



School of Engineering
Okanagan Campus

ANNUAL REPORT 2021-22



Researchers Mohammad Arjmand, Jian Liu and Amir Ahmadian examine a conductive polymer nanocomposite sample, created from non-recyclable plastic and rubber waste, that can be used for electrical applications.

Welcome



MESSAGE FROM THE DEAN

In 2022, the City of Kelowna was named the fastest growing metropolitan area in Canada. I have had the opportunity to hear first hand from the community how vital the School of Engineering is, to sustaining and propelling this growth.

Recently, UBC Engineering tied for first in the MacLean's rankings of Engineering programs in Canada. That success can be partly attributed to the work of our students, staff, and Faculty on the Okanagan campus.

This past year included many changes, but once again the School of Engineering demonstrated its ability to embrace change and look forward to new opportunities. As a Faculty, we are thrilled to see Dr. Rehan Sadiq installed as the new Provost of the Okanagan campus and welcome a new Director, Dr. Will Hughes, to the School.

Known as a champion of engineering pedagogy, Dr. Hughes' emerging vision for the School of Engineering seeks to grow connections throughout the Faculty through respect and compassion, while creating an inclusive environment that provides opportunities for upward mobility and generates original work that confronts locally relevant and globally significant problems.

As we look towards 2023, the School of Engineering continues to see sustained growth in every facet. Our students and alumni continue to raise the bar within their disciplines and beyond, while our researchers are uncovering solutions to challenges our world is faced with.

James Olson, PEng, PhD, FCAE
Dean, Faculty of Applied Science
Professor of Mechanical Engineering



MESSAGE FROM THE DIRECTOR


I am pleased to present you with the School of Engineering's 2021-22 Annual Report. As a new member of our community, it has been encouraging to watch our faculty, staff and students come together to achieve great things. As you will see throughout this report, the teaching, learning and research being conducted at the School is an important driver for the campus and our community.

Performance metrics aside, it is our people that distinguish the School of Engineering as the unique place that it is. Since I arrived in July, I have encountered a warm and welcoming community that is a wonderful environment for learning and discovery. We are delighted to welcome some new faces onto our leadership team including Sabine Weyand and Claire Yan (as co-associate directors of undergraduate studies), and Dean Richert as program chair for Mechanical Engineering.

As we look to the future, we can't rely on our past successes and approaches to lead to continued growth and development. We need to focus our energy on our strengths, and empower our community to succeed. Thank you for taking time to review the year that was at the School of Engineering. Thank you for joining me to envision the years to come. Whether you are a student, staff, faculty, partner or member of our wider community, I look forward to connecting with you this year.

The School of Engineering is more than a space for technical innovation, it is a preferred partner to elevate our society and economy one student and one collaboration at a time.

Will Hughes, PhD
Director, School of Engineering



As one of the fastest growing post-secondary engineering programs in Canada, the School of Engineering continues to work towards maintaining its vision of being a premiere destination for exceptional engineering education and research, providing an intimate and dynamic environment for finding creative engineering solutions that positively impact the community and the world.

