



Hands-on education

Graduates need more than top grades in today's competitive climate—they need practical work experience. The University of Waterloo, the granddaddy of engineering co-ops, began its co-op programs in 1957. Today, there's not an engineering school in the province that doesn't have a co-op or internship program in at least some of its streams. Here's why.

by Karen Hawthorne

Dave Grummett was offered a full-time job at a Honda manufacturing plant in Alliston, ON, long before he graduated from mechanical engineering at Lakehead University in Thunder Bay—thanks to his opportunity to shine at the plant during a four-month, co-op work term.

“Basically, I was offered a job before I left,” says Grummett, 24, who worked on testing the interiors of prototype vehicles during his co-op. “I worked with great people, testing roof liners, the thermal chamber, doing all kinds of testing.”

Grummett opted to return to Lakehead to complete his engineering degree. After graduation, he says, his co-op experience put him in an enviable position. He con-

sidered a few offers from Honda and others before signing on with Honda, where today he's part of the development team for new models.

“To be able to walk into a job was great,” he says. “I jumped right into the game.”

With a hard economy and stiff competition for jobs, practical work experience gives graduates more than a leg up—it's a foot in the door. Valuable experience gained in the workplace enhances the relevance of academic programs and makes students more employable. The students are able to develop technical and professional skills in a professional environment, get a head start

on networking and have their work assessed by engineers and faculty professors.

“I'm a huge believer in co-op,” says Mike White, facilities manager at Tycos Tool & Die in Concord, ON. “Students get exposure and relevant experience. The return for the employer is people with new, fresh ideas with a fresh outlook.”

A graduate in mechanical engineering from the University of Waterloo, White went through the traditional co-op of alternating academic and work terms of equal length. He did a co-op with Tycos at one point and was hired on by the company full-time about a month after graduation.

Promoting women in science

Program for female students combines scholarships and work experience

The National Research Council (NRC) Women in Engineering and Science Program (WES) has awarded scholarships and provided work experience to encourage hundreds of female students to pursue careers in science, engineering and mathematics since the program was initiated in 1989.

Zahra Khan, one of 65 women currently in the program, is enrolled in PEO's Student Membership Program (SMP). She is working at NRC's Institute for Chemical Process and Environmental Technology on Computational Fluid Dynamics (CDF) modelling.

“My work at NRC is not only helping me to develop critical thinking and problem-solving skills, but is also providing me with experience in areas very relevant to my field,” says Khan, now in her third year at Carleton University in aerospace engineering. Khan is specializing in aerodynamics, propulsion and vehicle performance.

Another PEO SMP participant, Sarah Taylor-Falcioni, is working with the Institute for National Measurement Standards in the Electric Power Measurement Group on a project to develop a measurement system for the calibration of optic instrument transformers. A third-year student in Carleton University's communications engineering program, Taylor-Falcioni says she has improved her troubleshooting and communications skills on the project, among other relevant skills development: “I have designed, built, verified and evaluated the performance of electronic circuitry.”

WES scholarships are awarded for two to three years. Students contribute to NRC by working during the summer months, or during co-op work terms, on leading-edge projects in NRC's laboratories. Students are mentored by NRC professionals who help them define and achieve their academic and professional goals.

Each Canadian university may nominate up to three candidates who have entered the second year of an engineering, science or mathematics undergraduate program. For more information, check out the NRC (WES) program website, www.nrc-cnrc.gc.ca, under the heading “Careers, Employment Programs.”

— Gayle Aitken, Manager, Research and Communications

Tycos has employed engineering co-op students on rotating, four-month placements since 1996, reaping the benefits of employing enthusiastic, qualified students. Because the employment is short-term, the risk is low and the employer doesn't have to commit to full-time, long-term employment in an uncertain economy.

"We're not always sure there is going to be enough work and we don't want people sitting around twiddling their thumbs," says White. Co-op students at Tycos over the past summer have worked on price negotiations for purchasing machines, overseeing contractors and implementing environmental policies-projects with a high degree of responsibility.

"The biggest thing with employers is to give the student a challenge," says White. "Give them a problem to solve, don't just tell them what to do."

