr. Ghaus Rizvi

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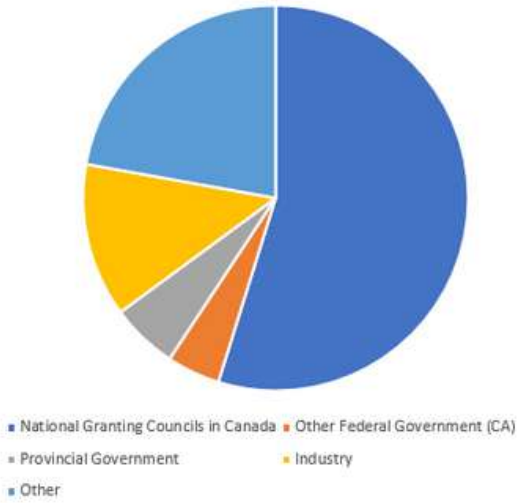
RECENT SELECTED RESEARCH GRANTS AND CONTRACTS

SOURCES FOR ENGINEERING RESEARCH FUNDS 2023 - 2024



AUTOMOTIVE ENGINEERING

Dr. Moustafa El-Gindy

Partnership - Volvo Group North America **($803,800)**

Discovery Grant - NSERC **($168,600)**

Dr. Zeinab El-Sayegh

Discovery Grant - NSERC **($135,000)**

Discovery Launch Supplement - NSERC **($12,500)**

Dr. Yuping He

DEaS **($60,000)**

Mitacs Accelerate Proposal **($30,000)**

Mitacs Accelerate Proposal **($45,000)**

Discovery Grant - NSERC **($192,000)**

Dr. Xianke Lin

Discovery Grant - NSERC **($189,000)**

Accelerate Entrepreneur - Mitacs **($255,000)**

MECHATRONICS ENGINEERING

Dr. Meaghan Charest-Finn

Grant - Eigen Innovations **($30,000)**

Accelerate - Mitacs **($90,000)**

Fellowship - Age-Well **($8,000)**

Dr. Haoxiang Lang

Discovery Grant - NSERC **($147,000)**

Accelerate - Mitacs **($247,500)**

Partnership - Senturing Technologies Ltd. **($247,500)**

Partnership - Funglyn Inc. **($20,250)**

Alliance - NSERC **($30,000)**

Collaborate 2 Commercialize - OCI-OCE **($30,000)**

Dr. Scott Nokleby

Innovation for Defense Excellence and Security (IDEaS) - DND **($189,750)**

Partnership - RMUS Canada Inc. **($105,000)**

Discovery Development Grant - NSERC **($30,000)**

Internal - NSERC Discovery Grant Support Program - Ontario Tech **($5,000)**

Partnership - MDA **($30,000)**

Accelerate - Mitacs **($30,000)**

Dr. Jaho Seo

Discovery Grant - NSERC **($115,000)**

Partnership - City of Oshawa **($20,000)**

Partnership - Hyundai Motor Company **($79,920)**

Partnership - KIMM **($20,422)**

KITECH Sponsored Research Program - KITECH **($36,950)**

Partnership - SurroMind **($295,744)**

Partnership - AKCSE **($5,000)**

Partnership - KIMM **($20,897)**

Partnership - Weston Family Foundation **($30,000)**

Dr. Aaron Yurkewich

ECR Grants - Age-Well **($7,500)**

Fellowship - Age-Well **($10,000)**

SOFTWARE ENGINEERING

Dr. Akramul Azim

Discovery Grant - NSERC **($161,000)**

Alliance - NSERC **($90,000)**

Accelerate - Mitacs **($37,500)**

Partnership - Mobile Innovations Corporation **($37,500)**

Partnership - eCamion Inc **($100,000)**

Partnership - GlassHouse Systems **($478,800)**

Partnership - Team Eagle Ltd. **($79,800)**

Partnership - NRC **($40,000)**

Dr. Mohamed El-Darieby

Discovery Grant - NSERC **($126,863)**

OVIN (Ontario Vehicle Innovation Network) Regional Future Workforce Program - OCI-OCE **($489,800)**

