VISION 2015
Building on Excellence

Waterloo Engineering Strategic Plan
2011 – 2015

Adel Sedra
Dean of Engineering

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WATERLOO
ENGINEERING

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I. EXECUTIVE SUMMARY

Vision 2015: Building on Excellence builds on the very strong foundation established by Waterloo Engineering's previous plan, *Vision 2010: A Blueprint for Excellence in Engineering Education and Research* (2005-2010). Like Vision 2010, our Vision 2015 strategic plan is ambitious, but it is achievable. The Vision 2015 plan asks all members of the Waterloo Engineering community to stretch ourselves in the direction of a common goal: to take what is a great school of engineering and move it even further forward, in the global context.

Simply put, Waterloo Engineering aspires to be a truly world-class school of engineering. The programs we offer, the students we graduate, and the solutions we develop will be sought after by outstanding students, employers, employees and partners. To meet that aspiration, we are committed to attracting, engaging, and retaining outstanding people; offering excellent academic programs and services; undertaking high-impact research; building connections and promoting collaboration; fostering innovation and entrepreneurship; and providing world-class facilities to support excellence.

While the Vision 2015 plan calls for strategic growth in many areas, its emphasis is on quality improvements. We will not grow simply to be bigger: any growth will support carefully planned initiatives and strategies that will make us better. Over this plan period, we will invest strategically in key areas, including teaching, the undergraduate lab experience, graduate program intensity and visibility, research support, communications and recruitment to name a few.

In all, our faculty complement will grow by 20% and staff will increase by 25% between 2011 and 2015. Of the 62 faculty positions to be filled during the Vision 2015 plan period, 31 were open as of May 1, 2011 and another 14 are new positions being introduced to support our participation in Waterloo's UAE campus initiative. Of the 49 staff positions to be filled, 13 were open on May 1, 2011 and another 13 result from the UAE initiative and our undergraduate nanotechnology and management engineering programs. Although much of this growth is tied to specific initiatives, it remains a significant opportunity for Waterloo Engineering. As detailed in the academic units' implementation agreements (see Section V), new faculty will be hired in areas of recognized strength and to capitalize on new opportunities and emerging areas. Furthermore, a number of new faculty and staff positions are being established to support specific Vision 2015 priorities and strategies, such as launching new graduate programs, piloting undergraduate teaching innovations, enhancing industrial relations and improving client service.

Of course, with the opportunity inherent in this growth also comes significant responsibility: we must attract and select outstanding faculty and staff for each of these positions. This will require time and commitment from many. We must also ensure that we engage and retain these new hires as well as the outstanding faculty and staff members already here. Essential to doing so will be improvements to internal communications, increased celebration of faculty and staff excellence, and a heightened commitment to service excellence. The Vision 2015 plan also calls on us to support the development of all faculty and staff throughout their career and to fully engage all faculty members in teaching, research and service for the enrichment of each individual and the faculty as a whole.

Over the Vision 2015 plan period, our undergraduate intakes will increase only marginally. Overall enrolment in our undergraduate programs will grow as the chemical and civil engineering programs we are offering at Waterloo's UAE campus reach steady state. We anticipate that by the end of this plan period we will achieve our intake target of 120 engineering students at that campus each year, resulting in increased enrolment at both the UAE and Waterloo campuses. Our undergraduate complement will increase more substantially by 2015 if the proposal for a new program in biomedical engineering is successful. Should this program be introduced, it will be supported by an appropriate increase in faculty and staff positions in addition to the growth projections outlined above. Ultimately, we anticipate our growth in faculty to outpace our undergraduate enrolment growth over this plan period, resulting in some reduction in our undergraduate student-to-faculty ratio.

Although the student-to-faculty ratio is a widely accepted indicator of academic program quality at the undergraduate level, reducing it is not our most important Vision 2015 undergraduate goal. From 2011 to 2015, we are investing over $8.5 million to upgrade our undergraduate student labs. This remarkable investment will not only allow us to significantly modernize and improve the quality of our lab equipment, but will also facilitate meaningful change to the content and delivery of labs and – ultimately – to the student learning experience. While these changes will occur across the Faculty of Engineering, nowhere will be they be more evident than in the Department of Mechanical & Mechatronics Engineering, where an engineering clinic will be piloted to integrate and deepen student learning through a practicum-focused student learning environment. Strategies will also be implemented to improve the engagement, retention and overall experience of our undergraduate students. And, because co-operative education is at the foundation of our undergraduate program, we will make a number of enhancements to co-op job development.

To further support our students' learning, we have developed a Vision 2015 teaching plan. Key to its implementation is a new administrative role being introduced this year in Waterloo Engineering. The associate dean, teaching will enhance support and development for faculty members and TAs and will share best practices related to teaching across the faculty and the university.

Our graduate program has grown significantly over the past six years. During the Vision 2015 plan period we will attend to that growth by working to ensure consistently high quality supervision, quality academic programs, extensive course offerings, significant academic rigour and a rich student experience. We will also further grow our graduate student complement. Our graduate student intake targets are projected to increase by 44% from 2011 to 2015. These projections are supported by the increased supervisory capacity that will result from the growth in faculty described above, by the introduction of new programs, and by strategic enhancements to our existing programs. To successfully meet these targets with outstanding graduate students, we will invest in graduate student recruitment and will conduct a thorough competitive analysis of our funding offers.

Of course, with significant growth projected in our faculty complement and graduate student body, we also anticipate substantial growth in the size, scope and impact of our research program. We are calling for annual research funding to increase by 33%, or almost $20 million, between 2011 and 2015. While much of this increase will result from faculty growth, we are also aiming for the average funding per tenured/tenure-stream faculty member to increase by approximately 10%. While we recognize this is an ambitious goal, it is achievable given the targeted Vision 2015 strategies and investments that will be deployed in research support and industrial relations at the faculty and departmental levels.

It should go without saying that we aim to attract outstanding people from the broadest possible population and to engage every remarkable student, faculty and staff member who is part of our community. To that end, we must continue – indeed, expand – our outreach programming, our efforts toward increased internationalization, and our support for women in engineering and other individuals and groups who identify with under-represented elements of diversity.

Entrepreneurship and innovation are hallmarks of Waterloo Engineering, evidenced in numerous student innovations, alumni and faculty start-ups, and the very presence of an entrepreneurship centre within the faculty. Over the Vision 2015 plan period we will enhance existing programs and introduce new initiatives that foster innovation and entrepreneurial activity among our students, faculty and staff.

Of course, new resources are essential to the success of this plan. A Vision 2015 Fund has been assembled in collaboration with the university to fund seven new faculty positions and 18.5 new staff positions. Other positions will be funded through our participation in Waterloo's UAE campus initiative, collaboration with the Institute for Quantum Computing, research chair programs and endowments, our two newest undergraduate programs, and departmental allocations from special funds such as graduate growth and differential tuition fees. Another important source of funding will be philanthropic gifts.

In addition to these positions and other financial commitments (such as the Vision 2015 Undergraduate Laboratory Enhancement Initiative), our plans will be supported in through integrated communications,

marketing and recruitment efforts. Decisions regarding the allocation of technology resources, expertise and information systems will also be made in a strategic manner, informed by our academic priorities and organizational needs articulated in this plan. Furthermore, our capital plan will be updated to reflect the additional space required to support the faculty, staff and student growth projected for the Vision 2015 plan period, as well as to address our ongoing space deficit. Key to this plan will be the construction of two additional engineering buildings and the renovation and reallocation of existing space to ensure the effective use of all facilities currently available to the faculty.

We are confident that with the continued commitment and guidance of our senior leadership and the excellent work of all our students, faculty, staff, alumni and other community members, the Vision 2015 plan will help establish Waterloo Engineering as a truly world-class school of engineering.

Summary of Goals

Goal A1: Increase the Faculty Complement Strategically
Goal A2: Increase the Staff Complement to Appropriate Levels
Goal A3: Establish a Culture of Service Excellence
Goal A4: Improve Internal Communications
Goal A5: Recognize and Promote Faculty and Staff Excellence
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Goal A7: Fully Engage All Faculty Members
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Goal B2: Enhance the Undergraduate Academic Program
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Goal B4: Improve the Undergraduate Student Experience
Goal B5: Increase the Number of Co-op Jobs
Goal B6: Provide Unemployed First Work Term Students a Meaningful Experience
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Goal B8: Ensure the Ongoing Accreditation of all Engineering Programs
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Goal D1: Increase Research Funding
Goal D2: Establish a Shared Commitment to Research Excellence
Goal D3: Eliminate Barriers to Research Success
Goal D4: Celebrate Research Excellence
Goal E1: Enhance Support for Teaching at the Faculty Level
Goal E2: Contribute to the Development of Faculty Members and TAs as Teachers
Goal E3: Affirm the Importance of Teaching
Goal F1: Expand the Scope of Waterloo Engineering Outreach Programs
Goal F2: Enhance the Waterloo Engineering Community through Participation in Outreach
Goal F3: Increase the Participation of Women in Engineering at Waterloo
Goal F4: Build an Inclusive Atmosphere within Waterloo Engineering
Goal G1: Increase International Undergraduate Enrolment
Goal G2: Increase International Experience Opportunities for Undergraduates
Goal G3: Increase International Graduate Studies and Research Collaborations
Goal G4: Pursue Targeted Collaboration Initiatives in India
Goal G5: Support the Ongoing Development of UAE Campus Programs
Goal H1: Enhance Initiatives to Foster Entrepreneurial Activity and Innovation

Waterloo Engineering at the Beginning of Vision 2015

The metrics and indicators in Tables 1 and 2, below, describe Waterloo Engineering in the spring of 2011 and represent the Vision 2015 plan baseline. In cases where more recent data have become available during the planning process, the most recent information available is included in the sections of the plan that follow and in the data appendices at the end of this document.

Table 1: Key Metrics, 2010/11

Key Metric	2010/11
Faculty	271.3
Staff	194.3
Undergraduate Students (FTE)	5027
Undergraduate Students (head count)	6346
International Undergraduate Students	462
Female Undergraduate Students	1197
Undergraduate Degrees Granted	918
Graduate Students (FTE)	1519
Graduate Students (head count)	1844
International Graduate Students	626
Female Graduate Students	441
Research Graduate Students	1153
Graduate Degrees Granted	573
PhD Degrees Granted	94
Sponsored Research Funds	$60.4 M
Alumni	33,032
Space Holdings (including under construction)	60,830 nasm
Permanent Recurring Budget	$64.3 M
Total Annual Budget	$81.2 M
Endowment	$74.2 M
Vision 2010 Campaign Progress to Date	$80.4 M

Table 2: Key Performance Indicators[1], 2010/11

Key Performance Indicator	2010/11
Female Faculty/Total Faculty	14%
Faculty/Staff	1.4
Undergraduate Students/Faculty	17.7
International Undergraduates/Total Undergraduates	7.3%
Female Undergraduates/Total Undergraduates	18.9%
Undergraduate Degrees Granted/Faculty	3.4
Graduate Students/Faculty	6.1
Research Graduate Students/Faculty	4.5
International Graduate Students/Total Graduate Students	33.9%
Female Graduate Students/Total Graduate Students	23.9%
Graduate Degrees Granted/Faculty	2.3
PhD Degrees Granted/Faculty	0.4
Graduate Students/Total Students	23%
Sponsored Research Funds/Faculty	$253,689
Sponsored Research Funds/Permanent Recurring Budget	1.01
Space Holdings (including under construction)/FTE Student	10.4 nasm
Permanent Recurring Budget/FTE Student	$9,827
Endowment/FTE Student	$11,332

[1] Some indicators exclude the School of Architecture, the Conrad Business, Entrepreneurship and Technology Centre and/or lecturers in the Centre for Society, Technology and Values. For complete explanatory notes on Tables 1 to 4, please see Appendix J.

Waterloo Engineering in Context

Table 3: Waterloo Engineering in the Institutional Context, 2010/11

Metric	Share of University of Waterloo
Undergraduate Students (head count)	22.6%
International Undergraduate Students	17.6%
Female Undergraduate Students	9.6%
Undergraduate Degrees Granted	20.6%
Graduate Students (head count)	41.7%
International Graduate Students	52.7%
Female Graduate Students	26.3%
PhD Students	38.8%
Graduate Degrees Granted	37.9%
PhD Degrees Granted	39.7%
Regular Faculty Members	26.7%
Sponsored Research Funds	31.7%
Alumni	21.6%

Table 4: Waterloo Engineering in the Provincial and National Contexts, 2010

Metric	Share of Ontario	Share of Canada
Undergraduate Students (FTE)	16.7%	7.1%
International Undergraduate Students	9.7%	3.8%
Female Undergraduate Students	15.5%	6.5%
Undergraduate Degrees Granted	16.9%	7.5%
Graduate Students (FTE)	18.6%	7.0%
PhD Students (FTE)	21.1%	8.0%
International Graduate Students	24.4%	6.9%
Female Graduate Students	20.8%	7.3%
Graduate Degrees Granted	20.6%	10.4%
PhD Degrees Granted	20.0%	9.2%

Table 5: Waterloo Engineering in International University Rankings, 2011

Ranking Agency	Rank in Engineering Field	
	World	North America
Times Higher Education World University Rankings	48	26
QS World University Rankings	56	19
Academic Ranking of World Universities (Shanghai Rankings)	52-75	35-41
Performance Ranking of Scientific Papers for World Universities (Taiwan Rankings)	74	33

In addition to our strong standing in international university rankings' studies of engineering fields (summarized in Table 5), Waterloo Engineering was the only Canadian school among the top 10 schools in the world for producing top-ranked engineers according to an *Indentified.com* study of company founders and chief executives. This study also found that more company founders and chief executives hold advanced engineering degrees than MBAs.

II. VISION 2015 PLANNING PROCESS

The Vision 2015 process is informed by the significant success of two planning cycles led by Dean Sedra as Provost at the University of Toronto (1993-2002) and by his experience leading the Engineering Planning Committee (EPC) through the development and implementation of Waterloo Engineering's very successful first strategic plan, Vision 2010, from 2004-2010. These plans, including Vision 2015, share a number of essential attributes of a good planning process: they are transparent, tied to resource allocation, actionable, informed by data, reviewed annually, and broadly consultative through the engagement of multiple stakeholder groups.

Dean Sedra launched the Vision 2015 planning process following the wrap-up of the Vision 2010 plan, published in September 2010 (available at http://uwaterloo.ca/engineering/vision2010). Although the planning process varied slightly between academic and administrative units, the main steps common to both (shown in more detail in Appendix B) include the self study, draft plan, internal review and external assessment, and final plan.

In November 2010 a retreat was held for EPC (see Appendix B for membership) to establish the Vision 2015 aspiration, key priorities and framework. Shortly after that meeting, each EPC member struck representative planning committee(s) in his or her unit. The plan's baseline data was circulated to EPC members and they began to work, with their committees, on completing a self study for their area. Each unit then used its self study as a foundation to inform the development of their draft plan, which was then reviewed internally by a subcommittee of EPC.

Following internal review, each academic unit's draft plan was subjected to external review by a team of two leaders in its discipline (see Appendix B for a list of assessors). Assessors reviewed the unit's draft plan and spent two days at Waterloo meeting with stakeholders. The invaluable feedback that these assessors provided to our academic units was then used to inform their final Vision 2015 plans. From these plans, a plan implementation agreement was reached between the dean and academic unit head, including resource allocation decisions. These agreements are published here in Section V.

Concurrently, administrative unit draft plans were revised to reflect the internal feedback received. The dean met with each associate dean, the director of advancement, and the executive officer to finalize these plans and to determine resource allocation. These plans are summarized in this faculty plan, the draft of which was reviewed by two esteemed leaders in engineering education in April 2012.

While these processes were followed in parallel in academic and administrative units, their efforts were integrated through regular EPC meetings and retreats and through cross-membership on academic and administrative planning committees. Regular communication with stakeholders across the faculty and in each academic unit has facilitated information-sharing, engagement and consultation at each stage of the plan process. This has included: representation of all stakeholder groups on various planning committees; town hall meetings; web site updates; meetings with our Dean's Advisory Council and Dean's Development Council (see Appendix I for membership); and formal submissions made by groups such as the undergraduate Engineering Society and the Dean's Staff Advisory Committee.

Integration with the University's Sixth Decade Plan

As we were developing this plan, University of Waterloo President Feridun Hamdullahpur initiated a mid-cycle review (MCR) of the University of Waterloo's Sixth Decade Plan, which he describes as an opportunity to "consider the ambitious goals set out in 2006, reflect on our accomplishments, realign our plan, and introduce an accountability framework with action plans and progress outcomes." The MCR is built on six foundational pillars: academic excellence; research excellence and impact; co-operative education; graduate studies; internationalization; and entrepreneurship. As our Vision 2015 aspiration and key priorities are entirely consistent with these institutional pillars, we anticipate that the implementation of many of the goals outlined in this plan will be further informed and enhanced by the action plans developed through the MCR. Such developments will be reported on in our Vision 2015 annual update reports.

III. VISION 2015 STRATEGIC PLAN

Our Aspiration

Waterloo Engineering aspires to be a truly world-class school of engineering. The programs we offer, the students we graduate, and the solutions we develop will be sought after by outstanding students, employers, employees and partners.

Waterloo Engineering will be:

- the top choice of outstanding high school students from Canada and abroad who are seeking a challenging academic program of the highest quality, fully integrated with real-world experience
- in demand by excellent students, both domestic and international, seeking high-calibre graduate education and by working engineers seeking professional upgrading opportunities
- the destination of choice among Canadian and global employers seeking co-op students or graduates at all levels for full-time employment
- sought after by outstanding engineering faculty looking for a rewarding career that supports teaching and research excellence
- the top choice of industry, government and community partners seeking to connect with outstanding researchers, students, entrepreneurs and innovators to solve local, national and global challenges

Our Key Priorities

1. Attracting, engaging, and retaining outstanding people: undergraduate students, graduate students, faculty and staff
2. Committing to excellence in academic programs and services
3. Undertaking high-impact research, both within and across the disciplines and spanning the theoretical to the practical
4. Building connections and promoting collaboration
5. Fostering innovation and entrepreneurship
6. Providing the world-class facilities required to support excellence in education and research

Measuring Our Progress

We will measure and report on progress toward our Vision 2015 aspiration each year until 2015.[2] The performance measures indicated throughout the Vision 2015 plan and detailed in the data appendices will be calculated and reported on annually. The dean, associate deans, and heads of academic units will provide annual progress reports that highlight that year's strategic achievements and challenges and identify the areas of the plan yet to be implemented. These reports will also include new strategies to capitalize on opportunities or deal with challenges not identified at the beginning of the plan period.

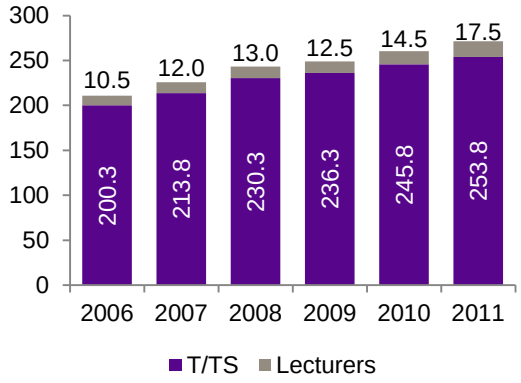
As important as these published updates are, the process that leads to their development is what is truly essential. Each year, each Waterloo Engineering unit will spend time analyzing performance indicators, discussing the plan's implementation to date with various stakeholders, and considering new opportunities and challenges. EPC will also hold an annual retreat to bring together and consider the richness of information resulting from each unit's update process and to make decisions for the faculty's future accordingly.

[2] The various metrics and performance indicators used in this plan are calculated at different times during the year; therefore, different plan targets have different end dates in the year 2015. For example, the 2015 projected faculty and staff counts refer to May 1, 2015 while the student intake projections refer to November 1, 2015.

A. Faculty and Staff

Waterloo Engineering's previous strategic plan, Vision 2010, called for substantial faculty growth. As depicted in Figure 1, our faculty complement has increased by 60.5 positions or 28.7% since 2006.

Figure 1: Growth in Regular Faculty Over Time



As of May 1, 2011 Waterloo Engineering's regular faculty complement included 253.8 tenured/tenure-stream faculty members and 17.5 lecturers, for a total of 271.3. The proportion of faculty members who are women ranged across departments from 0% to 37.5%, with a faculty-wide average of 14%. This data is detailed in Figures 2 and 3 and is outlined in further detail in Appendix C, Faculty and Staff Data.

Figure 2: Regular Faculty by Type, May 1, 2011

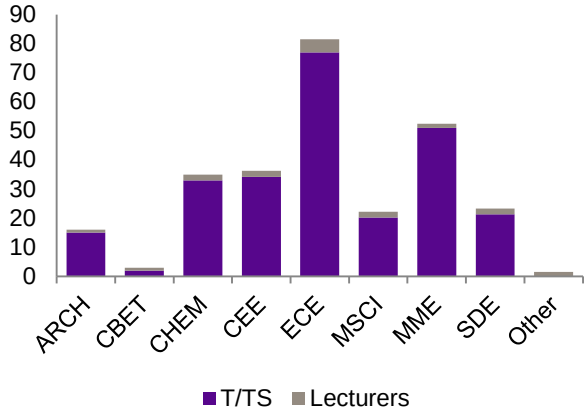
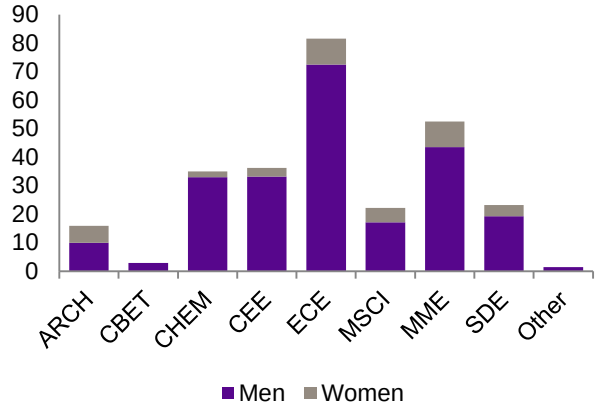


Figure 3: Regular Faculty by Gender, May 1, 2011



Although we officially count faculty on May 1 of each year, of course new faculty members are hired throughout the year. By the end of the 2011 calendar year, our faculty complement had reached 282.3, comprised of 262.8 tenured/tenure-stream faculty and 19.5 lecturers.

Our current faculty complement includes individuals who have earned their PhDs from a wide range of schools (see Figure 4). This diversity brings a wealth of perspectives to the faculty's teaching and research activities. As a result of a Vision 2010 strategy, we have limited our hiring of "fresh" Waterloo PhDs to only truly exceptional cases, thereby expanding this important diversity.

As shown in Figure 5, approximately 77% of our eligible faculty complement in engineering disciplines are registered or have applied for their PEng (including some limited licenses). While this is a significant improvement over recent years, more needs to be done, particularly in those departments with lower registration rates. (The proportion registered or licensed ranges from about 67% to 90% across engineering departments.) Since this measure directly influences our accreditation as an engineering school in Canada, related year-by-year targets are outlined in the undergraduate studies section.

Figure 4: Regular Faculty by PhD School, May 1, 2011

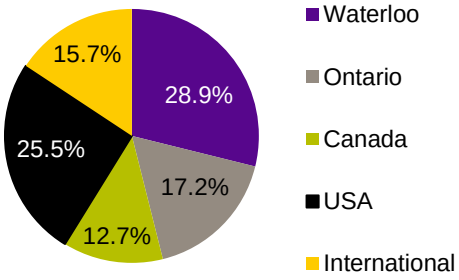


Figure 5: Regular Faculty by PEng, May 1, 2011

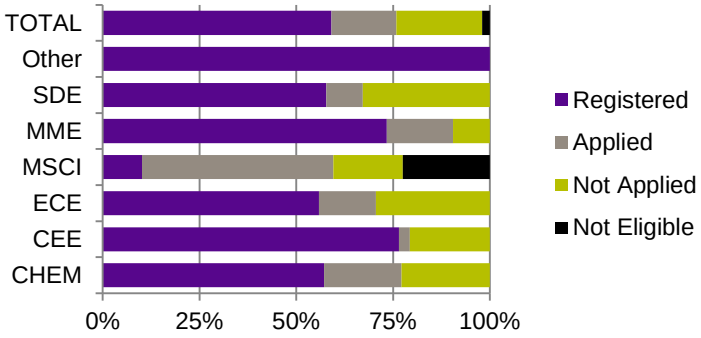
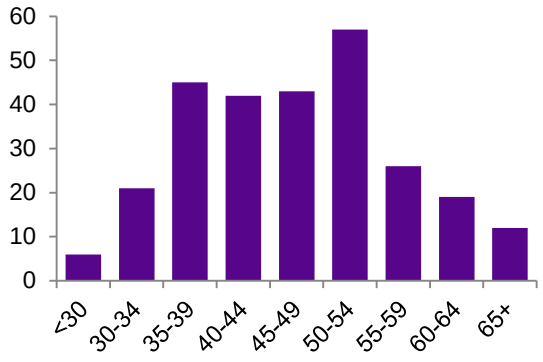


Figure 6: Age Distribution of Regular Faculty, May 1, 2011



Another important measurement in planning for our future is the age distribution of our faculty. While the removal of mandatory retirement makes projecting retirements less precise, we must still plan for faculty renewal to address the challenges of large cohorts potentially retiring in relatively short time frames. Currently, 21% of our regular faculty complement is aged 55 and older, a relatively healthy number that is balanced by a significant number of younger faculty. Approximately 4.5% is aged 65 and older. As a result of our Vision 2010 faculty growth, over a quarter of our faculty complement is under the age of 40. However, we must pay attention to the large cohort aged 40 to 55, which accounts for a full 52% of our current complement.

In addition to our regular faculty complement, Waterloo Engineering is enriched by the contributions of a wide range of non-regular faculty members, as shown in Figures 7 and 8.

Figure 7: Non-regular and Non-faculty Appointments by Department, Nov. 1, 2011

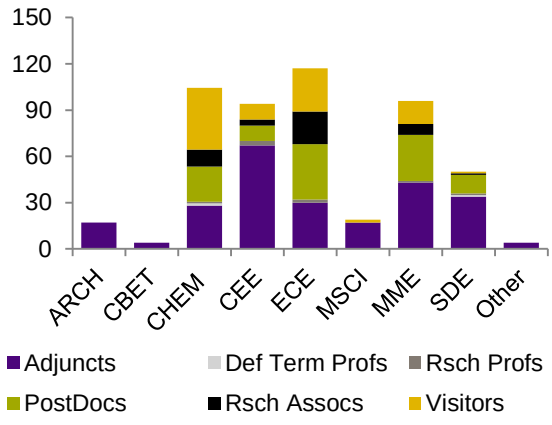
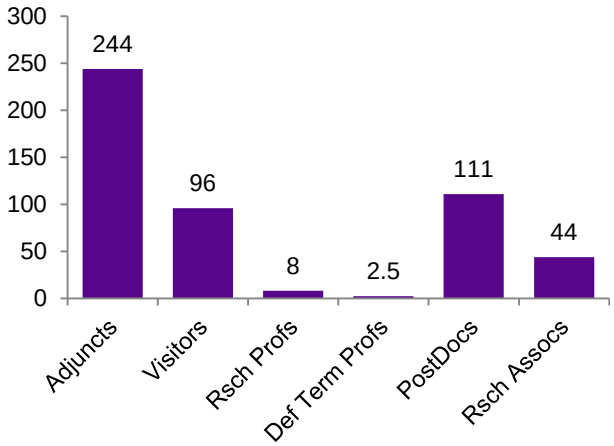


Figure 8: Non-regular and Non-faculty Appointments by Type, Nov. 1, 2011



Our staff complement also grew significantly as a result of the Vision 2010 plan, increasing by 47 full-time equivalent positions or 29.4% between 2006 and 2011 (including 12.5 staff positions open on May 1, 2011).

Figure 9: Growth in FTE Staff Over Time

As of May 1, 2011 Waterloo Engineering's regular staff complement (i.e. permanent staff paid from the operating budget, excluding open positions) included 101.8 administrative staff and 92.5 technical staff, for a total of 194.3. Of these, 63.8 work in administrative support offices and the remaining 130.5 work in our academic units. Further details are provided in Figures 10 and 11, below, and in Appendix C.

Figure 10: FTE Staff in Academic Units, May 1, 2011

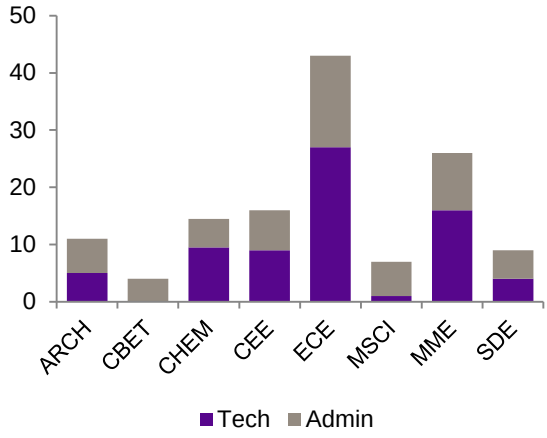
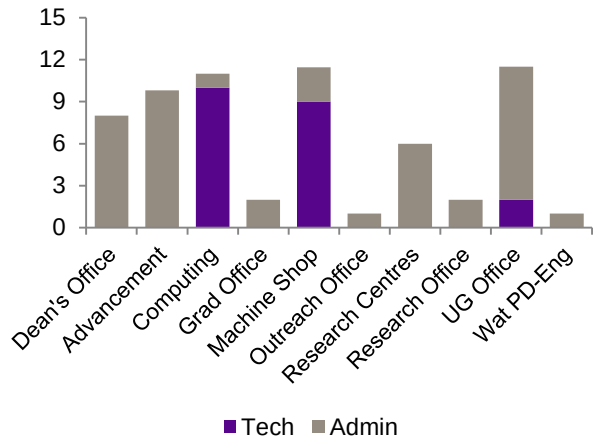
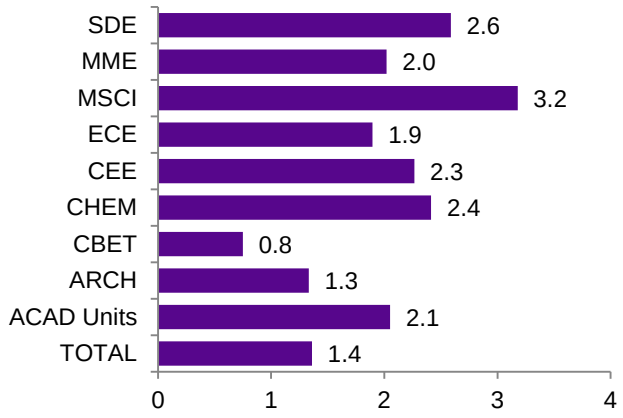


Figure 11: FTE Staff in Administrative Units, May 1, 2011



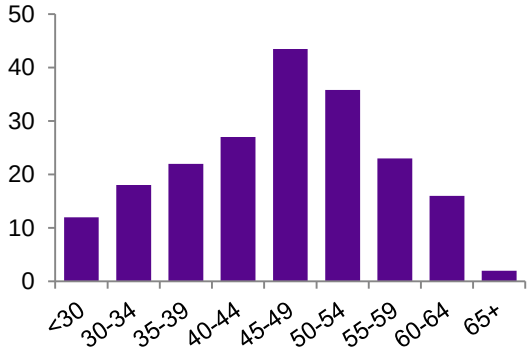
We also must note that a number of additional staff members, who are paid through funds other than the operating budget or are engaged on limited-term contracts, also actively contribute to the success of the faculty and its departments but are not captured in the regular staff counts presented here.

Figure 12: Faculty to Staff Ratio, May 1, 2011



Across the faculty, on May 1, 2011 there was an average of 1.4 regular faculty members per FTE staff member. The average across academic units was 2.1 faculty members per staff member. Figure 12 shows the distribution of this ratio across units. The variation in this ratio among academic units results largely from differences in the technical intensity of their disciplines. A detailed breakdown of this ratio by technical and administrative staff is provided in Appendix C: Faculty and Staff Data.

Figure 13: Age Distribution of Staff, May 1, 2011



It is also important that we remain mindful of the age distribution of our staff complement. As seen in Figure 13, staff renewal will be an increasingly important activity for Waterloo Engineering, as almost 21% of our staff complement is aged 55 and older and over 53% of the staff is 40 to 55 years old.

VISION 2015 FACULTY AND STAFF PLAN

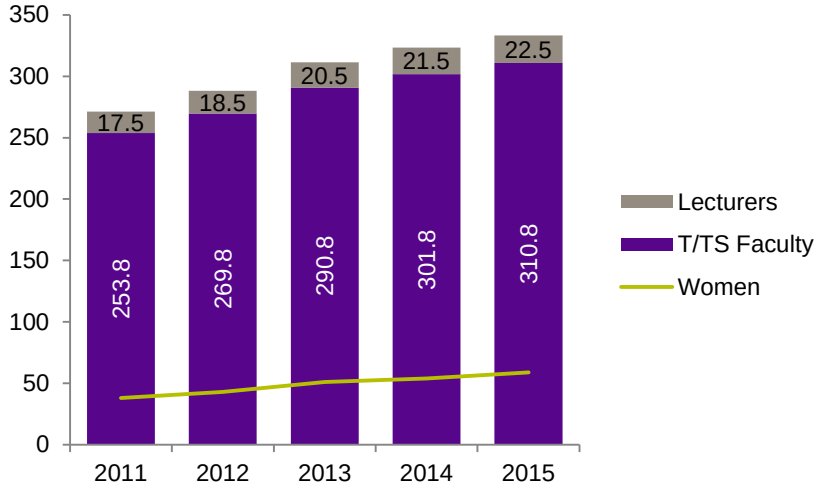
As established in the Vision 2015 key priorities, attracting, engaging and retaining outstanding people is paramount to the success of this plan. Of course this includes the faculty and staff who are currently here and those we will recruit over the plan period. Our faculty and staff are key to achieving all of our plan priorities. Without them, we cannot offer excellent academic programs and services, nor can we undertake high-impact research. They build connections, promote collaboration, and foster innovation and entrepreneurship among themselves, with students, and with the broader community.