Learning and earning

The University of Waterloo's faculty of engineering became the first in Canada to offer co-op programs in civil, chemical, electrical and mechanical engineering back in 1957. But it wasn't until the late 1980s that engineering co-op programs really began to bloom across the country, with a softening economy and a recognized need from employers that engineers' skills should be grounded with more hands-on experience. Now, more than three out of four universities nationally—and all of Ontario's engineering schools—offer some form of practical engineering experience; some programs are mandatory, while others are optional but require a certain academic standing. Students have a broader range of opportunities today with placements in government, research and development, and the private sector.

"These are extremely well-qualified students who will go out and perform admirably for employers," says John Westlake, P.Eng., senior program administrator, engineering, at the University of Waterloo. Westlake, a graduate of UW in chemical engineering, is an advocate for the co-op program at UW, in which students are required to alternate academic terms with co-op work terms.

UW's engineering school, renowned for its computer, electrical and software programs, coordinates about 4000 co-op place-

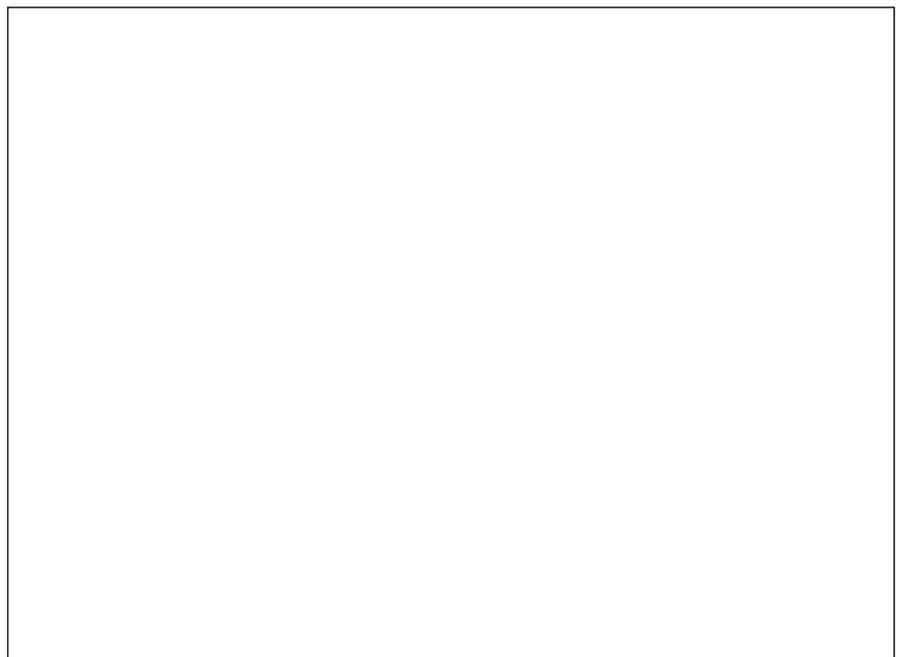
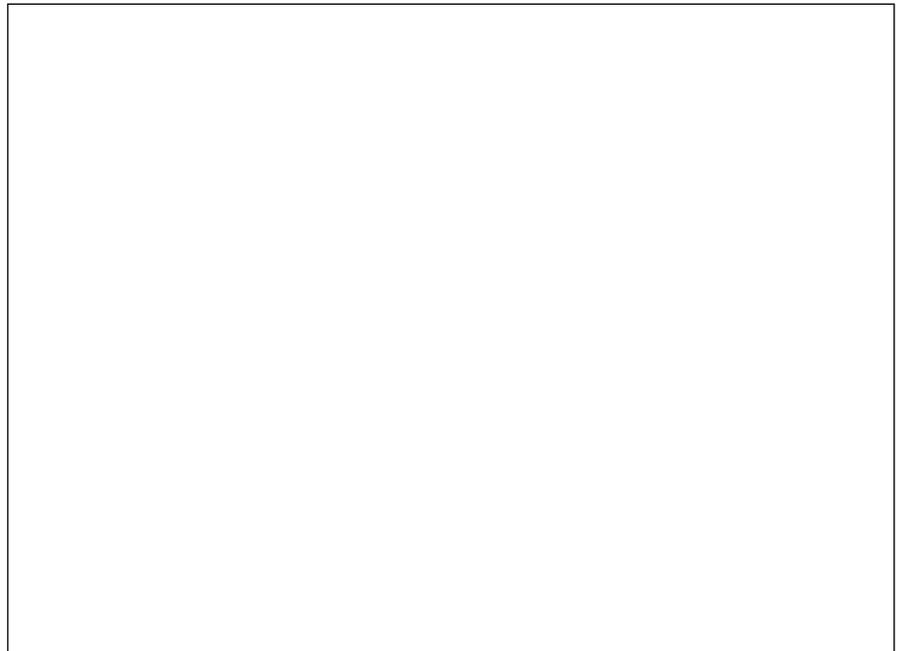
ments each year and graduates are courted by some of the top companies in Ontario and across North America. When the IT sector was booming, there were more than two jobs available for every UW graduate in IT-related programs, says Westlake, but as the market bottomed out in the last few years, that ratio has leveled off to about one job for every graduate.