Dr. Khalid Elgazzar

Discovery Grant - NSERC **($138,000)**

Chair, NSERC Tier 2 - CRC **($500,000)**

Highway Infrastructure Innovation Funding Program - MTO **($101,250)**

Dr. Ramiro Liscano

Discovery Grant - NSERC **($138,000)**

CAS University Research - IBM Center of Advanced Studies **($82,000)**

CAS University Research - IBM Center of Advanced Studies **($68,000)**

Alliance - NSERC **($118,900)**

Dr. Qusay Mahmoud

Discovery Grant - NSERC **($120,000)**

Promo Science - NSERC **($600,000)**

PromoScience Supplement - NSERC **($5,000)**

Dr. Masoud Makrehchi

Discovery Grant - NSERC **($120,000)**

Dr. Mennatullah Siam

Discovery Grant - NSERC **($120,000)**

Discovery Launch Supplement - NSERC **($12,500)**

ELECTRICAL ENGINEERING

Dr. Min Dong

Discovery Accelerator Supplement - NSERC **($120,000)**

Discovery Grant - NSERC **($330,000)**

Dr. Walid Morsi Ibrahim

Discovery Grant - NSERC **($198,000)**

Research Tools and Instruments - NSERC **($60,277)**

Dr. Jing Ren

Discovery Grant - NSERC **($140,000)**

Internal - CRCP EaRTH Initiative - Ontario Tech **($12,500)**

Dr. Langis Roy

Accelerate - Mitacs **($45,000)**

TalentEdge Internship Program - OCI-OCE **($100,000)**

Discovery Grant - NSERC **($165,000)**

Dr. Shahram ShahbazPanahi

Discovery Grant - NSERC **($210,000)**

Alliance - NSERC **($200,000)**

Dr. Tarlochan Sidhu

Discovery Grant - NSERC **($230,000)**

Dr. Vijay Sood

Discovery Grant - NSERC **($165,000)**

Dr. Ying Wang

Discovery Development Grant - NSERC **($40,000)**

Contribution - Ontario Tech **($5,000)**

Dr. Sheldon Williamson

Discovery Grant - NSERC **($329,000)**

Chair, NSERC Tier 2 - CRC **($500,000)**

Idea to Innovation - NSERC **($20,000)**

Partnership - Customachinery **($30,000)**

Accelerate - Mitacs **($45,000)**

Alliance Missions - NSERC **($140,000)**

Idea to Innovation - NSERC **($125,000)**

Contribution - Ontario Tech **($5,000)**

Alliance - NSERC **($160,000)**

Accelerate - Mitacs **($75,000)**

Partnership - IntellectuLogy Solutions **($80,000)**

Dr. Mohamed Youssef

Discovery Grant - NSERC **($168,000)**

Discovery Grant - NSERC **($40,000)**

Accelerate (Co-PI) - Mitacs **($45,000)**

Research Grant - Imperial Oil of Canada, Ltd. **($75,000)**

ENERGY AND NUCLEAR ENGINEERING

Dr. Kirk Atkinson

Discovery Grant - NSERC **($160,000)**

Industrial Research Chair - NSERC **($385,000)**

Faculty Funding - Ontario Tech **($281,750)**

Partnership - UNENE **($385,000)**

Partnership - COG **($145,600)**

Research Tools and Instruments - NSERC **($133,902)**

Internal - Research Entity Award 2023 - Ontario Tech **($40,000)**

Partnership - COG **($175,000)**

Dr. Hossam Gaber

Accelerate - Mitacs **($110,000)**

Partnership - NVS Canada **($90,000)**

Partnership - Cherkam Industrial Systems Ltd. **($45,000)**

Accelerate - Mitacs **($45,000)**

Accelerate - Mitacs **($90,000)**

Alliance - NSERC **($348,000)**

Partnership - Pro-Flange Limited **($90,000)**

Partnership - UNENE **($84,000)**

Internal - CRCP EaRTH Initiative - Ontario Tech **($12,500)**

Climate Action Awareness Fund - ECCC **($202,020)**

Alliance International Catalyst - NSERC **($25,000)**

CNSC Small Modular Reactors Research Grant Initiative - NSERC **($343,000)**

Globalink Award - Mitacs **($12,000)**

Discovery Grant - NSERC **($215,000)**

Dr. Glenn Harvel

Discovery Grant - NSERC **($195,000)**

Sponsored Research Agreement - UNENE **($138,000)**

CNSC Small Modular Reactors Research Grant Initiative - NSERC **($360,000)**

Partnership - MDA **($28,999)**

Dr. Daniel Hoornweg

Accelerate - Mitacs **($7,500)**

Greenhouse gas emissions inventory and progress to net-zero - Regional Municipality of Durham **($60,000)**

