The University of Western Ontario (Western University) is situated in London, Ontario located about 200 km south-west of Toronto - with a population of about 385,000
Western University

- Founded in 1878, one of Canada’s oldest universities

- Canada’s sixth-largest university
  - 1,325 full-time faculty members
  - 40,000 students from 128 countries
  - 12 faculties and schools, and three affiliated university colleges

- 400+ majors, minors & specializations

- 120 professional & graduate programs

- Research-intensive: $238M annually
Western University

• One of the oldest and most beautiful university campuses in Canada
• Ranked among the top 1% of higher education institutions worldwide
• One of the highest national entrance averages of first-year students at 90.6%
• 95.2% employment rate after graduation
• More than 325,000 alumni in 150 countries worldwide
• 26 faculty recipients of 3M National Teaching Fellowships-2nd highest in Canada
Signature Research Areas

- Neuroscience and Brain & Mind
- Child & Youth Development
- Global Health Equity & Social Innovation
- Imaging
- Materials & Biomaterials
- Environmental Sustainability & Green Energy
- Wind Engineering & Natural Disaster Mitigation
- Philosophy of Science
- Planetary Science & Exploration
- Musculoskeletal Health
Western Engineering

Founded in 1954, we are home to:

- Department of Chemical & Biochemical Engineering
- Department of Civil & Environmental Engineering
- Department of Electrical & Computer Engineering
- Department of Mechanical & Materials Engineering
- School of Biomedical Engineering
- John M. Thompson Centre for Engineering Leadership and Innovation
Western Engineering Facilities

Four buildings on Western’s Main Campus:

- Spencer Engineering Building
- Thompson Engineering Building
- Claudette MacKay-Lassonde Pavilion
- Amit Chakma Engineering Building
Western Engineering by the Numbers

• 110 faculty members
• 80+ staff members
• 2000+ undergraduate students
• 800+ graduate students
  ➢ 300+ PhD students (research-based)
  ➢ 200+ MESc students (research-based)
  ➢ 300+ MEng students (course-based)
• More than 11,000 alumni
Western Engineering Graduate Programs

- Master of Engineering (MEng) – Course based
- Master of Engineering Science (MESc) – Thesis based
- Doctor of Philosophy (PhD) – Thesis based

WE Graduate and Postdoctoral Studies Website: https://www.eng.uwo.ca/graduate
Master of Engineering (MEng)

• Course-based program

• Admission: A minimum of 70% average (North American Standard) based on last two years of Bachelor’s degree
  - English Language Proficiency requirements (where applicable)

• Program requirements: 10 courses or 8 courses + Project
  - 8 Technical courses + 2 Professional courses
  - 6 Technical courses + Project + 2 Professional courses

• Normal study period: 1 year
Master of Engineering Science (MESc)

- Achieved through a combination of course-work and Masters thesis research
- Admission: A minimum of 78% average (North American Standard) based on last two years of Bachelor’s degree
  - English Language Proficiency requirements (where applicable)
  - Acceptance by a Faculty supervisor(s)
- Program requirements: 4 courses + thesis
- Normal study period: 2 years
- Opportunities for professional development through courses and workshops
Doctor of Philosophy (PhD)

- Achieved through a combination of course-work and PhD thesis research
- Admission: A minimum of 78% average (North American Standard) based on Master’s degree
  - English Language Proficiency requirements (where applicable)
  - Acceptance by a Faculty supervisor(s)
- Program requirements: 8 courses (exemption for up to 4 courses from Master degree could be considered) + thesis
- Normal study period: 4 years
- Opportunities for professional development through courses and workshops
Western Engineering Research Specialization for Graduate Studies

- Department of Chemical & Biochemical Engineering
- Department of Civil & Environmental Engineering
- Department of Electrical & Computer Engineering
- Department of Mechanical & Materials Engineering
- School of Biomedical Engineering

WE Research Website: https://www.eng.uwo.ca/research
Department of Chemical & Biomedical Engineering – Areas of Research

• Biomaterials and Biochemical
• Environmental and Green Engineering
• Particle Technologies and Fluidization
• Macromolecular and Materials Engineering
• Reaction and Process Systems Engineering
• Water and Energy
Biomaterials and Biochemical Engineering

Research Focus:

- Bio-separation, bio-remediation, bio-pharmaceuticals
- Bio-polymers, bio-sensors, bio-reactor design
- Tissue engineering, materials for biomedical applications, and drug delivery.