Goal A1: Increase the Faculty Complement Strategically

The Vision 2015 plan calls for a very significant increase to our faculty complement. As detailed in Figure 14, our regular faculty complement will grow by 62 positions or over 20% between May 1, 2011 and May 1, 2015.

This growth will afford Waterloo Engineering remarkable opportunities to build on the excellent foundation in place across our units by supporting new graduate programs and innovative undergraduate teaching initiatives, improving undergraduate student to faculty ratios, providing additional graduate student supervisory capacity and increasing the critical mass and impact of key research programs.

Figure 14: Projected Annual Regular Faculty, 2011-2015



ARCH	16.0	18.0	19.0	19.0	19.0
CBET	3.0	4.0	6.0	8.0	9.0
CHEM	35.0	36.0	40.0	44.0	47.0
CEE	36.25	40.25	43.25	45.25	48.25
ECE	81.5	83.5	89.5	90.5	92.5
MSCI	22.25	26.25	29.25	30.25	30.25
MME	52.5	53.5	56.5	57.5	58.5
SDE	23.3	24.3	25.3	26.3	26.3
Other[3]	1.5	2.5	2.5	2.5	2.5
TOTAL	271.3	288.3	311.3	323.3	333.3

- Fill all open faculty positions and establish new positions in strategic areas

  Of the 62 positions to be added over the Vision 2015 plan period, 31 were open on May 1, 2011. These include replacements for faculty who have retired or resigned, positions to complete hiring for our nanotechnology and management engineering programs, and positions resulting from programs offered at the University of Waterloo's UAE campus[4].

  Of the remaining 31 positions, 14 result from our participation in the UAE campus[4], five will be hired in collaboration with the Institute for Quantum Computing and two are research chair positions. The remaining 10 represent strategic growth across the faculty, targeted in existing and emerging areas of strength (as identified by each department) and to support key initiatives to improve the undergraduate experience and to enrich the graduate program. A detailed breakdown of these positions and the funding sources supporting them is included in Section IV and further information about each unit's strategic hiring areas is included in the implementation agreements in Section V.

  During the plan period, faculty members who retire will not be automatically replaced in their unit or research area. A case must be made by the academic unit to retain the position, in a defined area that best meets its needs and strategic directions. In this way, these positions will provide further opportunity to hire in areas of strength or to increase our capacity in emerging areas.

[3] Faculty in the first-year engineering office and the student design centre.

[4] Much of the growth in the departments of civil & environmental and chemical engineering aims to ensure complements sufficient to send faculty members to the UAE campus to teach in their programs there and to teach the UAE students who join the Waterloo campus for years three and four. Including filled, open and future positions, each department will add 11 faculty members as a result of the UAE program. To provide appropriate support to their increased faculty and student complements, five staff positions will also be added in each department.

- Recruit and hire outstanding faculty

  Every hiring unit will employ best practices to proactively identify and recruit excellent candidates (including under-represented groups) and will remain vigilant in the application of high standards to all hiring practices and decisions. New faculty members will be hired strategically in identified areas of strength, from diverse schools, and at appropriate levels to ensure balance.

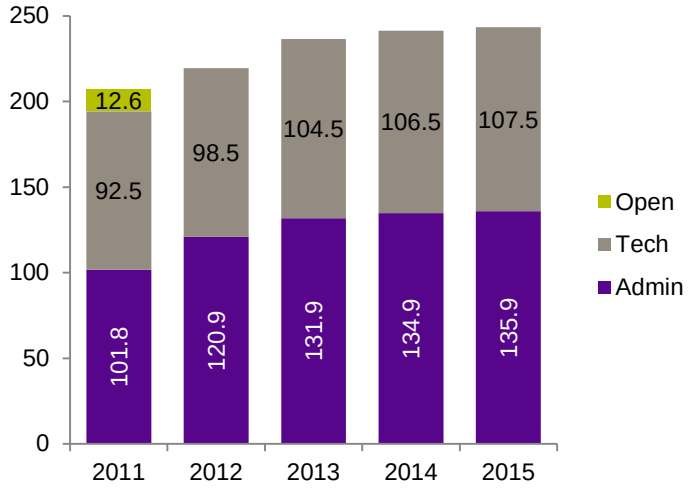
Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Number of new faculty hired and performance to target
- Total faculty, including the number of lecturers and the number of women
- Distribution of new faculty members by PhD school

Goal A2: Increase the Staff Complement to Appropriate Levels

Over the Vision 2015 plan period, we aim to grow our staff complement at a rate commensurate with our faculty growth, and in an equally strategic manner. Figure 15 outlines the planned 25% growth in regular staff between May 1, 2011 and May 1, 2015.

Figure 15: Projected Annual FTE Staff, 2011-2015



ARCH	11.0	11.0	11.0	11.0	11.0
CBET	4.0	4.0	5.0	5.0	6.0
CHEM	16.5	18.5	21.5	24.5	24.5
CEE	16.0	18.0	19.0	20.0	21.0
ECE	45.6	47.6	50.6	50.6	50.6
MSCI	7.0	8.0	9.0	9.0	9.0
MME	29.0	29.0	30.0	30.0	30.0
SDE	9.0	9.0	10.0	10.0	10.0
ADMIN	68.8	74.3	80.3	81.3	81.3
TOTAL	206.9	219.4	236.4	241.4	243.4

The planned faculty and staff increases will result in a stable ratio of regular faculty to staff over the Vision 2015 plan period. The overall Faculty of Engineering ratio will remain at 1.4 and the average in academic units will drop slightly, from 2.1 to 2.

- Add staff positions at appropriate levels to manage workload and support strategic initiatives

  An additional 49.1 staff members will be hired over the Vision 2015 plan period. This includes filling 12.6 positions that were open on May 1, 2011 and adding 36.5 new positions. Of those new positions, 10 result from our participation in the UAE campus[4], three are connected to our

nanotechnology and management engineering programs and five result from converting contract positions to permanent status.

The remaining 18.5 positions are new positions allocated to manage increased workloads resulting from recent growth and to support strategic initiatives identified throughout this plan. These include improving the undergraduate student experience, enriching graduate programs, supporting research and enhancing industrial relations. A breakdown of these positions and their funding sources is provided in Section IV. Information about the nature of the positions to be added is included in the appropriate sections of the plan and in the academic units' implementation agreements (Section V).

♦ Facilitate reorganization for increased capacity, improved efficiency and enhanced service

New Vision 2015 staff resources will allow a number of units to review and adjust organizational structures to ensure efficient operations, balanced workload and a positive work environment for all staff. For example, additional staff in the graduate and undergraduate offices will allow those offices to optimize workloads across staff, with a focus on improving their availability and responsiveness to the students they serve. Additionally, many academic units are revising their staff organizational structures to include or enhance the role of an administrative officer; this individual will provide financial and human resource expertise at the department level, thereby improving the work environment for all staff and enhancing the professional support provided to the unit's leadership.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- New staff hired and performance to target
- FTE staff, by type and gender
- Faculty to staff ratio
- Staff retention, by unit
- Units' reports on progress toward the strategic goals new staff will support

Goal A3: Establish a Culture of Service Excellence

One Vision 2015 key priority commits to excellence in academic programs and in services. While subsequent sections of this plan address academic program excellence, it is the responsibility of every operating unit to meet this commitment by providing excellent service to our internal and external clients. Every unit has clients to whom it provides service and support. In some cases, the clients supported by a particular unit are obvious (for example, the engineering undergraduate office serves and supports our undergraduate students); however, it bears noting that our client base is often quite broad, ranging from current students, staff, and faculty to prospective students, partners, and alumni.

♦ Provide staff development opportunities related to client service

Engineering's executive officer, working with the Dean's Staff Advisory Committee (DSAC), will seek to identify professional development opportunities related to client service and to promote these to engineering staff members. Where appropriate and feasible, arrangements will be made to offer special sessions of some program(s) specifically for engineering staff.

♦ Recognize and reward excellence in client service

All unit heads are encouraged to identify staff members who provide excellent customer service for recognition within their unit and as nominees for the annual Dean of Engineering Outstanding Staff Performance Award. DSAC is also charged with recommending other mechanisms that might be developed to further recognize and reward excellence in client service across the faculty.

♦ Share best practices in client service among the faculty's various units

Each of the faculty's administrative units has addressed improvements to client service in its Vision 2015 plan. For example: staff increases in the graduate and undergraduate offices are being

targeted to enhancing availability to students and responsiveness to all internal and external clients; the undergraduate office is developing and publishing service standards for its clients; to ensure accountability to engineering clients, the research office is working to codify responsibilities across all individuals and offices involved in research support; the engineering computing office is making significant improvements to its availability and responsiveness to client needs through increased help desk hours and the introduction of a single point of contact for phone or email requests. A number of feedback mechanisms, including engineering computing's proposed annual client survey, the research office's planned scorecard evaluation system and the undergraduate student engagement survey, will provide information about client satisfaction to improve future efforts. Through the annual plan updates and planning committee meetings, best practices and models for improving client service will be identified for wider implementation across the faculty.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Staff participation in client service professional development opportunities
- Individual units' survey results, as applicable

Goal A4: Improve Internal Communications

An important step in engaging our faculty and staff members is keeping them informed of developments in the faculty and their unit. Waterloo Engineering is committed to transparency and accountability and will strive to ensure our internal communications help meet this commitment.

♦ Establish an internal communications framework and tools to best meet faculty and staff needs

A working group, led by the communications team and including representatives from administration and DSAC, will conduct an audit of the existing ways in which information is communicated to faculty and staff and an assessment of audience members' needs and preferences. Based on its findings, an internal communications framework will be established to meet the needs and preferences identified. The engineering communications team will then ensure appropriate communications tools are in place.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Use of communications tools developed
- Faculty and staff feedback

Goal A5: Recognize and Promote Faculty and Staff Excellence

Without question, Waterloo Engineering has an excellent complement of faculty and staff worthy of internal and external recognition. Among our current and former faculty members are 15 Royal Society of Canada Fellows, three Order of Canada recipients, 27 Canadian Academy of Engineering Fellows, 11 Fellows of the Engineering Institute of Canada and three recipients of Canada's Top 40 Under 40. Many other honours earned recently by our faculty are included in Appendix C.

We must make more effort to identify and recognize this excellence in order to demonstrate our appreciation of those faculty and staff members, to hold them as up as models to their peers, and to enhance the reputation and profile of the faculty and university.

♦ Increase nominations to internal and external awards and honours

During the Vision 2015 plan period, the structure and mandate of the Faculty Awards and Honours Committee will be revised and the level of professional support provided to the committee will be enhanced in order to support the identification of nominees and the development of high-calibre nominations to the most prestigious major external awards and honours. These changes will aim to increase both the number of nominees and the success rate of nominations made.

Improved internal communications tools will also be used to better communicate other awards and honours, along with their eligibility criteria and application procedures, to all potential nominators and nominees. This will include faculty awards, university awards and external awards.

- Establish additional awards within Waterloo Engineering

  As outlined elsewhere in this plan, new awards for graduate student supervision and for research performance will be introduced during the Vision 2015 period. Additional mechanisms to recognize staff members for excellence in client service will also be considered.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Total recipients of prestigious major external awards
- Nominations submitted to major external awards and the success rate thereof
- Number of honours awarded to Waterloo Engineering faculty and staff, by category
- Nominations submitted to Faculty of Engineering-administered awards

Goal A6: Support the Career-Long Development of Faculty and Staff

Through their participation in disciplinary and professional groups, faculty members have significant opportunity for professional development, especially in their research areas. However, fewer opportunities exist in areas such as teaching and leadership. Furthermore, there are few such organizations for staff. We will work to fill these gaps during the Vision 2015 plan period.

- Identify and promote development opportunities for faculty and staff

  Our administrative units will identify and promote existing on-campus opportunities for faculty (e.g. programs offered by the Centre for Teaching Excellence, sessions offered through the research office) and will develop and offer complementary programs as appropriate. All unit heads and managers should support their staff members' participation in on-campus programs such as the skills for the electronic workplace series and sessions offered by the office of organizational and human development. Chairs, directors and associate deans are also encouraged to consider extending opportunities for staff to pursue appropriate off-campus training and development.

- Establish a culture of mentorship

  Academic units are strongly encouraged to ensure that all new faculty members have a mentor and that exemplary faculty members become mentors to new faculty. Mentorship also plays a role in developing leaders, as the dean mentors chairs and associate deans and as chairs mentor associate chairs. Additionally, managers of staff should support interested staff members in finding a suitable career mentor or in becoming a mentor to others as appropriate.

- Identify and cultivate future leaders

  Although at Waterloo Engineering we have worked hard to ensure that highly professional and skilled staff members are available to support the work of the faculty and its departments, there is still no substitute for the leadership provided by department chairs, associate deans and the dean. It follows that one important task for the faculty leadership is the identification of leadership abilities in early and mid-career faculty members and helping those interested in leadership careers to develop their leadership and administration skills. This goal is shared by university administration.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Participation in development opportunities promoted or offered by faculty offices
- Proportion of new faculty who have a mentor
- Number of individuals identified to attend leadership programs
- Number of staff members sent for off-campus professional development

Goal A7: Fully Engage All Faculty Members

Waterloo Engineering is committed to the concept of the "fully-functioning faculty member." That is, we aspire to have all of our faculty members fully involved in teaching, research and service. Our regular teaching load is about three courses a year[5] of which normally two are undergraduate and one is graduate. Holders of research chairs are permitted to reduce their teaching by a maximum of one course so as to be able to concentrate more fully on research. Graduate student supervision is an integral part of teaching and of course plays a crucial role in helping faculty members establish a team that supports their research program. We expect a fully-functioning faculty member to supervise on average five to six research graduate students. The intensity of faculty members' research is typically measured by the external funding their programs garner, and on average in 2010/11 Waterloo Engineering professors attracted just over $250,000. We intend to raise this figure to near $280,000 by 2014/15. Although admittedly a crude metric that does not fully account for the wide variety of research programs, this is nevertheless a measure of activity and – since funding is usually obtained competitively – of the value outside agencies place on the quality of one's research. The third element of the work of a fully-functioning faculty member is service. Here service is divided into two components: internal service to one's department, faculty and the university; and external service to one's profession and society as a whole. A component of internal service that is difficult to quantify is "good citizenship," by which we refer to being available to help with a variety of tasks. Good citizenship goes a long way to building a cohesive, supportive and collaborative academic community.

- Promote a holistic and integrated view of teaching and research

  The importance of being involved in research goes beyond the obvious goal of generating new knowledge that can be put to use for the benefit of society. By being involved in research, fully-functioning faculty members remain at the cutting edge of their field which in turn ensures their continued membership in the international community of engineering scientists and scholars. Even more importantly it guarantees that their teaching content will remain current. Indeed, the best academics are those who are able to forge a close nexus between their teaching and research. Thus, rather than looking at teaching and research as two separate functions that compete for one's limited time, the successful academic brings their research to bear on their teaching and uses their teaching to test their research questions and ideas. This holistic and integrated view of the two main functions of a faculty member can make their contributions much richer and their satisfaction greater.

- Maintain the engagement and contributions of all members of our highly capable professoriate

  We must recognize that over a long academic career a faculty member's interests can change. Indeed some academics may become more interested in research, others in teaching, and others in service. One of the aims of the Vision 2015 plan is to recognize, accept, facilitate and appropriately reward these changes in interest and focus. For example, a faculty member could choose to increase his or her teaching load and correspondingly the teaching weight in his or her load distribution for merit evaluation purposes.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Graduate students per tenured/tenure-stream faculty
- Research funding per tenured/tenure-stream faculty
- Teaching load histograms provided by each academic unit each year

[5] The teaching load is somewhat higher in the Department of Management Sciences where many of the courses do not have a heavy lab component and the number of research graduate students per faculty member is below the norm.

B. Undergraduate Studies

Enrolment in Waterloo Engineering undergraduate programs has increased by 22.7%, from 5341 to 6554, since 2006. This growth results largely from programs that were introduced in recent years reaching steady state. This includes management engineering, which graduates its first class this year, mechatronics engineering, introduced in 2003, and nanotechnology engineering, introduced in 2005. Additionally, our enrolment – of international students, in particular – has increased since 2009 as a result of the civil and chemical engineering programs we are offering at Waterloo's campus in Dubai, United Arab Emirates. Over that same time frame, the proportion of students that are international has increased from 4% to 9%. The number of women studying in our programs has increased from 1025 to 1300 in those six years, reaching 19.8% of all undergraduate students (including architecture) in 2011, up from 19% in 2006. Over the same time frame the number of Waterloo Engineering undergraduate degrees granted has increased by 27%, from 810 to 1026. More detailed undergraduate data is provided in Appendix D.

Figure 16: Growth in Undergraduate Enrolment Over Time

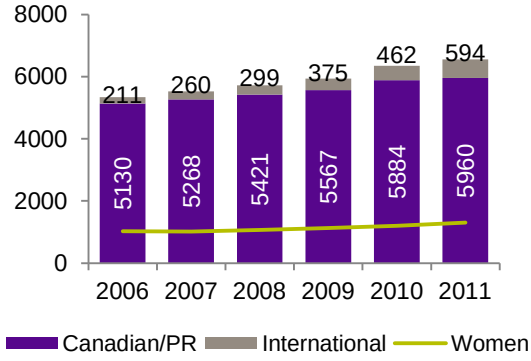
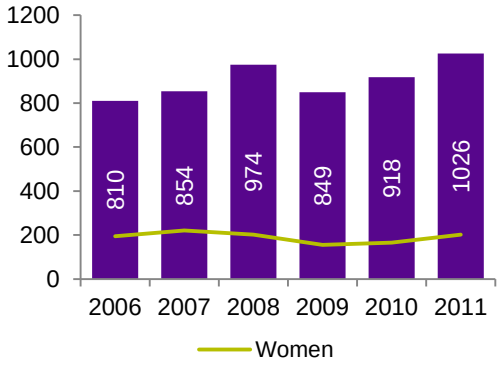


Figure 17: Growth in Undergraduate Degrees Granted Over Time



We reached record undergraduate enrolment and an all-time high number of degrees granted in 2011. Total undergraduate enrolment reached 6554 in fall 2011 and we granted 1026 undergraduate degrees at convocations in spring and fall, 2011. The distribution of enrolment and degrees by program is shown in Figures 18 and 19. In fall 2011, 19.8% of our undergraduate student population was comprised of women and 9.1% were international students. Women earned 19.7% of the degrees granted in 2011, and 3.6% of degree recipients were international students. Due to our co-op program, through which all undergraduate students alternate work and school terms, a proportion of Waterloo Engineering undergraduates are in class for only one out of the three terms in any given academic year. To account for this phenomenon, we also calculate an annual full-time equivalent (FTE) undergraduate enrolment, which for 2010/11 was 5026.5.

Figure 18: Undergraduate Enrolment, Fall 2011

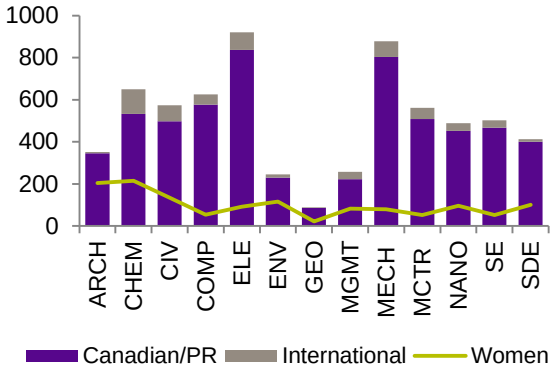


Figure 19: Undergraduate Degrees Granted, 2011

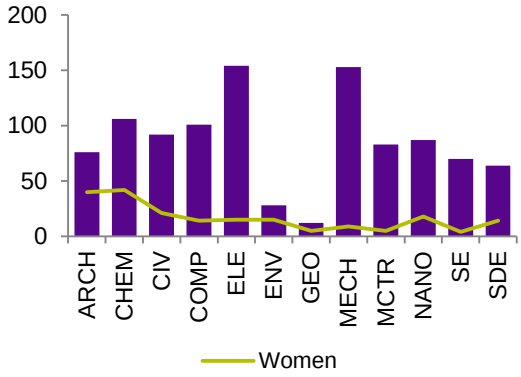
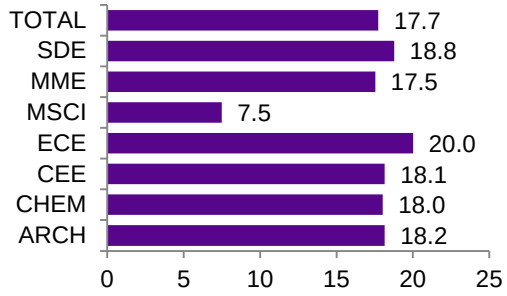
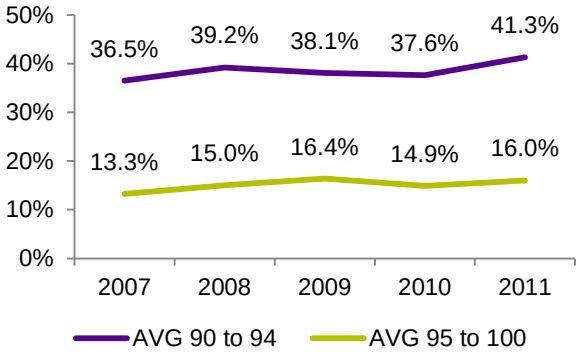


Figure 20: Undergraduate Students per Regular Faculty Member (FTE), 2010/11



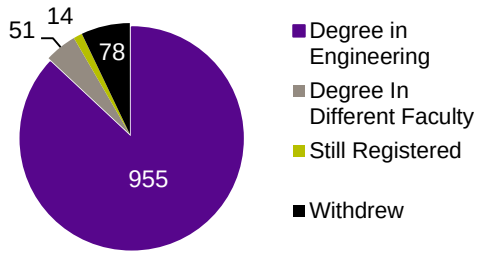
Widely recognized as one indicator of undergraduate program quality, the ratio of undergraduate students to regular faculty members is a metric we monitor annually. Over the previous plan period, significant faculty hiring resulted in a 4% decrease of this ratio at the faculty level. It has since increased slightly, from 17.3 in 2009/10 to 17.7 in 2010/11.

Figure 21: Final Entering Grade Average Ranges Over Time



Waterloo is widely recognized as offering Canada's best undergraduate engineering program, and as such attracts truly remarkable applicants. One measure of this quality is the final entering high school average of admitted students, shown in Figure 21. In 2011, the proportion of entering students with an entering average between 90 and 94 reached a high of 41.3% and the proportion of students with averages 95 and over was 16%. That is, over 57% of our incoming class had high school averages of 90% or above.

Figure 22: Graduation Status of 2003/04 Cohort After 7 Years



In recent years, undergraduate degree completion has become an increasing concern across Waterloo (and, indeed, the Canadian university system as a whole), including in engineering. As shown in Figure 22, 87% of our 2003/04 cohort graduated with a Waterloo Engineering degree within seven years; 4.6% earned a degree in another Waterloo faculty and 7% withdrew from Waterloo entirely. While this data is informative, it is by its nature dated. As noted in Goal B3 below, we must define additional retention metrics that can be measured and reported on during the course of students' studies.

VISION 2015 UNDERGRADUATE STUDIES PLAN

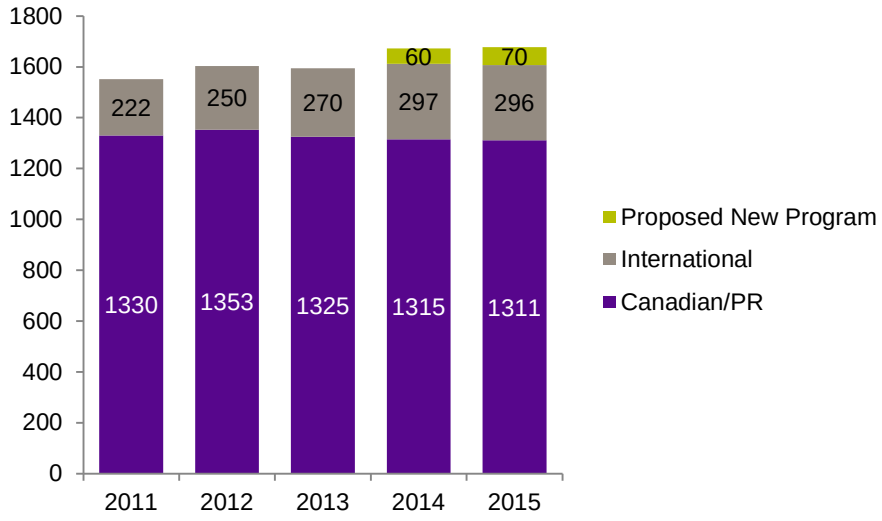
Our Vision 2015 key priorities commit to excellence in undergraduate academic programs and to attracting, engaging and retaining outstanding undergraduate students. An argument could easily be made that we already attract outstanding undergraduate students and offer them an excellent and, in fact, unique undergraduate program. However, we must not take our strengths for granted. Through the Vision 2015 plan period we aim to take our excellent undergraduate programs and outstanding students, both current and future, and move them even further forward.

Goal B1: Maintain Relatively Stable Undergraduate Intake Targets

The Vision 2015 plan calls for a minimal increase in undergraduate student intake of about 3.5%, from 1552 in 2011 to 1607 in 2015. This growth results almost exclusively from projections that intake in our programs offered at Waterloo's UAE campus will reach steady state during the plan period. Given the projected increases to our faculty complement outlined in Figure 14, above, it can be expected that the undergraduate student-to-faculty ratio will decline slightly over the plan period.

At the time of publishing this plan, a proposal to add one new multidisciplinary undergraduate program is in development. The Department of Systems Design Engineering is proposing to start a biomedical engineering program in 2014. The addition of this program would result in a total increase in undergraduate intake of 8% over the plan period. Of course, if a new program is added sufficient additional faculty and staff positions, funded by the program's grant and tuition revenues, will also be added to ensure its success.

Figure 23: Projected Annual Undergraduate Intake, 2011-2015



ARCH	74	76	72	72	72
CHEM	138	140	140	140	140
CH:UAE	33	40	50	60	60
CIV	113	115	115	115	115
CIV:UAE	30	40	50	60	60
ECE	341	360	355	355	355
ENVIRO	65	70	70	70	70
GEO	19	27	28	30	30
MECH	214	210	210	210	210
MCTR	133	130	125	125	125
MGMT	66	65	60	60	60
NANO	116	115	110	110	110
SDE	89	90	90	85	80
SE	121	125	120	120	120
Proposed New: BIO				60	70
TOTAL	1552	1603	1595	1672	1677

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Undergraduate student intake, by program, gender, visa status and final entering average range, and performance to target
- Undergraduate student-to-faculty ratio, by department

Goal B2: Enhance the Undergraduate Academic Program

During the early consultation stage of this planning process, as the planning committee was working to establish the aspiration and key priorities for Vision 2015, the undergraduate student Engineering Society presented us with informative results of a student survey, which indicated students' top priorities to improve their experience involved improving overall teaching (by professors and TAs) and modernizing labs. We are directly addressing both of these issues here.

- Foster consistently high quality teaching by all instructors

  A top priority for the Vision 2015 plan is to support all of our academic units and faculty members in enhancing the quality of teaching across the faculty. To that end, the Vision 2015 plan is the first faculty document to include a section dedicated to teaching: See Section E for a full description of our plans to enhance teaching across the faculty over the Vision 2015 plan period.

- Redesign and modernize the lab experience

  Laboratory teaching is an integral part of modern engineering curricula. We believe that in many cases we have not taken full advantage of the excellent learning opportunities inherent in our labs. To that end, many of our academic units are planning improvements to their laboratory course offerings through the design of new undergraduate laboratories, new modes of laboratory content delivery, the introduction of more open-ended questions earlier in the curriculum, the integration of more design content in earlier years, and the use of case studies and project-based learning to integrate knowledge across courses and years of the program. For example, chemical engineering is planning to develop new experiments and introduce more pilot-scale equipment, and civil and environmental engineering is integrating laboratory redevelopment plans with curriculum redevelopment. Furthermore, the NSERC-Waterloo Chair in Design Engineering will support departmental efforts by providing case studies and guidance for their effective use to teach engineering science and design. Most notably, mechanical and mechatronics engineering is establishing the innovative "engineering clinic," which will introduce a practicum-focused student learning environment aimed at enhancing deeper learning and connecting theoretical concepts to practical application. The clinic will be threaded vertically and horizontally across the curriculum to provide an early, systematic and sustained environment for the development of knowledge, skills, values and behaviors critical to student success in professional practice, as practitioners, designers, researchers or entrepreneurs.

- Ensure a modern, high-quality learning environment

  Engineering students need to experience modern equipment in a hands-on environment. In keeping with our key priorities of academic excellence and providing world-class facilities, we must remain current with contemporary and innovative tools. To meet this goal, the university is investing $8.5 million over five years to establish the Vision 2015 Undergraduate Laboratory Enhancement Initiative (see Section IV, Supporting the Plan for details). These funds will be used to support the renewal and upgrading of undergraduate teaching equipment and laboratories in departments and in our first-year teaching lab. In many departments, this investment is essential not just to upgrade and renew lab equipment but also to facilitate the teaching innovations outlined above.

- Enrich student understanding of the curriculum structure and relevance

  Waterloo Engineering's first-year "concepts courses" aim to help first-year students make connections between the curriculum and engineering practice. The First-Year Council will seek mechanisms to further help students make these connections and to provide them a perspective on the whole of their program: how it is laid out, why that is, and what they can expect to learn over the course of their studies.

We also aim to further enrich the undergraduate academic experience over the Vision 2015 plan period by establishing mechanisms that help faculty members bring their research to the classroom in an engaging way (through lectures, anecdotes, and/or projects) that reinforces how their research relates to the course content. By doing so, faculty members can further build connections between coursework and engineering practice and can help demystify research.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Teaching metrics as defined in Section E, Teaching
- Annual unit reports on improvements and innovations in undergraduate lab content and delivery
- Annual unit reports on improvements to undergraduate lab facilities and related expenditures

Goal B3: Support the Retention of Undergraduate Students

Retention is about helping students enjoy achieving and demonstrating expertise; it is not about promoting students that have not yet demonstrated an appropriate level of expertise in a given set of subjects. To fulfill this goal we aim to put in place resources to help all students succeed to the best of their ability. In addition to the strategies outlined below, it is also anticipated that the work of the new associate dean, teaching (see Section E) and our initiatives to modernize lab equipment and enhance the lab experience (described above) will contribute positively to student retention.

♦ Enhance first-year student success

The Faculty of Engineering has a long history of commitment to the success of its first-year students, carried out in large part through the first-year studies office and related support services offered in collaboration with central offices such as counselling services. In recent years we have built on this commitment, most notably through the creation of a second associate director for first year in 2011 and the establishment of a task force to study first-year engineering retention. That task force's report, *Engineering Education for Enduring Success*, informs our Vision 2015 key first-year success strategies. In the very near term we will make essential upgrades to our first-year students' learning environment by upgrading the WEEF Lab (a multi-purpose lab space used for lectures, tutorials, computer instruction, electrical laboratory measurements and help sessions) and by establishing a tutoring centre to provide academic support to more first-year students. Over the Vision 2015 plan period, we will also complete redevelopment of our first-year courses with the support of the associate dean, teaching and the university's Centre for Teaching Excellence (CTE). This redevelopment focuses on conceptual learning, support for active learning approaches, clarity in learning goals and assessment standards, and increased university skills content. We will also seek longer-term commitments by teachers from other faculties who teach our first-year students. The implementation of an *Engineering Education for Enduring Success* recommendation now allows reduced loads for students who are struggling academically in 1A. This is supported by a special make-up term for most of our programs in spring (a small number of programs have their make-up term in fall), which was piloted very successfully for the first time in spring 2011. Support for this term will be normalized over the Vision 2015 plan period. It is also recommended that each academic unit consider assigning a first-year support instructor to for first-year students, as is currently used with great success in the Department of Civil & Environmental Engineering.

♦ Support student success at all levels

In addition to the various department-level efforts to improve upper-year student retention in each program, a number of complementary faculty-wide initiatives will be implemented over the Vision 2015 plan period. Key among them will be for the faculty to establish a collaborative working relationship with the central student success office to ensure we pursue complementary and mutually beneficial initiatives to support our students. During the Vision 2015 plan period we will also introduce a course to help students achieve an appropriate command of English for university study. This course will be made available in students' 1B term with the expectation that by addressing communication challenges earlier, students may be able to reach their potential sooner. The nature, format and developer of this course will be determined after the university's English

Language Competency Task Force reports on its study of existing English language programs across campus.

Of course, to measure the success of these strategies we need to first understand and quantify our current retention rate. There have been a number of attempts to quantify retention at the university level and in engineering. We will continue to work at both levels to move toward effective and easily-disseminated measures of retention that will inform decision-making and performance measurement in this important area throughout the plan period.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Cohort graduation rates
- Development and analysis of first-year and overall retention data
- Number of first-year courses redeveloped
- Participation and success rates for the spring make-up term
- Participation and success rates for the English language course, once developed

Goal B4: Improve the Undergraduate Student Experience

♦ Improve service and communications

The engineering undergraduate office (EUGO), facilitated by the addition of two staff positions and some reorganization to optimize workloads and service provision, will make significant enhancements to its service levels and communications with undergraduate students over the Vision 2015 plan period. The EUGO will increase its availability to clients to include service over the lunch hour and will develop and publish service standards to enhance its accountability. The EUGO will work with the engineering communications team and the engineering student relations officer to develop a communications plan with an aim to improve and strengthen communication with undergraduate students. Changes envisioned include more access to advice in the EUGO, simplified and improved access to data, and regular information sessions with the associate dean, undergraduate. To further support the provision of advice to students, the EUGO will improve support for student advisors in departments. A committee of engineering undergraduate advisors will be established to provide a forum for advisors to raise common issues, exchange best practices, and pursue training activities.

