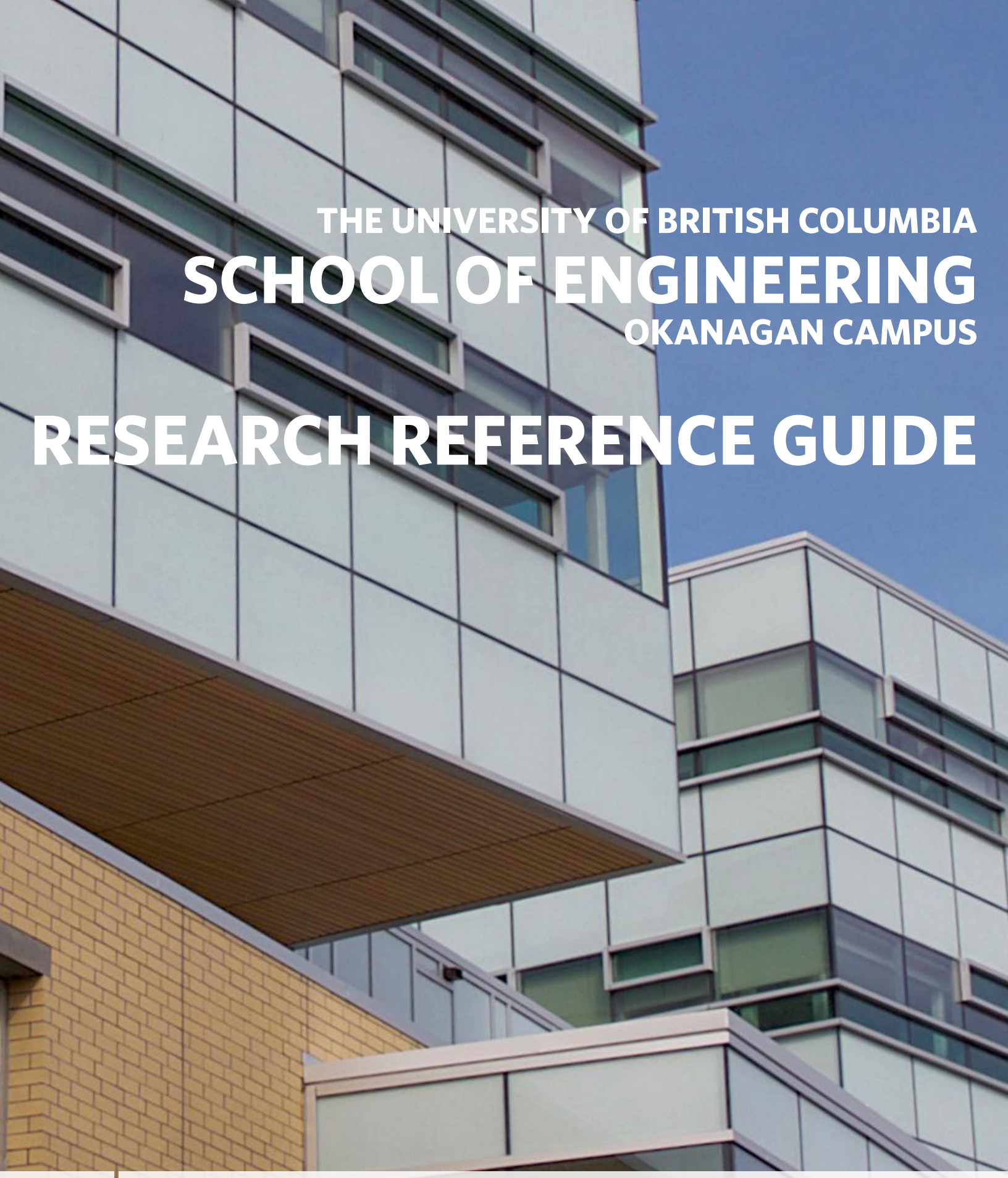


THE UNIVERSITY OF BRITISH COLUMBIA

SCHOOL OF ENGINEERING

OKANAGAN CAMPUS

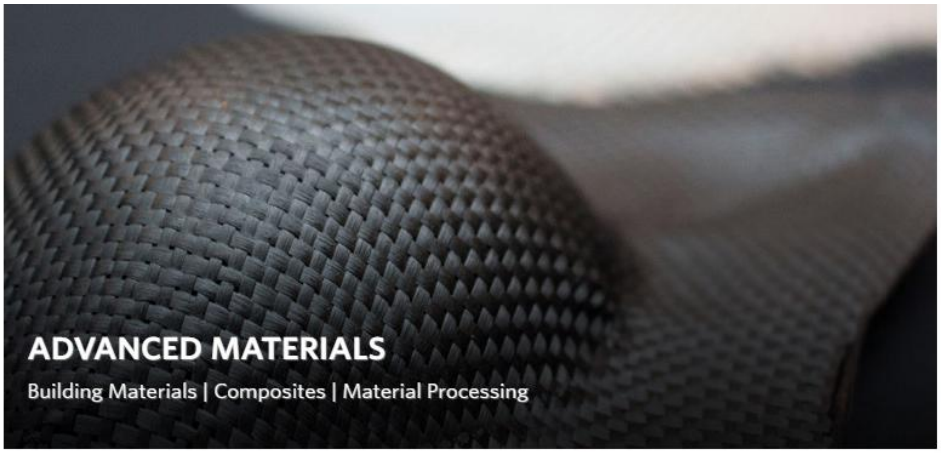
RESEARCH REFERENCE GUIDE

THE UNIVERSITY OF BRITISH COLUMBIA

World-class researchers power industry partnerships at the School of Engineering

Research is the cornerstone of success in business, and it is equally as pivotal for a successful university. At the School of Engineering, we are motivated by innovation. Driven by curiosity, and the goal of uncovering solutions that lead to meaningful change, the engineering programs at UBC Okanagan are making an important impact throughout the region, across Canada and around the world.

For over a decade, researchers at the School of Engineering on UBC's Okanagan campus have been building partnerships to innovate in areas as varied as fuel-cell technology, composite materials, wearable devices, wastewater recovery, microfluidics, industry 4.0, intelligent systems, smart materials, transportation and nano-technologies. World-class faculty and facilities enable us to support many stakeholders in the community including students, industry, not-for-profit organizations, and the general public. Our research has been concentrated into five key research clusters:



Researchers on the Okanagan campus of UBC are developing the building blocks for light-speed computing that could revolutionize the notion of what computers can do. Through the latest innovations, our labs are developing biomedical engineering solutions that are changing health care. Our civil engineering research teams are helping communities make better decisions about how and when to replace infrastructure while developing new and innovative materials for their replacement.

UBC has invested millions in state-of-the-art laboratory equipment, and our faculty have been awarded tens of millions for research infrastructure and operation through highly competitive national grants. Our research collaborations with industry have received Collaborative Research and Development grants from the Natural Sciences and Engineering Research Council of Canada (NSERC) that have enabled research, training and technology transfer.