1757 Undergraduate students

413 Graduate students

69 Faculty

38 Staff

UNDERGRADUATES BY YEAR

27% First-year

28% Second-year

20% Third-year

25% Fourth-year

UNDERGRADUATES BY PROGRAM*

19% Civil

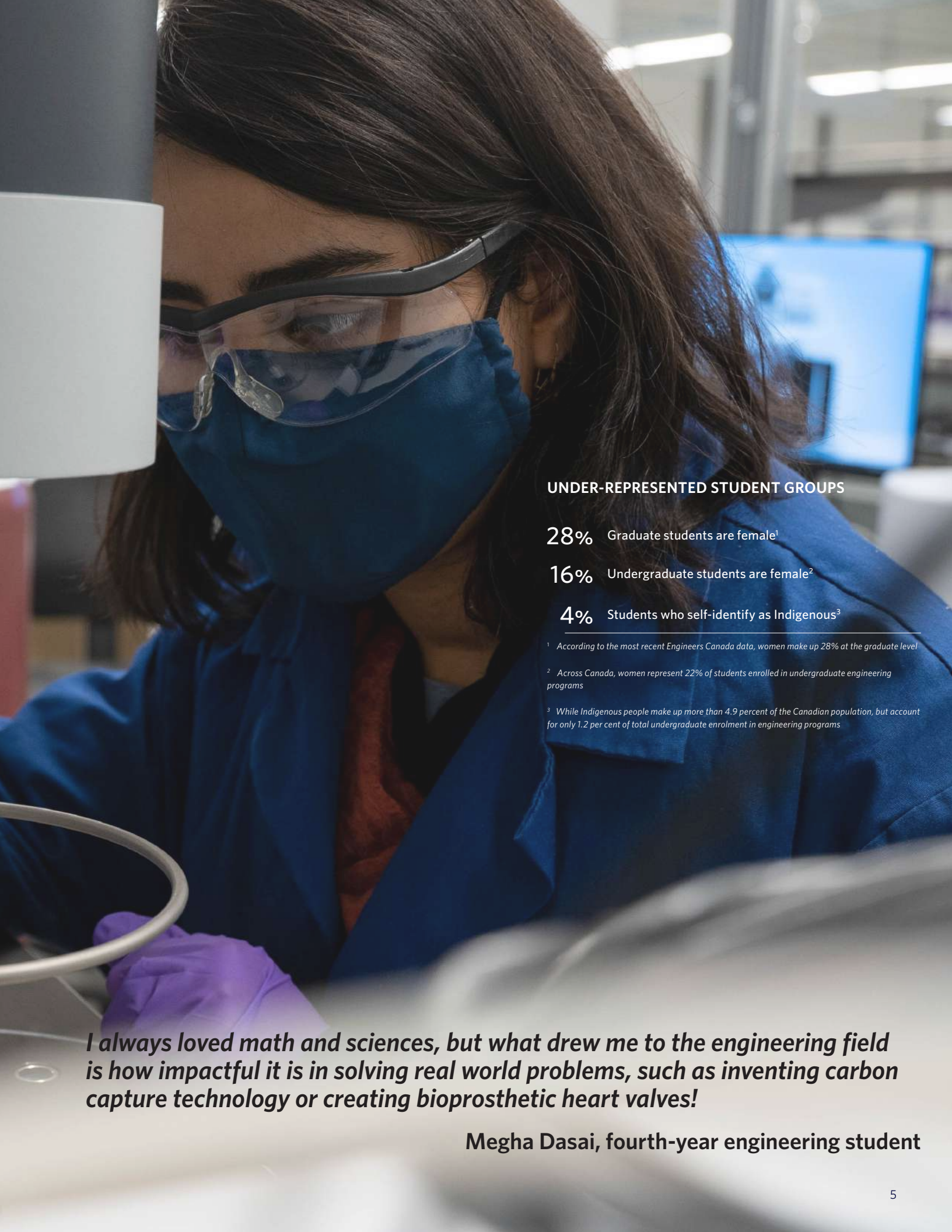
19% Electrical

2% Manufacturing*

32% Mechanical

* Manufacturing launched in 2018/19 with its first graduating cohort in 2022

** All first-year students are considered undeclared



UNDER-REPRESENTED STUDENT GROUPS

28% Graduate students are female¹

16% Undergraduate students are female²

4% Students who self-identify as Indigenous³

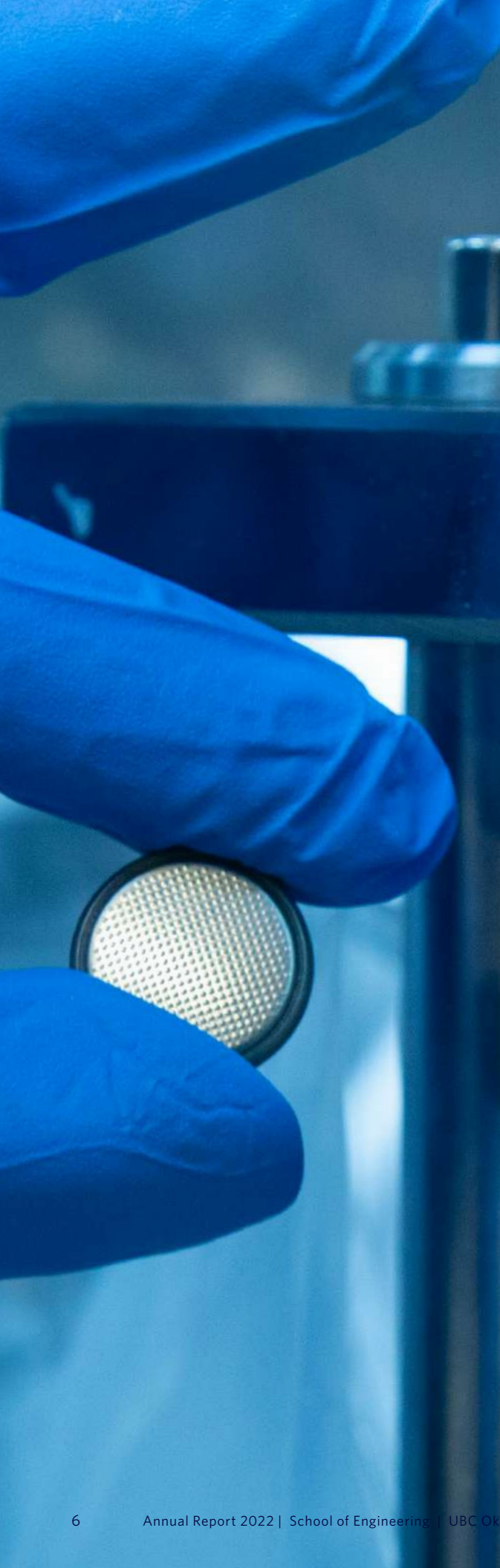
¹ According to the most recent Engineers Canada data, women make up 28% at the graduate level

² Across Canada, women represent 22% of students enrolled in undergraduate engineering programs

³ While Indigenous people make up more than 4.9 percent of the Canadian population, but account for only 1.2 per cent of total undergraduate enrolment in engineering programs

I always loved math and sciences, but what drew me to the engineering field is how impactful it is in solving real world problems, such as inventing carbon capture technology or creating bioprosthetic heart valves!

Megha Dasai, fourth-year engineering student



UBC Okanagan is a close-knit community that I really enjoyed being a part of. It was easy to meet new people in and out of my program of study and seeing familiar faces everyday made my experience a rich one.

Maddy Light, Alumna

Research Partnerships

At the cutting-edge of research innovation, School of Engineering researchers are leading many inter-disciplinary projects that hold great potential.

With over 26 industry partners, researchers are uncovering innovative solutions within the School's key research clusters of advanced materials, advanced systems, clean technologies, health technologies and urban infrastructure. Partners include municipalities across British Columbia (Kelowna, West Kelowna, Summerland, Richmond, Burnaby, District of Lake Country, Regional District of North Okanagan, and the Greater Vancouver Regional District), Indigenous organizations (Westbank First Nation and the Penticton Indian Band), and industry (FortisBC, ESS Technologies, MagniX, Tekmar, Kal Tire, Emil Anderson Group, Rogers, Tolko, Fenix Advanced Materials, ZEN Graphere, and Telus).

In 2022, twelve School of Engineering researchers were recognized for being among the top 2% of cited scientists worldwide in their fields according to the annual Stanford top-cited researcher study. The researchers cited were Morad Abdelaziz, Shahria Alam, Mohammed Arjmand, Julian Cheng, Wilson Eberle, Kasun Hewage, Zheng Liu, Abbas Milani, Stephen O'Leary, Rehan Sadiq, Solomon Tesfamariam, and Mohammed Zarifi.