♦ Enhance undergraduate processes

The EUGO will seek opportunities to enhance processes for the benefit of all undergraduate students. This will include: the introduction of increased flexibility in promotion rules and the creation of partial load promotion rules; enhancements to the exchange program (described in more detail in the internationalization section); and the development of a mechanism to support interdisciplinary fourth-year design projects. The EUGO will also lead efforts to reassess existing options and introduce specializations to both broaden and deepen our programs.

♦ Develop an annual student engagement survey

At the time of publishing this plan, the faculty's student relations officer is working with members of faculty administration and academic units to develop an annual survey of students focused on student engagement. The survey results will ultimately provide very useful information to the faculty and academic units about our student experience.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- EUGO client feedback
- Changes to promotion rules
- Number of interdisciplinary fourth-year design projects

- Number of options and specializations available and the number of students completing the requirements for each
- Response rates on the student engagement survey
- Analysis of the student engagement survey results

Co-operative Education

As our undergraduate enrolment increases, so does the number of co-op positions required to provide our students the quality co-op experience that is central to a Waterloo Engineering undergraduate education. Of the 7299 co-op positions sought by Waterloo Engineering students in 2011, 7062 were secured, 12% of which were outside of Canada. In 2010/11, Waterloo Engineering undergraduate students earned $80.6 million on co-op work terms. A unique element of the co-op experience at Waterloo is the integration of online professional development modules completed by students during work terms to enhance work-term learning opportunities. In 2010, the Faculty of Engineering's original PDEng professional skills development program was replaced by a second-generation program, WatPD-Engineering, which was first offered in winter 2011.

Figure 24: Waterloo Engineering Co-op Employment, 2011

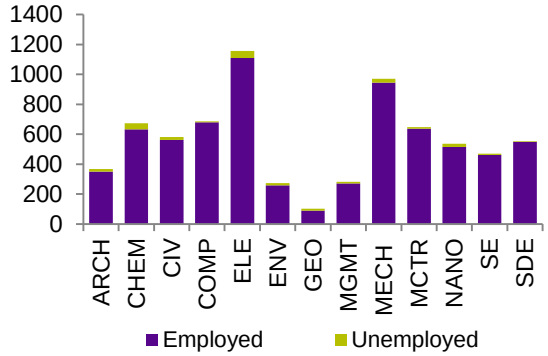
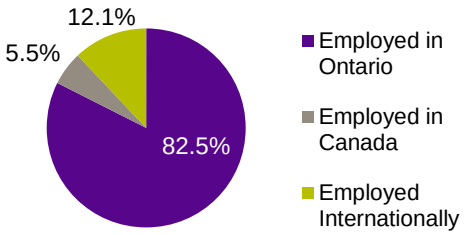


Figure 25: Waterloo Engineering Co-op Employment by Location, 2011



Goal B5: Increase the Number of Co-op Jobs

Overall Waterloo Engineering student co-op employment rates have been consistently high (ranging from 96% to 97.9%) in recent years. However, a number of students do remain unemployed each term (the majority of whom are in their first work term) and a number of jobs are unpaid and/or obtained late in the term.

♦ Implement a program-focused initiative to assist in job development

Currently job development is primarily conducted by the university office of co-operative education and career action (CECA), supplemented by jobs found directly by students. Over the Vision 2015 plan period we will implement a new collaborative effort between CECA and the engineering programs with the objective of identifying opportunities for job development that are not currently being exploited. Chemical engineering is currently participating in a pilot for this initiative and all programs will be included over the Vision 2015 period.

♦ Introduce two-term jobs for junior students

Students entering their first work term face the most challenges in securing co-op employment. Employers have indicated that these students would be more attractive if there was an expectation that the students would return for a second work term (with an intervening academic term), as this

would substantially reduce the time and resources required for training. Repeat terms with the same company also offer many potential benefits to students, ranging from acquiring progressive work experience to easing logistics around living arrangements. While a number of students return for a second work term with the same employer, this practice is not the norm and CECA does not actively develop jobs on this basis. A formal system will be developed that consists of a mixture of one-term and two-term jobs for junior students. Significant effort will be required to promote this opportunity to employers and students and to implement the required changes in job development, hiring and work term counselling procedures.

- Introduce eight-month work terms for senior students

  An increasing number of engineering schools across Canada offer optional professional experience programs. And while most of these offer much less total experience than Waterloo's program, in many cases the work terms are of longer duration. As a result, we must compete for the best student job opportunities against schools whose students can complete a longer term with the employer. Waterloo recently surveyed current co-op employers and learned there is significant interest in hiring senior students for a period of eight months. As a result of these findings and to provide the best possible job opportunities to our students, Waterloo Engineering is moving toward making one eight-month work term available in our programs. The mechanism for doing so is largely determined at the department level and as a result there will be differences between programs in terms of the seniority of students available for eight-month work terms and the time of year that students will be available. The associate dean, co-operative education and professional affairs (CEPA) will work with CECA and the academic units to facilitate this change successfully for our students and employers. Two departments will participate in phase one of this initiative starting in January 2012, with the first students participating in eight-month terms starting in January 2013. All other programs will be engaged starting in January 2013.

- Develop additional international work term opportunities

  This strategy and the metrics for measuring its success are detailed in the internationalization section, below.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Overall number of co-op work terms and employment rate, by program
- Number of unemployed students, by program, level and term
- Number of unpaid co-op positions, by program, level and term
- Conversion of department-initiated job leads to new job postings and subsequent fill rate of those jobs
- Number of students returning to the same employer for a second work term, by program and level
- Number of eight-month co-op job opportunities developed
- Number of students participating in an eight-month work term

Goal B6: Provide Unemployed First Work Term Students a Meaningful Experience

As described above, significant effort will be targeted to increase the number of jobs available to first work term students. However, complete employment cannot be guaranteed and students who do not secure jobs in their first work terms can be at a competitive disadvantage when applying for jobs in the subsequent term.

- Develop a program to enhance the employability of unemployed first work term students during their next work term

  A pilot skills development program with similar features to that of a regular work term job will be offered for unemployed first work term students in 2012, led by the Conrad Business,

Entrepreneurship and Technology Centre. Students accepted into the program will work in inter-disciplinary teams and will experience short work placements in start-up companies. Team members will be required to meet deadlines, exercise leadership, take on responsibility, and fulfill a variety of employment roles. Students will receive a $2,000 stipend to help offset living costs.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Participation in the pilot program
- Success measures to be determined by the pilot program implementation team

Goal B7: Support the Successful Implementation of WatPD-Engineering

♦ Ensure sufficient selection of current WatPD courses for engineering students

Over the Vision 2015 plan period, engineering will develop two new elective courses to complement the existing suite of five WatPD courses. It is anticipated these courses will first be offered in 2013 and 2015. Two other new electives are planned by the Co-op Education Council over this same timeframe. We are also committed to renewing WatPD-Engineering courses on a three-year cycle to keep them current and to ensure they continue to take advantage of advances in online learning.

♦ Establish a framework to assess the WatPD-Engineering program's effectiveness

WatPD-Engineering is unique to Waterloo and is believed to provide students with valuable professional skills that enhance their learning while on work term and prepare them to excel in their professional careers. A formal process that critically assesses the effectiveness of the program in conveying professional skills will be established and integrated with the outcomes assessment process that is employed for CEAB accreditation (see below).

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Number of courses developed and renewed
- Results of the assessment framework to be developed for WatPD-Engineering

Accreditation

Waterloo Engineering offers 12 undergraduate engineering programs and at the time of publishing this plan 11 of them are accredited by the Canadian Engineering Accreditation Board (CEAB). Our newest program, management engineering, is expected to receive accreditation in June 2012 when it graduates its first cohort of students. Given our size and the relative complexity of our programs, in particular our many interdisciplinary programs (some of which are shared with departments outside the faculty), accreditation requires considerable attention and resources. Relatively recent changes in the accreditation process that will require assessment of outcomes or graduate attributes and the use of assessment results for continuous improvement will add to this complexity. We are making significant investments to support the transition to outcomes-based assessment over the Vision 2015 plan period.

Goal B8: Ensure the Ongoing Accreditation of all Engineering Programs

♦ Implement a system of outcomes assessment for all programs

To implement an outcomes-based process for program improvement each program must undertake a number of activities including: outcomes identification; development of performance indicators; identification of assessment opportunities; and development of assessment tools. While the associate dean, CEPA has led considerable work at the faculty level in developing a first generation of assessment tools, in particular related to our co-operative education employer assessments and our capstone design programs, there remain a number of outcomes that require assessment tool development. These assessments must also be implemented effectively and cohesively across programs. Much of this work must be completed at the program level, led by outcomes co-ordinators representing each program. To support this very important role and to recognize the

significance of this service task over the Vision 2015 plan period, the faculty will provide departments a stipend for one course reduction for each outcome co-ordinator upon request. Outcomes co-ordinators will receive training in outcomes assessment, co-ordinated through the CEPA office, such that a community with expertise in this area evolves within the faculty.

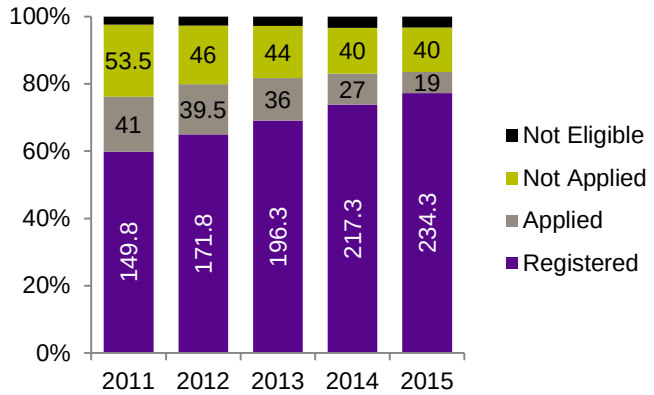
It is anticipated that the outcomes assessment process will be data intensive. Data will be generated in a variety of means in a distributed manner. Implementation of a system of data collection, manipulation and presentation will be essential for an effective and efficient ongoing process. The use of software for facilitating many of these functions should be explored and implemented under the direction of a contract IT support position working for engineering computing and very closely with the associate dean, CEPA and the outcomes co-ordinators.

♦ Increase the proportion of eligible faculty members who are licensed professional engineers

The teaching of engineering science and design by licensed professional engineers will continue to be a requirement of CEAB accreditation for the foreseeable future. Waterloo Engineering has dedicated significant energy and resources through the CEPA office to promote the licensure of faculty in all engineering departments. This concerted effort has resulted in a significant number of new registrations within the faculty during the last five years. It is anticipated that similar effort will be required during the Vision 2015 period to ensure that new faculty register when they become eligible and to continue to encourage existing non-registered faculty to register. The intensity of such efforts will vary by department, as determined by their current proportion of eligible faculty who are registered or have applied for their license (see Figure 5 in the faculty and staff section).

Figure 26 summarizes the current registration status of faculty in engineering disciplines (excluding the School of Architecture, the Conrad Business, Entrepreneurship and Technology Centre, and the Centre for Society, Technology and Values) and establishes targets for registration over the Vision 2015 period. Across the faculty, we expect growth from 78% to 86% of eligible faculty being registered or applied between 2011 and 2015.

Figure 26: Projected Annual Faculty Registration Status, 2011-2015



Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Production and review of outcomes data for program review
- Results from structured ongoing critical review of the outcomes assessment process
- Proportion of eligible faculty who are licensed professional engineers or have applied for license, by department

C. Graduate Studies

Since 2006, Waterloo Engineering graduate enrolment has increased by a remarkable 50%, from 1224 to 1829. The enrolment of PhD students, considered an important benchmark for any research-intensive university, has also seen impressive gains: from 510 in 2006 to 725 in 2011, for a 42% increase. Over this same period, graduate degrees granted have increased by 64.5%, from 372 to 612 and PhDs awarded have increased from 62 to 116, for an 87% increase. Additional graduate student data is provided below and in Appendix E, Graduate Studies Data.

Figure 27: Growth in Graduate Enrolment Over Time

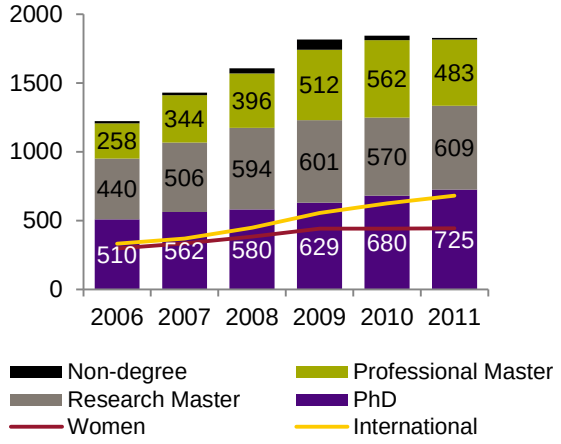
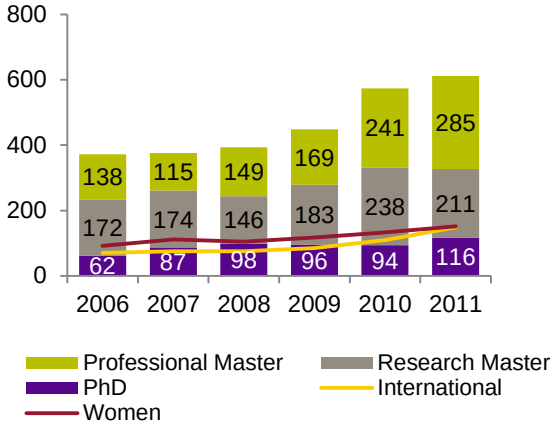


Figure 28: Growth in Graduate Degrees Granted Over Time



Waterloo Engineering's graduate student population is a rich mix of male and female domestic and international students involved in research and professional degrees in a broad spectrum of disciplines and interdisciplinary areas. As shown in Figure 29, 1829 students were enrolled in our graduate programs in fall 2011, 24% of whom were women and 37% of whom were international students. The student complement includes approximately 40% doctoral students, 33% research master's students, and 26% professional master's students. After accounting for part-time students, the fall 2011 full-time equivalent (FTE) enrolment was 1500. The 2010/11ratio of FTE graduate students to tenured/tenure-stream faculty members for the faculty as a whole (including non-degree students) was 6.1, of whom 2.5 were PhD students and 2.0 were research master's students, for a total of 4.5 research students. Departmental ratios (excluding CBET, with 20.4 professional master's students per tenured/tenure-stream faculty member in 2010/11) are presented in Figure 30.

Figure 29: Graduate Enrolment, Fall 2011

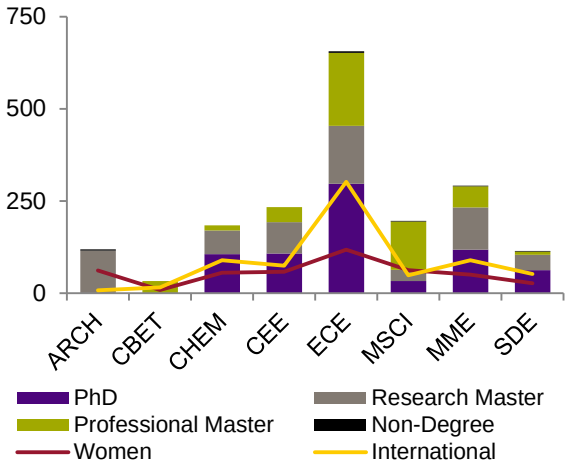
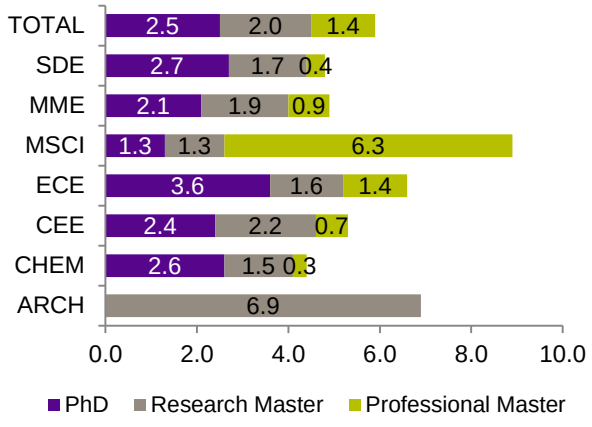


Figure 30: Graduate Students per T/TS Faculty, 2010/11



In 2011, Waterloo Engineering awarded 612 graduate degrees, of which 19% were PhDs and 25% were awarded to women. The breakdown by department is presented in Figure 31. In 2011, the number of PhD degrees granted exceeded 100 for the first time ever. The ratio of degrees granted per tenured/tenure-stream faculty member is as important a metric to track as the average FTE student enrolment per faculty member. Figure 32 shows this ratio for the faculty as a whole (2.4 degrees, including 0.5 PhDs and 1.3 total research degrees) and for each department excluding CBET, which awarded 21.5 professional master's degrees per tenured/tenure-stream faculty member in 2011.

Figure 31: Graduate Degrees Granted, 2011

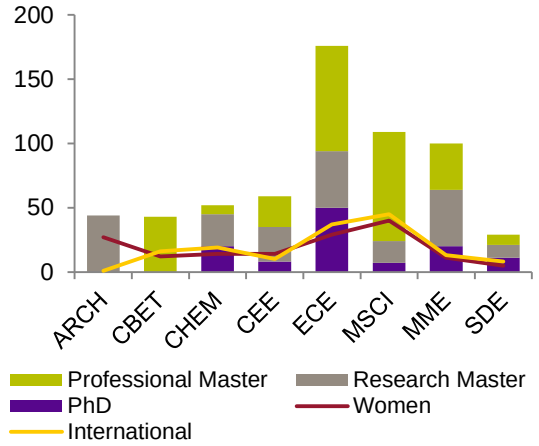
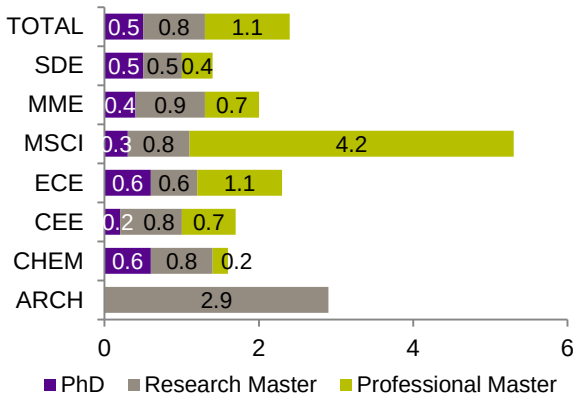


Figure 32: Graduate Degrees Granted per T/TS Faculty, 2011



Research student financial support comes from research supervisors in the form of graduate student researchships or assistantships, from departments through teaching assistantships, and from external and internal (University of Waterloo and Faculty of Engineering) scholarship programs. Waterloo Engineering PhD students are guaranteed minimum funding of $19,650 for four years, conditional on performance.

Figure 33: Graduate Fiscal Support, 2010/11: Engineering Research Master's Students

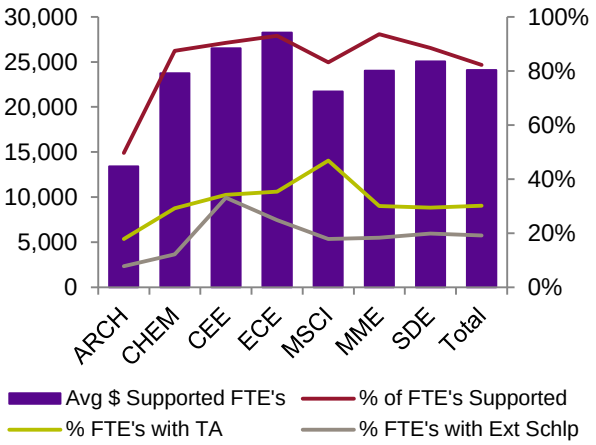
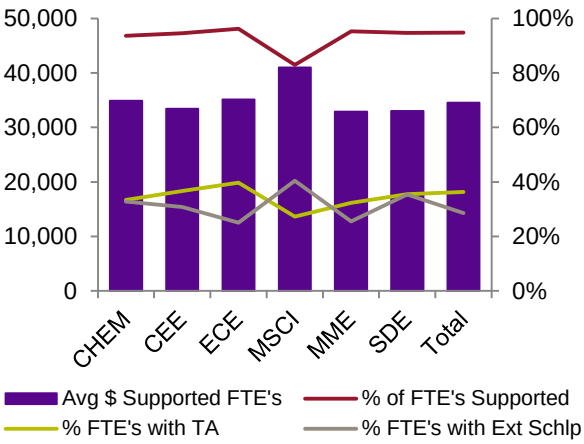


Figure 34: Graduate Fiscal Support, 2010/11: Engineering Doctoral Students



VISION 2015 GRADUATE STUDIES PLAN

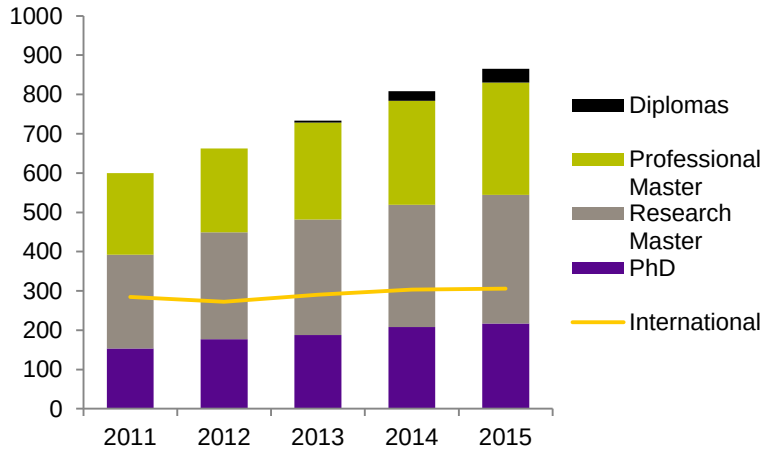
Graduate students count prominently among the outstanding people that our Vision 2015 plan commits to attract, engage and retain. This includes doctoral and research master's students who contribute significantly to our research priorities and professional master's students who represent an additional

opportunity for the faculty to make meaningful connections and contributions outside our campus. This plan commits to excellence in our graduate academic programs and services.

Goal C1: Strategically Increase Graduate Enrolment

Our Vision 2015 plan calls for graduate student intake to increase by 44%, from 599.5 in 2011 to 865.4 in 2015. This plan for continued growth results from projected increases to our faculty complement, increased research activity, and the introduction of new graduate programs. The increase in intake is targeted largely to Canadian and permanent resident students, resulting in a decrease in the international proportion of graduate students, from the current 47% to about 35%. This growth plan will require a significant expansion of the pool of graduate studies applicants to ensure we meet our targets with high-quality students. Furthermore, we must review the balance of graduate students to postdoctoral fellows (see Figures 7 and 8) to ensure that postdoctoral fellows are not filling roles that might better be held by graduate students and that – as described in more detail in Goal C4 below – the number of postdoctoral fellows is not negatively impacting graduate student funding. Of course, some postdoctoral fellows are required; however, we are committed foremost to educating future engineers, PhDs and academics.

Figure 35: Projected Annual Graduate Intake, 2011-2015



ARCH	40.0	50.0	50.0	50.0	50.0
CBET	31.0	45.0	64.0	85.5	97.0
CHEM	73.9	67.0	74.0	80.0	87.3
CEE	80.5	85.0	90.0	100.0	100.0
ECE	195.0	204.0	221.0	235.0	246.0
MSCI	51.8	61.4	68.1	77.0	88.1
MME	93.4	112.0	123.0	134.0	145.0
SDE	33.9	38.0	43.0	47.0	52.0
TOTAL	599.5	662.4	733.1	808.5	865.4

- Introduce new graduate programs in areas of strength

  Over the Vision 2015 plan period, the Department of Mechanical & Mechatronics Engineering will introduce a Master of Engineering in Mechatronics and the Conrad Business, Entrepreneurship and Technology Centre (CBET) will introduce a Master of Business, Intrapreneurship and Innovation and a Master of Product Management.

- Enhance the professional master's program

  Many of our academic units are revising the structure and delivery of their professional master's programs to facilitate access by working professionals, giving consideration to online, evening/weekend and short-duration courses. Of note, mechanical and mechatronics engineering is

expanding its MEng program to include live streaming of professional development courses for working engineers across Canada.

The University of Waterloo and Waterloo Region are recognized as a technology hub and centre of entrepreneurial activities. Waterloo Engineering will provide our graduates with opportunities to formally develop and nurture their entrepreneurial, business and commercialization skills. Beginning in 2013, CBET will begin offering a Diploma in Advanced Management to students in Master of Engineering programs.

- Develop and implement a strategic recruitment plan for graduate studies

  As indicated above, we must expand the pool of prospective graduate students applying to Waterloo Engineering. A graduate student recruitment specialist will be added to the engineering advancement team to work closely with the engineering graduate studies office (EGSO) and academic units to develop and implement a strategic graduate student recruitment plan. The recruitment specialist will co-ordinate and enhance graduate student recruitment initiatives (print and electronic materials, advertising, events, etc.) to better match the dynamic needs of potential students and supervisors. The recruitment plan will include targeted initiatives aimed at identified groups, including academically strong domestic students and women students. Opportunities for strategic enhancements to international graduate student recruitment are outlined in Section G, Internationalization.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Undergraduate student intake, by gender and visa status, and performance to target
- Total graduate students by program, gender and visa status
- Ratio of graduate students to tenured/tenure-stream faculty, by program
- Number of full- and part-time students in professional programs
- Total graduate degrees awarded by program, gender and visa status
- Ratio of graduate degrees awarded to tenured/tenure-stream faculty, by program
- Total graduate student applications and related selectivity and yield rates, to be developed
- Percent of enrolled graduate students that are major award holders, by visa status
- Number of Waterloo Engineering undergraduates entering Waterloo Engineering graduate studies
- Balance of postdoctoral fellows to graduate students, by department

Goal C2: Improve Graduate Operations and Service

- Provide excellent service to all clients

  EGSO clients include prospective graduate students, current graduate students, faculty and staff, all of whom have different needs and expectations. The addition of one staff position in the EGSO, along with an accompanying reorganization of tasks among staff, will provide a central service contact in the EGSO and will allow the office to meet its client commitments (the volume of which has grown as a direct result of recent graduate program growth) in a timely manner.

- Improve the quality and delivery of information

  The EGSO is responsible for providing information about the guidelines, regulations, procedures and policies that govern graduate studies. This service is of increasing importance as the number of faculty and graduate students grows and their needs become more complex. Efforts to improve the quality of information disseminated and the mode of delivery will begin with a long-overdue update to the engineering graduate studies manual, which will also be made available online. EGSO staff will then work with departments to ensure regular updates of the material on an ongoing basis. A study of information flow will also be initiated to identify where changes can be made to simplify and streamline processes.

- Ensure timely processing of applications and admission correspondence

  The EGSO will work closely with the departments and the central graduate studies office to implement a monitoring strategy to ensure timely processing of applications and regular communications with prospective students during all stages of the application process. A review of the information flow at various levels across the campus will be initiated, with the objective of improving functionality and reducing duplication. This review will be concurrent with the ongoing work to improve the current automated graduate application system for all users.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Application processing times
- Client satisfaction surveys
- Annual review of web pages and graduate student manual for timeliness and accuracy

Goal C3: Improve the Graduate Program

- Foster consistently high quality graduate student supervision

  The EGSO will work with our academic units to establish an environment that fosters and rewards excellence in graduate student supervision. Academic units are encouraged to establish representative student committees through which graduate students can express their concerns, ask questions and seek information important to them. Working with the new associate dean, teaching (see Section E) and the Centre for Teaching Excellence, the associate dean, graduate studies will develop and promote workshops, panel discussions and information sessions about graduate student supervision for all engineering faculty. Work will also continue on the development of a faculty-specific document outlining expectations and best practices for graduate supervision. To reward faculty members who are excellent graduate supervisors, and to affirm the importance Waterloo Engineering places on graduate student supervision, a Waterloo Engineering award of excellence in graduate student supervision will be introduced in 2012.

- Improve graduate course offerings

  The faculty will introduce a mandatory research methodologies course to enhance our graduate programs. Some departments are already offering such a course, and a mechanism will be established to implement it across the faculty. Additionally, most departments are planning other enhancements to their graduate course offerings, in terms of quantity and delivery. The work of the new associate dean, teaching, should also lead to improvements in graduate courses and to increased availability of related measures to facilitate ongoing quality improvement.

- Increase the academic rigour of graduate programs

  Engineering will adopt a new approach for conducting the PhD comprehensive exam and evaluation of the research proposal by separating these assessments into two distinct phases. The associate dean, graduate studies will chair a task force mandated to devise a mechanism to implement this change. Additionally, more frequent meetings with PhD supervisory committees will be encouraged to ensure that students are on track with their research and have an opportunity to benefit from supervisory committee input on their program. Establishing an early relationship with the supervisory committee is anticipated to reduce delays in meeting the comprehensive milestone and enhance the rigour of the exam. Furthermore, to facilitate timely degree completion overall, the EGSO will consider more strict enforcement of deadlines for the completion of comprehensive exams as well as the adoption of completion dates for required course work.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Number of engineering faculty earning internal and external awards for supervision
- Degree completion data, including time to complete various milestones and time to withdraw

- Comprehensive exam results
- Total number of graduate courses offered by each department
- Analysis of graduate course evaluations

Goal C4: Enhance the Graduate Student Experience

♦ Evaluate current graduate student funding

The faculty remains committed to guaranteed minimum funding and the regular assessment of these levels. However, more information is needed to determine if our graduate student funding is sufficient and competitive. To that end, a study of Waterloo Engineering graduate student funding in comparison with our peers will be conducted to understand this situation fully. The funding we provide and the offers made in our letters of acceptance will be carefully reviewed. Additionally, our analysis of the balance of postdoctoral fellows to graduate students, discussed above in Goal C1, must consider whether the current balance is affecting our capacity to adequately fund graduate students. By studying the balance between the share of research expenditures going to support graduate students and the share being used to hire postdoctoral fellows, we can gain insight into whether funds that might be used to support graduate students are being used otherwise. The EGSO will also work with the engineering advancement office to develop a strong case for philanthropic support to establish financial awards for graduate students.

♦ Attend to graduate student space needs

The current Waterloo Engineering space plan identifies the need for two new buildings (see Section IV, Supporting the Plan). The resulting additional space will facilitate ongoing enhancements to the quantity and quality of space available to graduate students and will support the provision of world-class facilities to meet research needs. Furthermore, to address the current lack of dedicated work space on campus for professional master's students, a computer lab will be developed for their use. The lab will include computing stations as well as space for collaborative work and project meetings.

♦ Establish a graduate student society in engineering

In addition to ensuring the continued activity of graduate student associations in our academic units, the creation of a Waterloo Engineering graduate student association will also be explored. A faculty-wide association would facilitate information sharing between graduate students and the faculty and could also help establish a broader community of graduate students across disciplines and programs.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Results of the study of graduate student funding
- Measures of research expenditures used to support postdoctoral fellows and graduate students, by department, to be developed
- Participation in Waterloo Engineering graduate studies association
- Analysis of engineering student response to the Graduate and Professional Student Survey

D. Research

Waterloo Engineering has experienced unprecedented growth in externally-funded research in recent years. As detailed in Figure 36, our research funding increased from $32.2 million to $60.4 million or by 87.6% from 2005/06 to 2010/11. While some of this growth results from our increased faculty complement over the same period, increases in research funding have outpaced faculty growth. This is demonstrated by the 59% growth in average research funds per tenured/tenure-stream faculty shown in Figure 37.

Figure 36: Research Funds by Sector ($millions) Over Time

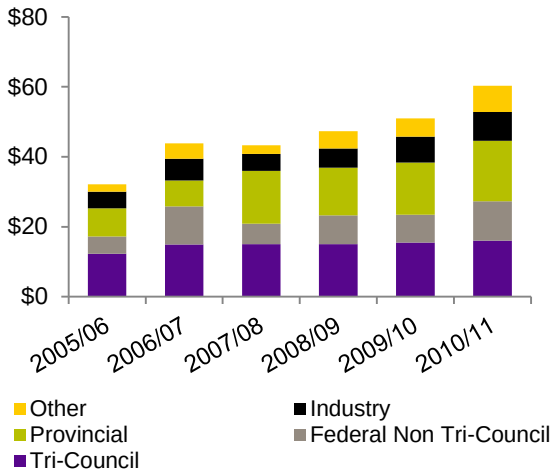


Figure 37: Average Research Funds per T/TS Faculty Member($thousands) Over Time

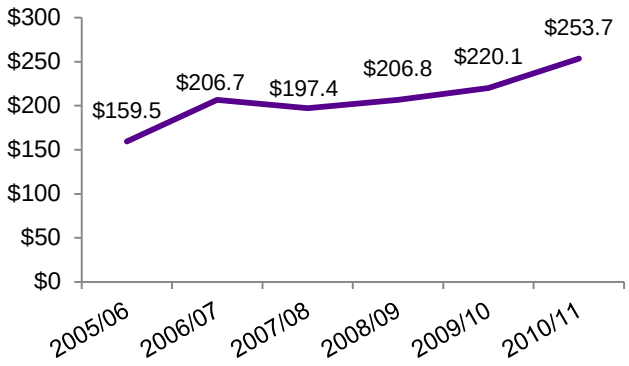
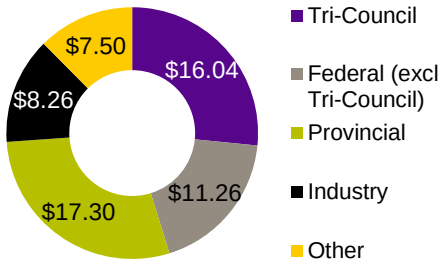
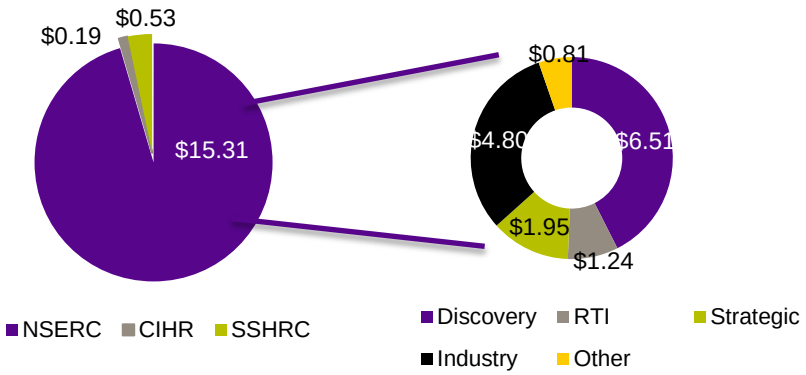


Figure 38: Research Funds by Sector ($millions), 2010/11



In 2010/11, Waterloo Engineering external research funding reached an all-time high of $60.36 million. As shown in Figures 38 and 39 and detailed in Appendix F, 45% of this funding came from the federal government (including 27% from the federal tri-council granting agencies) and 29% from the provincial government. Industry funding accounted for 14% of all research funding in 2010/11.