The School of Engineering is an incubator of innovation and research. The School hosts numerous institutes, centres and nodes that stimulate discoveries through collaboration both inter-disciplinary and cross campus. The Materials and Manufacturing Research Institute (MMRI), based on the Okanagan campus, brings together researchers from all disciplines to conduct high-quality, high-impact research at the interface of basic and applied sciences. MMRI hosts the Composite Research Network (CRN) Okanagan node. The CRN boasts over 100 industry partners and experts who investigate develop solutions and address the challenges within the complex world of composites.

The Okanagan campus is also home to a Clean Energy Research Centre node where researchers are uncovering safe, widespread and equitable access to sustainable energy. Together with the Cluster of Research Excellence in Green Infrastructure, the two groups have helped to establish the School of Engineering as a hub for sustainability research in power generation and construction. In collaboration with Okanagan College, UBC has established the Green Construction and Training Partnership that will enhance training and research opportunities across the region.

Part of the Faculty of Applied Science, the School of Engineering at UBC's Okanagan campus is building upon over 100 years of engineering teaching and research excellence at UBC. The School has full accreditation in three programs: Civil, Electrical, and Mechanical Engineering while its newest program (Manufacturing Engineering) launched in September 2019.

Along with the inception of the Manufacturing Engineering program, the School of Engineering is constructing new teaching and research facilities on and adjacent to campus. These new facilities will house state-of-the-art equipment for training and research purposes, and mark the first stage of development for UBC's envisioned digital learning factory.

Since its inception in 2005, the School of Engineering has seen momentous growth in research and teaching infrastructure, as well as in its student body that has grown to over 1700 undergraduate and graduate students.

The School's growth — and growing success in research endeavours — would not have been possible without the support of industry. We welcome new collaborations and inquiries about research partnerships.