Microalgae cultivation          Tissue Engineering          Biomimetic Nanostructures used for Inhibiting the Growth of Biofilm

Faculty Members: A. Bassi, L. Flynn, B. Gillies, D. Karamanev, K. Mequanint, L. Rehmann, A. Rizkalla, and J. Zhang
Environmental and Green Engineering

Research Focus:

- Green energy from agriwaste and hydrogen production
- Biofuel cells, bio-refinery
- Green solvents and materials development
- Chemical and biological wastewater treatment.

Ionic liquid based biorefining
Pollution Prevention
Thermal biomass processing

Particle Technologies and Fluidization

Research Focus:
- Fluidization (gas-solid, liquid-solid, multi-phase, circulating fluidized bed)
- Industrial crystallization
- Coating, drying and high shear granulation.

High Quality Powder Coating Process Using Ultra-fine Powders

Macromolecular and Materials Engineering

Research Focus:

• Production, manipulation, characterization and application of advanced materials.

• Fundamental research in controlling polymer and nanostructures using various synthesis and advanced characterization techniques.

• Functional biomaterials, light weight composites and materials needed in alternative energy application.

Research Focus:

• Development of new catalytic materials and innovative reactor design for multiphase and multifunctional reactors

• Optimization and advanced control of multi-scale process systems, ranging from molecular level to the enterprise level

Water and Energy

Research Focus:
- High-rate wastewater treatment technologies
- Combined sewer overflow treatment
- Water Reuse; microbiology & ecotoxicity

Institute for Chemicals and Fuels from Alternative Resources (ICFAR)

- Leader in the development of technologies and processes for production of chemical and fuels from alternative resources
- Specializing in biomass and waste conversion, fluid-coking technologies
Department of Civil & Environmental Engineering – Areas of Research

- Environmental and Water Resources
- Geotechnical and Geoenvironmental
- Structural and Infrastructural
- Wind Engineering and Environmental Fluid Mechanics
Environmental and Water Resources

Research Focus:
• Acid rock drainage
• Coupled liquid, vapour and heat transfer in soils
• Electrokinetic dewatering
• Soil and groundwater remediation
• Detection of soil and groundwater contamination
• Resuspension of flooded mine tailings
• Landfill leachate treatment

Geotechnical and Geoenvironmental

Research Focus:
• Tunneling and underground structures
• Dynamics of soils and foundations
• Soil-structure interaction
• Design, analysis and construction of piles
• Machine foundation

Research Focus:

- Effect of earthquakes and wind loads on structures
- Structural safety and code calibration
- Finite element development
- Fluid-structure interaction
- Analysis, design and stability of shell structures
- Dynamics of structures

Research Focus:

- Impact of climate variability and change
- Manage of water resources under extreme climates (Floods and Droughts)
- Risk and reliability
- Mitigation of roof collapses due to ponding and snow loads

Faculty Members: G. Bitsuamlak, G.A. Kopp, C.M. Miller, H. Peerhossaini
Department of Civil & Environmental Engineering – Research Facilities

Wind Engineering, Energy and Environment (WindEEE) Research Institute

- Globally-unique research facility to study a wide range of wind systems including downbursts and tornados and their impact on structures and environment
Boundary Layer Wind tunnel Laboratory

- Five wind tunnel test areas
- Used to investigate the aerodynamics of buildings, bridges and other structures
Department of Electrical & Computer Engineering – Areas of Research

• Biomedical Systems
• Communication Systems and Data Networking
• Microsystems and Digital Signal Processing
• Power Systems
• Robotics and Control
• Software Engineering
Biomedical Systems

Research Focus:

• Computer vision
• Acoustic/ultra-sound, CT, MRI and other medical imaging and analysis
• Surgical simulation, virtual and augmented reality
• Haptics and teleoperation
• Computer-assisted surgery, minimally-invasive surgery

Faculty Members: J. Lacefield, H. Ladak, V. Parsa, R. Patel, A. Samani, A. Trejos
Communication Systems and Data Networking

Research Focus:

• Circuit simulation, high-speed communication
• Efficient, secure, reliable wireless and satellite communication
• Networking protocols and architecture. Network flow control, simulation and fault tolerance
• Intelligent networks, software defined networks