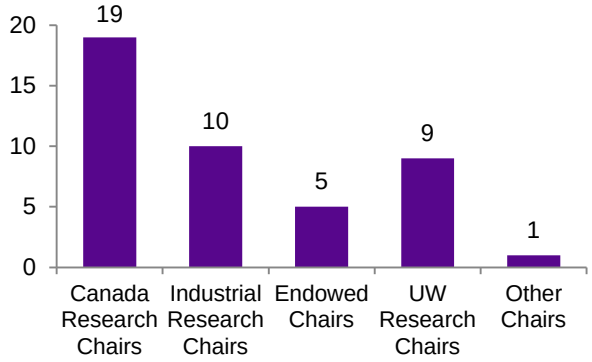
Figure 39: Tri-Council Funding and NSERC Funding by Type ($millions), 2010/11



Of course, funding cannot be our sole measure of research success. Measures of scholarly output and research impact are also required. At the time of publishing this plan, a university-level working group has been struck to develop bibliometric measurement tools and indicators for use across the institution. Future annual updates to this plan will include such measures.

Another indicator of our research success is the recognition earned by our faculty members for research excellence. Currently, 44 Waterloo Engineering faculty members (over 17% of all faculty) hold major research chairs. This includes 10 Tier 1 Canada Research Chairs, nine Tier 2 Canada Research Chairs, nine NSERC Industrial Research Chairs, one NSERC Design Chair, five endowed chairs, nine University Research Chairs and one other chair. See Appendix F, Research Data for a complete list of chair holders.

Figure 40: Research Chair Holders, 2011



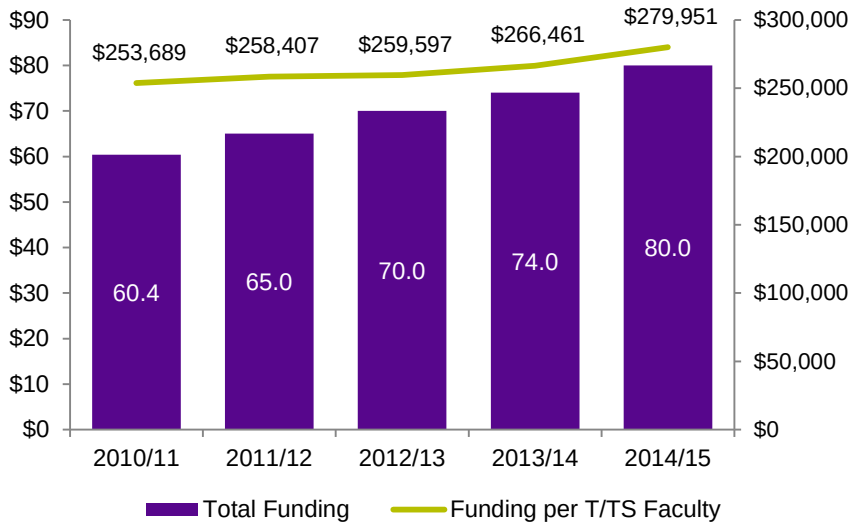
VISION 2015 RESEARCH PLAN

Research is in and of itself a key priority for Waterloo Engineering to achieve its Vision 2015 aspiration. Furthermore, to carry the research momentum and growth of the past six years forward into Vision 2015, we must also bring the other Vision 2015 key priorities (attracting, engaging and retaining outstanding people; committing to service excellence; building connections and promoting collaboration; fostering innovation; providing world-class facilities) to bear in our pursuit of research excellence.

Goal D1: Increase Research Funding

Our Vision 2015 projection for external research funding (see Figure 41) calls for an increase of 33% in total funding and 10% in average funding per tenured/tenure-stream faculty member over the plan period. It should be acknowledged that the departmental research funding projections included in the implementation agreements (Section V) total $9-10 million less than these targets annually. However, we are certain that the faculty-level targets provided in Figure 41 are achievable, given our projected faculty growth and the strategies to support research growth outlined below.

Figure 41: Projected Annual Research Funding ($millions), 2010/11-2014/15



Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Overall research funding, by department
- Tri-council funding performance relative to peers

Goal D2: Establish a Shared Commitment to Research Excellence

While our faculty complement and research activity have grown significantly in the past six years, the number of principal investigators who take an active role in attracting close to 70% of the research funding has changed very little. It is essential that more faculty members share in the commitment to make Waterloo Engineering the destination of choice for world-class research. Initiatives will be implemented that provide the necessary support to allow all faculty members to take a more active role in building sustainable research programs that connect with industry, leverage research funds, and increase visibility through high impact journal papers and conference presentations.

♦ Support and motivate increased research activity

Waterloo Engineering's academic units will seek mechanisms to motivate all of their faculty members to take an active role in research. For example, departments should return a minimum of 25% of their share of research overhead to faculty members for their use within their research program. We will also investigate, during the Vision 2015 plan period, the possibility of allowing researchers to charge a personal stipend to their overhead, up to a specified cap.

♦ Support the development of faculty members as researchers

The ERO will identify, promote and develop workshops on effective proposal preparation and will host information sessions with external funding agency representatives.

♦ Develop stronger ties with industry

Industrial collaboration continues to be one of our strengths. Working with industry increases the relevance of our research, enhances technology transfer and improves the training environment for students. Over the course of the Vision 2015 plan period, three industrial relations officer positions will be added (one in electrical & computer engineering, one in chemical engineering also working with management sciences, and one in the engineering research office working with departments that do not have an industrial relations officer,) to work directly with our academic units to develop new industrial partnerships and to maintain existing relationships. The ERO will work with departments, centres/institutes and university offices to co-ordinate industrial relations activities and will offer programs aimed at bringing together industry and researchers, such as the annual WE Innovate research showcase, lunch hour seminars, and public lectures.

♦ Increase international collaboration

While we are successful at attracting research funding from outside Canada, there are opportunities for more professors to be engaged with international organizations. The development of an international research strategy for engineering is included in Section G, Internationalization.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Research funding per tenured/tenure-stream faculty member, by department
- Number of faculty members participating in ERO-hosted workshops and information sessions
- Proportion of research funding from industrial sources, by department
- Number of industrial research contracts, by department
- Average research contracts per tenured/tenure-stream faculty member
- Bibliometric indicators of research activity and impact, to be developed
- Proportion of research funding from international sources
- Bibliometric indicators of international collaboration, to be developed

Goal D3: Eliminate Barriers to Research Success

Many factors can discourage researchers from increasing their research activity. We must work to eliminate potential barriers to ensure that all faculty members are able to reach their full potential.

- Enable a culture of collaboration and co-operation

  A contributing factor in our recent research successes is the leadership shown by centres and institutes in promoting interdisciplinary research. Existing centres and institutes (see Appendix A) have been instrumental in co-ordinating and developing large research initiatives such as Canada Foundation for Innovation and Ontario Research Fund grants. The recently approved Centre for Bioengineering and Biotechnology is expected to result in increased funding from the Canadian Institutes of Health Research. Clear reporting protocols and metrics for support must be established to ensure the continued success of these major centres and institutes.

  A number of academic units are establishing the position of associate chair for research during the Vision 2015 plan period. This new administrative position will help drive their academic units' research activity forward and will co-ordinate strategies and communications among the faculty members in their unit, the various offices across campus that support research, external funding agencies and industry partners.

  The technical research groups in each department represent an underutilized opportunity for research collaboration. We will work with all stakeholders to identify best practices for technical research groups to function as vehicles for collaboration. Technical writing support services will be provided through the ERO to encourage these groups to generate collaborative research proposals for major funding programs.

  A 2012 pilot project will introduce a series of monthly social events (pub nights, coffee houses, etc.) for faculty members, anchored by a speaker or similar feature, to provide opportunities for faculty to build personal networks across research areas and academic units.

- Improve client service

  The ERO will clearly define the activities and responsibilities of all offices and individuals involved in the research administrative process and will work to ensure faculty members know where to access the services they need. Reasonable expectations will be established and a scorecard evaluation system will be developed to ensure that a constructive feedback loop exists. A significant investment in research finance support will provide additional expertise to support this important facet of research administration. Automated process improvements in the engineering machine shop, along with the addition of a third CNC machining centre, will also improve the timeliness of some services used by engineering researchers (as well as students and staff).

- Improve access to resources

  Maximizing the utilization of our resources will help increase research activity. We will work to ensure that all researchers are aware of the resources available to support research, and that access is provided to these resources. We will establish a framework for enabling shared access to equipment in a fair and equitable manner for all stakeholders. Under the leadership of the ERO, and in collaboration with all departments, a Faculty of Engineering asset inventory and access system will be created to facilitate faculty and graduate student access to shared equipment. Guidelines for reasonable access to resources will be established, including best practices for user fee recovery.

- Improve the efficacy of communications

  The improved internal communications tools described in the faculty and staff section above will be used to more clearly and promptly communicate research opportunities to all faculty members.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Number of faculty members involved in interdisciplinary projects
- Number of major proposals prepared by major centres/institutes and technical groups, and the success thereof
- Attendance at faculty social events
- Report cards on service quality
- Faculty satisfaction surveys
- Number of people trained to use shared equipment

Goal D4: Celebrate Research Excellence

Recognition can be an effective motivator for high performance. Waterloo Engineering celebrates research achievements with our annual engineering research awards; however, more can be done.

♦ Recognize research excellence

Significant effort will be made to increase the number and quality of nominations to external research-oriented awards and fellowships. We will also establish new awards that expand the internal research awards program, including the introduction of a Faculty of Engineering lifetime research achievement award.

♦ Increase public awareness of research strengths and achievements

Over the Vision 2015 plan period, awareness of engineering research stories will be increased through traditional and emerging media channels. The ERO will actively assist in identifying research achievements and encouraging faculty members to share their research stories and act as media contacts. The engineering research website will be updated regularly with fresh and engaging content about our researchers' achievements.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Number of internal award winners
- Number of nominations for external awards and fellowships and the success thereof
- Media coverage of Waterloo Engineering research stories

E. Teaching

We cannot meet our commitment to academic excellence or fully engage undergraduate and graduate students without quality teaching. Each instructor at Waterloo Engineering directly influences how students learn: through course design, content delivery, student engagement and outcome assessment.

Goal E1: Enhance Support for Teaching at the Faculty Level

♦ Establish an associate dean, teaching in the Faculty of Engineering

Waterloo Engineering will add the administrative position of associate dean, teaching to provide leadership in teaching within engineering to improve the depth, effectiveness and efficiency of student learning. The associate dean will work closely with Waterloo's Centre for Teaching Excellence (CTE) to bring its expertise to the benefit of engineering and will develop complementary programs and initiatives specific to engineering.

We are pleased that Professor Gordon Stubley, formerly the inaugural teaching chair in Waterloo's Department of Mechanical & Mechatronics Engineering and an exceptional teacher and mentor himself, will become the first individual to hold this position on May 1, 2012.

- Establish a committee of department representatives dedicated to teaching

  The associate dean will establish a community of practice with interested members from across our academic units. This might include teaching chairs, teaching quality co-ordinators, and other individuals who will work with the associate dean to share best practices in teaching and learning, to support efforts to improve teaching quality, and to foster and promote teaching innovations.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Summary of annual initiatives and programs, provided by the associate dean
- Engineering participation on CTE committees and groups

Goal E2: Contribute to the Development of Faculty Members and TAs as Teachers

- Establish minimum teaching development expectations for all new faculty members

  Beginning in March 2012, all new faculty members joining Waterloo Engineering will meet with staff in Waterloo's CTE to develop an individual learning about teaching plan. The subsequent completion of a series of four workshops (focused on understanding learners, classroom dynamics and engagement, learning assessment, and course design) will be mandatory for those without equivalent training or demonstrated expertise.

- Promote opportunities for all instructors to learn more about teaching over their career

  Through the associate dean, teaching and departmental representatives, all Waterloo Engineering instructors will be encouraged to consider a variety of opportunities related to teaching development. This might include professional conferences, CTE workshops, networks and learning communities, or programs mounted within engineering. The ExpecTAtions training program for TAs will also be reviewed and rejuvenated, including more involvement by departments, with an aim to improve the quality of TA training for the TAs and for the students they will teach.

- Provide mentorship in teaching

  The associate dean, teaching will provide confidential mentoring to faculty members who have an interest in improving their teaching and will work with academic unit leadership to connect interested faculty members with mentors and model teachers in their area.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Engineering instructor participation in CTE programs
- Teaching-related initiatives offered in engineering and the participation therein
- Number of faculty members participating in teaching mentorship activities

Goal E3: Affirm the Importance of Teaching

As outlined in the faculty and staff section, above, all Waterloo Engineering faculty members are expected to participate fully in the life of their academic unit and the faculty, committing to the pursuit of excellence in research, teaching and service. All of these functions are essential to the success of each individual faculty member and to the overall excellence of the faculty.

- Include an assessment of teaching potential when hiring new faculty

  Beginning in 2012, all applicants for Waterloo Engineering faculty positions will be required to give a seminar or teach a class so that their teaching potential may be assessed as part of the selection process.

- Measure teaching quality and outcomes for individual and institutional improvement

  The associate dean will lead efforts to improve teaching assessment and feedback. This will include efforts to make better use of course critique results to build a useful set of indicators for individuals, academic units and the faculty as a whole and to enhance students' understanding of the value and use of these assessments. It might also involve the enhancement of existing critiques or the development of additional measures. The associate dean will also work with the committee of undergraduate program outcomes co-ordinators to contribute to the ongoing enhancement of program outcomes as they relate to and are impacted by teaching quality.

- Recognize and reward excellence in teaching

  Efforts will be intensified to identify excellent teachers to be nominated for internal and external awards, to act as models and mentors for their colleagues, and to serve as members of peer networks and communities of practice.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Assessment of teaching quality in applicants to faculty positions
- Course critique results
- Number of engineering nominations to teaching awards and the success rate thereof
- Engineering faculty participation in teaching-related networks and communities of practice

F. Outreach

Over the past 20 years Waterloo Engineering has engaged in significant outreach programming, originally led by individual faculty members or student/staff groups. In September 2008, the associate dean, outreach portfolio was established to consolidate and oversee outreach and women in engineering programming for engineering. Our flagship outreach program is Engineering Science Quest (ESQ), established by the Waterloo faculties of science and engineering in 1991. Typically 2,200 children in Grades 1 to 9 attend hands-on ESQ summer campus every summer (200 at rural and aboriginal satellite locations). ESQ also delivers about 250 in-school workshops annually. In 2008 we began to promote the FIRST Lego League (FLL) locally, connecting engineering student, faculty and staff mentors with elementary schools interested in starting a FLL team for students in Grades 4 to 8. To date we have helped 17 local schools set up FLL teams (170 participants) and we hosted a regional FLL competition in 2010 and 2011. Our outreach office also offers a number of open house and community events, including the Engineering Explorations open house for students in Grades 6 to 8 and their parents. Established in 1992, this event attracted 750 people in 2011. In 2010, the Designing the Future symposium was introduced to showcase top final-year engineering design projects to the local community, pre-university students and alumni.

The underlying goals of all our outreach programming are to increase science, engineering and technology literacy in the world and provide an appreciation for the role these professions play in our daily lives; to increase understanding and awareness of what it means to study engineering/science at a post-secondary level; and to provide accessible programming, so that all interested pre-university students can attend our programs despite financial, geographical, psychological and/or physical barriers.

VISION 2015 OUTREACH PLAN

At its core, our outreach program is about building connections with external communities and strengthening collaborations with internal partners. Outreach initiatives also directly support our efforts to attract, engage and retain outstanding people by introducing prospective students to Waterloo Engineering and by engaging current students, faculty and staff in the life of the Faculty of Engineering through involvement in our outreach programs.

Goal F1: Expand the Scope of Waterloo Engineering Outreach Programs

- Expand outreach activities to include high school programming

Our traditional outreach programs have targeted elementary school participants. Over the Vision 2015 plan period we will include high school participants through workshops offered to high schools and through increased opportunities, including weekend/summer programming and a leadership development program, for high school students to visit Waterloo Engineering. All programs will highlight our strengths, including research, student design projects and student teams. Entrepreneurship and innovation will also be emphasized as they continue to be hallmarks of the Waterloo Engineering program. Table 6 provides five-year targets for the engagement of high school students.

Table 6: High School Program Participation Targets, 2011-2015

	2011	2012	2013	2014	2015
Campus Visits	80	100	140	160	200
Workshops/Weekend Program	120	170	220	270	320
Leadership Program		20	40	50	50
Target # of High School Participants	200	290	400	490	570

- Increase the breadth of Kitchener-Waterloo school engagement

  Although ESQ runs over 200 workshops in schools annually, a small percentage of elementary schools in the Kitchener-Waterloo region participate (currently 13, or 14% of area schools). We aim to increase the number of local elementary schools engaged to 33 (or 37% of schools) over the Vision 2015 plan period, as shown in Table 7. We will also continue to endorse and promote local schools' participation in the FIRST Lego League (FLL) and will continue to host the annual regional FLL tournament on campus.

Table 7: ESQ Workshop Participation Targets, 2011-2015

	2011	2012	2013	2014	2015
Target # of K-W Schools Reached	13	18	23	28	33

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- High school student participation in outreach programs and performance to target
- Number of Kitchener-Waterloo schools participating in ESQ workshops and performance to target
- Number of teams competing at the regional FIRST Lego League tournament
- Other assessment tools and benchmarks, to be developed by the outreach office and its partners to measure the impact and value of different programs

Goal F2: Enhance the Waterloo Engineering Community through Participation in Outreach

- Engage current Waterloo Engineering community members in outreach activities

  The Waterloo Engineering outreach office will provide meaningful opportunities and training to allow undergraduate and graduate students, faculty, and staff to enhance their experience at Waterloo through participation in outreach activities. Such participation will provide opportunities to augment communication, curriculum development, teaching and leadership skills.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Participation by Waterloo Engineering students, faculty and staff in outreach programs

DIVERSITY

Waterloo Engineering established a women in engineering (WiE) committee in 1991 with a mandate to address the needs of female students and faculty in Waterloo Engineering and to develop strategies to increase the number of women in engineering through proactive programming. Following the incorporation of WiE initiatives in the mandate of the associate dean, outreach in 2008, the WiE committee has continued to be very active with strong engagement from all members. Figures 42 and 43 show the current participation levels of women in Waterloo's engineering and architecture programs. Ongoing outreach programming aimed at female participants includes Guides Badge Day, started in 2009 at Waterloo Engineering to provide Girl Guides with an opportunity to earn their engineering badges; GoEngGirl, a province-wide program for girls in Grades 7 to 10 offered since 2005; and most recently CATALYST, a program Waterloo Engineering initiated in 2011 to provide female Grade 11 students a more in-depth exposure to the engineering profession and university student life.

Figure 42: Women in Engineering Programs, 2011

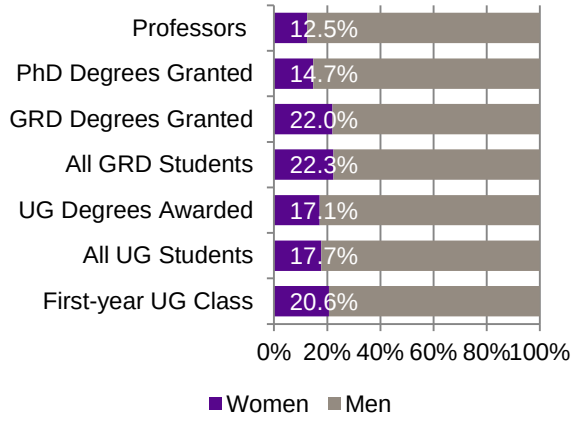
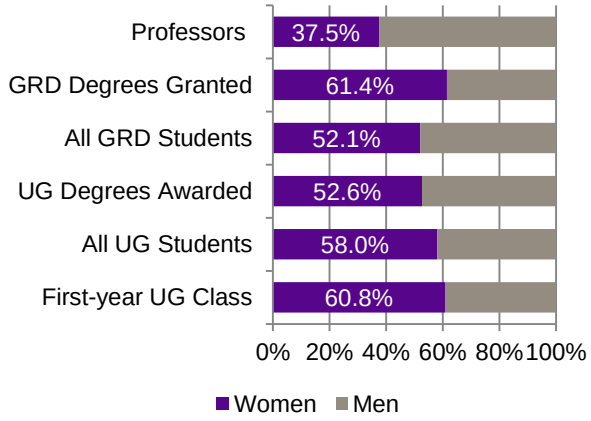


Figure 43: Women in Architecture Programs, 2011



While the participation of women in engineering remains a key concern for Waterloo Engineering (and indeed for all schools of engineering in Canada), we must be mindful that a much more broad range of individuals and groups may identify with under-represented elements of diversity across engineering. Elements of diversity currently falling into this category include, but are not limited to, gender identity, sexual orientation, culture, and place of origin. To better address the needs of all under-represented groups, we have recently expanded the mandate of the associate dean, outreach to include diversity and inclusivity in this broad sense.

Taking steps to actively support diversity and inclusivity within our faculty will enable the recruitment and retention of a more diverse faculty, staff and student base. As outlined in the Professional Engineers Ontario Position Paper on Diversity and Equity (May 2007): "Increasing diversity through representation of minority and under-represented groups is more than a question of fairness for organizations. It helps them do their work better and is essential to understanding and voicing concerns that are central to the organization's mandate. In practical terms, a homogeneous organization is unlikely to draw upon the fullest possible range of skills and support from members and staff, and/or meet the needs of a diverse clientele."

Goal F3: Increase the Participation of Women in Engineering at Waterloo

- Increase the confirmation rates of offers made to female undergraduate engineering applicants

  Confirmation rates on admission offers to engineering programs at Waterloo are historically lower for female applicants than males. In 2010, the female offer confirmation rate was 32% compared to the male confirmation rate of 43%. Over the course of the Vision 2015 plan period, we aim to bring the confirmation rate of women applicants to a level commensurate with their male

counterparts (as outlined in Table 8). To meet this goal, the outreach office will work very closely with engineering's marketing and undergraduate recruitment co-ordinator to develop and support confirmation strategies targeted to women applicants, including the CATALYST event described above and other targeted women applicant events.

Table 8: Female Engineering Undergraduate Confirmation Targets, 2011-2015

	2011	2012	2013	2014	2015
Target Confirmation Rate of Undergraduate Women	35%	37%	40%	43%	45%

- Establish best practices related to the recruitment of women faculty

  The associate dean, outreach will work to identify best practices around faculty hiring to ensure proactive recruitment methods are used to attract a diverse applicant pool to apply for Waterloo Engineering faculty positions. The associate dean will engage with the department advisory committees on appointments to ensure such information is disseminated to the appropriate hiring committee each time a new position is approved for advertising.

- Develop a better understanding of the experience of women in engineering at Waterloo

  Despite significant effort made over the years to increase the participation of women in our programs, to date little emphasis has been placed on learning about their experiences while at Waterloo. The undergraduate student engagement survey (described in the undergraduate studies section above) will be analyzed by gender to track the experiences of female engineering students at Waterloo relative to their male counterparts. This will provide baseline data as well as insight into areas that need to be improved, perhaps through future WiE programming. Following this survey, opportunities will be sought to gain similar feedback from women graduate students, faculty and staff.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Participation of women in engineering programs at all levels (as identified in Figure 42, above)
- Confirmation rate of undergraduate engineering admission offers to women applicants and performance to target
- Number of women applicants to faculty positions in each engineering department
- Analysis of the student engagement study results by gender

Goal F4: Build an Inclusive Atmosphere within Waterloo Engineering

Waterloo Engineering is committed to providing an environment in which all individuals, including those who identify with under-represented groups, can have a positive experience.

- Establish a framework to report and respond to issues of diversity and inclusivity

  The associate dean, outreach will chair a task force mandated to create visible channels in Waterloo Engineering through which students, faculty and staff can report concerns regarding diversity and inclusivity and through which appropriate responses to such concerns can be made. This group will also identify and promote mechanisms for Waterloo Engineering community members to receive support related to discrimination and harassment.

- Support individuals and groups that may identify with under-represented elements of diversity

  The task force will recommend initiatives to provide more visibility to under-represented individuals and groups and to reaffirm the value their inclusion brings to the faculty. Efforts will also be made to

build an understanding among all engineering faculty, staff and students of the benefits of diversity and what they as individuals can do to promote inclusivity within Waterloo Engineering.

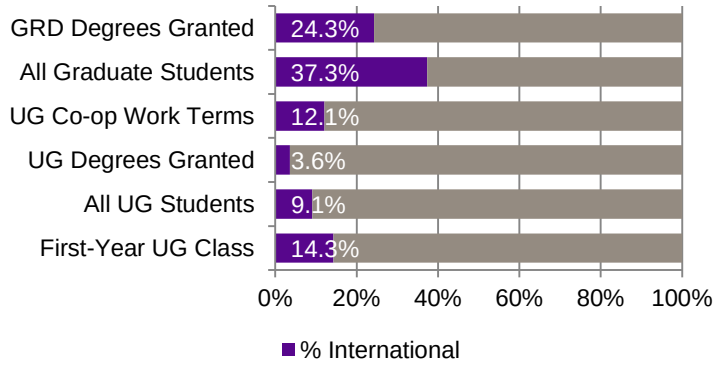
Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Development of reporting, response and support mechanisms related to diversity and inclusivity
- Feedback from individuals and groups raising concerns and/or receiving support
- Participation in faculty-wide programming aimed at increasing the visibility and inclusivity of under-represented groups

G. Internationalization

In 2005, when we initiated our Vision 2010 planning process, the enrolment of international undergraduate students was just 2.5%. We have successfully increased that proportion to 9% of our undergraduate student body and 14% of undergraduate student admissions in 2011. This increase results from additional international positions created as a result of the Vision 2010 plan and from the two programs (civil engineering and chemical engineering) that we have offered at the university's UAE campus since its founding in 2009.

Figure 44: International Student Metrics, 2011



In recent years, between 10% and 12% of our co-op work terms have been outside of Canada and an increasing number of our undergraduate students (96, in 2011) are participating in an international exchange. Another 205 incoming exchange students joined Waterloo Engineering in 2011 from partner institutions. Our exchange program, shown by a 2009 Engineers Canada study to be the largest in Canada, currently includes agreements with 26 countries (Australia, Austria, China, Czech Republic, Denmark, England, Finland, France, Germany, Holland, Hong Kong, India, Ireland, Italy, Japan, Mexico, Norway, Poland, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey and Wales).

Figure 45: Waterloo Engineering Exchange Program Participation Over Time

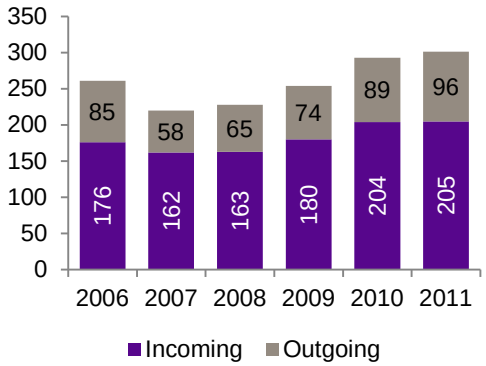
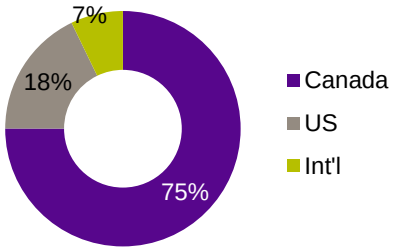


Figure 46: Industry Funding by Source ($millions), 2010/11



In 2010/11, a quarter of the $8.25 million received in industrial research funding came from outside Canada, with just over 7% from outside of North America.

VISION 2015 INTERNATIONALIZATION PLAN

Our Vision 2015 aspiration is clear: to be a truly world-class school of engineering. To meet this goal, we need to bring Waterloo Engineering to the world and bring the world to Waterloo Engineering. In the pursuit of our Vision 2015 key priority to build connections and promote collaboration, it is insufficient to focus on local connections among members of the faculty or university community, or even with colleagues and partners in Canada. We must seek to enhance our global relationships at all levels.

This is not simply an act of self-promotion; rather, it is necessary for the education of engineers today. The engineer of the future must be able to work on geographically- and culturally-diverse teams, must understand the international context they will work in, and must be prepared to solve increasingly complex global problems. Given our fundamental commitment to real-world learning, it is not enough to address these issues in our curriculum. We must bring diverse, global perspectives to our classrooms and labs and provide opportunities for our students to gain international experience.

Goal G1: Increase International Undergraduate Enrolment

- Admit more international students in undergraduate programs

  As outlined in Figure 23 in the undergraduate studies section, by the end of the Vision 2015 plan period approximately 18% of undergraduate students admitted to Waterloo Engineering will be international. This will result from our two programs in the UAE reaching steady-state intake of 60 students each (the majority of whom are expected to be international students) and from an increase of approximately 25 undergraduate spaces targeted to international students on our main campus. Many of these are additional spaces and some result from a strategic decision by our largest department, electrical & computer engineering, to increase its proportion of international students to better reflect the mix of applicants seeking admission to its programs in recent years.

Table 9: International Undergraduate Targets, 2011-2015

	2011	2012	2013	2014	2015
International Undergraduate Admissions Target	222	250	270	300	300

- Enhance international recruitment efforts

  A number of permanent staff and co-op students located in Dubai work extensively throughout the UAE, GCC countries, Iran, South Asia and Africa to market the UAE campus and to recruit students for its programs. While not their primary role, their efforts could also be leveraged to enhance awareness of the University of Waterloo overall and to support recruitment for main campus programs. As well, in recent years we have joined forces with Waterloo's Faculty of Mathematics to

undertake joint international recruitment. Our associate director of admissions has taken the lead on this effort and has made visits to India, some Middle Eastern and African countries, and Trinidad. In India, we are experimenting with working through an agent.

- Provide support to all international students

  The University of Waterloo provides a broad suite of services for international students, primarily through Waterloo International and the student success office. As we increase our international student enrolment we must remain vigilant that their needs are being sufficiently met. Targeted efforts to ensure the successful transition of students from our UAE campus to the Waterloo main campus will also be required, as noted below.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Number of international undergraduate students admitted and performance to target
- Confirmation rate of offers made to international student applicants
- International proportion of total undergraduate enrolment
- Analysis of student engagement survey results by visa status and/or campus

Goal G2: Increase International Experience Opportunities for Undergraduates

Waterloo Engineering undergraduates benefit from an extensive international exchange program and numerous opportunities to pursue co-op work terms outside Canada. The university's Sixth Decade Plan calls for 25% of undergraduates to spend a study, service or work term outside Canada. This is already the case in engineering, but we aim to do more. Over the Vision 2015 plan period, we will work to increase such opportunities so that ultimately one out of every two undergraduates, on average, has the opportunity for an international experience over the course of his or her studies.

- Increase participation in international exchange

  As noted in Figure 45 above, participation in engineering exchange programs has increased in recent years. The faculty aims to continue this growth over the Vision 2015 plan period, especially in the number of outgoing exchange students. To this end, a number of improvements are planned for our exchange operations, including modifying co-ordinators' role to facilitate recruitment and student advising; implementing strategies to reduce attrition of students between claiming an exchange space and leaving; improving student feedback mechanisms; and supporting growth in the number of exchange agreements.

- Develop additional international co-op work term opportunities

  Table 10 outlines our goals for increases to international co-op work terms over the Vision 2015 plan period. The associate dean, co-operative education and professional affairs will work with the Waterloo office of co-operative education and career action (CECA) to develop initiatives to accelerate international job development for engineering students. The UAE campus may also provide a platform to support the development of co-op jobs at all levels in the Gulf region and in other regions from which it is actively recruiting. The growth of international jobs will require focused effort by CECA and the close integration of faculty, CECA and UAE campus efforts.

Table 10: International Co-op Work Term Targets, 2011-2015

	2011	2012	2013	2014	2015
International Work Term Target	847	860	895	930	965

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Number of incoming and outgoing international exchange students
- Countries with which we have an exchange agreement
- Number of international co-op work terms
- Proportion of all engineering work terms that are outside Canada

Goal G3: Increase International Graduate Studies and Research Collaborations

Our research and graduate programs are enriched when we collaborate with leading experts around the world, and our work with international organizations enhances both our work and our reputation. The exchange of faculty and graduate students enriches the academic life of the faculty and facilitates international connections and research collaborations.

♦ Develop an international research strategy

The engineering research office will work with the university's office of research and Waterloo International to develop a strategy for increasing international research funding and for raising international awareness of Waterloo Engineering research. The faculty will participate fully in opportunities offered by the university and other partners, such as the research office's international research partnerships grant. These efforts will also be co-ordinated with international graduate student recruitment efforts.

♦ Pursue strategic internationalization in graduate studies

The engineering graduate studies office will work with academic units to better capitalize on existing international agreements and to pursue the development of new agreements that build on research and program strengths across the faculty. This might include 3+x exchange programs, which provide an opportunity for students to complete their last year of undergraduate requirements and also pursue a master's degree at Waterloo, and dual PhD degrees (Cotutelles), which allow one doctoral dissertation to satisfy the requirements of two different universities in different countries. We have recently signed such an agreement with the American University of Cairo (AUC). We will also work to increase the number of agreements with foreign governments that wish to sponsor their qualified nationals to do graduate work at Waterloo Engineering. A recent agreement with Iraq is one such example.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Proportion of industrial research funding from international sources
- Number of international research contracts and their total value
- Bibliometric indicators of international collaboration
- Number of international graduate students admitted and performance to target
- International proportion of total graduate enrolment
- Percent of international students holding external awards
- Number of countries with which we have graduate student education agreements
- Number of graduate students in 3+x and dual PhD degree programs

Goal G4: Pursue Targeted Collaboration Initiatives in India

Over the past decade India has emerged as a significant producer of engineering talent. As well, the growth of technology enterprises in India, especially those centered on software engineering, has been truly impressive. Another important phenomenon has been the rise of the middle class and the thirst for obtaining high quality higher education in the West.