Rehan Sadiq, Executive Associate Dean
School of Engineering
Faculty of Applied Science
Okanagan campus

ADVANCED MATERIALS & MANUFACTURING

Building materials, composites, electronic materials, material characterization and material processing.

Ahmad Al-Dabbagh - Assistant Professor

Development of model-based and data-based approaches for the control, monitoring, and automation of systems and processes.

Mohammad Arjmand - Assistant Professor

Processing, molding and characterization of multifunctional polymeric nanocomposites with a variety of properties including electrical, gas sensing, thermal, mechanical, optical and thermoelectric.

Lukas Bichler - Associate Professor

Development of new materials and processing methods; recycling of manufacturing by-products.

Kevin Golovin - Assistant Professor

Advanced manufacturing related to the aerospace industry including coatings, 3D printing and fibre composites.

Abbas Milani - Professor

Advanced modeling, simulation, and multi-criteria design optimization of composite materials, structures and manufacturing processes.

Homayoun Najjaran - Professor

Advanced manufacturing, industry 4.0, mechatronics and control systems with applications in robotics, industrial automation and unmanned systems.

Dimitry Sediako - Assistant Professor

Advanced modeling, simulation, and multi-criteria design optimization of composite materials, structures and manufacturing processes.

ADVANCED SYSTEMS & DATA ANALYTICS

Big data and networks, communication networking, photonics and electromagnetics, robotics and controls and sensors.

Ahmad Al-Dabbagh - Assistant Professor

Development of model-based and data-based approaches for the control, monitoring, and automation of systems and processes.

Anas Chaaban - Assistant Professor

Relaying for interference management specifically network information theory. Researching optical wireless communications, communication theory, relay networks and coding theory.

Kenneth Chau - Associate Professor

At the intersection of nanotechnology and optics, moulding light to create the next generation of light tools. Using smart windows and incorporating nanotechnology and optics to distribute power and communications.

Julian Cheng - Professor

Improving optical and digital wireless communications with an emphasis on fundamental research. Orthogonal frequency division multiplexing, spread spectrum communications, statistical signal processing for wireless applications, and optical wireless communications.

Chen Feng - Assistant Professor

Information and coding theory, big data and blockchains. Adapting new ideas and tools from information theory, coding theory, stochastic processes, and optimization to design better networking systems.

Jonathan Holzman - Professor

Integrated optics including micro- and nano-photonic technologies targeted at a variety of applications, including ultrafast all-optical processing, optical wireless communications and terahertz spectroscopy.

Jahangir Hossain - Associate Professor

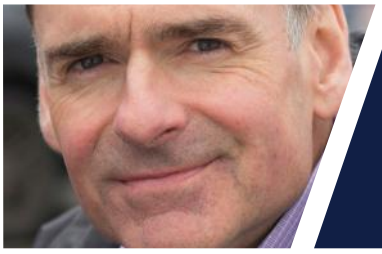
Contemporary wireless communication systems focused on bandwidth and energy efficient technologies for wireless systems leading to longer battery life and high data rate support.

Mina Hoorfar - Professor

Theoretical and experimental advancements in surface science and microfluidic technologies. Investigating electrochemistry (fuel cells), advanced imaging (microCT), computational modeling, and fabrication of microstructures.

Thomas Johnson - Associate Professor

Solving applied problems in radio frequency and microwave circuits and systems. Investigating RF power sources for wireless and industrial applications, applied electromagnetics and pulse encoders for switch-mode power amplifiers.



Richard Klukas - Associate Professor

Using optical, ultrawideband, WiFi signals and sensors for indoor positioning and navigation. Improving methods for integrating various indoor positioning technologies and vehicle-to-vehicle ranging systems.

Sunny Li - Associate Professor

Advancing liquid / air cooling technologies, thermal / fluid sciences in sustainable energy systems and thermalfluidics in micro devices and systems.

Zheng Liu - Associate Professor

IoT-based sensing, intelligent systems, machine learning and data analytics, computer vision and pattern recognition, information fusion.

Loïc Markley - Assistant Professor

Electromagnetic wave engineering, with an emphasis on metamaterials and metamaterial related devices to further the design of high-frequency electronic circuits and antennas.

Homayoun Najjaran - Professor

Advanced manufacturing, industry 4.0, mechatronics and control systems with applications in robotics, industrial automation and unmanned systems.

