

HELPING CITIES REACH THEIR POTENTIAL

U of T Engineering is partnering with industry and government to build more liveable cities, with an eye toward supporting sustainable economies. We can bring the same energy to your industry. Whether you're a sector-leading company, a nimble startup or a visionary entrepreneur, U of T Engineering delivers solutions to help you succeed. We have a strong track record — of success, of entrepreneurship, of patents, of inventions, of solutions.

HERE'S WHAT PARTNERING WITH U OF T ENGINEERING DELIVERS:

- An inside track to breakthrough technologies
- Customized solutions to industrially relevant problems
- An extra spark of innovation to your company
- Collaboration with U of T Engineering's world-leading researchers, including top graduate students, undergraduate students and alumni

**RESEARCH
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Engineering

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RESEARCH IN FOCUS:

SMART CITIES & CRITICAL INFRASTRUCTURE

CHALLENGE:

How do we deal with threats — increasing density, climate change, limited natural resources — to a city's quality of life?

SOLUTION:

Build efficient and sustainable infrastructure.



UNIVERSITY OF
TORONTO

Engineering

THE POWER OF PARTNERSHIP

U of T engineers are teaming up with government and industry to design more liveable cities.

Transportation professor Eric Miller, for example, has created sophisticated computer models to analyze and forecast travel patterns on behalf of the Greater Toronto Area and the Ontario Ministry of Transportation.

“In order to design effective transportation networks, you need to understand where people live and work and how they make their travel decisions,” says Miller. “These models have reached the point where

they can also be used to analyze other forms of critical infrastructure.”

Incidentally, U of T Engineering spinoff companies, including Cast Connex and Kinetica, are marketing groundbreaking technologies to enhance the earthquake resilience of buildings.

Our engineers are also helping cities manage waste, including greenhouse gas emissions. Working with the World Bank, U of T engineers have created inventories of emissions to help it decide where to spend development dollars.

THE DETAILS

Cities are the economic engines of the world. With more than 50 per cent of us living in cities — and more of us heading to them every year — we can’t afford to let those engines stall. Our collective well-being depends on it.

Yet the challenges are immense, including increasing density, climate change and rising demands on limited natural resources. A well-run city needs efficient transportation networks, sustainable infrastructure and systems for reducing wastes such as greenhouse gas emissions.

Enter University of Toronto engineers. At the U of T Transportation Research Institute (UTTRI), researchers are designing efficient, cost-effective, equitable, sustainable and resilient transportation systems essential to productivity and quality of life.

At the Centre for Resilience of Critical Infrastructure (CRCI), engineers are creating infrastructure to withstand the unexpected, including natural disasters like earthquakes.

U of T Engineering researchers are also working alongside top institutions such as Carnegie Mellon, IIT Bombay, University of Warwick and New York University (NYU) on a global initiative dedicated to cities engineering. The collaboration, based at NYU, is called the Center for Urban Science and Progress (CUSP).

A complementary initiative, U of T’s Master of Engineering in Cities Engineering and Management is training tomorrow’s problem-solving engineers. Students graduate with a comprehensive understanding of the interaction between a city’s systems and services, and its ability to generate prosperity.



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Professor Eric J. Miller
Bahen-Tanenbaum Professor



PROFESSOR BAHER ABDULHAI INTELLIGENT TRANSPORTATION SYSTEMS

Traffic congestion is the bane of commuters’ lives and harms a city’s economy and environment.

Professor Baher Abdulhai, director of the Toronto Intelligent Transportation Systems Centre and Testbed, is addressing the traffic congestion problem. Using emerging technologies and advanced traffic-management systems, he is helping motorists get from A to B as quickly as possible while causing the least amount of pollution. In fact, his expertise in building intelligent transportation networks has made the University of Toronto a world centre of excellence in this area.

Under his supervision, U of T Engineering graduate Samah El-Tantawy developed smarter traffic lights using game theory and artificial intelligence to teach lights how to adjust to traffic patterns in real time. Tests show significant reduction in delays and travel times.



PROFESSOR CHRIS KENNEDY WASTE NOT, WANT NOT

As cities grow, they create waste that, if not properly managed, could be their undoing. The key to building a sustainable city lies in understanding its ‘metabolism,’ says Professor Chris Kennedy, a civil engineering professor. Cities bring in energy, materials, water and nutrients. Then they grow and produce waste.

Kennedy conducted one of the first urban metabolism studies of a North American city — for the Greater Toronto Area — and made comparisons with cities worldwide. He is particularly interested in evaluating greenhouse gas emissions. His inventory tallies emissions produced both inside the city (from car exhaust, for example) and outside (power plants that provide electricity to the city). Today, the World Bank uses his greenhouse gas inventory of 40 cities to decide how to spend its development funds.



PROFESSOR CONSTANTIN CHRISTOPOULOS RESILIENT INFRASTRUCTURE

Most buildings in the developed world are designed not to collapse during earthquakes. This saves lives. But what many of us don’t realize, says Professor Constantin Christopoulos, is that even when seismic-resistant buildings don’t collapse, they are damaged and often need to be razed and rebuilt.

The earthquakes that struck Christchurch, New Zealand in 2011 crystallized the resulting economic devastation. While very few buildings collapsed, two years later, downtown businesses are still paralyzed and an estimated 90 per cent of the buildings must be demolished.

Christopoulos, Canada Research Chair in Seismic Resilience of Infrastructure, wants to keep our cities’ economic engines running. He is designing building systems that allow structures to deform and absorb an earthquake’s energy. His systems reduce structural damage, allowing a building to quickly and safely resume its function.