- ♦ Continue to foster collaboration with IITs and support other India-focused initiatives

  All of the trends above make it imperative that Waterloo Engineering continue the various initiatives we have been pursuing in India over the past few years. These include intensifying our efforts in recruiting undergraduate students for both the UAE and the Waterloo campuses; fully utilizing the MOUs we have with most IITs to host faculty and enrol graduate students; continuing the collaboration with IIT-Rajasthan to support its establishment; and enhancing current research collaboration with Indian universities and seeking financial support for these initiatives from government and industrial sources.

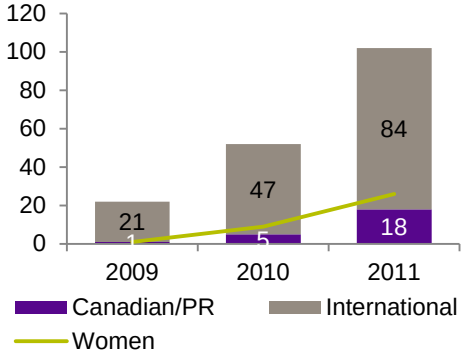
Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Number of Indian undergraduates enrolling in Waterloo Engineering and the growth in this number, year over year
- Number of Indian graduate students enrolling in Waterloo Engineering
- Growth in research collaborations with Indian universities
- Progress in the relationship with IIT-Rajasthan as measured by joint activities

UAE Campus

Waterloo Engineering has been offering chemical engineering and civil engineering undergraduate programs at Waterloo's campus in the United Arab Emirates since it opened in 2009. Offered in partnership with the Higher Colleges of Technology (HCT) of the UAE, Waterloo's campus in Dubai operates in a "2+2" mode in which students study in the UAE for two years then come to the main Waterloo campus to complete their degrees. As shown in Figure 47, engineering program enrolment in the UAE has increased from 22 in 2009 to 102 in 2011. The proportion of women enrolled has increased to over 25% in that time.

Figure 47: Enrolment in Engineering Programs at UAE Campus Over Time



As with all Waterloo Engineering programs, these students follow a mandatory co-op program. They typically spend their first two work terms in the region surrounding the UAE campus, which has required significant job development effort due to the limited culture of paying students for work in that region. Every effort is made to find Canadian jobs for their third work term, to facilitate acclimatization to Canada and to improve their competitiveness when they seek subsequent work term jobs in Canada.

Goal G5: Support the Ongoing Development of UAE Campus Programs

- ♦ Increase UAE campus enrolments

  As noted in Goal G1, above, intake in our two programs offered at the UAE campus is expected to reach steady state by the end of the Vision 2015 plan period, contributing to significant increase in the international proportion of our undergraduate population. Ongoing efforts to enhance the campus' image in the region and surrounding countries and targeted recruitment initiatives will help us reach the intake targets outlined in Table 11.

Table 11: Projected UAE Campus Annual Undergraduate Intake, 2011-2015

	2011	2012	2013	2014	2015
Chemical Engineering	33	40	50	60	60
Civil Engineering	30	40	50	60	60
TOTAL	63	80	100	120	120

- Foster the development of a rich student life experience at the UAE campus

  Waterloo Engineering undergraduate students are enriched by a very active Engineering Society, diverse clubs and outstanding extracurricular opportunities, including student design teams. Similarly, the UAE campus has established a student council, orientation programs, social events and a seminar series for students. To foster this development and to further connect students at our two campuses, the engineering student relations officer will work with the Engineering Society and the dean to develop mechanisms that will help share the expertise of senior student leaders on the main campus with students at the UAE campus as they develop student life programming.

- Support the successful transition of UAE students to the Waterloo campus

  We must take steps at the faculty and department levels to ensure the successful transition – academically, socially and culturally – of each cohort of students from the UAE campus. Special welcome programming for these students is particularly important because they begin their Canadian studies in the winter term and therefore miss the university-wide orientation program offered to new students each fall. A number of events were organized this winter to welcome the first cohort of UAE students to the Waterloo campus. These activities happened in the participating departments as well as through the engineering office of student relations in collaboration with the undergraduate student Engineering Society.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- UAE campus admissions and performance to target
- Feedback received from participants in welcome programming for UAE students each winter
- UAE student success rates after they join the main campus, in comparison with overall rates

H. Entrepreneurship

Entrepreneurship and innovation are hallmarks of Waterloo Engineering. We are home to the Conrad Business, Entrepreneurship and Technology Centre (CBET), which helps entrepreneurs foster innovation, create new ventures and identify new markets. CBET offers the flagship Master of Business, Entrepreneurship and Technology (MBET) to graduate students and administers the Enterprise Co-op (E Co-op) program designed to help Waterloo undergraduate co-op students take their business idea and make it a reality. Participation in E Co-op provides students access to professional staff, mentors, workshops, seminars and workspace in the renowned Communitech Hub accelerator.

Our students regularly excel in entrepreneurial competitions. In recent months, a team of management engineering students won the grand prize at the 2012 Institute of Industrial Engineers National Student Conference, a team of chemical engineering students won the first Walmart Green Student Challenge, and a team of MBET students took home first prize in the 2012 RBC Next Great Innovator Challenge for the second year in a row. MBET students also won the grand prize in the 2011 IBK Capital-Ivey Business Plan Competition, which is widely regarded as Canada's premier graduate student business plan competition.

Waterloo Engineering students are also active participants in the university's VeloCity program, which helps Waterloo students and alumni turn ideas into businesses, connecting them with technology,

mentors, and a vast network of entrepreneurs in its residence and workspace programs. Often approximately 30 to 50% of students in the 70-bed, on-campus VeloCity residence are engineering students. A significant number of engineering student and alumni start-ups are also currently working in the VeloCity Garage, located in the Communitech Hub.

Among these start-ups is BufferBox, believed to be the first parcel delivery kiosk service in Canada, which started as a fourth-year design project in the mechatronics engineering program and won the 2011 Innovation Award at the Queen's Entrepreneurs' Competition and the Waterloo Nicol Entrepreneurial Award. Other award-winning Waterloo Engineering start-ups include Aeryon Labs, co-founded by Waterloo Engineering alumni, which won the 2011 Ontario Centres of Excellence Mind to Market Award. Also in 2011, and less than a year after spinning off from Waterloo Engineering, Innovative Processing Technologies was awarded market readiness funding by the Ontario Centres of Excellence. Its co-founder, a Waterloo mechanical engineering alumnus and researcher, was awarded the Martin Walmsley Fellowship for Technological Entrepreneurship. Waterloo's "creator owns it" intellectual property policy, widely recognized for helping move ideas into the economy, continues to be another important driver of our start-up culture.

Goal H1: Enhance Initiatives to Foster Entrepreneurial Activity and Innovation

- Enhance existing supports for entrepreneurship and innovation

  CBET is at the core of many of our entrepreneurial activities, and over the course of the Vision 2015 plan period we will transition it from a centre to a school within the faculty. It will be one of the few such academic units in Canada, differentiated from entrepreneurship centres by its full-time faculty, research profile, emphasis on degree programs, and strong relationship with other departments in the Faculty of Engineering. Over the Vision 2015 plan period, we will prioritize the development of increased synergy between CBET and the rest of the Faculty of Engineering. Formal collaboration initiatives will be actively sought to connect CBET students with the rest of the engineering student body and faculty complement.

  The E Co-op program administered by CBET will also be expanded over the Vision 2015 plan period, and we will seek to identify and encourage innovative and entrepreneurial engineering undergraduates to pursue an MBET degree.

  Many of our student innovations and alumni start-ups begin as capstone design projects. By the end of the Vision 2015 plan period all of our engineering programs will include a capstone design project and a mechanism will be developed to facilitate interdisciplinary projects at the faculty level. The integration of CBET graduate students into the capstone project process as "commercialization mentors" is also being considered.

- Introduce new initiatives to foster innovation and entrepreneurial activity

  Waterloo Engineering will provide our professional graduate students with opportunities to formally develop and nurture their entrepreneurial, business and commercialization skills. Beginning in 2013, CBET will begin offering a Diploma in Advanced Management to students in Master of Engineering programs.

  Also in 2012, CBET will pilot a skills development program for undergraduate students who do not secure a co-op job in their first work term. During this program they will be exposed to entrepreneurship through short work placements in start-up companies.

  The Department of Systems Design Engineering also plans to foster entrepreneurial activity among its senior students as part of their design courses and projects. The department will create a focused incubator space that will be offered competitively to senior design teams and will encourage these entrepreneurial groups to connect with regional high-tech support through organizations such as VeloCity, Communitech and E Co-op.

Progress toward this goal will be measured by the following annual metrics and performance indicators:

- Progress made toward CBET's transition to a school
- Number of students participating in E co-op, by program
- Number of Waterloo Engineering undergraduates pursuing an MBET after graduation
- Number of MEng students completing the Diploma in Advanced Management, by program

IV. SUPPORTING THE PLAN

To meet our aspiration to be a truly world-class school of engineering, we must sufficiently support the strategies that are most likely to move us forward on our key priorities. The Vision 2015 plan is tightly linked to resources: we have projected the costs of all proposed initiatives and have prioritized the allocation of budget and positions based on our strategic goals.

Thanks to the excellent work of our planning committee, the effective financial management of the faculty, and the support of the University Provost, Geoff McBoyle, we have been able to assemble a pool of resources to establish the Vision 2015 Fund. This fund has been allocated selectively to provide new personnel resources (outlined in Section A, below) to support our Vision 2015 priorities. Additionally, one-time-only funds totaling $8.5 million over five years have been secured to establish the Vision 2015 Undergraduate Laboratory Enhancement Fund to enrich the lab experience of our undergraduate students as outlined in the undergraduate studies section, above.

Support for the implementation of our Vision 2015 plan is not, however, limited to budget allocations and the creation of faculty and staff positions. As articulated in our key priorities, we must provide world-class facilities to support excellence in education and research. This includes buildings to house our labs, classrooms, and offices as well as the equipment and technology used in them. Sections C and D below describe our plans to address these needs during the Vision 2015 plan period.

Philanthropic gifts also provide essential financial support to our strategic priorities. Furthermore, alumni who are engaged in the life of the faculty are our best ambassadors and can help cultivate prospective students, co-op positions, and industrial relationships. And the way we promote and celebrate the faculty and its community members influences our reputation and our attractiveness to prospective students, partners and employees. Our advancement efforts, described in Section E, are focused on these key supports.

A. Faculty and Staff Positions

A cornerstone of achieving the ambitious goals set out in this plan will be the strategic allocation of faculty and staff positions to lead new initiatives, support growth, and ensure ongoing excellence.

Table 12: Faculty Positions to be Filled During the Vision 2015 Plan Period

Unit	Open	New from Unit Funds	New from Vision 2015 Fund	New from Other Funds*	Total Open and New Positions
Architecture	3	0	0	0	3
CBET	2	1	3	0	6
Chemical	5	0	0	7	12
Civil & Environmental	4	0	0	8	12
Electrical & Computer	5	0	1	5	11
Management Sciences	8	0	0	0	8
Mechanical & Mechatronics	1	2	2	1	6
Systems Design	3	0	0	0	3
Undergraduate Office	0	0	1	0	1
TOTAL	31	3	7	21	62

**Other funds include 14 additional positions resulting from our participation in the UAE campus initiative, 5 positions funded by the Institute for Quantum Computing, 1 Industrial Research Chair and 1 junior professor funded through an endowed chair.*

Table 13: New Vision 2015 Faculty Positions

Fiscal year	Unit	Positions	Funding Source
2011/12	CBET	1 tenured/tenure-stream	Vision 2015 Fund
	Undergraduate Office	1 lecturer	Vision 2015 Fund
2012/13	Chemical	2 tenured/tenure-stream	UAE
	Civil & Environmental	3 tenured/tenure-stream	UAE
	Electrical & Computer	2 tenured/tenure-stream	IQC
	Electrical & Computer	1 tenured/tenure-stream	Vision 2015 Fund
	Mechanical & Mechatronics	1 tenured/tenure-stream	NSERC IRC
	Mechanical & Mechatronics	2 lecturers	Vision 2015 Fund
2013/14	CBET	1 tenured/tenure-stream	Unit
	CBET	1 tenured/tenure-stream	Vision 2015 Fund
	Chemical	3 tenured/tenure-stream	UAE
	Civil & Environmental	2 tenured/tenure-stream	UAE
	Electrical & Computer	1 tenured/tenure-stream	IQC
	Mechanical & Mechatronics	1 lecturer	Unit
2014/15	CBET	1 tenured/tenure-stream	Vision 2015 Fund
	Chemical	2 tenured/tenure-stream	UAE
	Civil & Environmental	1 tenured/tenure-stream	Chair endowment
	Civil & Environmental	2 tenured/tenure-stream	UAE
	Electrical & Computer	2 tenured/tenure-stream	IQC
	Mechanical & Mechatronics	1 lecturer	Unit

Table 14: Staff Positions to be Filled During the Vision 2015 Plan Period

Unit	Open	New from Unit Funds	New from Vision 2015 Fund	New from Other Funds*	Total Open and New Positions
Architecture	0	0	0	0	0
CBET	0	1	1	0	2
Chemical	2	1	1	6	10
Civil & Environmental	0	0	0	5	5
Electrical & Computer	2.6	2	3	0	7.6
Management Sciences	0	0	0	2	2
Mechanical & Mechatronics	3	0	1	0	4
Systems Design	0	0	1	0	1
Advancement Office	4	0	3	0	7
Co-op Edn & Prof'l Affairs	0	0	0	0	0
Dean's Office	1	0	1	0	2
Engineering Computing	0	0	0	0	0
Graduate Office	0	0	1	0	1
Machine Shop	0	0	1.5	0	1.5
Outreach Office	0	0	1	0	1
Research Centres	0	1	0	0	1
Research Office	0	0	2	0	2
Undergraduate Office	0	0	2	0	2
WatPD-Engineering	0	0	0	0	0
TOTAL	12.6	5	18.5	13	49.1

**Other funds include 10 positions resulting from our participation in the UAE campus initiative, 2 to support our management engineering program and 1 for our nanotechnology engineering program.*

Table 15: New Vision 2015 Staff Positions

Fiscal year	Unit	Positions	Funding Source
2011/12	Chemical	1 technical	UAE
	Chemical	1 technical	Unit
	Civil & Environmental	1 administrative	UAE
	Civil & Environmental	1 technical	UAE
	Electrical & Computer	1 administrative	Vision 2015 Fund
	Electrical & Computer	1 administrative	Unit
	Management Sciences	1 technical	Management Engineering
	Advancement Office	1 administrative	Vision 2015 Fund
	Dean's Office	1 administrative	Vision 2015 Fund
	Machine Shop	0.5 technical	Vision 2015 Fund
	Outreach Office	1 administrative	Vision 2015 Fund
	Research Office	1 administrative	Vision 2015 Fund
	Research Office	1 administrative	Vision 2015 Fund
2012/13	CBET	1 technical	Vision 2015 Fund
	Chemical	1 administrative	UAE
	Chemical	1 administrative	Nanotechnology
	Chemical	1 technical	UAE
	Civil & Environmental	1 technical	UAE
	Electrical & Computer	1 administrative	Unit
	Electrical & Computer	1 administrative	Vision 2015 Fund
	Electrical & Computer	1 administrative	Vision 2015 Fund
	Management Sciences	1 administrative	Management Engineering
	Mechanical & Mechatronics	1 technical	Vision 2015 Fund
	Systems Design	1 technical	Vision 2015 Fund
	Advancement Office	1 administrative	Vision 2015 Fund
	Advancement Office	1 administrative	Vision 2015 Fund
	Graduate Office	1 administrative	Vision 2015 Fund
	Machine Shop	1 technical	Vision 2015 Fund
	Research Centres	1 administrative	Unit
	Undergraduate Office	1 administrative	Vision 2015 Fund
2013/14	Chemical	1 administrative	Vision 2015 Fund
	Chemical	1 administrative	UAE
	Chemical	1 technical	UAE
	Civil & Environmental	1 technical	UAE
	Undergraduate Office	1 administrative	Vision 2015 Fund
2014/15	CBET	1 administrative	Unit
	Civil & Environmental	1 technical	UAE

B. Budget

Despite annual expenditure reductions of 1% to 3% imposed by central university administration on the faculty's budget, Waterloo Engineering has managed to increase its operating revenue year after year and to put the increased resources to good use. We have done this by starting new programs, both undergraduate and graduate; expanding the undergraduate enrolment of both domestic and international students; increasing graduate enrolment, again of domestic and international students; and growing the research enterprise.

It is important to note, however, that all of the above initiatives were undertaken in a planned and strategic manner and not simply opportunistically so as to generate more revenue. As an example, rather than simply increase undergraduate enrolment in existing programs in response to the government's "double cohort" initiative, we established new and attractive programs (e.g. mechatronics and nanotechnology). Similarly, our Vision 2010 plan called for a large increase in graduate enrolment before the government announced the Research Higher program, which we proceeded to take full advantage of.

Within the faculty, we have adopted an integrated approach to the sharing of incremental revenue and budget reductions among the academic units. This has enabled the units to make the best possible decisions on the utilization of their resources. Such a system, however, requires more sophisticated financial management at both the faculty and the departmental levels. We have greatly improved the quality of financial management at the faculty level and as part of the Vision 2015 plan we are in the process of doing so in our academic units.

On a go-forward basis, it is our view that the university budget system is in dire need of a complete revamp. The current system is opaque and encourages special deals, which in turn promotes suspicion. Most seriously, it does not encourage and support planning, since academic planning that is not tightly connected to budget is of little value. It is engineering's hope that the university will move expeditiously to design and implement a new revenue-based budget system. If this occurs, engineering will be able to go further in its current internally decentralized budget system, facilitating increased creativity and entrepreneurship among the academic units.

In addition to the faculty and staff positions being added during the Vision 2015 plan period, significant other financial resources are being allocated to support our strategic priorities. Chief among these are investments to be made through the Vision 2015 Undergraduate Lab Enhancement Initiative. The allocation of these funds, along with other major Vision 2015 Fund allocations to support facilities and equipment improvements, are detailed in Table 16.

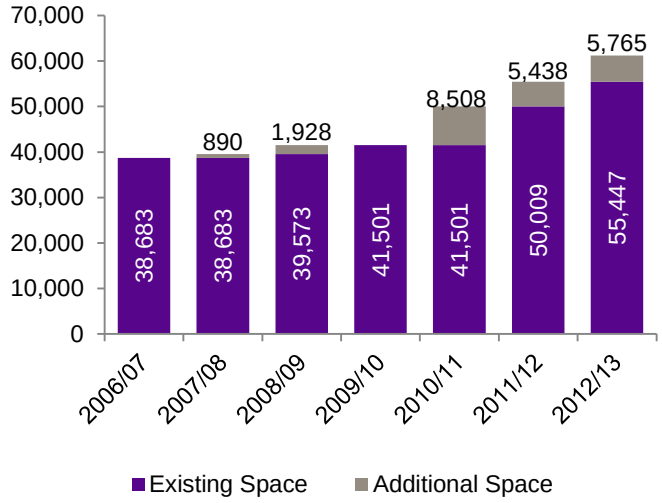
Table 16: Vision 2015 Fund Equipment and Facilities Expenditures

Expenditure	2011/12	2012/13	2013/14	2014/15	2015/16	TOTAL
UG Lab Upgrades: Chemical	$350,000	$350,000	$700,000	$400,000	$500,000	$2,300,000
UG Lab Upgrades: Civil & Environmental	$100,000	$200,000	$200,000	$200,000	$300,000	$1,000,000
UG Lab Upgrades: Electrical & Computer	$500,000	$600,000	$300,000	$500,000	$300,000	$2,200,000
UG Lab Upgrades: Mechanical & Mechatronics	$500,000	$300,000	$250,000	$350,000	$350,000	$1,750,000
First-Year WEEF Lab Upgrades	$1,000,000					$1,000,000
UG Student Tutoring Centre	$50,000					$50,000
UG Computing Lab Upgrades	$197,600	$161,000	$139,300	$36,800	$22,600	$557,300
High-Speed CNC Machining Centre		$75,000				$75,000
TOTAL	$2,697,600	$1,686,000	$1,589,300	$1,486,800	$1,472,600	$8,932,300

C. Space

The creation of new space was fundamental to the successful implementation of our previous plan, Vision 2010. From 2006 to 2011, we increased our nominal space holdings by 43%, from 38,683 net assignable square metres (nasm) in 2006 to 55,447 nasm in 2011. This was accomplished through expansion to two existing buildings and the construction of two impressive new buildings, the award-winning Engineering 5 and Engineering 6, which have enriched our campus and the lives of the students, faculty and staff who study and work in them. Furthermore, almost 5,500 nasm of additional space for engineering will be added when the Mike and Ophelia Lazaridis Quantum-Nano Centre comes online later this year, providing essential and inspiring space to the faculty members and students involved in our nanotechnology engineering program.

Figure 48: Growth in Space (nasm) Over Time



Another key aspect of the space plan developed to support our Vision 2010 priorities is the renovation and upgrading of aging space to safely and appropriately accommodate new occupants and to provide efficiencies in space use through consolidation. As departments have acquired space in new buildings, they have relinquished some existing space for other units (in particular those that did not acquire additional space in new buildings) to grow. The most significant current renovation project is the upgrading of the C-Wing of the Douglas Wright Engineering building (DWE). By early 2013, this will yield some 2000 nasm of renovated space but only about 300 nasm (20 offices) of additional space.

Despite the remarkable achievement in acquiring this additional space, our need for space remains a very significant and potentially constraining factor for Waterloo Engineering. We are currently 10,400 nasm short of the modest space targets established for 2010. This shortfall includes space required to accommodate the growth in students, faculty, staff and research activities realized during the Vision 2010 plan period as well as growth resulting from our participation in Waterloo's UAE campus initiative. Furthermore the Vision 2015 plan calls for more growth, which cannot be achieved without sufficient quality space. Early estimates place our total space requirements as of 2015 at approximately 78,000 nasm.

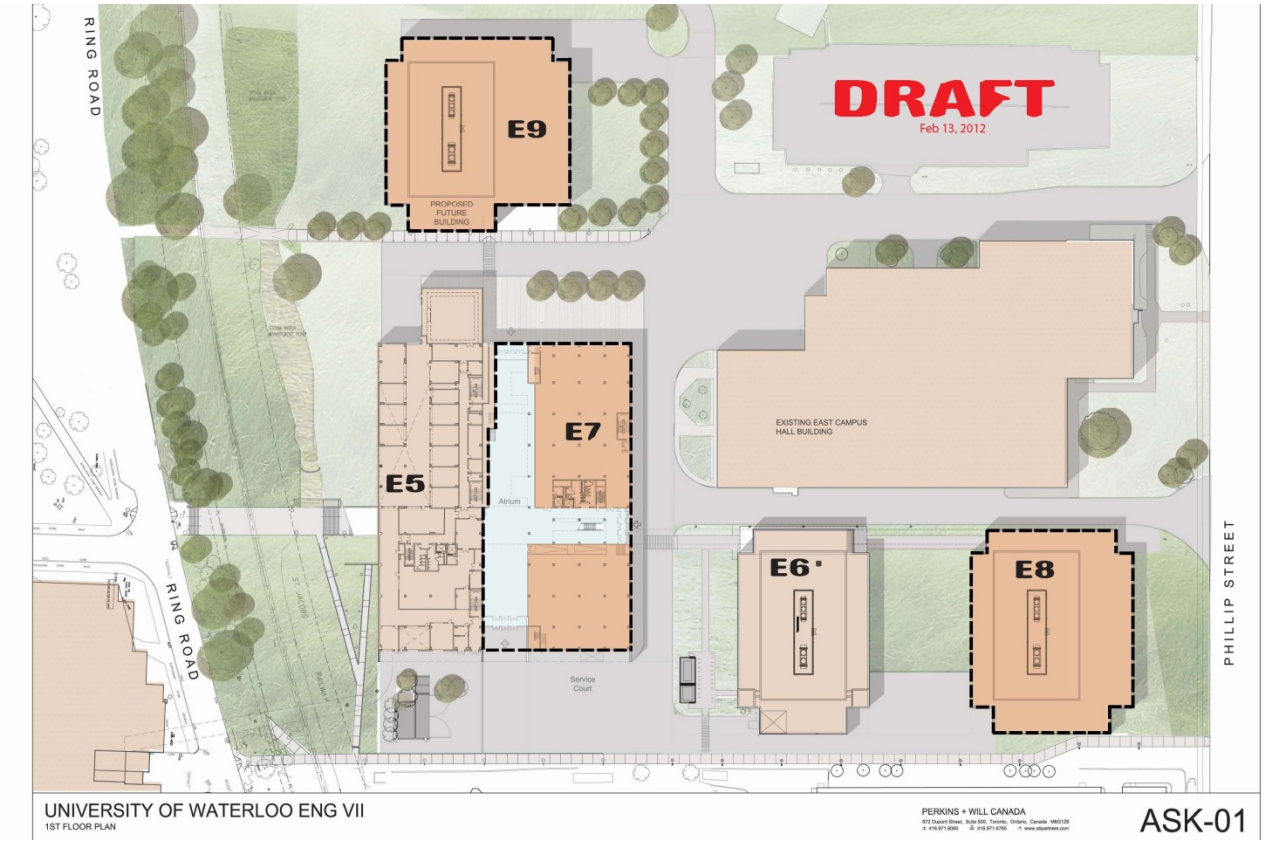
To meet these urgent needs, our priority space projects for the Vision 2015 plan period will be the completion of the DWE C-Wing renovation and the construction of two new buildings: Engineering 7 and Engineering 8. (Figure 49 shows the draft site plan for additional engineering buildings, co-located with E5 and E6 on the East Campus, and Table 17 provides the projected additional space and the cost associated with these projects.) Engineering 7 will be connected to E5 and will serve to link E5 to E6. The atrium that will link E5 and E7 will provide exceptional space for undergraduate students through services and infrastructure, building on the remarkable student space in E5, most notably in the world-class student design centre that encompasses its first two floors.

Table 17: Vision 2015 Priority Space Projects

Project	Projected Additional Space	Projected Cost
Engineering 7	9,000 nasm + 1,000 nasm atrium	$60 million
Engineering 8	6,500 nasm	$45 million
DWE C-Wing Renovation*	300 nasm	$16.5 million

** NOTE: the DWE C-Wing renovation started late in the Vision 2010 plan period and was included in the space funding priorities under that plan.*

Figure 49: Engineering East Campus Site Plan



Furthermore, to plan for sufficient and appropriate space to implement our Vision 2015 plan, we are currently undertaking a comprehensive update of our existing space plan. This exercise will both analyze our current use of space and provide a full understanding of the specific capital needs, unit by unit, that will result from the growth projected in the Vision 2015 plan.

To fund these projects, we will continue to apply the space-funding formula that we used effectively to fund the $113.5 million cost of E5, E6 and DWE C-Wing: Roughly one-third of the cost is obtained from institutional resources (i.e. the department, faculty and university), one-third from government sources, and one-third from private funding.

To assemble the institutional contribution to this formula, we have developed a space monetization policy within the faculty, with the overall intent to introduce a rational approach to deal with space utilization. Every year, the academic units are asked to contribute to the building fund. Their contributions are matched by the faculty and the combined sum is matched by the Provost. Periodically, each unit is provided a statement showing its credit in the building fund, to which are added the funds raised by the unit (or by the faculty on the unit's behalf). On the debit side, each academic unit is charged a certain flat amount for each nasm of new and renovated space it is allocated and is given credit, again at a certain flat rate, for every relinquished nasm. The goal is for each unit to reach a balance over time between its credit and debit.

D. Information Technology

The inclusion of information technology as a resource to support the Vision 2015 plan marks a shift in how we approach the use and allocation of information systems and technology resources, including the expertise of the individuals who develop, support and maintain them.

This change in perspective is facilitated by a reorganization of computing campus-wide, focused on consolidation, standardization and shared management of resources (for example, email and active directory services). This reorganization changes how IT staff work and creates strategic opportunities within engineering. Where IT staff had often been mired in the commodity aspect of computing, they can now focus on activities that will benefit all users and support the faculty's strategic goals.

Information technology, viewed as a resource, helps engage and retain outstanding people, supports excellence in academic programs, and in itself constitutes an important service aspiring to excellence. Most importantly, it is essential to providing the world-class facilities required to support excellence in education and research.

Key information technology resource commitments made to support the Vision 2015 plan include:

- As described in the undergraduate studies section above, the WEEF lab will be substantially renovated and upgraded to provide an excellent learning and modern computing environment for our first-year students.
- Undergraduate computer labs and terminal servers will be upgraded and/or renovated on a rotating basis, following a regular schedule to ensure a quality computing environment for our students.
- A dedicated computer lab will be developed for professional master's students, who currently do not have access to dedicated computing resources on campus. The lab will include desktop and laptop computing stations as well as space for collaborative work and project meetings.
- Support for computing clients will be enhanced. Two part-time Helpdesk positions will be added to increase operating hours. Access to computing support for staff will be simplified through a single point of contact by phone or email, through which requests will be routed for the most efficient and appropriate response.
- Engineering computing will help improve operational efficiency across the faculty by proactively identifying inefficient or ineffective operations and/or duplication of work and making recommendations to improve them. The associate dean, computing has established a process by which such needs and opportunities will be identified and solutions will be developed, either by adapting and sharing existing departmental systems across the faculty or by implementing new systems where required.

E. Advancement

The engineering advancement office includes professional staff engaged in development, alumni relations, student relations, marketing and communications. Appendix I, Advancement Data includes detailed statistics about our alumni, philanthropic gifts and pledges, and progress toward our current Vision 2010 Campaign goals.

The advancement office will support the Vision 2015 plan by enhancing the faculty's reputation as an international leader in engineering education and research, and by securing the philanthropic support required for our priority initiatives. Over the coming year, the advancement office will conduct a feasibility assessment of the Vision 2015 development requirements and will create an integrated marketing and communications plan and a development and alumni relations plan, both informed by the Vision 2015 plan priorities and goals.

The development and alumni relations plan will include strategies to:

- Close the gap in the Vision 2010 Campaign, with a focus on infrastructure funding.
- Develop and execute a fundraising strategy for Vision 2015 priorities, in particular as they relate to capital needs and graduate fellowships.
- Maintain faculty-level fundraising while supporting department priorities through enhanced annual fund initiatives and goals.
- Engage our alumni at a higher level by offering strategic engagement opportunities based on their interests and capacity.
- Evaluate and restructure the alumni program, moving away from a broad-based event model.

- Increase the number of one-on-one meetings between alumni and engineering alumni affairs.
- Strategically advance our alumni.

The communications and marketing plan will include strategies to:

- Expand Waterloo Engineering's profile as a world-class school of engineering.
- Strengthen the faculty brand through consistent messaging and visual identity.
- Improve all web sites and introduce new electronic and social media strategies.
- Develop and implement a strategic graduate student recruitment program.
- Support efforts to create an engaging and inclusive environment for current students.
- Lead efforts to keep faculty and staff informed of key initiatives and achievements.

V. ACADEMIC UNIT IMPLEMENTATION AGREEMENTS

A. School of Architecture

RICK HALDENBY, DIRECTOR

Table 1: Faculty Hiring Plan

POSITION TYPE	Baseline: May 1, 2011 Filled	Open	TOTAL	Faculty to be hired 2011/12	Faculty to be hired 2012/13	Faculty to be hired 2013/14	Faculty to be hired 2014/15	Total Faculty: May 1, 2015
Current TTS	15	3	18	2	1			18
Current Lecturers	1		1					1
New TTS								0
New Lecturers								0
TOTAL	16	3	19	2	1	0	0	19

Table 2: Faculty Hiring Plan by Gender

GENDER	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Male	10	11	12	12	12
Female	6	7	7	7	7
TOTAL	16	18	19	19	19
% female	37.5%	38.9%	36.8%	36.8%	36.8%

Table 3: Faculty Hiring Plan by Funding Source and Target Area

TARGET	YEAR	FUNDING SOURCE
Architectural Practice	2011/12	Resignation replacement
Architecture; Design	2012/13	Resignation replacement
Architecture; Urban Design	2012/13	Resignation replacement

Table 4: Staff Hiring Plan

POSITION	Baseline: May 1, 2011 ADMIN	TECH	TOTAL	Staff to be hired 2011/12 A	T	Staff to be hired 2012/13 A	T	Staff to be hired 2013/14 A	T	Staff to be hired 2014/15 A	T	Total staff: May 1, 2015 A	T	TTL
Filled Staff	6	5	11									6	5	11
Open Staff												0	0	0
New Staff												0	0	0
TOTAL	6	5	11	0	0	0	0	0	0	0	0	6	5	11

Table 5: Undergraduate Intake Plan

	FALL 2011 INTAKE			FALL 2012 TARGET			FALL 2013 TARGET			FALL 2014 TARGET			FALL 2015 TARGET		
PROGRAM	CPR	INTL	TTL	CPR	INTL	TTL	CPR	INTL	TTL	CPR	INTL	TTL	CPR	INTL	TTL
Architecture	72	2	74	70	6	76	66	6	72	66	6	72	66	6	72

Table 6: Graduate Intake Plan

	2011 FTE INTAKE			2012 FTE TARGET			2013 FTE TARGET			2014 FTE TARGET			2015 FTE TARGET		
PROGRAM	CPR	INT	TTL	CPR	INT	TTL	CPR	INT	TTL	CPR	INT	TTL	CPR	INT	TTL
Rsch Master	39	1	40	48	2	50	48	2	50	48	2	50	48	2	50
TOTAL	39	1	40	48	2	50	48	2	50	48	2	50	48	2	50

Table 7: Research Funding Projections

	2010/11 Actual Funding	2011/12 Target Funding	2012/13 Target Funding	2013/14 Target Funding	2014/15 Target Funding
Total Research Funding	$260,542	$250,000	$250,000	$250,000	$250,000

Table 8: Research Funding per Tenured/Tenure-Stream Faculty Member Projections

	2010/11 Actual Funding/ TTS	2011/12 Target Funding/TTS	2012/13 Target Funding/TTS	2013/14 Target Funding/TTS	2014/15 Target Funding/TTS
Total Research Funding per TTS	$17,369	$14,706	$13,889	$13,889	$13,889

B. Conrad Business, Entrepreneurship & Technology Centre

ROD MCNAUGHTON, DIRECTOR

I INTRODUCTION

Conrad is a leading provider of innovative and industry relevant degree programs focused on creating and growing technology-based businesses. During the 2011-2015 period the centre will:

- Introduce innovations to the flagship MBET program
- Grow by launching two new master's degree programs and offering the Diploma in Advanced Management to students in MEng degree programs
- Add three new full-time continuing faculty members to its complement
- Add an IT related staff position to support growth and new programs
- Enhance its research culture
- Restructure as a school within the Faculty of Engineering
- Launch the new Conrad brand and develop a distinctive identity within the Faculty of Engineering

- Establish a development committee and renew the Conrad Advisory Council
- Raise $18million for space to accommodate growth and scholarships
- Develop a strong alumni network
- Plan for a new phase of growth in 2015-2020

Conrad will distinguish itself from the entrepreneurship centres at other Canadian universities by levering its experience designing innovative master's programs, success in combining scholarship with real-world practice and location within the Faculty of Engineering to expand its portfolio of graduate degree programs. These programs will address markets within companies and amongst recent graduates distinct from that targeted by the MBET program. Increased enrolment will support the hiring of additional tenure-track faculty who will also contribute to the research profile of the centre.