Stephen O'Leary - Professor

Wide-band gap III-V and disordered semiconductors related to optical response of materials, novel electron devices, solar cells, x-ray image detectors and large-area electronics.

Rudolf Seethaler – Associate Professor

Mechatronics for automobiles including development of high-speed and large displacement actuation devices, electromagnetic valve trains, distributed control sensor fusion and power distribution systems.

Mohammad Zarifi – Assistant Professor

Development of microwave resonator sensors, high-speed and lower power analog to digital converters, microelectromechanical sensors.

CLEAN TECHNOLOGY & ENVIRONMENTAL SYSTEMS

Morad Abdelaziz - Assistant Professor

Smart grids, renewable energy, distributed generation, HPC applications for power systems and the integration of an electrified transport systems within electrical grids.

Joshua Brinkerhoff – Assistant Professor

Understanding flow dynamics and turbulence to improve performance and efficiency in aerospace, nuclear, and gas industries.

Wilson Eberle – Associate Professor

Enabling technology for advanced energy applications through power electronics. Developing power conversion and smart-grid technologies for advanced industrial energy applications.

Cigdem Eskicioglu – Professor

Development of waste reduction and resource recovery methods through advanced bioprocesses and micropollutant removal.

Mahmudur Fatmi – Assistant Professor

Transportation engineering & planning including travel behaviour analysis, land-use interaction, activity-based modeling, econometric methods & agent-based microsimulation.

Kevin Golovin – Assistant Professor

Drag reduction in turbulent flow, sustainable material solutions, water purification, and interfacial coatings enabling green and sustainable development.

Kasun Hewage – Professor

Life cycle thinking in built environment including water-energy-carbon nexus, energy efficient buildings, construction waste management, and life cycle assessment and costing in engineering products and processes.

Mina Hoorfar – Professor

Developing and integrating sensors into gas and water systems. Using a sensitive metal oxide semiconductor coupled with selective microfluidic diffusion channel, the sensors can sample, filter and analyze.

Sina Kheirkhah – Assistant Professor

Through design improvements, technology, tools and knowledge helping large-scale power generation industries mitigate combustion instabilities. Building next generation combustion engines.

Jian Liu – Assistant Professor

Advanced nanofabrication, atomic/molecular layer deposition, renewable energy storage and conversion, Li-ion and next-generation batteries (Li-S, Na-ion, all-solid-state) for transportation and stationary applications.

Gordon Lovegrove – Associate Professor

Inter-disciplinary policy, infrastructure and vehicle research to sustain global community quality of life, including new tools for active transport, safety planning, hydrail retrofits, and SMARTer growth development patterns.

Sepideh Pakpour – Assistant Professor

Foundations of healthy buildings: ventilation, indoor air quality (IAQ), dust & pests, moisture; indirectly related to thermal health, safety & security, water quality, noise, lighting and views.

Deborah Roberts – Professor

Anaerobic biological treatment of industrial wastewater, microbial fuel cells for conversion of waste to energy agricultural systems, and sulphur oxidizing microbes and their effects on the environment.

Rehan Sadiq – Professor

Drinking water quality modelling, environmental risk assessment, lifecycle thinking and decision-making.

Alexander Uhl – Assistant Professor

Developing printed photovoltaics, tandem solar cells, and photoelectrochemical devices (PECs) for clean electricity and solar fuels.

Liwei Wang – Assistant Professor

Power system analysis, electrical machine and drives, power electronic converter design, control and topology, utility power electronics applications, HVDC and FACTS, renewable energy sources, and distributed generation.

HEALTH TECHNOLOGIES

Biomaterials, biomechanics, disease detection, health monitoring and medical devices.

Ian Foulds – Associate Professor

Microelectromechanical systems (MEMS), microfluidics and microfabrication to discover new ways to increase outputs through parallel packaging of MEMS. Wirelessly powered / controlled implantable drug delivery system.

Chen Feng – Assistant Professor

Information and coding theory, big data and blockchains. Adapting new ideas and tools from information theory, coding theory, stochastic processes, and optimization to design better networking systems

Mina Hoorfar – Professor

Drug and disease detection, lab-on-chip devices and proton exchange membrane methanol fuel cells. Rapid cancer cell detection. Biosensor for detection of biomarkers on lab-on-chip platforms.

