

Program Review for Software Engineering Undergraduate Co-op Program Review

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Executive Summary

As with all undergraduate Engineering degree programs at the University of Waterloo, co-operative education is a fully integrated and mandatory component of the Software Engineering program. This report outlines seven years of data, from 2012-2018, representing Software Engineering students' experiences throughout co-op recruitment and employment.

Software Engineering has seen an overall increase (26%) in the number of students scheduled out for work terms annually over this seven year period (with overall growth in Engineering being 22%), peaking in 2017. The average employment rate also trends very high, with an overall employment average of 99.5% and multiple terms during this 7 year period reaching 100% employment, with more Software Engineering students employed through the interview process (applications & interviews through WaterlooWorks) than Engineering overall. Co-operative Education continues to have strong relationships with Software Engineering employers, with Facebook, Microsoft Corporation, Amazon.com Inc. and Google being the largest employers. Students are focused on specific positions, with the most common titles including "Software Engineering" and "Software Developer", with 75% of Software Engineering student employed within the Professional, Scientific & Technical Services and Wholesale, Distribution & Retail industries. With regards to work term location, 37% of the work terms during this seven year period have occurred within the United States.

While on a work term, Software Engineering students receive "Outstanding" evaluations at a significantly higher rate as compared to other Engineering programs (40% vs 28%). These students also share a very high level of overall satisfied with their experience, with 55% rating their work term a 9 or 10 (with the Engineering average being 44%). Within the Rate My Work Term data, Software Engineering students are reporting higher levels of agreement across all questions, with significant differences in the reported relatedness of positions to academic programs (4.54 versus 3.88 across all of Engineering). Software Engineering students also indicate a very high level of agreement regarding opportunities to learn and develop new skills as well as making meaningful contributions at work.

With regards to program integration, it is critical that students see individual program staff and faculty members as co-op champions. Demonstrating an understanding of the process/timing for co-op recruitment activities, awareness of the time commitment required as well as helping students draw out their strengths and relevant skills are significant drivers in enhancing student experience and success. How is workplace skill development addressed or incorporated into the classroom? How does learning acquired or enhanced during the work term connect to, or translate into the classroom learning? Do students have an opportunity to share learning, perspectives or ask questions generated on their work term with their peers? Moving forward, Co-operative Education recommends that Software Engineering continue to consider how to seek opportunities to integrate classroom and work experience, with Co-operative Education's support and involvement. Engaging students to bring their knowledge from the workplace back into the classroom, and supporting them in taking their classroom knowledge to their co-op work terms, is a fundamental aspect of strengthening our work-integrated learning programs at the University of Waterloo.

Co-operative Education will continue to work with Software Engineering to support students in attaining and excelling in rewarding work experiences throughout their degree at the University of Waterloo. Co-operative Education continues to seek student feedback and find opportunities to engage students throughout their co-op experience.

Co-operative Education at UW

Co-operative Education and Work-Integrated Learning Canada (CEWIL Canada) defines work-integrated learning (WIL) as: a model and process of curricular experiential education which formally and intentionally integrates a student's academic studies within a workplace or practice setting. WIL experiences include an engaged partnership of at least: an academic institution, a host organization, and a student. WIL can occur at the course or program level and includes the development of learning outcomes related to employability, personal agency, and life-long learning (CEWIL, 2018).

At the University of Waterloo, Undergraduate co-op programs follow an alternating sequence of academic terms followed by relevant, paid, work experience; 4-months of study followed by 4-months of work.

Academic learning is shared/applied on the job and work experience is shared/applied in the classroom. Genuine work experience in and of itself provides work place and professional skills and knowledge development that is different from, yet complementary to, those obtained from the academic learning experience.

Co-op students graduate with up to two years of work experience, which better positions students for transition to full-time employment, or further post-secondary

pursuits. The co-op alternating model allows students multiple opportunities to test-drive and determine their best career fit as they progress throughout their undergraduate degree.