2021/22 Funding

FUNDING BY DISCIPLINE

30%	Civil \$4,966,937
17%	Electrical \$2,872,758
4%	Manufacturing \$649,918
48%	Mechanical \$7,966,428

FUNDING BY SOURCE

33%	Tri-Council Funding \$5,540,966
6%	Infrastructure \$986,886
17%	UBC Internal Funding \$2,756,956
44%	Other External Funding \$7,171,232

Research Headlines

SMART TECHNOLOGY TO SAFEGUARD WATER

A new research partnership NSERC, TELUS and the Regional District of North Okanagan has researchers beginning to address an existing gap by leveraging new sensors to wirelessly monitor water quality in the distribution system - **Anas Chaaban** and **Nicolas Peleato**

MORE ACTIVE ACTIVITY TRACKING

Researchers with UBC Okanagan's Nanomaterials and Polymer Nanocomposites Laboratory, have created even smaller, lighter and highly-accurate sensors that can be integrated into clothing and equipment - **Mohammad Arjmand**

BLOCKCHAIN IMPROVES SUPPLY CHAIN

New research from UBC Okanagan suggests blockchain technology can improve the sustainability and efficiency of supply chains - **Samuel Yousefi** and **Babak Tosarkani**

INCORPORATING HYDROTHERMAL LIQUEFACTION INTO WASTEWATER TREATMENT

Evaluating hydrothermal liquefaction as a means to sustainably convert sludge waste into a renewable energy source - **Cigdem Eskicioglu**

NEXT-GENERATION BATTERY RESEARCH

UBC Okanagan researchers have teamed up with a BC company to create a smaller, more powerful battery than what's currently available - **Jian Liu**

COVID CHANGED THE WAY WE SHOP

UBCO research investigates post-pandemic shopping habits have evolved - **Mahmudur Fatmi**

SMART WINDOWS REDUCE PATHOGENS

Daylight passing through smart windows results in almost complete disinfection of surfaces within 24 hours while still blocking harmful ultraviolet (UV) light, according to new research from UBC's Okanagan campus - **Sepideh Pakpour**

AIRCRAFT CAN GET HIGHER AND GREENER

UBCO researchers cook up cleaner jet fuel with graphene nanomaterials - **Sepehr Mosadegh** and **Sina Kheirkhah**

SEISMIC DESIGN AND EVALUATION OF CONTROLLED OUTRIGGERED ROCKING WALL

Next-generation earthquake engineering design seeks to develop robust structural systems to limit structural and non-structural damage after strong earthquake shaking - **Lisa Tobber**

SEISMICALLY-ENHANCED BRIDGES

New research collaboration seeks to safeguard bridges against earthquakes - **Shahria Alam**

PERSONALIZED ANTIBIOTIC THERAPY

UBC researchers have developed a method for monitoring bacterial responses to antibiotics in health-care settings that opens the door to personalized antibiotic therapy for patients - **Mohammed Zarifi**

KEEPING IT CLEAN AND COOL

New study investigates environmentally friendly ways to cool homes - **Mohammad Al Hashmi** and **Kasun Hewage**

SMART TECHNOLOGY STRENGTHENS MATERIALS

Researchers at UBC Okanagan have come up with an easier way to examine the complex structure of fibres and multiscale materials, helping to ensure newly developed composites won't fail under excessive loads - **Tina Olfatbakhs** and **Abbas Milani**

MACHINE LEARNING IDENTIFIES TOXINS

Novel approach can quickly identify toxins from oil sands and tailing ponds - **María Claudia Rincón Remolina** and **Nicolas Peleato**



Engineering school and the UBCO Motorsports team have given me the ability and the knowledge to turn the ideas in my head into a reality.

Nathan Van Zyderveld, Alumnus

Innovation & Entrepreneurship

Capstone team wins Simon Cox Student Design Competition

A proprietary-free catheter drainage device, designed by a group of fourth year engineering students at UBC Okanagan has won the Simon Cox Student Design Competition.

The competition, in its seventh year, is intended to raise awareness of the day-to-day challenges facing people with neuromuscular disorders and spinal cord injuries, and how innovative designs can make a real difference.

The team of **Spencer Bell, Rhys Herzberg, Shane Rutley, Runliang Wu** in collaboration with their peer **Misha Tvrdik** (and faculty supervisor Assistant Professor **Sabine Weyand**) also won the Interdisciplinary and Overall Prize at the 2022 School of Engineering Capstone Showcase. The capstone judges were particularly impressed in the manner in which the students collaborated with stakeholders including a person living with MS to develop the device.