Thomas Johnson – Associate Professor

Non-invasive blood pressure measurement sensing methods and wireless power circuits for embedded sensors. Focused on solving applied problems in the area of radio frequency (RF) and microwave circuits and systems.

Zheng Liu – Associate Professor

Flexible sensing for eHealth system, electronic health record systems, signal processing and information fusion for health monitoring and diagnosis.

Gordon Lovegrove – Associate Professor

Inter-disciplinary policy, infrastructure and vehicle research to sustain global community quality of life, including new tools for active transport, safety planning, Hydrail retrofits, and SMARTer growth development patterns.

Hadi Mohammadi – Assistant Professor

Cardiovascular engineering / technology, and cellular / molecular biomechanics. Next generation of cardiovascular devices (prosthetic heart valves, etc).

Homayoun Najjaran – Professor

MEMS particularly wearable and microfluidic devices for prognostics and diagnostics. Precision control of microfluidic systems for lab-on-a-chip and point-of-care-testing technologies.

Sepideh Pakpour – Assistant Professor

Foundations of healthy buildings: ventilation, indoor air quality (IAQ), dust & pests, moisture; indirectly related to thermal health, safety & security, water quality, noise, lighting and views.

URBAN INFRASTRUCTURE & CLEAN TECHNOLOGIES

Planning and decision-making, sustainable buildings, transportation, waste management and water systems.

Shahria Alam – Professor

Smart materials and their structural applications such as seismic rehabilitation of deteriorated structures, performance-based design of reinforced concrete, prestressed concrete and masonry structures.

Joshua Brinkerhoff – Assistant Professor

Simulation of multiphase turbulent flows for compressed and liquefied gas systems and dispersion of atmospheric pollutants in urban and industrial environments.

Kasun Hewage – Professor

Life cycle thinking in built environment including water-energy-carbon nexus, energy efficient buildings, construction waste management, and life cycle assessment and costing in engineering products and processes.

Zheng Liu – Associate Professor

Data-driven decision making, predictive maintenance of civil infrastructure, aircraft, and complex machine.

Nicholas Miguel Peleato – Assistant Professor

Advanced characterization of organic matter for evaluation of drinking water treatment processes and assessment of source water quality. Development of low-cost pre-treatment methods to effectively mitigate

Ahmad Rteil – Assistant Professor

Design, evaluation and repair of infrastructure systems including reinforced / prestressed concrete structures.

Rehan Sadiq – Professor

Asset management of civil infrastructure systems, water supply systems and reliability engineering.

Sumi Siddiqua – Associate Professor

Nuclear waste repositories, energy pipelines, chemical stabilization of road subgrade materials, soil nano-particles, soil-water chemistry and the reuse of industry by-products.

Dwayne Tannant – Professor

Geotechnical engineering and engineering geology applied to surface and underground excavations in rock, terrain analysis, geohazard identification and evaluation, rock support design, blasting, rock mass characterization,

Solomon Tesfamariam – Professor

Timber-based hybrid building design, infrastructure management, seismic risk assessment of civil infrastructure systems, risk-based decision making, multi-hazard resiliency framework.

For information about research opportunities and collaboration
contact Colin Wilson at 250-317-7688 or visit https://engineering.ok.ubc.ca/research/

LABS & FACILITIES

The School of Engineering has world-class, state-of-the-art laboratory facilities.

- Advanced Control and Intelligent Systems (ACIS) Laboratory
- Advanced Materials for Energy Storage Lab
- Applied Laboratory for Advanced Materials and Structures
- Applied Micro & Nanosystems Facility
- Biological Solutions Laboratory
- Bioreactor Technology Group Laboratory
- Centre for Transportation and Land Use Research (CeTLUR)
- Chau Research Group
- Combustion for Propulsion and Power Laboratory
- Communication Theory Lab
- Composites Research Network Okanagan Laboratory
- UBC-Okanagan Computational Fluid Dynamics Laboratory
- Energy Systems and Power Electronics Laboratory
- Facility for Environmental and Biological Imaging
- Feng Research Group
- Heart Valve Performance Laboratory (HVPL)
- Integrated Optics Laboratory
- Intelligent Sensing, Diagnostic and Prognostic Research Lab
- Laboratory for Solar Energy and Fuels (LSEF) Research
- Life Cycle Management (LCM) Laboratory
- Micro-Electronics and Advanced Sensors Laboratory
- Nanomaterials and Polymer Nanocomposites Laboratory (NPNL)
- Natural Gas Fuel System Laboratory (NGFSL)
- Okanagan Laboratory for Control Systems Research
- Okanagan Polymer Engineering Research & Applications (OPERA) Lab
- Research in the Advanced Thermo-Fluidic Laboratory (ATFL)
- RF and Microwave Technology Research Laboratory
- Sustainable Transport Safety Research Laboratory
- Tesfamariam Research Group
- Thermal Management & Multi-phase Flows Lab (TMMFL)

EQUIPMENT & CAPACITY

The School of Engineering has world-class, state-of-the-art laboratory facilities.