Within the Vision 2015 planning period Conrad will complete its transition from a centre to a school within the Faculty of Engineering, and will move to a larger space, perhaps located on the university's south campus. As a school, Conrad will be further differentiated from entrepreneurship centres by its full-time faculty, research profile, emphasis on degree programs, secure budget, and a strong relationship with other departments in the Faculty of Engineering. It will be one of the few such academic units in Canada and will be able to claim pre-eminence in its success at linking technology and business, and scholarship with business practice.

II ACADEMIC PLAN SUMMARY

A. FACULTY AND STAFF PLAN

1. Transition from a model of using faculty seconded from other departments and sessional instructors to one in which there is a core of tenured/tenure-track faculty supplemented with sessionals who bring professional experience to the classroom
    - Target having two-thirds of teaching tasks taught by tenured/tenure-track faculty
        i. Expand Conrad's faculty complement from six to nine positions
        ii. Replace one retiring faculty member
    - Hire faculty that can provide leadership to new programs
2. Hire an IT and online learning support manager to support growth and launch of new programs
3. Convert Enterprise Co-op co-ordinator position from a contract to a continuing appointment (once permanent mandate to run E Co-op is secured)
4. Replace individuals in non-complement/part-time positions such as the entrepreneur-in-residence and lead mentor/business plan coach as required during the planning period

Table 1: Faculty Hiring Plan

	Baseline: May 1, 2011							
POSITION TYPE	**Filled**	**Open**	**TOTAL**	**Faculty to be hired 2011/12**	**Faculty to be hired 2012/13**	**Faculty to be hired 2013/14**	**Faculty to be hired 2014/15**	**Total Faculty: May 1, 2015**
Current TTS	2	3	5	1	2			5
Current Lecturers	1		1					1
New TTS						2	1	3
New Lecturers								0
TOTAL	3	3	6	1	2	2	1	9

Table 2: Faculty Hiring Plan by Gender

GENDER	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Male	3	4	5	6	7
Female	0	0	1	2	2
TOTAL	3	4	6	8	9
% female	0%	0%	16.7%	25%	22.2%

Table 3: Faculty Hiring Plan by Funding Source and Target Area

TARGET	YEAR	FUNDING SOURCE
TBD	2013/14	Vision 2015 Fund
TBD	2013/14	CBET
TBD	2014/15	Vision 2015 Fund

Table 4: Staff Hiring Plan

	Baseline: May 1, 2011			Staff to be hired 2011/12		Staff to be hired 2012/13		Staff to be hired 2013/14		Staff to be hired 2014/15		Total staff: May 1, 2015		
POSITION	ADMIN	TECH	TOTAL	A	T	A	T	A	T	A	T	A	T	TTL
Filled Staff	4	0	4									4	0	4
Open Staff												0	0	0
Other Staff										1		1	0	1
New Staff							1					0	1	1
TOTAL	4	0	4	0	0	0	1	0	0	1	0	5	1	6

Table 5: Staff Hiring Plan by Function and Funding Source

FUNCTION	YEAR	FUNDING SOURCE
IT and online learning support	2012/13	Vision 2015 Fund
Enterprise Co-op co-ordinator	2014/15	CBET

B. UNDERGRADUATE STUDIES PLAN

1. Secure permanent mandate to run Enterprise Co-op
    - Launch BET 300 (offered in spring and fall terms) and 400 (offered in winter term) beginning in Spring 2012
        i. BET 300 will be offered to students who wish to launch a venture and plan to participate in Enterprise Co-op, while BET 400 will be offered to students who have completed an E Co-op term and are growing their business
    - Expand E Co-op to approximately 20 students per term from its current base of 8-10 students per term
    - Integrate E Co-op into CECA administrative systems
2. Collaborate with CECA in developing programs around alternative labour models (e.g. consulting, social venturing, subcontracting, etc.)
    - Launch a program for first-year students who do not secure a position with a company by the first week of their co-op term
    - Encourage master's co-op programs and involvement of master's students in E Co-op

3. Explore opportunities to create undergraduate entrepreneurship options/specializations
    - Monitor environment for creating an undergraduate degree program

C. GRADUATE STUDIES PLAN

1. Enhance MBET program
    - Retain MBET as a flagship program with enrolment stable around 50 students per year
    - Increase applicant pool and the proportion of Canadian/permanent resident students
    - Create additional value for students through certificates and ability to complete the educational requirements for CMC designation
    - Identify ways to help students transition from the program to their own business when they graduate
2. Launch Master of Business, Intrapreneurship and Innovation (MBII) degree
    - Target employees in a corporate environment who seek to become champions of innovation
    - Part-time hybrid online/block course delivery
    - Prepare full proposal and business plan to launch in September 2013
3. Launch Master of Product Management (MPM) degree
    - Target recent graduates who seek an industry relevant graduate experience
    - Develop management professionals that know how to develop, launch and grow the market for technology-based products
    - Full-time 4 term program, with two 4 month work terms
    - Prepare full proposal and business plan to launch in May 2014
4. Offer Diploma in Advanced Management to students in MEng degree programs
    - Provide engineering professionals with the opportunity to improve leadership skills and business knowledge
    - Begin with the 2012/2013 MEng cohort
5. Develop a strategic marketing plan to ensure graduate intake targets are met
6. Explore opportunities for additional taught master's programs to launch in 2015-2020 period
7. Plan for introduction of research-based master's and/or PhD program in the 2015-2020 period

Table 6: Graduate Intake Plan

	2011 FTE INTAKE			2012 FTE TARGET			2013 FTE TARGET			2014 FTE TARGET			2015 FTE TARGET		
PROGRAM	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**
Course-based Master (MBET)	14	17	31	25	20	45	25	25	50	25	25	50	25	25	50
Diplomas (new)							5	0	5	23	2	25	30	5	35
Course-based Master (new)							5	4	9	6	5	11	7	5	12
TOTAL	14	17	31	25	20	45	35	29	64	54	32	86	62	35	97

D. RESEARCH PLAN

1. Grow Conrad's research capacity and reputation
    - Expand research capacity by hiring tenured/tenure-track faculty
    - Increase number of cross-appointments into the centre and/or adjunct appointments
    - Increase awareness of Conrad's research program among stakeholders
    - Acknowledge that the research program will remain nascent during the planning period
        - Begin planning how to significantly expand research output during 2015-2020 period

2. Cultivate a research culture that is balanced between contribution to scholarship and industry relevance
    a. Focus on innovation, entrepreneurship and commercialization
    b. Include stakeholders, especially Advisory Council, in identifying research opportunities
3. Develop opportunities for new faculty to supervise research master's and PhD students
    a. Negotiate cross-appointments with appropriate departments
4. Encourage collaboration with researchers in other disciplines
    a. Participation in research grants as part of larger teams in engineering to address commercialization issues associated with new technologies
5. Identify a senior faculty member to champion research development
    - Establish a culture of research mentoring
    - Develop a research plan for the centre
        - Identify ways to take a leadership role in the national and international entrepreneurship research communities

Table 7: Research Funding Projections

	2010/11 Actual Funding	2011/12 Target Funding*	2012/13 Target Funding	2013/14 Target Funding	2014/15 Target Funding
Total Research Funding	$39,000	$200,000	$230,000	$260,000	$300,000

**NOTE: Increase in 2011/12 is due to a SSHRC grant of approximately $200,000/year through 2015 which moved with the director's appointment change*

Table 8: Research Funding per Tenured/Tenure-Stream Faculty Member Projections

	2010/11 Actual Funding/TTS	2011/12 Target Funding/TTS	2012/13 Target Funding/TTS	2013/14 Target Funding/TTS	2014/15 Target Funding/TTS
Total Research Funding per TTS	$19,500	$66,667	$46,000	$37,143	$37,500

E. DEVELOPMENT PLAN

1. Establish a development committee as a sub-committee of the Conrad Advisory Council
    - Improve integration of Conrad's development activities with the engineering advancement office
    - Develop a campaign to raise $18million over next 5 years
    - Include support of the development committee in the responsibilities of the communication and strategy manager
2. Establish an alumni committee
    - Develop an alumni relations plan and systems to track alumni and keep them informed and engaged
    - Integrate alumni activities with the engineering advancement office
    - Include support of the alumni committee in the responsibilities of the marketing and community relations manager
3. Raise $18million during the planning period
    - Growth will create the need for additional offices, classrooms and student workspace
        - Require 15,000 square feet (~1500 nasm)with an approximate cost of $10million
        - Current lease expires in 2015
        - Target moving to a floor in E7
        - Explore collaborative funding models that reduce the amount Conrad needs to raise
    - Scholarships needed to attract and support students in MBET and new degree programs
        - Environment is very competitive – need significant scholarships to attract students

        - Move toward endowments to reduce annual effort required to raise one-time scholarships
            - Target $120,000 payout in annual scholarships for MBET – requires endowment of $4million (@3% return)
            - Target $60,000 payout in annual scholarships for Master of Product Management – requires $2million endowment (@3% return)
            - Target $60,000 payout in annual e-launch awards for Enterprise Co-op – requires $2million endowment (@3% return)
    - Develop materials that describe giving opportunities to support fundraising activities

F. GOVERNANCE, ADMINISTRATION AND LEADERSHIP

1. Complete transition from independent centre to school within the Faculty of Engineering
    - Prepare proposal for approval by EFC and Senate in 2015
2. Launch “Conrad” brand and develop a distinctive identity for the centre as an academic unit within the Faculty of Engineering
3. Clarify role of the Conrad Advisory Council
    - Prepare terms of reference for council
    - Renew membership of council and introduce staggered terms
4. Review role of entrepreneur-in-residence (EIR)
    - Review ways of supporting the director in managing external relations, including possibility of expanding role of EIR
5. Encourage adoption of administrative processes in line with other departments in engineering
    - Develop closer working relationships with other departments in engineering
6. Improve administrative systems to increase efficiency and scalability as the centre grows
    - Develop activity based reports of budget and expenditures
7. Plan for succession at the director and associate director levels
8. Redefine administrative manager position and appoint an administrative officer to manage all aspects of the centre’s finances and HR activities
    - Change lines of reporting so that staff report to the administrative officer
9. Measure progress toward Vision 2015 objectives
    - Translate Vision 2015 plan into a strategy map
    - Align internal processes with plan objectives
    - Develop a scorecard to measure progress

III RESOURCE PLAN

Conrad plans to expand by offering the Diploma in Advanced Management to students in MEng programs, and by launching two new course-based master’s programs. These programs will attract incremental new students and generate additional income; however, there will be significant costs associated with increasing the centre’s faculty complement, new staff positions, and space.

Table 9: New Plan Expenditures

RESOURCE	FUNDING SOURCE	2011/12	2012/13	2013/14	2014/15	2015/16
2 new faculty positions	Vision 2015 Fund			1	1	
1 new faculty position	CBET			1		
1 new staff position	Vision 2015 Fund		1			
1 new staff position	CBET				1	

C. Department of Chemical Engineering

TOM DUEVER, CHAIR

I INTRODUCTION

Waterloo's Chemical Engineering Department is a research intensive department offering large chemical engineering undergraduate and graduate programs and, in collaboration with chemistry and electrical & computer engineering, the undergraduate program in nanotechnology engineering. Since 2009 it has also started offering its undergraduate chemical engineering program at the UW Dubai campus. The department has a total faculty complement of 40 of which 36 positions are filled (35 were filled as of the baseline date of May 1, 2011), a staff complement of 16.5 of which 14.5 positions are filled, an undergraduate population of about 650 and a graduate student population of about 180. The undergraduate program uses the co-op system in which students alternate between eight academic terms and six work term placements. The department offers one of the best undergraduate programs in Canada. The graduate program does not rank as highly but is counted in the top 20%. In research the recent Taiwan Rankings placed the department at 46th position in the world and 1st overall in Canada. In the US context the department would likely rank in low 20s of an overall ranking.

Waterloo Chemical Engineering aspires to be the leading chemical engineering department in Canada in terms of undergraduate, graduate, and research programs and among the leading departments in North America. To accomplish this goal, a number of key priority areas will be addressed which are briefly summarized below.

Over the five-year planning period, the department will be hiring 11 new faculty members bringing the total faculty complement to 47. The priority is to hire the best possible faculty members to fulfill the long-term strategic needs of the department's research and teaching programs. In addition, the department plans to add 8 new staff positions to add critically needed personnel to the administrative and technical support groups.

In the undergraduate program curriculum improvements will be undertaken to achieve better course integration, improve the offering of technical electives, redesign and modernize the laboratory experience and to improve the co-op experience including increasing first-year placements and the introduction of an eight-month co-op work term.

Improving graduate recruitment is a key priority in order to strengthen the graduate program. This includes both CPR and international recruitment. The priority is to attract and recruit high quality applicants. The graduate course offering needs to be improved by improving the quality of the 600 level courses and by increasing the number of 600 and 700 level courses. Finally the development of an online MEng program will be pursued.

Key to the success of the department is the success of its research program. The first key priority here is to improve the performance of the department in securing research funds including larger-scale grants such as CFI. In addition each department research theme area will develop a planning document, which will describe resource needs. Additional key staff will be added to support the research enterprise and the position of associate chair research will be created.

Finally another key priority is to continue to pursue the upgrading of space and facilities. The primary focus here is the design and construction of E8, which will constitute the second half of the new chemical engineering building.

II ACADEMIC PLAN SUMMARY

A. FACULTY AND STAFF PLAN

Goal A1: Recruit New Faculty According to the Schedule in Tables 1 and 2

- Utilize key advertising media as well as personal networks to recruit top faculty candidates in Canada and around the world.
- Ensure that appropriate laboratory and office facilities are available prior to starting the recruitment process.
- Assign a teaching and research mentor to each new hire.

Table 1: Faculty Hiring Plan

	Baseline: May 1, 2011							
POSITION TYPE	**Filled**	**Open**	**TOTAL**	**Faculty to be hired 2011/12**	**Faculty to be hired 2012/13**	**Faculty to be hired 2013/14**	**Faculty to be hired 2014/15**	**Total Faculty: May 1, 2015**
Current TTS	30	4	34	1	1	1	1	34
Current Lecturers	2		2					2
New TTS								0
New Lecturers								0
Other TTS:UAE	3	1	4		3	3	2	11
Other Lecturers:UAE								0
TOTAL	35	5	40	1	4	4	3	47

Table 2: Faculty Hiring Plan by Funding Source and Target Area

TARGET	YEAR	FUNDING SOURCE
Multiscale Modeling	2011/12	Resignation replacement
Energy/Emissions	2012/13	Nanotechnology
Petrochemical	2012/13	UAE 4
Petrochemical	2012/13	UAE 5
Sustainable Energy	2012/13	UAE 6
TBD	2013/14	Vision 2015 Fund
Polymers	2013/14	UAE 7
Catalysis	2013/14	UAE 8
TBD	2013/14	UAE 9
TBD	2014/15	Nanotechnology
TBD	2014/15	UAE 10
TBD	2014/15	UAE 11

NOTE: The target areas for many of the hires will be determined via the planning document which will be prepared by each of the research themes, which is one of the objectives in the research plan below.

Goal A2: Increase the Number of Faculty Holding Professional Engineering License According to Table 3

- Continue to actively encourage and assist faculty to obtain full or limited licence. This will continue to be co-ordinated with the help of the associate dean CEPA office.
- Continue to implement a merit score increase in year the license is obtained.

Table 3: Faculty Hiring Plan by PEng

REGISTRATION STATUS	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Registered	20	22	27	32	35
Applied	7	10	8	7	7
Not Applied	8	4	5	5	5
TOTAL	35	36	40	44	47
% registered of total	57.1%	61.1%	67.5%	72.7%	74.5%
% registered+applied of total	77.1%	88.9%	87.5%	88.6%	89.4%

Goal A3: Increase Number of Female Faculty Members According to Table 4

- Strike a task force to work with the associate dean outreach and WiE to determine if barriers exist that make Waterloo Chemical Engineering unattractive to female faculty candidates.
- Adopt proactive recruiting, identifying promising female PhD students early on through conferences and other contacts/networks and actively recruiting these candidates early on.

Table 4: Faculty Hiring Plan by Gender

GENDER	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Male	33	33	36	38	39
Female	2	3	4	6	8
TOTAL	35	36	40	44	47
% female	5.7%	8.3%	10%	13.6%	17%

Goal A4: Recruit New Staff as Shown in Tables 5 and 6

- Utilize key media and recruitment processes to attract top candidates.
- Assign a mentor to each new hire.

Table 5: Staff Hiring Plan

	Baseline: May 1, 2011			Staff to be hired 2011/12		Staff to be hired 2012/13		Staff to be hired 2013/14		Staff to be hired 2014/15		Total staff: May 1, 2015		
POSITION	ADMIN	TECH	TOTAL	A	T	A	T	A	T	A	T	A	T	TTL
Filled Staff	5	9.5	14.5									5	9.5	14.5
Open Staff	1	1	2	1	1							1	1	2
Other Staff:UAE					1	1	1	1	1			2	3	5
New Staff					1	1		1				2	1	3
TOTAL	6	10.5	16.5	1	3	2	1	2	1	0	0	10	14.5	24.5

Table 6: Staff Hiring Plan by Function and Funding Source

FUNCTION	YEAR	FUNDING SOURCE
Senior demonstrator	2011/12	Department
Nanotechnology lab instructor	2011/12	Open May 1, 2011
Graduate studies co-ordinator	2011/12	Open May 1, 2011
Technical service manager & safety co-ordinator	2011/12	UAE
Financial assistant	2012/13	UAE
Technical secretary (nanotechnology)	2012/13	Nanotechnology
Chemical technologist	2012/13	UAE
Undergraduate assistant	2013/14	UAE
Industry relations officer	2013/14	Vision 2015 Fund
Technical research support	2013/14	UAE

Evaluation Methodology:

- Number of open and new faculty and staff positions filled
- Number of female faculty hired
- Number of new PEng registrations

Goal A5: Introduce Strategies for Interdepartmental Social and Professional Interactions

- Utilize new facilities in E6 for a weekly or bi-weekly coffee break.
- Undertake measures to make the departmental flagship seminar series more prominent.
- Promote and support other opportunities for faculty, staff and students to socialize.

B. UNDERGRADUATE STUDIES PLAN

Goal B1: Improve the Laboratory Experience in the Curriculum

- The Vision 2015 Undergraduate Laboratory Enhancement Initiative is making a substantial investment of $2.3million over 5 years to the department, providing the opportunity to develop new experiments that address new areas in chemical engineering practice and complement thematic areas of research in the department. This will lead to a substantial enhancement of the laboratory experience of all of our undergraduate students.
- Purchase new off the shelf laboratory equipment where possible.
- Design and fabricate equipment where needed.
- Introduce more pilot-scale equipment for undergraduate laboratories.
- Develop more open-ended laboratories with a view towards providing students with more creative laboratory studies.

Evaluation Methodology:

- Number of new labs implemented
- Funds spent on new equipment
- Student feedback

Goal B2: Improve the Undergraduate Curriculum

- Address the CEAB outcomes-based accreditation.
- Achieve better course integration within the curriculum. This will be achieved by encouraging better communication between faculty teaching a particular cohort and faculty teaching in a particular theme.
- Increase the offering of technical electives. Courses on topics deemed to be important by the department will be developed where possible. Proposals for new courses will be evaluated by the curriculum committee who will bring courses to the departmental meeting for approval.

- ♦ Increase the use of case studies and amount of design content through co-operation with the Waterloo Cases in Design Engineering group.
- ♦ Review the Teaching Assistant deployment and training in the curriculum. The TA specifications including hours for each course will be developed and the type of training required for different TA tasks must be determined.

Evaluation Methodology:

- Curriculum revisions made
- Course mapping and yellow page completion (The course yellow page provides a detailed week by week summary of what is covered)
- Number of new technical electives introduced
- Number of case studies introduced
- TA specifications per course
- Degree to which the curriculum meets the desired outcomes

Goal B3: Improve the Co-op Experience

- ♦ Complete the work of the CECA/chemical engineering year 1 task force project. This project has been initiated with a view towards improving the employment of first-year students in particular. This task force will look at co-op job development and necessary first-year curriculum changes.
- ♦ Re-design streaming to accommodate 8-month work terms. In collaboration with CECA and the associate dean CEPA, an eight-month work term will be introduced into each chemical engineering streams using an elective model as much as possible.
- ♦ Appoint departmental CECA liaison officer who will serve on the task force mentioned above in the short term and in the long term will be the contact for any co-op and CECA inquiries.

Evaluation Methodology:

- Number of year 1 co-op jobs created
- Number of volunteer positions held by chemical engineering students on co-op terms
- Number of 8-month co-op jobs created

Goal B4: Improve Links with Alumni and Industry

- ♦ Create an industry relations officer position, working closely with the engineering research office.
- ♦ Develop and implement an exit survey for the 4B class
- ♦ Develop and implement an alumni survey in collaboration with the faculty's advancement office.
- ♦ Establish a database of volunteer guest speakers for undergraduate courses.

Evaluation Methodology:

- Exit survey results analysis and response rate
- Alumni survey results analysis and response rate
- Number of guest speakers invited

Table 7: Undergraduate Intake Plan

	FALL 2011 INTAKE			FALL 2012 TARGET			FALL 2013 TARGET			FALL 2014 TARGET			FALL 2015 TARGET		
PROGRAM	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**
Chemical	120	18	138	120	20	140	120	20	140	120	20	140	120	20	140
UAE: Chemical	5	28	33	5	35	40	8	42	50	10	50	60	10	50	60
Nanotechnology	107	9	116	105	10	115	100	10	110	100	10	110	100	10	110

C. GRADUATE STUDIES PLAN

Goal C1: Improve Recruitment of High Quality Graduate Students

- Host an on-campus recruitment event for potential CPR students from other Canadian institutions.
- Host recruitment event for Waterloo third and fourth-year students.
- In collaboration with the engineering communications team develop more effective advertising tools such as web pages, Facebook and other social media, brochures, pamphlets and annual research summaries.
- Exploit collaborations, connections and conferences to recruit high quality international students.

Evaluation Methodology:

- Number of CPR applicants and students admitted
- Number of Waterloo graduate applicants and students admitted
- Number of international student applicants and students admitted
- Number of scholarship holders admitted
- Number of scholarships received by students in the programs

Goal C2: Improve the Graduate Course Offering and Quality

- A single list of 600 level core courses will be developed including syllabi for each course developed by the instructors (minimum 2) teaching the course and approved by the department. Rules for core course requirements for each program will be established.
- A schedule for offering the 600 level courses will be established one year in advance.
- Over the Vision 2015 plan period, the total number of graduate courses, including core courses but not including 500 level and those held with 500 level courses, will be increased to 20 per year.

Evaluation Methodology:

- 600 level courses approved by the department
- New 600 level courses introduced
- Number of graduate courses offered annually
- Course averages and failure rates

Goal C3: Determine the Feasibility of an Online MEng Program

- Strike a small task force to determine the potential benefits for having online graduate courses. In particular this might benefit part-time students and those not resident in Waterloo.
- Determine the effort required to mount a course online and establish which courses are particularly well-suited for this mode of delivery. Investigate the technology available to do so.
- Conduct a feasibility study to determine if there is a market for an online professional MEng program for chemical engineers working in the chemical, resource and energy industries.

Evaluation Methodology:

- Feasibility report

Table 8: Graduate Intake Plan

	2011 FTE INTAKE			2012 FTE TARGET			2013 FTE TARGET			2014 FTE TARGET			2015 FTE TARGET		
PROGRAM	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**
PhD	6.3	23	29.3	10	19	29	10	19	29	12	18	30	12.3	18	30.3
Rsch Master	19.3	12	31.3	21	10	31	23	10	33	25	10	35	27	10	37
Prof Master	4.3	9	13.3	7	0	7	12	0	12	15	0	15	20	0	20
TOTAL	29.9	44	73.9	38	29	67	45	29	74	52	28	80	59.3	28	87.3

D. RESEARCH PLAN

Goal D1: Develop Research Theme Planning Documents

- Appoint theme co-ordinator for each research theme who will be responsible for co-ordinating the writing of the planning document.
- Summarize current inventory and future need for research equipment.
- Determine future directions and hiring needs.

Evaluation Methodology:

- Planning document for each of the seven themes

Goal D2: Improve Research Funding

- Appoint an associate chair research who can liaise with the ERO and monitor and broadcast funding opportunities.
- Provide teaching load reduction and writing support (through the ERO) for faculty members leading a large research grant application.
- Revisit the overhead return sharing policy.
- Develop a plan at the departmental level for increasing industrial grant funding.
- Hire an industrial relations officer to develop and strengthen connections with industry

Table 9: Research Funding Projections

	2010/11 Actual Funding	2011/12 Target Funding	2012/13 Target Funding	2013/14 Target Funding	2014/15 Target Funding
Total Research Funding	$5,021,511	$6,000,000	$7,000,000	$7,600,000	$9,225,000

Table 10: Research Funding per Tenured/Tenure-Stream Faculty Member Projections

	2010/11 Actual Funding/TTS	2011/12 Target Funding/TTS	2012/13 Target Funding/TTS	2013/14 Target Funding/TTS	2014/15 Target Funding/TTS
Total Research Funding per TTS	$152,167	$176,471	$184,211	$180,952	$205,000

Evaluation Methodology:

- Number of large grants (CFI, ORF, etc.) secured where a faculty member from the department is the lead investigator
- Amount of industrial grant funding income
- Amount of tri-council funding
- Total research funding per year (performance against target)
- Funding per faculty member

Goal D3: Improve Research Support

- Establish an associate chair research whose mandate would include mentorship of junior faculty with grants, liaising and co-ordinating activities with industry, interface with ERO and URO for issue resolution and improved communication and collection and tracking of research related data.
- Hire additional staff to assist with managing research accounts.
- Hire a technical service manager to co-ordinate technical services provided in the department.
- Hire additional technical staff for the central analytical lab.
- Hire an industrial relations officer (see Goal D2, above).

Evaluation Methodology:

- Feedback from faculty and graduate students

E. SPACE PLAN

Goal E1: Work Towards the Construction of E8 to Address the Space Needs of the Department Related to UAE-based Growth and Undergraduate Laboratory and Teaching Needs

- The design of E8 will be completed by the space committee in collaboration with the faculty space personnel. This includes the detailed design of undergraduate laboratory space to house the new and existing experimental setups.
- Work with the engineering advancement office to raise funds for the construction of E8.
- Continue with annual contributions to the faculty's building fund.

F. TECHNICAL SERVICES PLAN

Goal F1: Develop and Implement a Technical Services Plan for the Department

- Recruit and appoint a technical services manager.
- Develop a plan, which will define all technical service areas, the tasks to be accomplished on a weekly/monthly/per term basis in each area and how the services will be deployed in the different facilities (DWE, E6, QNC).

III RESOURCE PLAN

Additional revenue will come about during the plan period primarily through increases in differential tuition fees, and CPR and international graduate growth. There will likely be a modest increase due to increased overhead returns. The additional resources will be used to hire a senior demonstrator, to assist with graduate student recruitment and to make contributions to the faculty's building fund.

New plan expenditures include sources for hiring new faculty and staff and the budget for undergraduate lab upgrades. The plan expenditures table below summarizes the sources of funding for new hires. Of particular note is the department's allocation from the Vision 2015 Undergraduate Laboratory Enhancement Initiative, described above, which totals $2.3 million over five years. The schedule for deploying the funds is given below.

Table 11: New Vision 2015 Expenditures

RESOURCE	FUNDING SOURCE	2011/12	2012/13	2013/14	2014/15	2015/16
2 new faculty positions	Nanotechnology		1		1	
1 new faculty position	Vision 2015 Fund			1		
8 new faculty positions	UAE		3	3	2	
1 new staff position	Vision 2015 Fund			1		
1 new staff position	Department	1				
1 new staff position	Nanotechnology		1			
5 new staff positions	UAE	1	2	2		
Undergraduate lab upgrades	Vision 2015 Fund	$350,000	$350,000	$700,000	$400,000	$500,000
Social/faculty interaction	Department	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$25,000

D. Department of Civil & Environmental Engineering

Neil Thomson, Chair

I INTRODUCTION

The Department of Civil and Environmental Engineering (CEE) can be looked upon as one of the founding departments of the Faculty of Engineering. Its first chair, Professor Douglas Wright was simultaneously the dean of engineering and later the university president. The next three deans of engineering were also from the Civil Engineering Department. Since the inception of the co-op program, the department has operated two program streams with about 80 students in each class. The geological engineering program was introduced in the early eighties jointly with the Earth Sciences Department. A severe drop in the civil engineering enrolment in the early nineties refocused the department's activities towards the emerging field of environmental engineering. The environmental engineering program was introduced in the early nineties and was fully accredited by the time the first class graduated in 1999. The mid-nineties brought severe funding difficulties, and a special early retirement program (SERP) resulted in 18 senior faculty members retiring almost simultaneously. Following SERP only 14 faculty members remained and it took CEE about 10 years to recover to the pre-SERP faculty complement.

Currently CEE is responsible for the civil engineering program and the environmental engineering program, and is a major administrative and teaching resource for the geological engineering program. In 2009, CEE began offering the civil engineering program in Dubai as part of the University of Waterloo's partnership with the Higher Colleges of Technology in the United Arab Emirates (UAE). CEE is one of the largest combined civil/environmental/geological engineering departments in Canada. We pride ourselves as important contributors to the success of the University of Waterloo and aspire to remain the *best overall*.

As of May 1, 2011, the current complement in CEE is 38 faculty or 36.25 full-time equivalents (FTE) comprised of 20.25 professors, 6 associate professors, 8 assistant professors, and 2 lecturers. Our FTE total includes joint faculty positions with the School of Architecture (0.5 FTE), the School of Planning (0.5 FTE), and an Ontario Research Chair position shared with other units in the university (Faculty of Environment, and the Department of Management Sciences, Faculty of Engineering) (0.25 FTE). We have two NSERC Industrial Research Chairs (IRC), two Tier II NSERC Canada Research Chairs (CRC), one Tier I NSERC CRC, and one endowed research chair. We also have a number of very active emeriti. The current staff complement consists of 7 technicians, 2 IT staff, and 7 administrative staff for a total of 16.

In March 2011, CEE compiled a comprehensive self study that described changes that have taken place in CEE over the past 5 years, and identified areas for improvement and related challenges. On April 27, 2011 a CEE faculty retreat was held to discuss the Vision 2015 planning priorities. The CEE Vision 2015 Draft Plan was primarily focused on improvements to our various undergraduate and graduate programs, and ways to increase research output, capacity and impact. Our Vision 2015 draft plan was circulated to all faculty and staff for comment. A meeting was held on June 28, 2011 with all CEE graduate students to gather input. The draft plan was sent to select undergraduate students in all three CEE programs and these students were encouraged to share our plan with other students in their programs. A collective set of undergraduate comments was received and discussed at a meeting held July 26, 2011. From September 21 to 23, 2011 external assessors (Dr. Brenda McCabe and Dr. Andrew Scanlon) visited CEE to review our draft plan, and submitted their report to Dean Sedra on September 29, 2011. Based on the external assessment report, and feedback from CEE faculty, staff, graduate students, undergraduate students, and the Faculty of Engineering dean, associate deans and senior administrative staff the CEE Vision 2015 plan was revised.

ASPIRATION

Over the next five years, the Department of Civil and Environmental Engineering (CEE) will seize the opportunities resulting from faculty and staff growth to evolve into an outstanding civil and environmental engineering department on the world stage. CEE aspires to be one of the top three CEE departments in Canada and one of the top 20 CEE departments in North America.

CEE will be:

- recognized as the first choice for high school students interested in a career in civil, environmental, or geological engineering,
- renowned for research excellence in traditional and leading-edge areas,
- in demand by excellent domestic and international undergraduate and graduate students in search of graduate degrees and post-doctoral research experience,
- known among Canadian and global employers for producing outstanding engineering graduates,
- a location of choice for outstanding applicants looking for a rewarding career as a professor, and
- the preference of industry and government to connect with outstanding researchers.