Durham City Studio - Regional Municipality of Durham **($7,500)**

Dr. Lixuan Lu

Discovery Grant - NSERC **($184,000)**

Alliance - NSERC **($168,000)**

Collaborative Research and Development - UNENE **($84,000)**

Dr. Jennifer McKellar

Contribution - Ontario Tech **($20,000)**

Research Excellence Chair - Ontario Tech **($30,000)**

Accelerate - Mitacs **($165,000)**

Partnership - OPG **($165,000)**

Dr. Eleodor Nichita

Discovery Grant - NSERC **($162,000)**

Dr. Akira Tokuhiro

Collaborative Research and Training Experience Program Grant - NSERC **($87,983)**

Discovery Development Grant - NSERC **($30,000)**

CNSC Small Modular Reactors Research Grant Initiative - NSERC **($233,400)**

Dr. Edward Waller

Industrial Research Chair - NSERC **($715,000)**

Industrial Research Chair - UNENE **($715,000)**

Discovery Grant - NSERC **($295,000)**

MECHANICAL ENGINEERING

Dr. Martin Agelin-Chaab

Discovery Grant - NSERC **($195,000)**

Research Excellence Award - Ontario Tech **($1,000)**

Dr. Ibrahim Dincer

NPRP Proposal - Qatar National Research Fund **($70,350)**

Accelerate - Mitacs **($75,000)**

Partnership - Viona Consulting Inc. **($75,000)**

Contribution - Ontario Tech **($20,000)**

Research Excellence Chair - Ontario Tech **($30,000)**

Partnership - H2G **($227,500)**

Accelerate - Mitacs **($127,500)**

Discovery Grant - NSERC **($295,000)**

Internal - Research Entity Award 2023 - Ontario Tech **($40,000)**

Partnership - H2CS Hydrocool Systems Limited **($36,000)**

Accelerate - Mitacs **($44,000)**

Dr. Horia Hangan

Chair, NSERC Tier 1 - CRC **($1,400,000)**

Climate Action Awareness Fund LOI - ECCC **($429,570)**

Contribution - Ontario Tech **($45,000)**

Discovery Grant - NSERC **($250,000)**

Dr. Brendan MacDonald

Discovery Grant - NSERC **($135,000)**

Dr. Atef Mohany

Partnership - COG **($120,000)**

Collaborative Research & Development Grant - NSERC **($171,150)**

Discovery Grant - NSERC **($160,000)**

Partnership - COG **($93,334)**

Alliance - NSERC **($93,333)**

Partnership - COG **($126,000)**

Research Excellence Chair - Ontario Tech **($30,000)**

Dr. Marc Rosen

Discovery Grant - NSERC **($230,000)**

Partnership - McClymont and Rak Engineers Inc. **($99,090)**

Voucher for Innovation and Productivity - OCI-OCE **($146,800)**

Collaborative Research and Training Experience Program Grant - NSERC **($15,000)**