Joint UBCO & UMMC team wins International Overhead Imagery Hackathon

A UBCO / University of Mississippi Medical Center team outpaces stiff competition in virtual hackathon. A group of undergraduate and graduate students from UBC Okanagan's School of Engineering won the Overhead Imagery Hackathon (OIH). The international competition, hosted by the United States Air Force, University of Wisconsin Madison, and the Toyota Technological Institute at Chicago, pitted teams from across the globe to utilize Artificial Intelligence and Machine Learning (AI/ML) methods to classify different types of building damage caused by natural disasters, such as hurricane, flood, earthquake and fire. The UBCO team included graduate students **Junchi Bin** (a 3rd year PhD student), **Ran Zhang**, and **Ray Wang** under the supervision of Engineering Professor **Zheng Liu**.

CAPSTONE PROJECT MAKES LASTING IMPACT IN BARBADOS AND AROUND THE WORLD

Inspired by APSC 169 Fundamentals of Sustainable Engineering Design, a group of engineering students sought out a way to make a difference. For their fourth-year capstone project, they connected with Civil Engineering Professor **Cigdem Eskicioglu** to develop a wastewater treatment and biogas system.

The team included **Nicole Keeler, Landon Colvin, Ken Masuda, Austin Phillips, Taylor Phillips, and Siera Zandvliet**. They received support from Excel Worldwide Agriculture and a grant from the United Nations Development Programme, the team partnered with Dr. Nikolai Holder from the University of the West Indies and Jackman Dairy Farm to undertake the project.

ALUMNI'S NHL CONNECTION

A new collaboration between the NHL's St. Louis Blues and a Canadian immersive technology company, with a School of Engineering connection, is bringing the team its first metaverse shopping experience. The Blues have teamed up

with MantisXR to create an immersive reality retail experience. The company's technology and processes were developed by **Dr. Vincent Loi**, who graduated from the School of Engineering in 2021.

STUDENT TEAMS QUALIFY FOR GLOBAL HACKATHON

Two School of Engineering **APSC 169 student-led teams** have qualified for the finals of the World Engineering Day Hackathon. The teams include Team Graz (developing alternative water resources in Namibia) and Team Mobile Rain Harvesting System (to provide clean water to Indigenous Communities).

SOE TEAM MAKES PODIUM AT COMSOC COMPETITION

A graduate research team from UBC Okanagan placed second in North America in the IEEE Communication Society's Internet for All Competition. The 2022 competition included teams and individuals from across the globe developing solutions for connecting under-served communities to the internet. UBC Okanagan team was led by Assistant Professor **Anas Chaaban** and PhD candidate **Mamoud Hasabelnab**.

Teaching Excellence

Inspiring teaching

DR. AYMAN ELNAGGAR

2022 recipient of the Provost Teaching Excellence and Innovation Award

With over 30 years of industrial and academic experience, Dr. Ayman Elnaggar has been an innovative problem-solver inside and outside the classroom since he joined UBC Okanagan in 2014. He has led the development of several new initiatives and academic opportunities, including his successful proposal to introduce Fall Reading Week to the UBC community and the School of Engineering Dual-Credit Program.



Forging connections with students

DR. MEHRAN SHIRAZI

2022 recipient of the Provost Teaching Excellence and Innovation Award

Dr. Mehran Shirazi has quickly gained a reputation as a dedicated and supportive educator thanks to his tireless work and advocacy to ensure positive learning experiences for his students, earning several notable teaching accolades including Thank a Prof and Golden Apple awards as well as the Canadian Federation of Engineering Students Association Appreciation Award. He has worked extensively with the CTL and led important campus-wide initiatives, such as the Learning Technology Rovers and Learning Design Interns.



Research Excellence

The Principal's Research Chairs (PRC) program at UBC Okanagan provides internal funding support for top-tier researchers engaged in outstanding research or creative scholarship.

Three PRCs were announced for Engineering faculty in 2022 as part of the program's second cohort of appointments.