University of Waterloo's (UW) Advantage:

- **Largest in the world** >> 21,000+ students in more than 120+programs of study
- **World class experience** >> students work in 60+ countries
- **Competitive employment process** >> not a “placement”
- **Mandatory career preparation programs** >> 13+ job-skill development courses
- **Performance evaluation for each job** >> high incentive to perform well
- **Critical thinking** >> work reports and work reflections explore links between academic study and the workplace

Co-op Employment Process

Waterloo's co-op employment process is highly competitive; students apply for jobs they feel suit their skills and interests and then participate in an open interview process when selected by an employer.

Students and employers rank one another based on preference and a computer algorithm matches students to jobs.

Students are also encouraged to pursue their own employment and career interests, and are frequently able to turn these opportunities into credit-worthy co-op work terms.

Value to Employers:

- Hire with flexibility
- Fill immediate needs quickly
- Talent management strategy to find full time employees after graduation
- Low risk and cost-effective hiring
- Contribute to building country's talent pool

Employer Commitment:

- Provide students with worthwhile work
- Pay students
- Provide effective supervision, coaching and evaluation
- Participate in the employment process with integrity
- Promote co-op within company and to other employers

Value to Students:

- Enhance learning
- Evaluate career options
- Accumulate up to 2 years work experience
- Help finance education
- Build a network of professional contacts

Student Commitment:

- Balance the job search with academics
- Pay a co-op fee
- Meet employer expectations
- Respond to the demands of the work force
- Participate with integrity

Value to Institution:

- Makes the institution more attractive and affordable to students
- Attracts highly motivated students
- Drives more relevant curriculum
- Facilitates transfer of knowledge between the workplace and the classroom
- Builds a network of business and industry contacts that may be leveraged in areas such as research, development and advancement

Institution Commitment:

- Resources (cost and talent)
- Provide academic credit for work experience
- Value work experience in the classroom
- Hire students
- Teach classes year-round to accommodate work terms
- Promote to business, government, etc.

Program Background

Launched in 2001, Software Engineering is an interdisciplinary program supported by both the Faculty of Engineering and the Faculty of Mathematics. Graduates receive a Bachelor of Applied Science (BASc) and an education that provides them with a solid foundation in mathematics, computers and networks, computer science, and engineering.

Co-op Requirements

In parallel with completing co-op work terms, co-op plans have additional degree requirements to enhance work-integrated learning. Specifically, students in Engineering must complete 5 professional development courses (offered by WatPD), and 5 work term reports/reflections.

These requirements are considered academic in nature; responsibility for outlining criteria and tracking successful completion rests with the faculties.

WatPD Program Objectives (currently required of undergraduate co-op students only)

- To enhance the overall work-integrated learning experience of co-op students by providing engaging and relevant on-line courses that improve students' employability and workplace productivity.
- To promote the integration of what is learned at work with what is learned at school through critical reflection.
- To enable peer learning and foster a sense of community among co-op students.

Work Report Objectives

Co-operative Education and Work-Integrated Learning (CEWIL) Canada requires accredited co-op programs to include work reports as part of the co-op degree requirements. All of the undergraduate co-op programs in the Faculty of Engineering are accredited by CEWIL Canada; hence, all undergraduate Engineering co-op students must complete a specified number of work reports as part of their co-op program.

Work reports give students the opportunity to reflect on the connection between their academic studies and their work experiences. These reports should demonstrate evidence of critical analysis, good organization, clarity, and conciseness. In preparing work reports, students are able to work on presentation skills, forming arguments, developing and applying evaluation criteria, and performing quantitative analysis, and in the process, create a permanent record of their work.

If a student is not able to communicate effectively, the knowledge and skills he or she has acquired are of little value to others. Effective communication involves assembling, organizing, and presenting information in a logical and concise form. The structure and organization of work reports should convey to readers the exact meaning intended by the writer. Well-researched, organized, and documented work reports will have a positive impact on students' careers.

Academic/Work Term Sequencing

Plan	Year One			Year Two			Year Three			Year Four			Year Five		
Software Engineering	1A	1B	WT1	2A	WT2	2B	WT3	3A	WT4	3B	WT5	4A	WT6	4B	-

Software Engineering follows the Stream 8 model, where students are scheduled for their first work term following two academic terms. Work terms then alternate with academic terms, with 6 scheduled work terms before their 4B academic term.