"We've built a quality program from the ground up," Westlake says of the school's reputation. Currently, the school is developing an online job database for

co-op work terms. "From an education perspective, we integrate academic learning with work experience in tandem. We still feel that this is the best model."

Tennille Brown, a graduate from UW's computer engineering program, agrees. She received an honourable mention from the Canadian Association for Co-operative Education for its Co-op Student of the Year Award in 2000.

"I tend to be a very cautious person," says Brown. "A co-op term of four months is great, since it is long enough to make a useful con-





INDUSTRY PARTNERSHIPS

A number of Ontario universities, Queen's University in Kingston included, have fourth-year applied science students working on projects with industrial partners as part of their course work—reflecting the shift toward more hands-on learning in all areas of the educational curriculum. Students work on challenging projects that involve engineering design and analysis, intellectual property issues and health and safety issues.

“When you talk to people in industry about how the people they hire learn the skills for the job, it’s not done in two one-hour lectures per week—it’s done in the context of solving real problems,” says George Sweetman, P.Eng., director of Queen’s new Integrated Learning Centre. The facility integrates the work of many departments, allowing for open-ended project work, student competitive design teams, real-world industry-related problem solving and more active learning experiences. “There are no lecture halls,” Sweetman says of the \$25 million facility, which houses laboratories and workshop spaces.

“In addition to technical skills, we need to develop business understanding, systems analysis, teamwork and communications,” he adds. “If students just came and cracked the books for four years, it wouldn’t work. They need the technical skills, but they need all those other skills for the real world.”

While there is strong support for the traditional co-op model established by UW and emulated by other engineering schools, the trend toward more intensive hands-on learning is on the rise, with some of the province’s engineering schools offering 12- to 16-month internship placements. These longer periods allow for students to tackle and complete longer-term projects and further develop their skills and expertise.

According to a recent report from the Canadian Council of Professional Engineers, of all the undergraduate engineering students—48,634 in 2000/2001—at least one-third participate in some form of work placement. Of these, approximately 16,050 students, about 87 per cent, are in co-op and 13 per cent are in internships.

Lakehead University offers engineering technology and engineering degree programs. Upon completion of the two-year technology diploma program, students who meet the 70 per cent minimum requirement can opt to complete two more years of degree study to receive the B.Eng. degree. In 2000, the school established a co-op/internship option of four four-month work terms. Students are given the opportunity to take on longer-term projects in the workplace and gain further experience to go into the job market. The program has positioned Lakehead favourably to potential students and employers.

“When we’re presenting Lakehead at career fairs, we have a hall of fame book (of student success stories in the engineering program), which is a great recruitment tool,” says PEO Councillor Seimer Tsang, P.Eng., chair of Lakehead’s mechanical engineering department.