Abbas Milani, *Professor of Mechanical Engineering*
PRC Tier 1 Sustainable and Smart Manufacturing

Alexander R. Uhl, *Assistant Professor of Mechanical Engineering*
PRC Tier 2 Solar Energy Conversion

Mohammad Zarifi, *Assistant Professor of Electrical Engineering*
PRC Tier 2 Sensors and Microelectronics (Tier 2)

These new appointments highlight the importance and quality of research on the Okanagan campus. The research findings and creative scholarly activities of these outstanding researchers will translate into tangible benefits to the local region and global society.

New Options & Minors Take Flight

The School of Engineering now offers options in Aerospace, Biomedical, Environmental, Mechatronics and Resilient Infrastructure Management along with Minors in Arts, Computer Science and Management.

Advisors Support Students

Undergraduate Academic Advising provides assistance with academic planning, interpreting course requirements, and resolving academic and personal problems.

During the 2021/22 academic year, the team received more than 1200 booked appointments and a similar number of emails and drop-in meetings. Advisors assisted 974 unique students with course/degree planning, course registration, course withdrawals, transfer credits, graduate checks, co-op enquiries, and more.

Awards & Recognition

Rehan Sadiq
2022 Canadian Society for Civil Engineering (CSCE)
Albert E. Berry Medal

Mohammad Arjmand
2022 Canadian Society of Chemical Engineering (CSChE)
Innovation Award

Seyyedarash Haddadi
2021 Mitacs & NRC-IRAP Award for Commercialization

Stephen O'Leary & Rehan Sadiq
Engineers Canada Fellows (2021)

Amandine Drew
2022 Tyler Lewis Clean Energy Research Foundation
Award

Majed Amini
Top prize in the poster competition at the 49th
International Polymer Congress (2022)

Shayan Sheikhi Narani
2021/22 SRK Canada Graduate Award

Rehan Sadiq
2022 Canadian Institute of Engineering (EIC) Fellow

Kishoore Tamanna
2022 John Tiedje Fellowships

Amir Ahmadian
2022 John Tiedje Fellowships

Chinchu Cherian
2021 UBC Okanagan Postdoc Research Day Best
Presentation Award

Mohammad Arjmand
2022 American Chemistry Society's (ACS) Division of
Polymeric Materials: Science and Engineering (PMSE)
Emerging Leader

Wilden Living Lab (PI - Shahria Alam)
2021 EGBC Sustainability Award

I really enjoy both Computer Science and Engineering, and have found that taking the Computer Science Minor has provided me with an opportunity to focus on the things I love about both disciplines.

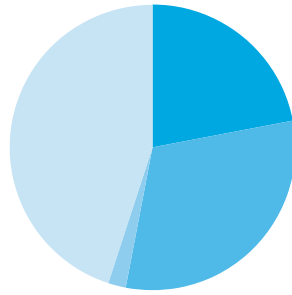
Carlos Calderon, Alumnus



Assistant Professor Dr. Sepideh Pakpour, along with student researchers Enrique Calderon and Rita Lam, examine a sample beside the natural light experimentation chamber. Their research suggests light through smart windows can work as a natural disinfectant against many illnesses including E.Coli and methicillin-resistance Staphylococcus aureus.

2020/22 FISCAL YEAR PROJECTS

22% Electrical - 109
30% Civil - 151
2% Manufacturing - 15
45% Mechanical - 226



PUBLICATIONS

1282 Scholarly outputs 2019 - 2022
>12k Citation count during that period
1.59 Field-weighted citation impact

*According to SciVal

SCHOOL OF ENGINEERING OPERATING BUDGET

As of August 2022, the School of Engineering has 58 Faculty members, 11 Lecturers, and 38 staff.

Operating Expenses	Capital Expenses	Faculty Salaries	Other Salaries & Benefits	Total Expenses
\$705,000	\$847,000	\$9,203,000	\$3,365,000	\$15.45M

GREEN INFRASTRUCTURE INTERDISCIPLINARY RESEARCH CLUSTER (2021)

The Centre for Green Infrastructure will integrate and leverage the expertise of researchers in engineering, economics, geography and the social sciences to develop comprehensive and integrated solutions, including new tools, techniques, policies and best management practices for planning, operations, and community engagement. These advances will be key to ensuring climate resiliency and environmental sustainability of critical municipal infrastructure.