- 007 James Bond Tester MK III
- 3000 kN Compression Tester
- 3D scanners, including two Creaform handheld scanners (VIUScan laser the LED-based Go!Scan 3D)
- 3D systems – ProJet 1500
- 500 kN Load Frame / Fatigue Tester
- 500kN (930 mm stroke) FPS Actuator
- 500kN (930 mm stroke) FPS TEST ACTUATOR
- 50kN (630 mm stoke) FPS TEST ACTUATOR
- 54 million pixels camera – 3D stitching
- 8 GHz Digital Phosphor Oscilloscope
- AATCC Spray Rating Instrument
- Advance metal lathe 16" Swing x 40" Long
- Advanced Battery Facility
- Advanced Control Educatin Kit 1103(PX4CLP_USB)
- Agilent – 660-IR
- Agilent – ExoScan
- Alkali Silica Reaction
- American Autoclave
- Anton Paar – MCR-502 Oven
- APAM melt mixer
- ASP1400 Differential Pressure Sensor
- Automatic Heated Vacuum Film Applicator
- Ballistic Impact Gun
- Ballistic Load Sensing Headform (BLSH)
- Barnstead Thermolyne furnace
- Bath sonicator
- BELMONT – SY-M-2535 High Speed EDM Drill
- BIOFLO 115 100-120v Master Control
- Blast simulator
- Blue-m – 1200˚ LGO furnace
- Blue-m Oven
- Blunt Trauma Torso Rig (BTTR)
- BMIL
- Bridgeport milling machines
- Brother – HS-70AM Wire EDM
- Buehler – CAST'N VAC 1000 Resin Impregnation System
- Buehler – IsoMet 4000Precision Diamond Saw Cutter
- Buehler – IsoMet LSS Low Speed Diamond Saw
- Buehler – The EcoMet 300 Polisher-Grinder
- CDNQ-9191 Compact DAQ chassis
- Cintiq tablets
- Claytools sculptural 3D modeling software
- Clean lay-up room including debulking tool and vacuum pump
- CNC Router
- Cobb Absorbency Measurement System
- Compression molding machine, hot stirrer
- Concrete Test Hammer
- Connex500 multi-material, high-resolution 3D printer
- Controller for FPS System
- Controller for MTS System
- Corrosion analyzing Instr. With rod and wheel elec.
- Corrosion Meter
- Digital Image Correlation System
- Doosan – Lynx 220 Turning Center
- Drop Weight Impact Testing Frame
- Dropmeter-S100 Portable Smartphone Contact Angle Goniometer
- EBSD Detector and associated software
- EK-H4 Humidity Sensor Evaluation Kit
- Electrically Heated Muffle Furnance with Controller P 330
- Enhanced Laser Velocity System
- EX-CELL-O Milling Machine
- Explosion proof freezer
- Extradia XCT-400 tomography machine
- FANUC – T-21-iFLA RoboDrill
- FASTCAM – Model SA5High Speed Camera
- FDM 3D printing setup
- Fluke Electronics-Ti10, Thermal Imaging Camera
- Four 250 kN (250 mm stroke) MTS Actuators
- Four 250 kN (250 mm stroke) MTS Actuators
- Freeze/Thaw Cabinet
- Friction/Peel tester
- Function Generator 33522A
- FurnaCE vtr-42m, 14"diaX16",208V 3ph,24a
- Geomagic Touch Haptic Device
- GHD Genesis Speed radar gun & traffic data logger
- Haas TL 1 CNC Lathe
- Haas TM 1, 3 axis CNC Milling Machine
- Haas UMC 750, 5 axis CNC Milling Center
- Heaton Dual Zone Bonder
- High temperature oven (CM Furnace 1800 C)
- Hitachi – S-3000N SEM
- Hoskin FLIR Camera
- Hot Press
- I363-CP35MHT80 Laser Displacement sensor
- IMA I-30 drill press
- IMER – COMBI 1000, 14" Diamond Saw
- Impact Tester
- Instron – Model 3345 Materials Testing System
- Instron – Model 8872 Fatigue Testing System
- Instron – Model 8874 Axial-Torsion Fatigue Testing
- Instron Environmental Chamber