Faculty Members: A. Dounavis, S. Primak, Q. Rahman, R. Rao, A. Shami, X. Wang
Microsystems and Digital Signal Processing

Research Focus:

- Industrial control systems
- Cryptographic and arithmetic hardware acceleration
- Audio processing, speech synthesis and recognition
- Fault-tolerant computing
- Nanoscale sensing

Speech synthesis and recognition

FPGA-based Hardware Design

Faculty Members: J. Jiang, V. Parsa, A. Reyhani, J. Sabarinathan
Power Systems Engineering

Research Focus:
- Renewable energy, smart grids
- Power grid protection and stability
- Nuclear power control systems and simulation
- Power switching, transmission and conversion
- Wind energy

Power generation and distribution

Nuclear Power Control Systems

Faculty Members: F. Badrkhani, J. Jiang, J. Moschopoulos, R. Varma
Robotics and Control

Research Focus:
• Industrial robotics
• Robotics theory (locomotion, coordination)
• Autonomous systems for planetary exploration
• Wearable and medical mechatronics
• Robotically assisted surgery

Faculty Members: L. Brown, K. McIsaac, R. Patel, I. Polushin, J. Sabarinathan, A. Trejos
Software Engineering

Research Focus:

• Software estimation, testing and lifecycle management
• Web services, cloud computing, IoT, distributed systems
• Artificial intelligence, machine learning, data analytics, big data
• Resource estimation and surveillance, health informatics
• Human-computer interaction
• Cybersecurity, cryptography, privacy, identity and trust

Institute for Earth & Space Exploration (CPSX)

- Leading organization for Earth and space exploration research and training in Canada
- Seeks to understand Earth’s formation, explore planets and apply technologies to mining, robotics, healthcare
Department of Mechanical & Materials Engineering – Areas of Research

- Automation Technologies and Systems
- Biomechanics
- Design and Manufacturing
- Materials and Solid Mechanics
- Micro and Nano Systems
- Thermo-fluids
Automation Technologies and Systems

Research Focus:
- Mechatronic systems, nonlinear and stochastic mechanics
- Dynamics & control, intelligent machining systems
- Computer assisted and surgical robotics, implantable transducer design, geometric modelling
- Sensors and actuators, medical devices and wearable sensor systems

Flexible bio- and opto-electronics
Wearable technology

Faculty Members: S. Asokanthan, G. Knopf, M. Naish, A. Price, O.R. Tutunea-Fatan
Biomechanics

Research Focus:
• Orthopaedic biomechanics, impact biomechanics, rehabilitation sciences
• Joint replacement (implant) design and analysis, motion and load transfer
• Advanced medical imaging, electromagnetic tracking system to measure motion
• Sport science, injury causation, analysis of elite and recreational sport
• Head biomechanics, traumatic brain injury

Radiostereometric Analysis

Imaging innovations

Faculty Members: L. Ferreira, J. Johnson, T. Jenkyn, G. Knopf, E. Lalone, D. Langohr, H. Mao, R. Willing
Design and Manufacturing

Research Focus:

- Design methodologies and tools, computer-aided design
- Multi-axis CNC machining, intelligent machining systems
- Ultra-precise single point cutting, micro-optics, laser polishing
- Additive manufacturing of advanced materials

Faculty Members: G. Knopf, O.R. Tutunea-Fatan, A. Price
Materials and Solid Mechanics

Research Focus:
• Microstructure and properties of metals, polymers, composite materials, nanomaterials
• Energy materials, optoelectronics, smart materials for mechatronic systems
• Fracture and failure analysis, tribology, material processing

Faculty Members: H. Abdolvand, S. Asokanthan, K. Coley, L. Jiang, E. Johlin, R. Klassen, D. Langohr, A. Price, X. Sun, J. Wood, Y. Zhao
Micro and Nano Systems

Research Focus:

- Micro/nano-materials functionalization, characterization, and modeling
- Energy conversion, Fuel cells and Energy storage (Lithium-ion batteries)
- MEMS and NEMS, Additive micro/nano-engineering
- Micro-optics and Biotechnology, nanophotonics

Faculty Members: H. Abdolvand, L. Jiang, E. Johlin, R. Klassen, G. Knopf, X. Sun, J. Wood, Y. Zhao
Thermo-fluids

Research Focus:

• Renewable energy systems, thermal energy storage
• Biological and environmental flows, turbulence
• Porous media, combustion
• Two-phase flows, conjugate heat and mass transfer
• Theoretical and computational fluid mechanics, biofluid mechanics

Low disturbance wind tunnel  CFD Modelling  Flow Measurements

Faculty Members: C. DeGroot, J.M. Floryan, R. Khayat, K. Ogden, E. Savory, K. Siddiqui, A. Straatman, C. Zhang
Fraunhofer Project Centre for Composites Research

- A joint venture between Western University and the Fraunhofer Institute of Chemical Technology (ICT) in Germany
- Develops, tests validates and characterizes new lightweight materials & advanced manufacturing processes at industrial scale
School of Biomedical Engineering – Areas of Research

BME promotes the cooperative involvement of clinical and basic researchers in disciplines including four research pillars:

- Biomaterials
- Biomechanics
- Imaging
- Mechatronics
Biomaterials

Research Focus:

• **Tissue scaffolds** to support growth, differentiation, and regeneration of cells and tissues

• **Injectable hydrogels, nanoparticles** and **microparticles** for localized delivery and controlled release of therapeutic agents

• **Nanoparticles for use in biosensors**

• **Nanoparticle contrast media** for magnetic resonance and optical imaging

• **Smart materials** for biosensors

• Bioactive glasses and composites for use in **dental implants**

Biomechanics

Research Focus:
• **Shoulder, elbow & hip implants** design with greater durability & biomechanical performance
• Development of **assistive technologies** to support patients during rehabilitation from stroke, musculoskeletal diseases, and sports injuries
• Investigation of the **biomechanics of impact and trauma**
• **Image-based computational modeling** of soft & hard tissues mechanical properties
• Investigation of the **fluid mechanics of blood flow & ventilation** to improve diagnosis and treatment of cardiovascular and respiratory diseases

Imaging

Research Focus:

• Development of **image processing algorithms and software** with an emerging emphasis on **applications of machine learning** to medical image analysis.

• **Hardware, software, & virtual reality displays** development for image-guided interventions

• Design of **MRI pulse sequences and radio-frequency coils** for applications such as neuroimaging, cardiac imaging, cancer imaging, and respiratory imaging.

• Development of methods and systems for **quantitative perfusion imaging** for applications such as cancer imaging, musculoskeletal disease, heart failure, etc.

Research Focus:

• Development of control methods and haptic feedback to the clinician for **surgical robotic systems**.

• Design of **actuators & wearable devices** for rehabilitation & tremor suppression.

• Development of **signal processing** and **machine learning methods** to use EEG and EMG feedback for control of assistive devices.

• Development of systems combining **virtual** or **augmented reality** and **haptic feedback** to train clinicians in surgical procedures such as minimally invasive cardiac valve repair, placement of cochlear or joint implants, and neurological ablation.

Faculty Members: M. Naish, R. Patel, A. L. Trejos
School of Biomedical Engineering – Research Facilities and Partnerships

As a School encompassing four faculties, BME promotes collaborative, multi-disciplinary research. BME thrives on the driven students and faculty at various research facilities in London.

Labs
• Canadian Surgical Technologies & Advanced Robotics (CSTAR)
• Centre for Functional and Metabolic Mapping (CFMM)
• Hand and Upper Limb Centre (HULC)
• Wolf Orthopaedic Biomechanics Laboratory (WOBL)

Institutes and Centres
• Biomedical Imaging Research Centre
• Bone and Joint Institute
• The Brain and Mind Institute
• BrainSCAN
• Centre for Advanced Materials and Biomaterials Research
• Lawson Imaging
• London Regional Cancer Program (LRCP)
• Robarts Imaging
Other Engineering Research Facilities

Labs
• Insurance Research Lab for Better Homes
• Robotics and Real-Time Systems
• Visualization and Virtual Reality
• Distributed Intelligent Systems
• Mobile Robotics and Computer Vision
• Control, Instrumentation and Electrical Systems
• Sensing and Mechatronic Systems
• Geometric Modeling and Virtual Sculpting
• Fuel Cell
• Nanomaterials and Clean Energy
• Access to Nanofab and Surface Science Western

Research Centres
• Institute for Catastrophic Loss Reduction (ICLR)
• The Particle Technology Research Centre (PTRC)
• Centre for Environment and Sustainability
• Geotechnical Research Centre
Questions?

Email: WereSgrd@uwo.ca