Lead

Shahria Alam

Cluster Research Team

**Rehan Sadiq | Kasun Hewage | Rudolf Seethaler | Wilson Eberle |
Thomas Johnson | Sumi Siddiqua | Kevin Hanna (FOS) | Ross Hickey**

The first day of classes, it felt like I had found my tribe. I was excited by all these concepts I was getting to learn that I had always been curious about.

Kailey Beckie, third-year engineering student

Emma Houiellebecq (BASc '13) recognized with Alumni UBC Achievement Award

Alumni UBC awarded the prestigious 2022 Global Citizenship Award to UBC Okanagan graduate Emma Houiellebecq for her contributions to the humanitarian sector around the world. Houiellebecq co-founded the UBC Okanagan chapter of Engineers Without Borders before serving as the Co-President of Engineers Without Borders in Vancouver after graduation. She was awarded a Gates Cambridge Scholarship to undertake a Master of Philosophy in Engineering for Sustainable Development at the University of Cambridge.

Houiellebecq has been working as an engineer in the international development and humanitarian sector across Africa and the Middle East. Most recently, she was working with the International Committee of the Red Cross (ICRC) in South Sudan and the Gaza Strip. As an ICRC Resilience Programme Advisor, she led the implementation of urban infrastructure projects in the Gaza Strip from 2019 to 2021. Prior to working with the ICRC, she was a Civil Engineer for the Africa Community Technical Services in Uganda.

After experiencing the challenges faced by the humanitarian sector when responding to complex crises, Houiellebecq decided to return to the University of Cambridge in 2021 to pursue a PhD on strengthening the resilience of urban infrastructure. She was awarded a second Gates Cambridge Scholarship to support her studies and will be undertaking her research in Venezuela and the Gaza Strip.

In her efforts to improve the lives of others around the world, she has joined collaborators in overcoming challenges by creating solutions that are achievable and sustainable.



Seeing the positive impacts of our projects really gives me the energy to continue.

Emma Houiellebecq, Alumna





alumni UBC

Student & Alumni Success

With over 2000 graduates since the first graduating class in 2009, School of Engineering alumni have become a major force throughout industry and academia in Canada and around the world. The lessons they learned at UBC and the networks they developed are the foundation of

2021 Convocation Numbers

35	PhD	54	MEng
302	MASc	302	BASc
24	MSc		

New Faculty & Staff

The School of Engineering was fortunate to welcome a number of outstanding new faculty and staff in 2022. These individuals join a community of educators, technicians, and support staff who empower students and researchers to achieve great things.

Ayse Alemdar Thomson

Project Manager

Richard Aleong

Lecturer

Matthew Brown

Lab Technician

Qian Chen

Assistant Professor

Trudy Chimko

Manager of Administration

Nikita Dawe

Lecturer

Aria Fani

Lab Tech V

Špela Grašič

Engineering Advisor

Jill Heinrichs

Administrative Assistant to the Director

Will Hughes

Director

Kent Levang

Finance Manager

Jin Li

Lecturer

Jessica Russo

Undergraduate Program Assistant

Hayden Soboleski

Engineering Co-op Coordinator

Elizabeth Trudel

Lecturer

Klaske van Heusden

Assistant Professor

Supporting Teaching & Learning

School of Engineering technicians provide a lift to students and faculty

During the 2021/22 academic year, the technical team supported 38 courses (VANT 151, APSC 182, ENGR 406, ENGR 310, ENGR 377, APSC 259, ENGR 340, ENGR 325, ENGR 359, ENGR 361, ENGR 451, ENGR 458, ENGR 342, ENGR 481, MANF 230, MANF 330, MANF 368, MANF 465, APSC 253, ENGR 416/516, ENGR 340, APSC 183, APSC 255, APSC 262, ENGR 320, ENGR 351, ENGR 423, ENGR 454, ENGR 467, ENGR 472/572, MANF 230, MANF 330, MANF 386, MANF 455, ENGR 385, MANF 475, MANF 486, APSC 258, ENGR 332 ENGR 315, MANF 230, and MANF 330).

In addition, technicians also received and completed over 370 research tickets





THE UNIVERSITY OF BRITISH COLUMBIA

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