- James Bond Tester
- Kent KGHS 6384 AD surface grinder
- Keyence- VHX-1000E Microscope
- Kodiak Recirculating Chiller
- Laboratory Fabric Padder
- LED Digital Colour System Discovery Zeiss Stereoscope
- Linear Displacement Transducers (LVDT)
- LiTZ Hitech – LV-800 Vertical Machining Center
- LMI-502 Digital Hardness tester
- Load Cells Ranging From (100N to 2000kN)
- LowStir Friction Welder
- LVSTD Detector upgrade for Mira-3 XMU FESEM
- MAHO – Model MH-700 Universal Milling Machine
- Manual Model 12-12H press
- Martindale Abrasion Instrument
- Mask Aligner System, A near UV(320NM-450NM), OAI's model 204 Mask Alignment system
- Materials Testing Systems
- Mechanical Ultrasonic Bath
- Metal Brakes
- Mini Jaw Crusher
- Mini lathe and mill
- Mini pulveriser
- MTS Landmark 370 (500 kN Load Frame / Fatigue Tester)
- National instruments DAQ modules
- National Interments DAQ Systems
- Netzsch 449 F3 STA thermal analysis machine
- Nikon – SMZ745t microscope
- Nitrogen generation system Olympus – 38DLP Ultrasonic Thickness Gage
- Olympus – EPOCH 600 Ultrasonic Flaw Detector
- Olympus – OmniScan Eddy current array acquisition
- Olympus – TomoScan FOCUS LT Portable phased array and automated UT Instrument
- OMAX – Model 2652 Waterjet Cutter
- Omax waterjet machine
- Optical Microscope (Zeiss)
- Optical Vibration Iisolation table
- Oscilloscope
- Ossila Automated Dipcoater
- Peaks Scientific – NML32A Nitrogen generator
- peltier plate & couette convection oven
- Phantom Miro M310 High Speed Camera monochrome
- Photoluminescence Instruments
- Plasma Etch PE25-JW
- Plasma-Enhanced Atomic Layer Deposition System
- Precisa – EP 125SM scale
- Precisa – XT 6200D scale
- Precisa – XT 920M scale
- Product Testing-Mechanical Testing (which includes Load frame, controller,cable set,grip set, wedge set...)
- Profometer 5+ Rebar Detector, Type Scanlog
- PSH VTR-42 208v 8.6KW ptb-3199
- Pulverisette 7 Premium Micro Mill
- QM-100 Projection Microscope
- Rapid Chloride Permeability Test
- Rebar Detector
- Research range
- RF & Microwave power Sensor
- Rheometer
- RTM System
- Sartorius – MA35M Balance moisture analyzer
- SC660 IR Camera
- Shear Ice Adhesion Measurement System
- SHT25 humidity/temp Sensor SMD
- SHT75 Humidity/Temp Sensor
- Signal Analyzer 20Hz-7GHz
- Silverschmidt Concrete Test Hammer
- SLG1430-150 LABKIT with LiquidFlow sensor
- Sonometer
- Spark Plasma Sintering Machine (SPS 10-3)
- Spinner , WS650Mz-23NPP Single wafer
- TA – InstrumentsDHR-3 Rheometer
- TA Instruments – Discovery
- TA Instruments – Q1000 DSC
- TA Instruments – Q800 DMA
- TA Instruments – Q400
- Tensile Ice Adhesion Measurement System
- Tensile testing machine
- Tescan Mira-XMU Scanning Electron Microscope
- Thermal camera and ground-penetrating radar
- ThermoTron Oven
- Tig & Mig welder
- Ultimaker 3 Professional 3D Printer
- USB4000 Plug-and-Play Miniature Fiber Optic Spectrometer
- Vickers Hardness Tester
- Viscometer Size #200/300
- Viscometer Rotational 115V/60
- VU- CON Complete Unit
- Waters – Acquity UPLC H-Class system
- Wireless Data Acquisition Unit NI 9215
- XLX EK-V7-VC707G Evaluation Kit
- Xradia – microXCT-400 Micro CT Scanner