KEY OBJECTIVES

1. Revision of the curriculum of our three undergraduate programs to improve our excellent programs, attract the best high school students and enhance the overall undergraduate student experience.
2. Improve the graduate student experience so that we continue to attract talented and highly productive applicants.
3. Build on our excellence in undergraduate and graduate teaching.
4. Attract new faculty who will conduct innovative and transformational research in the CEE domain.
5. Enhance research connections, and promote collaboration.
6. Ensure that the CEE staff provides the highest level of service to our students, faculty, and other staff.
7. Provide an atmosphere that is collegial, safe, and engaging for all undergraduate students, graduate students, faculty and staff.

II ACADEMIC PLAN SUMMARY

A. FACULTY AND STAFF PLAN

Faculty

The CEE Vision 2015 complement faculty target to May 1, 2015 is 48.3 FTE. The UAE initiative is associated with 11 new faculty. To date (November 2011) we have filled 3 UAE positions and 1 UAE position remains open. In addition, we have 1 regular position open as a result of a resignation, and the

Norman W. McLeod Endowed Research in Sustainable Pavement Engineering is associated with a junior professor position.

Table 1: Faculty Hiring Plan

POSITION TYPE	Baseline: May 1, 2011 Filled	Open	TOTAL	Faculty to be hired 2011/12	Faculty to be hired 2012/13	Faculty to be hired 2013/14	Faculty to be hired 2014/15	Total Faculty: May 1, 2015
Current TTS*	34.3	1	35.3	1				35.3
Current Lecturers	1		1					1
New TTS:JrChair							1	1
New Lecturers								0
Other TTS:UAE		3	3	3	3	2	2	10
Other Lecturers:UAE	1		1					1
TOTAL	36.3	4	40.3	4	3	2	3	48.3

**NOTE: Baseline count includes a position bridged to the retirement of another, also counted in the baseline.*

Table 2: Faculty Hiring Plan by PEng

REGISTRATION STATUS	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Registered	27.8	30.8	36.3	40.3	43.3
Applied	1	5.5	4	3	3
Not Applied	7.5	4	3	2	2
TOTAL	36.3	40.3	43.3	45.3	48.3
% registered of total	76.6%	76.4%	83.8%	89.0%	89.6%
% registered+applied of total	79.3%	90.1%	93.1%	95.6%	95.9%

Table 3: Faculty Hiring Plan by Gender

GENDER	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Male	33.3	36.3	38.3	40.3	42.3
Female	3	4	5	5	6
TOTAL	36.3	40.3	43.3	45.3	48.3
% female	8.3%	9.9%	11.6%	11.0%	12.4%

Table 4: Faculty Hiring Plan by Funding Source and Target Area

TARGET	YEAR	FUNDING SOURCE
TBD (see below)	2011/12	UAE 4
TBD (see below)	2012/13	UAE 5
TBD (see below)	2012/13	UAE 6
TBD (see below)	2012/13	UAE 7
TBD (see below)	2013/14	UAE 8
TBD (see below)	2013/14	UAE 9
TBD (see below)	2014/15	UAE 10
TBD (see below)	2014/15	UAE 11
Junior Professor	2014/15	McLeod Endowment

Actual retirement dates are difficult to estimate with the removal of the mandatory retirement age at the University of Waterloo. However based solely on the faculty age profile, we could expect approximately 3 retirements over the next 4 to 5 years. An essential part of our research plan is to strike an ad hoc committee with a mandate to generate a white paper that will provide a rigourous review of the current and projected future trends in CEE research, and include a critical assessment of our existing capabilities to meet these demands and whether we could fill these gaps with the projected hiring plan. This white paper (*expected September 2012*) will form the basis for the areas of study in which new positions will be created or where retirements will be replaced or reallocated within CEE.

Staff

The CEE Vision 2015 staff complement target to May 01, 2015 is 21. Table 6 indicates the tentative areas of the 5 staff hires (1 administrative and 4 technical) associated with the UAE initiative (funding source – UAE). These have been identified as: (1) administrative support for the graduate office, (2) a senior technician who will also have some managerial responsibilities; (3) a technician to support the transport/structures area; (4) a technician to support the growth in field research activities (environmental, water resources, geotechnical, structures), and (5) an IT support person to provide website/database support and handle the duties currently performed by co-op students (tentative). Depending on the outcome of the comprehensive curriculum and course content review exercise the need for a laboratory staff instructor may be required and changes to the above tentative staff hires will need to be considered. *By May 2012 we will have developed a plan for the technical staff hires.*

Table 5: Staff Hiring Plan

	Baseline: May 1, 2011			Staff to be hired 2011/12		Staff to be hired 2012/13		Staff to be hired 2013/14		Staff to be hired 2014/15		Total staff: May 1, 2015		
POSITION	**ADMIN**	**TECH**	**TOTAL**	**A**	**T**	**A**	**T**	**A**	**T**	**A**	**T**	**A**	**T**	**TTL**
Filled Staff	7	9	16									7	9	16
Open Staff												0	0	0
Other Staff :UAE				1	1		1		1		1	1	4	5
New Staff												0	0	0
TOTAL	7	9	16	1	1	0	1	0	1	0	1	8	13	21

Table 6: Staff Hiring Targets

FUNCTION	YEAR	FUNDING SOURCE
Graduate admissions assistant	2011/12	UAE
Tech1: Manager	2011/12	UAE
Tech2: Field	2012/13	UAE
Tech3: Transport/Structures	2013/14	UAE
Tech4: IT assistant	2014/15	UAE

B. UNDERGRADUATE STUDIES PLAN

The following undergraduate studies issues were identified as **priorities**:

1. **Comprehensive curriculum and course content review.**
   The last major curriculum change in CEE was in 2000 with some minor adjustments in 2002. A comprehensive review of the curriculum and course content for all three CEE programs is overdue and is a major focus of our undergraduate studies plan. A CEE curriculum review committee (CRC) was established in September 2011. Graduate attributes, curriculum thrusts and points of undergraduate engagement were identified and a detailed implementation framework for

curriculum review and revision was developed by December 2011. All faculty and staff will be engaged in this curriculum renewal. *The target for a revised draft curriculum for departmental discussion and approval is August 2012, and the revised curriculum should be effective for incoming students in 2014.*

2. **Laboratory equipment upgrades and enhancements.**
   We envision that the revised curricula will allow for some laboratories that are more open-ended and we should grasp this unique student learning opportunity. The CEE space plan clearly identifies undergraduate teaching laboratories (structures, geotechnical, environmental, and water resources) which are available for us to enhance the student laboratory experience. A revised curriculum needs to be developed before a firm estimate will be available. The faculty has allocated $1 million from the Vision 2015 Undergraduate Laboratory Enhancement Initiative to this important initiative. *An equipment estimate is expected by December 2012.*

3. **Student retention.**
   We realize that student failure is not the only reason students leave a program of study and, where possible, we will work with other groups at Waterloo who are also exploring student retention issues. *Annually we will track (to the best of our ability) reasons why students left their respective 4B cohort (effective May 2011).*

4. **Student engagement/experience.**
   The key to successful undergraduate programs is to provide a student with a variety of experiences in addition to a world-class academic program. This will ensure that we will attract and retain the highest quality students. We believe that the outcome from our proposed comprehensive curriculum and course content review will sustain our high quality programs and offer some enhancements to the CEE student experience. In addition, we will:
   - *Require all new CEE faculty hires to attend CTE workshops to ensure teaching quality. Starting March 2011.*
   - We will improve our TA evaluation process and provide recognition to those who are outstanding. *By May 2012, a modified TA evaluation method will be in place that will involve both the undergraduate students and course instructor. An outstanding CEE TA will be selected each term and will receive an award.*
   - Use of sessional instructors to fill teaching gaps is inevitable and cannot be eliminated; however, the number of sessional instructors that a specific cohort receives during their undergraduate program should be minimized. *Starting September 2011, the number of sessional instructors per cohort will be monitored*.
   - Increase faculty participation at CEE led undergraduate student events such as: the capstone design project presentations; Dean's Honors List luncheon; end-of-the-program celebration parties; and convocation. Attendance at these events is expected from a fully engaged faculty member. *A list of those attending will be part of the annual performance summary provided by the chair each year (begin in 2012).*
   - Several undergraduate student teams form each year to work on novel designs and to prepare for various competitions. *By February 2012, CEE will identify a "faculty champion" for the design competitions relevant to CEE students.*

5. **Eight-month work term.**
   In principle, CEE plans to facilitate an eight-month work term option between the 3B and the 4A terms for the civil engineering program. *Opportunities to incorporate an eight-month work term into the revised CIVE curriculum which have a low impact on resources need to be considered by December 2012.*

6. **Welcome and integration of UAE students.**
   Although the logistical details will evolve, we expect to run an orientation session, assign a faculty mentor, and provide UAE students with additional teaching assistant support. *Each year the type and degree of CEE support will be reviewed.*

Table 7: Undergraduate Intake Plan

	FALL 2011 INTAKE			FALL 2012 TARGET			FALL 2013 TARGET			FALL 2014 TARGET			FALL 2015 TARGET		
PROGRAM	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**
Civil	98	15	113	100	15	115	100	15	115	100	15	115	100	15	115
UAE: Civil	8	22	30	5	35	40	8	42	50	10	50	60	10	50	60
Environmental	60	5	65	62	8	70	62	8	70	62	8	70	62	8	70
Geological	18	1	19	25	2	27	25	3	28	27	3	30	27	3	30

C. GRADUATE STUDIES PLAN

The following graduate studies issues were identified as **priorities**:

1. **Graduate growth and quality.**
   Graduate growth in the research based programs will occur as more faculty members are hired and as the existing faculty members in the department mature. We envision additional growth in the MEng programs through strategic changes to the structure of the MEng programs. *Progress on meeting the targets for the number of graduate students will be evaluated by comparing actual intake and enrolment in each year with our targets.*

   We will seek to improve the quality of graduate students in our programs by more targeted recruiting of top candidates in both the CPR and international categories. The efforts to recruit top quality graduate students will be co-ordinated with faculty-level recruiting efforts. *Graduate student quality will be tracked by monitoring: the number of graduate students recruited from our own and other Canadian universities; the number of our students who hold an NSERC or OGS award; and the number of students who are funded by their home country or institution*.

2. **Graduate course offerings.**
   We are establishing a target of 33 (600 and 700 level) graduate courses per year by 2015. The ability to meet this target will be influenced by the number of faculty members in the department and the use of sessional instructors may be required. *Progress on meeting this target by 2015 will be evaluated by tracking the number of graduate courses offered each year*. We propose to introduce a compulsory "Research Methods" course to be taken by all MASc and PhD students. *The Fall 2011 skeleton offering of this course will be followed by a full offering in Fall 2012. This course will be taught by all CEE faculty.*

3. **MEng Program(s).**
   There is a strong desire to improve the quality and quantity of students in the MEng programs. The intent is to achieve this by making the MEng programs more attractive to students. We propose to phase out the MEng – Infrastructure Systems program and use the generic MEng program to focus on three to four "streams" in specialized areas (i.e. transportation, structures, water/environment, etc.). Each stream would have a number of core technical courses and students could also choose a number of elective courses. There may also be some core courses that are common to all streams. Students who successfully complete the required courses for a stream would receive a certificate at the time of graduation. To further increase the attractiveness of the MEng program, some courses will be offered in an online mode. *The success of the CEE revised MEng program offerings will be evaluated by tracking the number of graduates from the MEng program.*

4. **Graduate student experience.**
   To improve the graduate student experience we plan to: (1) introduce a compulsory "Research Methods" course that will bring all incoming research-based students together for a shared

classroom experience, (2) provide the opportunity for PhD students who have completed the CTE Certificate in University Teaching program to teach undergraduate courses as sessional lecturers (four offerings in the department per year), (3) continue our practice of providing more opportunities for graduate students who wish to be a TA or CA (course assistance is 50% of a TA) for a course; (4) upgrade the office furniture that graduate students have in their workspaces and provide consistent quality of furniture in our graduate spaces; and (5) develop a graduate student lounge to further facilitate interaction of graduate students. *Progress on improving the graduate student experience will be evaluated by conducting regular surveys of student satisfaction.*

5. **Graduate student progression.**
   To improve student progression, we propose to provide incentives for students to finish in a timely manner, such as only providing departmental scholarship awards to students who are within the time limits. In conjunction with the EGSO, the format of comprehensive exams will be revised and regular comprehensive committee meetings will be established. The required elements of a comprehensive proposal will be developed at the departmental level to restrict the effort and time required for this document to be produced. *Progress on improving graduate student progression will be evaluated by tracking the per cent of students who meet their program (or comprehensive exam) time limits as well as the average degree (and comprehensive exam) completion time*.

Table 8: Graduate Intake Plan

	2011 FTE INTAKE			2012 FTE TARGET			2013 FTE TARGET			2014 FTE TARGET			2015 FTE TARGET		
PROGRAM	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**
PhD	5.3	18	23.3	8	19	27	9	18	27	11	21	32	13	18	31
Rsch Master	27.2	11	38.2	25	11	36	26	12	38	28	14	42	30	12	42
Prof Master	19	0	19	22	0	22	25	0	25	26	0	26	27	0	27
TOTAL	51.5	29	80.5	55	30	85	60	30	90	65	35	100	70	30	100

D. RESEARCH PLAN

The following research issues were identified as **priorities**:

1. **Identification of emerging research areas.**
   We propose to form an ad-hoc research committee to conduct a detailed evaluation of emerging research areas and those research areas that we should discontinue. This will generate consensus for future directions and assist in planning for retirements and other hiring. This process will need to involve data collection from multiple stakeholders including government, industry, and other knowledgeable experts. *This white paper will be completed by September 2012 so that the findings can be incorporated into future hiring plans.*

2. **Strategies to increase research funding, output, capacity and impact.**
   The following strategies have all been suggested to encourage and expand research capacity and funding: (1) allow faculty to change their performance weighting from the normal 40-40-20 to 60-20-20 or 20-60-20, (2) access to a technical writer through the engineering research office to assist with development of major proposals, (3) the addition of faculty in complementary areas would allow faculty to pursue large tri-council research grants, (4) increase information sharing across the department with respect to research skills, (5) provide the opportunity for faculty to participate in professional development opportunities, and (6) establish a standing CEE research committee that will be responsible for the overall review and preparation of an annual report on research progress.

3. **Benchmarking of CEE research and funding.**
   Benchmarking of CEE research output was identified as a CEE planning priority. The Faculty of Engineering is currently exploring bibliometrics that could be used across the faculty. In addition to the pending bibliometric methods, we have identified research targets for: quantity of research publications, journals, and research funding. *These will be tracked annually.*

4. **Improve research collaborations.**
   To increase interdisciplinary and inter-departmental research collaborations, CEE faculty would be encouraged to submit proposals involving other colleagues within CEE, but also with colleagues from other Waterloo departments. Furthermore, proposals including colleagues at other Canadian institutions and international institutions would be highly encouraged. *Collaboration information was gathered and reported in the CEE self study and similar data will be monitored annually*.

Table 9: Research Funding Projections

	2010/11 Actual Funding	2011/12 Target Funding	2012/13 Target Funding	2013/14 Target Funding	2014/15 Target Funding
Total Research Funding	$9,078,100	$10,000,000	$10,500,000	$11,000,000	$12,500 000

Table 10: Research Funding per Tenured/Tenure-Stream Faculty Member Projections

	2010/11 Actual Funding/TTS	2011/12 Target Funding/TTS	2012/13 Target Funding/TTS	2013/14 Target Funding/TTS	2014/15 Target Funding/TTS
Total Research Funding per TTS	$264,668	$261,097	$254,237	$254,042	$269,978

E. OTHER PLANS

An integral part of the success of CEE moving forward is to have timely and professional print and electronic communication and marketing materials. CEE supports the Vision 2015 pilot effort to embed marketing communications co-ordinators, responsible to the engineering advancement office, in departments.

CEE also supports the recent creation of an industry relations officer in the engineering research office. The primary responsibility is to foster and strengthen external partnerships for departments, including CEE.

III RESOURCE PLAN

Some additional incremental resources will be generated over the plan period through small increases in MEng students and in international undergraduate students.

Table 11: New Plan Expenditures

RESOURCE	FUNDING SOURCE	2011/12	2012/13	2013/14	2014/15	2015/16
7 new faculty positions	UAE	1	2	2	2	
1 new faculty position	McLeod Endowment				1	
5 new staff positions	UAE	2	1	1	1	
Undergraduate lab upgrades	Vision 2015 Fund	$100,000	$200,000	$200,000	$200,000	$300,000
Undergraduate lab upgrades	Department	$50,000	$50,000	$50,000	$50,000	$50,000

E. Department of Electrical & Computer Engineering

MANOJ SACHDEV, CHAIR

I INTRODUCTION

The ECE department has seen rapid growth over the last five years. In the next five years, we are planning to consolidate our gains, and focus on all-round academic excellence.

Our undergraduate plan focuses on admissions and recruitment, student retention and engagement, infrastructure, and teaching quality. Recommendations include admitting more international students, revamping recruitment material, working with the faculty to allow reduced term loads for students, requesting permanent funding for lab maintenance, expanding into E7, encouraging the faculty to invest in first-year engineering infrastructure, a much expanded role for the teaching quality co-ordinator, enhanced training for TAs, streamlining of lab content, and introducing more flexibility in lab scheduling.

The graduate plan addresses the need to provide a rigourous, quality graduate program that compares well in the North American context. We are aiming for a growth of 16% in our PhD and research master graduate program over the next five years. Attracting Canadian and permanent resident (CPR) students is a key component of the department graduate plan.

The department's research plan builds on its success over the last five years. The department is setting aggressive research targets of carrying out high impact research, engaging industry, and raising funds for research. The department will hire an industry relations officer and appoint an associate chair for research for this purpose. We are planning to hire six additional faculty members to manage our teaching and research mandate. In addition, we are also planning to hire five additional staff members to serve growing administrative requirements.

II ACADEMIC PLAN SUMMARY

A. FACULTY AND STAFF PLAN

At present the department has 81.5 faculty members with 5 open positions. These open positions are in software, radio frequency integrated circuits, and nanotechnology, respectively. The department currently mounts 152 undergraduate and 60 graduate courses annually. A research chair holder in the department gets one course teaching reduction each year, and currently 15 teaching course reductions are associated with research chair holders. Similarly, 15.5 course reductions are associated with administration. A full complement of 86.5 is inadequate to mount these courses once sabbaticals are also taken into consideration. The department is planning to hire 6 new faculty positions to help fulfill its teaching and research obligations.

The ECE department is a large, diversified department; however, teaching and research resources are not evenly spread across its different specializations. Table 1 provides the proposed hiring over the planned period. In 2011-13 period, the department will hire to fill its 5 remaining open positions. In addition, the department is expecting 2-3 faculty retirements during the plan period; a case will be made to retain these positions in the department, strategically redistributed in areas of strategic interests such as software, bio-engineering and smart grid technology.

The ECE department's research profile has grown significantly in the last five years. We believe hiring a department industry relations officer (with dotted-line reporting to the associate dean, research) will further enhance our relationship with industry and will result in increased research funding. We will fill this position as soon as possible. The department will hire an administrative officer who will have responsibilities and duties to manage the administrative staff. In addition, the department will hire a research financial coordinator, an administrative assistant, and a graduate record specialist to better serve the growing departmental needs.

The department will make retaining faculty and staff a top priority. In the last several years, ECE has found faculty and staff retention an issue. The department workload has grown significantly owing to the size and diversity of its operation. We are hiring 5 staff members to better manage the work load.

Table 1: Faculty Hiring Plan

	Baseline: May 1, 2011							
POSITION TYPE	**Filled**	**Open**	**TOTAL**	**Faculty to be hired 2011/12**	**Faculty to be hired 2012/13**	**Faculty to be hired 2013/14**	**Faculty to be hired 2014/15**	**Total Faculty: May 1, 2015**
Current TTS	77	5	82	2	3			82
Current Lecturers	4.5		4.5					4.5
New TTS					1			1
New Lecturers								0
Other TTS:IQC					2	1	2	5
Other Lecturers								0
TOTAL	81.5	5	86.5	2	6	1	2	92.5

Table 2: Faculty Hiring Plan by PEng

REGISTRATION STATUS	**Baseline: May 1, 2011**	**Target: May 1, 2012**	**Target: May 1, 2013**	**Target: May 1, 2014**	**Target: May 1, 2015**
Registered	45.5	50.5	55.5	60.5	63.5
Applied	12	6	8	5	4
Not Applied	24	27	26	25	25
TOTAL	81.5	83.5	89.5	90.5	92.5
% registered of total	55.8%	60.5%	62%	66.9%	68.6%
% registered+applied of total	70.6%	67.7%	70.9%	72.4%	73%

Table 3: Faculty Hiring Plan by Gender

GENDER	**Baseline: May 1, 2011**	**Target: May 1, 2012**	**Target: May 1, 2013**	**Target: May 1, 2014**	**Target: May 1, 2015**
Male	72.5	74.5	78.5	79.5	80.5
Female	9	9	11	11	12
TOTAL	81.5	83.5	89.5	90.5	92.5
% female	11%	10.8%	12.3%	12.2%	13%

Table 4: Faculty Hiring Plan by Funding Source and Target Area

TARGET	**YEAR**	**FUNDING SOURCE**
Nanotechnology	2011/12	Nanotechnology
Software engineering	2011/12	Resignation replacement
Quantum computing	2012/13	IQC
Radio frequency integrated circuits	2012/13	Resignation replacement
TBD	2012/13	Resignation replacement
Nanotechnology	2012/13	Nanotechnology
TBD	2012/13	IQC
Software engineering	2012/13	Vision 2015 Fund
TBD	2013/14	IQC
TBD	2014/15	IQC
TBD	2014/15	IQC

Table 5: Staff Hiring Plan

	Baseline: May 1, 2011			Staff to be hired 2011/12		Staff to be hired 2012/13		Staff to be hired 2013/14		Staff to be hired 2014/15		Total staff: May 1, 2015		
POSITION	**ADMIN**	**TECH**	**TOTAL**	**A**	**T**	**A**	**T**	**A**	**T**	**A**	**T**	**A**	**T**	**TTL**
Filled Staff	16	27	43									16	27	43
Open Staff	2.6		2.6	2.6								2.6	0	2.6
New Staff				2		3						5	0	5
TOTAL	18.6	27	45.6	4.6	0	3	0	0	0	0	0	23.6	27	50.6

Table 6: Staff Hiring Plan by Function and Funding Source

FUNCTION	YEAR	FUNDING SOURCE
Administrative officer	2011/12	Vision 2015 Fund
Research finance co-ordinator	2011/12	Department
Administrative assistant	2012/13	Department
Industrial relations officer	2012/13	Vision 2015 Fund
Graduate records specialist	2012/13	Vision 2015 Fund

B. UNDERGRADUATE STUDIES PLAN

At the undergraduate level, the department is responsible for 2402 students. The department manages three cohorts of students enrolled in electrical engineering (EE) and computer engineering (CE); the average intake for the two programs combined has been 330 students. The department also participates in three collaborative engineering programs: software engineering (SE) with a 50% share, mechatronics engineering (MTE) with a 20% share, and nanotechnology engineering (NE) with a 33% share of students. In the last few years, the department has had to deal with a drop in the entering averages for EE and CE students. Consequently, ECE will have to make much stronger efforts than in previous years to make the EE and CE programs as attractive as the collaborative programs we participate in.

Goal B1: Enhance the Quality of Admitted Students in Electrical and Computer Engineering

We intend to keep the total number of students in the ECE cohorts constant. Our plan calls for pooling of all CPR and international students, with the cap on the number of international students steadily increasing year over year. In the last few years, the department has received a large number of high-quality international undergraduate applicants, and hence we are confident that the international cap numbers are realistic. We expect that opening up our programs to more international students will result in an increase in overall student quality.

- **Continue Pooling Applicants**: Continue the ECE practice of pooling together EE and CE applicants to help ensure we admit the best students.
- **Maintain Admission Targets Unchanged**: Do not increase the overall admission target during the plan period.
- **Increase International Admissions**: Gradually increase intake of high-quality international students.

Evaluation Methodology:

- Annual data from the engineering admissions director will allow us to monitor averages of the incoming students

Goal B2: Improve Student Retention Rates and Enhance Student Engagement

ECE must make steps to improve student retention rates. We note that the problem is multi-faceted, and some students choose to leave ECE even though they are progressing academically. In the last several years, the department has taken initiatives for student recognition and engagement. These initiatives include various social events which are generally well attended. Despite these events, students and faculty alike feel a lack of community spirit in the department.

- **Allow Reduced Loads:** Support the Faculty of Engineering proposal allowing students to take a reduced number of courses in a term.
- **Modify Early-years Courses:** Put efforts on big picture scenarios, student engagement, and deep learning.
- **Establish Student-to-Student Mentorship:** Engage/employ senior students to deliver study skills to junior students.
- **Better Understand Why Students Leave ECE:** Get data to better understand why students leave ECE and where they end up.
- **Support Extracurricular Design Projects:** ECE students currently run the ASIC Design Team and participate in several other projects such as the Solar Car, Formula SAE, Nano-Robotics, etc. ECE will provide faculty and financial support for such activities.

Evaluation Methodology:

- Annual failure rates from each cohort will be monitored
- Number of student events, and attendance at such events, will be logged
- Activity in extracurricular design projects will also be monitored

Goal B3: Enhance the Undergraduate Student Experience Through Infrastructure Improvements

In the fall of 2010, the Engineering Society carried out a survey of students to identify their top 10 concerns. Four of the top 10 issues are directly relate to the infrastructure. This data is consistent with the 4B exit survey data collected by the ECE department. Surveys of the ECE faculty members reveal, again, the same concern that the department and university infrastructure is insufficient, both in quality and quantity, to support current undergraduate operations.

- **Increase the Amount of Department Space Dedicated to Undergraduates** (e.g. lecture rooms, lab rooms, and study space): The ECE department needs extra space to accommodate its undergraduate students. The undergraduate students will have a 200 nasm study space in E5 building. The department has budgeted $100,000 for it. Similarly, E7 will also have space dedicated to student centric activities.
- **Dedicated Budget for ECE Labs:** The ECE department will use Vision 2015 Undergraduate Laboratory Enhancement Fund resources of $2.2 million over the plan period. In addition, the department will spend $500,000 of its resources for equipment upgrade and consumables.

Evaluation Methodology:

- An annual space audit will help us track space that ECE undergraduate students can use.
- The ECE lab budget and lab spending will also be tracked.

Goal B4: Improve Overall Teaching Quality

Teaching quality is an important but complicated topic. Students regularly express concerns about teaching quality. For example, of the top 10 issues raised by Faculty of Engineering students, two are directly related to teaching. More supporting evidence that teaching quality is a major concern for students is provided by the annual ECE 4B exit surveys, which regularly reflect significant concern about teaching quality issues. At present, the only quantitative measure of undergraduate teaching quality is provided by student course critiques.

- **Outcome-based Assessment:** ECE has made significant progress in developing an outcome-based assessment process. In the Vision 2015 plan period, we will re-orient the curriculum using an outcome-based assessment approach. An outcome-based approach potentially improves teaching quality since each instructor is forced to think about, and to help assess, outcomes of the course, and therefore will be more engaged in helping students to achieve those outcomes.
- **Teaching Quality Co-ordinator:** Recently, the ECE department appointed a faculty member as the teaching quality co-ordinator (TQC). We will expand the role and mandate of the teaching quality co-ordinator.
- **TA training and TA pool:** We are recommending that more extensive TA training be implemented and that the TA pool be increased to allow more senior undergraduate students to become TAs. The department contributes $450,000/year for TA support in addition to what it receives from the engineering faculty. The department will contribute $200,000/year of additional money to increase the number of TAs.
- **Focused Labs:** We are in the process of revamping almost all labs, and we are recommending that all labs be streamlined with clear purposes and reasonable workload. Teaching credit should be granted for major lab development.

Evaluation Methodology:

- Feedback will continue to be gathered from students at class-prof/rep meetings each term.
- The TQC will also submit an annual report summarizing impact that the position is having.
- We will also monitor the TA training progress and keep track of the percentage of TAs who have completed training.
- Finally, as the outcomes-based assessment process is put in place, lab outcomes will be monitored and both instructors and lab instructors will be required to adjust labs if outcomes are not being met; progress along these lines will be recorded as part of the outcomes-based assessment data logging process.

Table 7: Undergraduate Intake Plan

	FALL 2011 INTAKE			FALL 2012 TARGET			FALL 2013 TARGET			FALL 2014 TARGET			FALL 2015 TARGET		
PROGRAM	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**
Electrical & Computer	297	44	341	310	50	360	300	55	355	290	65	355	290	65	355
Mechatronics	112	21	133	115	15	130	110	15	125	110	15	125	110	15	125
Nanotechnology	107	9	116	105	10	115	100	10	110	100	10	110	100	10	110
Software	108	13	121	110	15	125	105	15	120	105	15	120	105	15	120

C. GRADUATE STUDIES PLAN

The ECE graduate program at Waterloo is one of the largest in the country with 746 graduate students. The department is planning to grow its PhD and research master program by 16% compared to 2010, while reducing the course-based FTE enrolment by 10. Part of this growth will be enabled by the hiring of 6 new faculty members in the department. The graduate planning committee identified five specific ways to further improve and strengthen our graduate program over the next 5 years.

Goal C1: Increase the Rigour of the PhD Examination

The department is of the opinion that comprehensive examinations are not rigourous enough compared to top ECE departments in North America. Students are expected to answer questions on background material as well as on the proposal. Often specific attention is not paid on the background information of the candidate. Students must pass the comprehensive examination in their 3rd or 4th term. However, the majority of students take more than 4 terms to pass the exam.

- **Split the Comprehensive Exam:** The comprehensive examination will be split into the background examination; and the research proposal. The background examination will be a written examination.
- **Formalize Exam Time Lines:** Students will pass the background examination within the first 3 terms of their PhD program. They must pass their research proposal within the next 3 terms of their PhD program.

Evaluation Methodology:

- Percentage of students successfully completing the background exam in first 3 terms
- How completing the background exam in a timely manner relates to the success rate in the proposal exam
- The additional staff resource requirement will also be monitored

Goal C2: Provide High-Quality PhD Supervision and Support Timely Degree Completion

A typical PhD student in the ECE department takes longer than 4 years to complete the degree. A PhD student can benefit from a timely, periodic feedback from his/her PhD committee which may speed up the time to graduation. Currently, this feedback is given at the time of the comprehensive examination. The graduate committee felt that there should be a mechanism in the 3rd year to provide feedback to the student leaving adequate time for students to take action and complete the degree in time. This also ensures that there will be at least one meeting with the committee every year in the first 4 years.

- **Timing of the PhD Seminar:** It is recommended that PhD student must give a seminar on his/her PhD work no more than one year after passing the research proposal examination. The complete PhD committee must be present at the seminar to provide constructive feedback on the student's progress and plan for graduation.
- **Encourage PhD Co-supervision:** The department will encourage faculty members to co-supervise students. Mentoring by senior faculty and more co-supervision by faculty members who are co-investigators in research projects will also be encouraged.

Evaluation Methodology:

- The percentage of students that are co-supervised will be monitored
- The number of students who complete the degree within 4 years will be tracked

Goal C3: Increase Graduate Course Requirements

Our goal is to provide graduate training that offers both breadth and depth competence in the student's research area. The results of our survey of graduates indicate that approximately half of our PhD graduates, and 60% of our MASc graduates, go on to careers in industry. These students need both a broad background as well as technical competence in their area of specialization. Data collected on our recent PhD graduates indicates that the vast majority of PhD students are taking the bare minimum of 3 courses in their thesis area. This goes against our stated intention of providing both depth and breadth in the PhD program. Therefore, the department felt that the number of required courses should be increased in the PhD program. In order to be able to provide breadth, we propose to introduce the notion of core courses in each of the 13 OCGS designated research areas of the department. The purpose of a core course would be to provide the basic knowledge and tools necessary in that area.

- **Establish Increased Graduate Course Requirements:** The course requirement for a MASc student will be maintained at 5 courses. However, the course requirement for a PhD student who is enrolled in the program after MASc should be increased from 3 to 4 courses.
- **Introduce Core Courses:** MASc students must take at least two core courses from the designated research area.

- **Allow Additional Courses from Faculties of Math and Science:** Recognizing the diversity in research areas within the ECE grad program, courses taken from the faculties of math and science will be approved as part of the coursework, over and above the currently allowed limits.

Evaluation Methodology:

- The incremental number of students taking courses from math and science faculties will be annually monitored

Goal C4: Increase Recruitment Efforts to Attract CPR Students and Improve Graduate Funding

In spite of a significant growth in our graduate program, the department is not attracting enough research CPR students. There are several reasons identified, Waterloo not being in a metropolitan area, insufficient promotional activities, and inadequate research assistantship.

- **Enhance ECE's Visibility as a Research-intensive Department:** Publish an annual brochure highlighting ECE research and graduate studies. Invite top undergraduate students to Waterloo for a visit.
- **Strive to Make Competitive Offers:** Make offer letter financially attractive. Include assurance of TA awards for top students who did undergrad degrees in Canada in the letter, along with applicable conditions. The department will contribute $200,000/year for CPR student RAs. In addition, the department will contribute $50,000/year for ECE graduate scholarships of $1,000 each.
- **Improve Graduate Funding:** Put more effort in with the view of increasing the number of NSERC and OGS scholarships in terms of application preparation and faculty assistance; encourage faculty members to consider increasing GRS funding above the NSERC recommended research assistantship.
- **Improve Student Morale:** The department will seek and provide more opportunities for students to interact and collaborate; town hall meetings will be held every term between the students and the department administration (chair / associate chair).

Evaluation Methodology:

- Data will be collected annually to monitor the incremental CPR population
- Every term the funding distribution data on the amount and spread for all MASc and PhD students will be collected

Goal C5: Restructure the MEng Program with a Focus on Quality

The ECE department currently accepts approximately 75 students every year to the MEng program. There is a significant difference in background of most of the MEng applicants compared to regular MASc candidates. We have noted that the MEng students perform relatively poorly, on average, in graduate classes compared to MASc. and PhD students who take the same classes. There are several reasons for the poorer performance of MEng students in their coursework. For example, the students might have a more difficult time adapting to academics given that many of them have spent several years outside an academic system. We believe that a high-quality MEng program is an important component of the ECE graduate program because it provides an opportunity for individuals in industry to update and improve their skill set. The program also provides new immigrants to Canada an opportunity to obtain a recognized degree from a Canadian institution and to integrate in the professional work force.