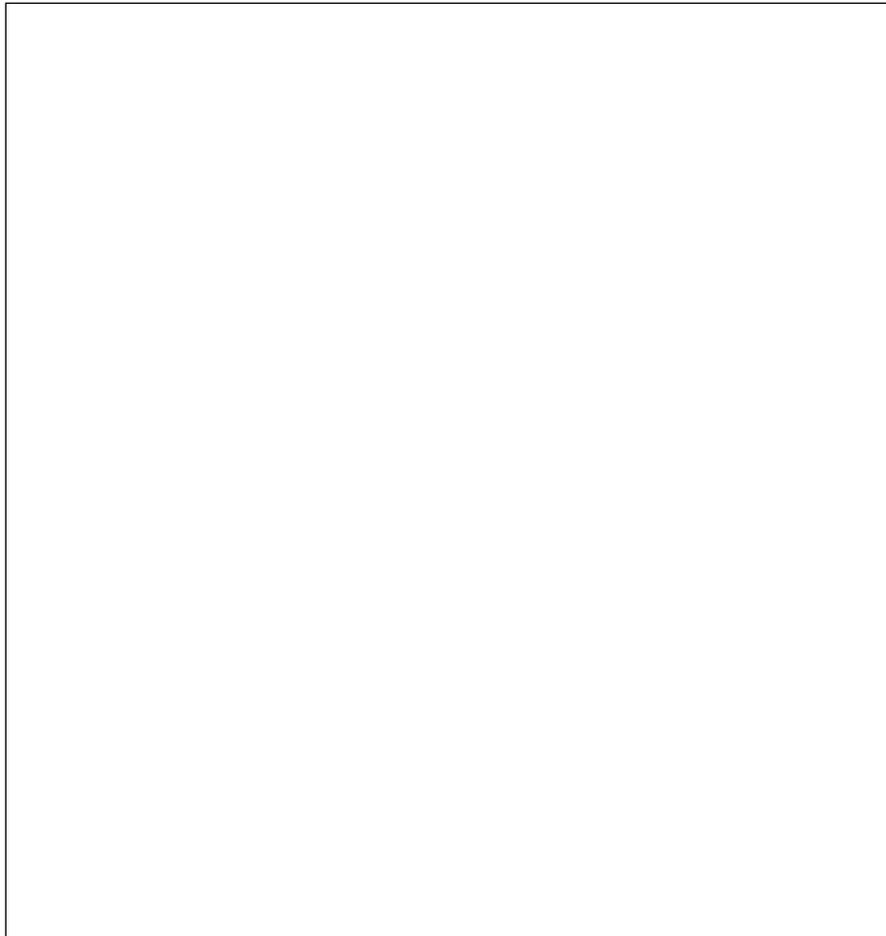
“Companies are looking for work experience, so the internship is an advantage,” he says.

Engineering at the University of Western Ontario (UWO) this year is introducing a summer engineering co-op program to students. The school also offers an optional Engineering Industry Internship Program (IIP), a 12- to 16-month employment period after the second last year of study, for those who meet

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tribution to the company, but short enough to try out a new type of job without the com-

mitment of full-time employment. Co-op has also worked to build my confidence.”



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the academic requirements. IIP participants are supervised by professional engineers and each student going out on IIP is given PEO's Pre-Graduation Experience Record Form and the PEO website address.

The IIP offers "more responsibility for students at the workplace" and the chance for employers to more fully evaluate potential employees before making long-term commitments," says Lesley Munteer, career development officer with the faculty of engineering at UWO.

"Students are coming out of other universities with internship and Waterloo with co-op experience, so we want our students to be just as competitive."

On the legislative side, another bonus of cooperative education—observed by most engineering schools in the province—is the emphasis on meeting the criteria defining professional experience required for licensure as a professional engineer.

By law, PEO requires 48 months of verifiable, acceptable engineering experience for licensure. Up to 12 months of undergraduate work experience completed after the mid-point of an undergraduate program may go toward fulfilling this requirement. During these work terms, students should be supervised by a professional engineer, or at least have their work verified by a professional engineer familiar with the work, in order to meet PEO's legislated requirements.

"Co-op students can work toward their work experience requirements (for licensure) while developing other skills that employers are looking for," says Noreen Calderbank, P.Eng., manager of PEO's engineering intern training program (EIT).

The strategy for PEO, she says, is to make presentations at engineering schools and career fairs about the importance of licensure and the opportunity co-op education creates to start fulfilling the necessary work experience requirements. To that end, PEO is also promoting its Student Membership Program to link engineering students more closely to the profession and is developing other opportunities for its engineering interns (EITs) to link with a professional engineers in industry.

"The idea of a formal mentoring program is to match EITs with a licensed, practising engineer to help them set and achieve goals as well as build relationships," says Calderbank. "It's about overall professional development—and keeping that going after graduation."

Engineering at the University of Toronto offers the Professional Engineering Year (PEY) program, a 12- to 16-month work term that's putting its students in high demand because they have a full year of substantial work experience close to graduation, says Cynthia Bishop, PEY director. Starting this year, students will go through intensive preparation for the program, including training in interview skills and salary and contract negotiations.

"It's also a tool to help fund their education," she says. "It's a way to let students have a break and regroup before their final (academic) year and really test-drive their career." ❖