MANUFACTURING ENGINEERING

Dr. Jana Abou-Ziki

Discovery Grant - NSERC **($189,000)**

Dr. Ahmad Barari

Discovery Grant - NSERC **($192,000)**

ORF - Research Infrastructure - MCU **($151,120)**

Faculty Funding - Ontario Tech **($51,150)**

Alliance Missions - NSERC **($353,700)**

Research Excellence Award - Ontario Tech **($1,000)**

Dr. Ramona (Haniyeh) Fayazfar

Accelerate - Mitacs **($11,250)**

Partnership - VPM Research Inc. **($3,750)**

Discovery Grant - NSERC **($135,000)**

Discovery Launch Supplement - NSERC **($12,500)**

Dr. Sayyed Ali Hosseini

Discovery Grant - NSERC **($135,000)**

Partnership - Fleming College **($375,000)**

Dr. Amirkianoosh Kiani

Discovery Grant - NSERC **($135,000)**

Alliance - NSERC **($45,000)**

Accelerate - Mitacs **($22,500)**

Partnership - Nova Graphene Canada **($22,500)**

Dr. Hossam Kishawy

Discovery Grant - NSERC **($195,000)**

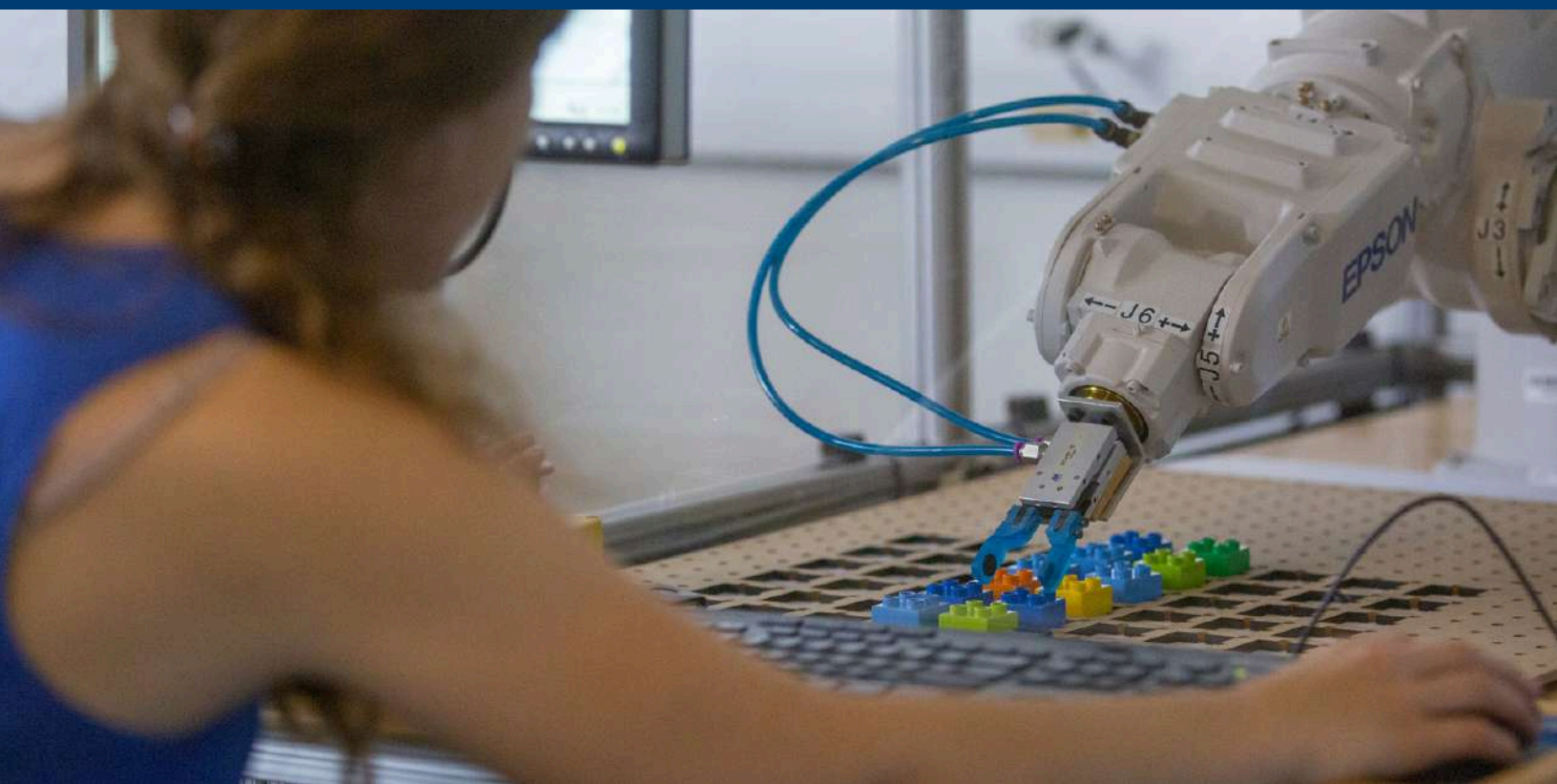
Dr. Ghaus Rizvi

Partnership - EHC Canada **($54,000)**

Collaborative Research & Development Grant - NSERC **($80,000)**

Discovery Development Grant - NSERC **($200,000)**

Contribution - Ontario Tech **($5,000)**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