- **Analyze Applicant Quality:** Recalibration of applicants' entrance averages based on the institute of undergraduate degree, as an increasing number of applicants are from schools that are not known to Waterloo.
- **Introduce MEng-Specific Core Courses:** Teach MEng only core graduate courses taught by sessional instructors, if necessary. MEng students must pass these core courses which will be part of their degree program, before continuing with the program.

Evaluation Methodology:

- Data will be collected every term on the per-course performance and averages of all MEng students to monitor the improvement in quality as a result of the implemented changes.

Table 8: Graduate Intake Plan

	2011 FTE INTAKE			2012 FTE TARGET			2013 FTE TARGET			2014 FTE TARGET			2015 FTE TARGET		
PROGRAM	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**
PhD	20	37	57	21	47	68	25	51	76	28	56	84	32	58	90
Rsch Master	25	35	60	28	41	69	31	46	77	34	46	80	37	48	85
Prof Master	24	43	67	27	26	53	30	24	54	32	23	55	35	20	55
Course-based Master	11	0	11	14	0	14	14	0	14	16	0	16	16	0	16
TOTAL	80	115	195	90	114	204	100	121	221	110	125	235	120	126	246

D. RESEARCH PLAN

From the ECE research self study report by the ECE Vision 2015 research planning committee, it is concluded that the ECE research program has been progressing very well in various performance measures over the past five years. Its performance measures are compatible with those of top universities in Canada and US. However, we need to improve our research profile to enhance the visibility and reputation of the department, especially outside of Canada. The department will create a position of associate chair research to drive our research agenda forward. In addition, the department will also hire an industry relations officer to solidify our relationship with industry.

In order for the department to stay competitive in research, the Vision 2015 research plan should be aggressively pursued. More emphasis should be placed on improving the quality and impact of our research program. Towards this end, the committee identifies five directions.

Goal D1: Increase the Department's Research Visibility

The ECE department research profile has grown significantly over the last five years. However, our visibility in research seems to not match our achievements, especially for audiences outside of Canada. Visibility is especially important to attract high calibre applicants to our graduate programs and research.

- I**mprove the Department's Web Presence**: The department will improve its web presence. The department website and the homepages of individual faculty members will be updated in a timely fashion.
- **Establish an ECE Distinguished Lecture Series:** The department will establish an ECE distinguished lecture series/colloquia and host invited talks. The department can set up a fund for this, especially to help junior faculty members to invite speakers. Whenever possible, we should host international workshops and conferences in the Kitchener-Waterloo area, to invite researchers to visit us.
- **Organize an Annual Research Day**: The department should organize an annual research day, to invite outside people and showcase our research achievements, which can also help to retain our top undergraduate students and MASc students to our MASc and PhD programs respectively.
- **Encourage Participation in Editorial Boards, Conferences:** The department should encourage faculty members to participate in editorial boards of journals, conference organizational committees.

Evaluation Methodology:

- Monitoring the number of graduate students that apply to the ECE department
- Monitoring and analyzing the number of visits to the department website
- Maintaining a minimum of three distinguished lectures per year and monitoring number of attendees
- Monitoring the number of conference participations by faculty and graduate students

Goal D2: Improve Research Quality

The department is determined to further enhance the quality and impact of our research. The quality of research is closely related to the calibre of our graduate students. As improving the quality of our graduate programs is essential to improving the quality of our overall research program, we should improve the effectiveness and efficiency in recruiting top graduate students.

- **Focus on Quality and Impact:** In annual merit assessment, extra emphasis will be given on research quality and impact. Publications in high quality journals and conferences will be encouraged.
- **Ensure Mentoring of Junior Faculty:** The department has hired several young faculty members in the last few years. At this moment, the department has an informal mentorship program in which a junior faculty member is mentored by a senior faculty member. The department will formalize the mentorship program.
- **Teaching Reduction:** The ECE department provides one course teaching reduction to research chair holders. If a faculty member (excluding chair holders) engages in large research initiatives, and is a very active researcher in terms of graduate students supervision, publications and funding; she/he will be considered annually for reduced teaching.

Evaluation Methodology:

- Monitoring of the collective number of total citations of ECE department faculty publications
- Monitoring the number of internal and external research awards that ECE faculty members receive
- Monitoring the department average number of graduate students per assistant professor and average research funding per assistant professor

Goal D3: Improve the Department's Research Profile

The department should look into ways to enhance its research profile. We should make high profile hires under Vision 2015 plan.

- **Establish a Task Force for Future Research Directions and Growth**: The academic research environment is constantly evolving, and the department should position itself to take emerging initiatives. A task force should be established to address such needs.
- **Seek High-Profile Faculty Candidates in Strategic Areas:** The department should hire top notch researchers in targeted areas.
- **Review Research Directions and Strategies at the Department Annual Retreat:** The ECE department organizes department retreats. Research groups should be requested to present research progress, trends, and new directions in their fields.

Evaluation Methodology:

- Monitoring the performance of recent ECE department faculty hires in terms of publications, graduate student supervision and research funding. Number should exceeds the current department's averages
- Having at least 30% of the annual department retreat program dedicated to research matters.
- Monitoring interest of faculty members to attend such retreats
- Monitoring the number of faculty members that holds professional awards such IEEE, CAE Fellows, etc.

Goal D4: Increase Research Funds

The department self study report identifies a bi-modal research profile in the department. The department must encourage faculty members with low research output to contribute more to research such as in student supervision, publications, and funding.

- **Increase Co-Supervision:** The department should encourage and enable the co-supervision of graduate students as a means to bring in faculty members with low research productivity and funding. It is expected that such a relationship may lead to increased research funds over time.
- **Provide Increased Flexibility in Individual Faculty Members' Workload Mix:** For faculty members who are more interested in and want to devote more time to teaching, the department should adjust the research/teaching/service distribution, in order to encourage the faculty members to teach more courses (more than the normal 3 courses per year). Such a practice will allow other faculty members to increase their distribution toward more research time to support intensification of their research activities.
- **Increase Connections and Partnerships with Industry:** The department must actively engage industry for research collaboration. The new industry relations officer staff position is expected to have a positive impact.

Evaluation Methodology:

- Monitoring the number of research proposal generated annually by the ECE department
- Monitoring and updating the ECE research targets established in Vision 2015
- Monitoring the industrial funding that the ECE department attracts

Goal D5: Improve the Research Environment

To provide necessary research support to faculty members, the department will appoint a research associate chair, establish the new staff position of industry relations officer, and form an ECE research committee.

- **Establish a Research Associate Chair**: The research associate chair should be a top researcher who is willing and able to devote time to the ECE research program. He/she will provide a strong leadership in the ECE research program, and will be responsible for establishing and, together with the department chair and other associate chairs, maintaining a mentoring program for junior faculty members.
- **Support Large Initiatives:** The department has established large research facilities through Federal and Provincial grants. However, maintaining them is an ongoing issue. The department will make special representation to the university for some support, perhaps through Federal Indirect Costs.

Evaluation Methodology:

- Monitoring overall research productivity of the department
- Monitoring the time taken from the department to process documents related to research such as, proposals, hiring documents of PDF's, office assignment to visitors, etc.
- Monitoring of distribution of research funding and output for faculty members. The goal is to eliminate the bimodal distribution and turn it to a normal distribution.

Table 9: Research Funding Projections

	2010/11 Actual Funding	2011/12 Target Funding	2012/13 Target Funding	2013/14 Target Funding	2014/15 Target Funding
Total Research Funding	$18,425,667	$20,000,000	$22,000,000	$23,500,000	$26,000,000

Table 10: Research Funding per Tenured/Tenure-Stream Faculty Member Projections

	2010/11 Actual Funding/TTS	2011/12 Target Funding/TTS	2012/13 Target Funding/TTS	2013/14 Target Funding/TTS	2014/15 Target Funding/TTS
Total Research Funding per TTS	$239,294	$253,165	$258,824	$273,256	$295,455

E. RECRUITMENT AND OUTREACH

The ECE department identifies recruitment and outreach as being critical to the future success of the program. Over the past five years, the engineering outreach office has grown tremendously and has developed many initiatives aimed at increasing the profile of engineering to the public. In order to leverage the existing outreach infrastructure more efficiently, ECE must become more organized in its outreach efforts. Furthermore, the department will work with the faculty's undergraduate recruitment co-ordinator to seek other ways to increase the profile of Waterloo ECE among prospective students and continue to attract high quality undergraduate students. All proposed ECE outreach and recruitment activities will use the resources and expertise available at the faculty level and will be pre-approved at the faculty level.

F. ANNUAL ASSESSMENT AND CALIBRATION

Annual assessment and calibration is important to ensure progress. The department will assess its progress twice a year. A full-day retreat will be organized every year at the end of July to assess the department's progress on Vision 2015 targets. At the retreat, all aspects of the plan will be reviewed. We will also have the opportunity to recalibrate our plan if required as circumstances may have changed. In addition, the department will also organize a shorter meeting in early December to provide an update on the plan. These dates are chosen when there are no scheduled classes and faculty members can participate without worrying about classes.

III RESOURCE PLAN

The department will pursue new sources of revenue. As mentioned in the undergraduate plan, the department will admit more high quality, international undergraduate students. The department will reduce the number of international MEng students while increasing domestic MEng students by a modest number. In addition, the department will sustain the number of students in its course-based master's program.

The Vision 2015 plan will require significant resources to implement. In addition to the central allocations captured in Table 11 below, the department will also commit more than $3 million of new money from its resources to implement the plan.

Table 11: New Plan Expenditures

RESOURCE	FUNDING SOURCE	2011/12	2012/13	2013/14	2014/15	2015/16
5 new faculty positions	IQC		2	1	1	1
1 new faculty position	Vision 2015 Fund		1			
1 new staff position	Vision 2015 Fund	1				
2 new staff positions*	Vision 2015 Fund			2		
Undergraduate lab upgrades	Vision 2015 Fund	$300,000	$800,000	$300,000	$500,000	$300,000
Undergraduate lab upgrades	Department	$100,000	$100,000	$100,000	$100,000	$100,000
Undergraduate study space	Department		$100,000			
ECE TA support	Department	$200,000	$200,000	$200,000	$200,000	$200,000
ECE grad scholarship	Department	$50,000	$50,000	$50,000	$50,000	$50,000
ECE grad student fund	Department	$200,000	$200,000	$200,000	$200,000	$200,000
Building fund	Department	$100,000	$100,000	$100,000	$100,000	$100,000

**NOTE: The department plans to hire for these positions in the year prior to central funding being available, and will therefore need to provide the required bridge funding for both.*

F. Department of Management Sciences

FRANK SAFAYENI, CHAIR

I INTRODUCTION

The Department of Management Sciences offers graduate degrees (masters, PhD) in management sciences, and an undergraduate degree in management engineering. The department currently has 26.3 faculty (4 of which were open on the May 1, 2011 plan baseline date and have since joined the department), and 7 permanent staff members.

The department aspires to establish a world-class reputation for excellence in research, teaching, and student experience for both undergraduate and graduate studies. The priorities based on self-study, external and internal feedback are to improve the quality in each of the following: faculty and staff performance, undergraduate studies, graduate studies, research funding, and external relationships.

II ACADEMIC PLAN SUMMARY

A. FACULTY AND STAFF PLAN

Faculty

The number of new faculty members in the department has increased as the result of our undergraduate program. In 2011/12, we hired 4 new faculty and we are planning to hire 3 more in 2012/13.

Goal A1: High Performance

- We follow very rigourous hiring procedures. We also take a number of steps in order to integrate the new faculty into our department and to communicate expectations with respect to performance. These include assigning a mentor to each new faculty member, monthly meetings with the chair, monthly departmental social events for faculty and staff, and an open classroom policy which encourages new faculty to attend any of the ongoing courses.

Evaluation Methodology:

- Individual faculty performance in teaching, scholarly activities, research funding
- Feedback from new faculty

Table 1: Faculty Hiring Plan

POSITION TYPE	Baseline: May 1, 2011 Filled	Open	TOTAL	Faculty to be hired 2011/12	Faculty to be hired 2012/13	Faculty to be hired 2013/14	Faculty to be hired 2014/15	Total Faculty: May 1, 2015
Current TTS	20.3	8	28.3	4	3	1		28.3
Current Lecturers	2		2					2
New TTS								0
New Lecturers								0
TOTAL	22.3	8	30.3	0	0	0	0	30.3

Table 2: Faculty Hiring Plan by PEng

REGISTRATION STATUS	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Registered: PEng	4.3	13.3	18.3	19.3	21.3
Applied	10	4	3	3	1
Not Applied	3	3	1	0	0
Not Eligible	5	6	7	8	8
TOTAL	22.3	26.3	29.3	30.3	30.3
% registered of total	19.1%	50.5%	62.4%	63.6%	70.2%
% registered+applied of total	64%	65.7%	72.6%	73.6%	73.6%
% registered of eligible	24.6%	65.4%	82%	86.5%	95.5%
% registered+applied of eligible	82.6%	85.2%	95.5%	100%	100%

Table 3: Faculty Hiring Plan by Gender

GENDER	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Male	17.3	20.3	22.3	23.3	23.3
Female	5	6	7	7	7
TOTAL	22.3	26.3	29.3	30.3	30.3
% female	22.5%	22.9%	23.9%	23.1%	23.1%

Table 4: Faculty Hiring Plan by Funding Source and Target Area

TARGET	YEAR	FUNDING SOURCE
Behavioural Sciences	2011/12	Resignation replacement
Applied Operations Research	2011/12	Resignation replacement
Applied Operations Research	2011/12	Management Engineering
Information Systems (IS)	2011/12	Management Engineering
Applied Operations Research or IS	2012/13	Resignation replacement
Behavioural Sciences	2012/13	Resignation replacement
Information Systems	2012/13	Management Engineering
Behavioural Sciences	2013/14	Management Engineering (current definite-term)

In addition to these positions, the department would require 2 additional faculty positions to allow us to selectively decrease the teaching load of our faculty who are actively seeking research funding and/or supervising quite a few graduate students. Currently, we are one of the only departments with a teaching load of 4 courses per year. Reducing this to 3.25 would allow for teaching load reduction on a selective basis. While the dean recognizes the potential of such a reduction, current resource constraints do not allow a commitment to fund these positions at the time of publishing this plan. This request should be reconsidered later in the plan period years, informed by the department's progress toward their research and graduate studies goals.

Staff

Two staff members will be retiring in 2012/2013. We will be replacing one of these roles with a department administrative officer and the other will remain as the secretary to the chair. In 2011, we hired a laboratory technician, and in 2012/13 we will be hiring a staff to help with the increased administrative workload resulting from the new undergraduate program.

Goal A2: High Performance

- We will be rigourous in the hiring of the new staff. We are also planning to review and possibly to reallocate tasks for all staff, provide training, and to communicate expectations about performance. The staff is included in the monthly social event.

Evaluation Methodology:

- Performance review with feedback from faculty
- Feedback from students

Table 5: Staff Hiring Plan

	Baseline: May 1, 2011			Staff to be hired 2011/12		Staff to be hired 2012/13		Staff to be hired 2013/14		Staff to be hired 2014/15		Total staff: May 1, 2015		
POSITION	**ADMIN**	**TECH**	**TOTAL**	**A**	**T**	**A**	**T**	**A**	**T**	**A**	**T**	**A**	**T**	**TTL**
Filled Staff	6	1	7									6	1	7
Open Staff												0	0	0
Other Staff (Mgmt)					1	1						1	1	2
New Staff												0	0	0
TOTAL	6	1	7	0	1	1	0	0	0	0	0	7	2	9

Table 6: Staff Hiring Plan by Function and Funding Source

FUNCTION	YEAR	FUNDING SOURCE
Laboratory technician	2011/12	Management Engineering
Administrative support	2012/13	Management Engineering

B. UNDERGRADUATE STUDIES PLAN

At the undergraduate level, the Department of Management Sciences offers the management engineering degree program and the option in management sciences.

Goal B1: Implement Outcomes-Based Program Evaluation

- We will complete the implementation of outcomes-based program evaluation and continuous improvement processes in anticipation of new CEAB accreditation requirements that take effect in 2014.

Goal B2: Reduce Student Attrition by Increasing Student Admission Averages

- Through an improved program marketing strategy we will work to build a stronger identity for management engineering, which we hope will translate into a stronger pool of applicants. This will enable us to reduce the fraction of "deflection" applicants admitted each year whose first choice Waterloo program is not management engineering. We plan to hold our enrolment intake steady (at 60 students per year) until average entering grades are high enough to warrant an increase. Our goal is to increase admission averages to the median of those of other Waterloo Engineering programs by 2015.

Goal B3: Increase the Average Teaching Quality of Faculty and TAs

- We will work to improve the teaching evaluations of faculty members, through systematic mentoring of weaker teachers by stronger ones and by placing more emphasis on teaching quality in faculty performance evaluation. We also plan to begin formally evaluating TA teaching quality and base future TA hiring decisions on past TA evaluations.

Goal B4: Enhance the Social, Professional, and Intellectual Experience of our Students

- We will complete implementation of our undergraduate work process laboratory and integrate the resources of this new facility into course curriculum. We will also complete implementation of new teaching and social spaces for our students. We are currently working with our students to establish a chapter of the Institute of Industrial Engineers, and assigning funds to support student research experiences and attendance at student conferences and competitions. We will establish a process by which exceptional students will be able to enter our master's program on an accelerated basis. Through our newly-created industry liaison position, we will work to enhance connections with industry and other external stakeholders to support co-op and graduate placement and identify industry-relevant student design projects.

Table 7: Undergraduate Intake Plan

	FALL 2011 INTAKE			FALL 2012 TARGET			FALL 2013 TARGET			FALL 2014 TARGET			FALL 2015 TARGET		
PROGRAM	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**
Management	55	11	66	55	10	65	50	10	60	50	10	60	50	10	60

<u>Option in Management Sciences</u>

Goal B5: Expand MSCI Option Course Offerings

- We will open at least 15 of our new management engineering core and elective courses to a limited number of other engineering students for credit toward the MSCI option. This will give option students greater flexibility in course selection, and improve access to the MSCI option by alleviating scheduling constraints.

Evaluation Methodology:

- Intake student's average
- Teaching evaluations
- Exit survey

C. GRADUATE STUDIES PLAN

The Department of Management Sciences will continue to seek excellence in graduate programs by setting objectives that focus on the quality of students and the availability of key resources such as funding and space.

Goal C1: Reduce Graduate Class Sizes

- We are currently offering one section of each of our required graduate courses (MSCI 603, 605, 607 and 609) with about 70-80 students. We are hoping to offer two sections at about 40. This means two offerings of each course, one in the fall and one in the winter.

Goal C2: Increase Graduate Course Availability

- With the expansion in the number of faculty hired, we are hoping to reach total course offerings of about 31, including 20 electives.

Goal C3: Introduce MMSc Specializations

- With a minimum of about 5 elective courses per area, we will explore offering specializations in Information Systems (IS), Applied Operations Research (AOR), and Management of Technology (MOT). Such a designation is awarded upon completing four elective courses in the required area. We are planning to offer the following minimum number of courses:

	Number of electives	Fall term minimum	Winter term minimum	Spring term minimum
Applied Operations Research (AOR)	9.5	1	2	2
Management of Technology (MOT)	5.3	1	2	2
Information Systems (IS)	7.8	1	2	2

Goal C4: Facilitate Transfers Between the Coursework and Thesis Programs

- We will continue to use the Graduate Research Scholarship to facilitate the transfer of students between MMSc and MASc. The scholarship, valued at $4,000, is awarded to students as one-time-only funding, conditional on finding a management sciences faculty member who is willing to act as a supervisor.

- In 2010/2011, the ratio of PhD students to tenured and tenure-stream faculty was 1.3, as was the research master's student ratio. We expect the supervisory intensity to reach 1.5 PhD students and 2 research master's students for a total of 99 research students by the end of the plan period:

Number of supervising faculty	28.3
MASc - at 2.0 per faculty	56.6
PhD - at 1.5 per faculty	42.5

It should be noted that the department's target for supervisory intensity is lower than the average expected across the faculty. This is due in large part to limited funding available for graduate students in the department. Additionally, with so many new faculty hires who will be building up their research programs during this plan period, we will not reach a steady state of graduate students by 2015. Finally it is important to bear in mind that if our current teaching load of 4 is reduced somewhat in the future, faculty should have additional time to devote to their research programs and could then increase their graduate supervision.

Goal C5: Increasing student funding level

- As the department is planning to increase its research student enrolment, it must also provide sufficient funding to support those students. Our goal is to provide a minimum of $20,000 per PhD student and $17,000 per master's student. A number of sources will be used to fund these students.

- The department is planning to use funds raised through the coursework master's programs to support students. In particular, funds from the online program and the international master's programs will be used to support the research activity of thesis-based students**.** The department expects to allocate about $120,000 per year for this, $40,000 of which will be used for the Graduate Research Scholarship to support the transfer of about 10 students. The rest of the funding will be allocated on a 1-to-1 basis to match support from the supervisor.

- We are also planning to use teaching assistantships towards student support. As exceptional students have been excellent TAs, we are planning to include TA support in their offer package to attract them.

Evaluation Methodology:

- Number of MASc and PhD students
- Number of MASc and PhD students per tenured/tenure-stream faculty member
- Number of graduate courses offered
- Funding level of the graduate students
- Tracking of the placement of our graduates
- Number of joint (faculty and graduate student) research publications
- Exit survey

MMSC Online Program

Over the past year, a number of improvements have aimed to make the MMSc online program more consistent with the management sciences on-campus MMSc program. All exams are hand-written now (in the past the students were allowed to use computers); all instructors are now required to have 2 hours of live and 1 hour of recorded lectures (any deviations from this format require written justification); only two exam dates are permitted per course, and in cases when students must write the exam on a different day than the scheduled exam date the instructor must prepare two exam papers; and standard graduate course critiques are now used to evaluate the teaching quality.

Goal C6: Maintain Annual Enrolment at the Current Level of 25-30 students

- The table below contains the number of applications and enrolments by term since winter 2009.

	Total Apps	Registration
Winter 2009	15	11
Spring 2009	18	8
Fall 2009	29	15
TOTAL 2009	62	34
Winter 2010	23	14
Spring 2010	7	2
Fall 2010	16	9
TOTAL 2010	46	25
Winter 2011	17	5
Spring 2011	14	9
Fall 2011	26	15
TOTAL 2011	57	29

Goal C7: Explore Possibilities of Combining On-Campus and Online Courses

- The on-campus courses would be taught as usual in a classroom, while also being video-recorded. The video-recorded lectures will be made available to online students for downloading or streaming from the web. In addition to this, a weekly one-hour live video tutorial will be also held by the instructor or TA. We piloted this approach in one of the courses in fall 2011. The informal feedback we received from the students was very positive. In the future we would also like to explore a possibility of live broadcasting of on-campus lectures to online students.

Goal C8: Increase Participation of Regular Faculty in the Online Program

- At present, only 3 regular faculty members are teaching in the online program. We would like to attract more regular faculty by offering them a choice of either counting an online course teaching as part of their regular teaching load or receiving a payment for each online course taught. In the case of the second option, we propose to have part of the payment go to the person's research account, and part be added to their salary.

Goal C9: Get More Frequent Feedback from Students

- Without face-to-face interaction with students, it is hard for the online instructors to know how their course is being received. In addition to the formal end-of-term course critiques, we would also like to introduce a midterm course and instructor evaluation survey, the results of which will only be made available to the instructor, with the goal of helping him/her to improve the course and tune it to the needs of the students.

Goal C10: Increase Social Interaction with Students

- Most of the students only come to campus for their convocation ceremony. We plan to have a social event once a year, possibly in April, inviting all online students and instructors teaching in the program. This will help the students to learn more about their fellow students and instructors. Many of the students live in the GTA, therefore we expect to have a good attendance if we hold it either in Toronto or Waterloo.

Evaluation Methodology:

- Number of online graduate courses offered
- Innovative teaching methods for online graduate students
- Number of courses taught by on campus faculty
- Exit survey

Table 8: Graduate Intake Plan

	2011 FTE INTAKE			2012 FTE TARGET			2013 FTE TARGET			2014 FTE TARGET			2015 FTE TARGET		
PROGRAM	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**
PhD	1.9	5	6.9	3	5	8	5	4	9	7	4	10	8	4	11
Rsch Master	4.6	0	4.6	5	10	15	6	11	17	8	12	20	11	13	24
Prof Master	16.1	17.3	33.4	22.6	8.9	31.5	26.3	8.9	35.2	31.2	8.9	40.1	37.3	8.9	46.2
Course-basedMaster	6.9	0.0	6.9	6.6	0.3	6.9	6.6	0.3	6.9	6.6	0.3	6.9	6.6	0.3	6.9
TOTAL	29.5	22.3	51.8	37.2	24.2	61.4	43.9	24.2	68.1	52.3	24.7	77.0	62.4	25.7	88.1

D. RESEARCH PLAN

Goal D1: Be Among the Top Management Sciences/Industrial Engineering/System Engineering Departments in Canada and the USA

The progress will be measured in terms of research output and funding. Research funding targets are specified in the following table.

		2011/12	2012/13	2013/14	2014/155
Total Research Funding		**$720,000**	**$970,000**	**$980,000**	**$1,050,000**
1.1	NSERC (DG)	$400,000	$400,000	$450,000	$500,000
1.2	SSHRC	$160,000	$160,000	$180,000	$200,000
1.3	Strategic Grant		$150,000	$150,000	$150,000
1.4	Industrial Contracts	$100,000	$200,000	$200,000	$200,000
1.5	Equipment Grants	$60,000	$60,000		

1.1 NSERC Discovery Grants: There are about 20 faculty members who can apply for Discovery grants. The average amount of a DG is expected to go from $20,000/year to $25,000/year in the next few years. In 2015, the total amount is expected to reach $25,000*20 = 500,000.

1.2 SSHRC Grants: There are about 8 faculty members who can apply for SSHRC grants. The total amount of SSHRC grants is expected to be $25,000*8 = 200,000/year in 2015.

1.3 NSERC Strategic Grants: A research team in healthcare and applied operations research, and a research team in computer and information management.

1.4 Industrial Contract Funding: Establish a strong tie with industry and build joint research programs. The funding level is expected to go from $100,000 to $200,000 in the next 3 years.

1.5 NSERC Equipment Grants: One in 2012 and one in 2013 are expected (mainly for computing resource (equipment and software)).

- Develop departmental support for faculty to apply for grants. This may include a new role of associate chair of research within the department.

- Work more closely with the engineering research office for possible opportunities and for the writing of the proposals.

- Take a more systematic approach to the development of collaborative industrial research funding opportunities.

Evaluation Methodology:

- Amount of annual research funding
- Research publication and citation measures

Table 9: Research Funding Projections

	2010/11 Actual Funding	2011/12 Target Funding *	2012/13 Target Funding	2013/14 Target Funding	2014/15 Target Funding
Total Research Funding	$823,155	$720,000	$970,000	$980,00	$1,050,000

**NOTE: Decrease in 2011/12 is due to the departure of a faculty member who holds a large SSHRC grant.*

Table 10: Research Funding per Tenured/Tenure-Stream Faculty Member Projections

	2010/11 Actual Funding/TTS	2011/12 Target Funding/TTS	2012/13 Target Funding/TTS	2013/14 Target Funding/TTS	2014/15 Target Funding/TTS
Total Research Funding per TTS	$40,550	$29,630	$35,531	$34,629	$37,102

E. INDUSTRY RELATIONS PLAN

The department seeks to strengthen relations with industry. It is believed that strengthening current industry partnerships, as well as forging new ones will improve the academic experience of our students through better co-op positions and projects, provide opportunities for applied research for many of our faculty members, and become a source of revenue to support research conducted by faculty and graduate students.

Goal E1: Strengthen Existing Industry Relationships

Currently the department has connections with industry through co-op employers, and industry partners from the capstone design projects, as well as past or existing industry partnerships forged by faculty members.

- We will improve communications with these current connections. Efforts will be channelled in the creation of and communication with a larger 'friends of the department' group. In addition, an annual management sciences open house will showcase the work of faculty and students to invited industry and government representatives. We will also seek opportunities to connect with industry through the students in our online master's program, the majority of whom are employed full-time in industry. We should explore ways to build on these industry relationships for such purposes as finding co-op jobs for our undergraduate students, finding topics and collaborators for 4th year student design projects, and possibly for establishing research partnerships with our faculty.

Goal E2: Create New Industry Partnerships

These partnerships will link us to private sector and government organizations with which we have had little or no previous relationship.

- We will increase the quantity and quality of exposure of our department's people, programs, and activities in various networking events organized by the Faculty of Engineering or other industry and domain specific occasions. We will also better advertise current and previous industry partnerships and the competencies and interests of our faculty and students.

Evaluation Methodology:

- Number of events organized and participated in
- Number of faculty members, students, and industry contacts that participate in the events
- Number of research projects that are initiated as a result of contact between faculty and industry
- Number of new co-op positions that are made available to management engineering students
- Number of capstone design projects that are industry based
- Number of seminar speakers that come from industry
- Moreover, the quality and usefulness of each effort will be tracked and improved through the use of feedback after each event

F. ADVANCEMENT PLAN

Goal F1: Strengthen the Relationship with our Growing and Diverse Alumni Body

MSCI alumni come from our graduate programs (on campus, online, and ADWEA) and the management engineering program (first class graduating in 2012).

- ♦ We will work with the engineering advancement office to improve communications with our alumni as well as to organize alumni events, as appropriate. We aspire to a more enriched participation on the part of our alumni as seminar speakers, and as partners in new co-op and industry-research relations.

Evaluation Methodology:

- Number of alumni events organized and participated in
- Number of alumni that participate in the events
- Number of research projects, new co-op positions, and capstone design projects that are created as a result of contact between the department and its alumni
- Number of alumni that give talks in the department as seminar speakers or as invited speakers for specific courses
- Number of alumni who donate to the university

Goal F2: Better Communicate the Department Through our Web Presence

We aim to make better use of our web presence to communicate the department, our mission and other relevant information to a variety of audiences, including current and prospective students, industry partners, and alumni.

- ♦ In anticipation of the new university-wide system of web design and the concurrent development of the Faculty of Engineering web system, the Department of Management Sciences is currently renovating its website. We will seek to better meet the demands of different audiences. For internal audiences, feedback on the website will be solicited from current students in early 2012. For external audiences, the department will track current user demographics to understand its characteristics as well as seek user feedback. The upgrade will be closely co-ordinated with faculty-level resources.

Evaluation Methodology:

- The quality and usefulness of information in the department's website will be tracked and improved through feedback from students, faculty, and external audience members.

III RESOURCE PLAN

Table 11: New Plan Expenditures

RESOURCE	FUNDING SOURCE	2011/12	2012/13	2013/14	2014/15	2015/16
4 new faculty positions	Management Eng	2	1	1		
2 new staff positions	Management Eng	1	1			

G. Department of Mechanical & Mechatronics Engineering

PEARL SULLIVAN, CHAIR

I INTRODUCTION

The Department of Mechanical and Mechatronics Engineering (MME) is the second largest department in the Faculty of Engineering. As home to nearly 1,400 undergraduates, 315 graduate students, 53 faculty members and 30 support staff, it is currently the largest mechanical engineering department in Canada.

MME offers a broad scope of engineering science education in the faculty through its two undergraduate co-op programs. Our mechanical engineering program, which accepts about 210 students annually, includes the study of mechanics of fluids, solid bodies and dynamics, controls, and thermal and materials sciences. In 2003, we led the development of the first interdisciplinary mechatronics engineering undergraduate program in Canada which enables students to interface mechanical engineering with aspects of electronics, computer and software engineering, and approach complex problems using systems engineering methodology. The mechatronics engineering program, which admits about 110 students annually, was accredited by the Canadian Engineering Accreditation Board in 2008 when the first cohort graduated.

Our research programs, which drive the content of our graduate education, are equally broad. They range from developing custom solutions to improve the quality of life of one individual to addressing major issues of national and global importance. Examples of our varied research areas include modelling human body response to impact trauma, electrification of automobiles, harnessing alternative energy sources, nanojoining of carbon nanotubes, miniaturization of diagnostic devices for chemical and biomedical testing, prototyping biomaterials and designing autonomous vehicles for search and rescue. Our research endeavours are continuously enriched as we reach out to other disciplines in engineering, science and mathematics to advance our techniques and technologies.

MME implemented its first strategic plan, Vision 2010, from 2006 to 2010. The period will be marked in its history as a time of unprecedented growth in graduate education and research. Our graduate student enrolment expanded by 60%, with impressive gains in the doctoral program. The current graduate enrolment is about 120 doctoral and 120 research master's students. Another 75 graduate students are enrolled in our professional master's program, with more than 50% of them being practicing engineers.

Research in the department spans five main theme areas: automotive, green energy, materials and nano-micro technologies including lab-on-a-chip devices, mechatronics and intelligent machines, and biomechanics/biotechnology. MME has 5 Canada Research Chairs and 5 prestigious Ontario Early Research Award recipients. External research funding nearly tripled from $6.7 million in 2005/06 to $19 million in 2010/11 – the highest in the Faculty of Engineering - firmly positioning us as one of the most research intensive departments in the University of Waterloo. Nearly 70% of the department's research activities are partnered with industry.

Under the Vision 2010 capital plan, the department expanded its physical space and consolidated its activities. MME now occupies more than 10,000 m^2 of physical space mainly concentrated in three buildings; Engineering 3 (E3 and E3X), the new Energy Research Center (ERC) and the new Engineering 5 (E5) which houses the department's administrative headquarters and the engineering student design centre. There are still, however, a handful of offices and classrooms spread over three other adjacent engineering buildings.

While mechanical engineering has long been a mainstay of engineering schools across the world, the discipline has enjoyed a recent upsurge of interest. It has been the most sought after undergraduate engineering program in North America for the past decade, supplanting electrical engineering. According to *Engineers Canada*, mechanical engineering enrolment has been the largest in Canada since 2006 attributing to more than 25% of total engineering enrolments. In the 2008 annual *U.S. News & World Report* issue devoted to graduate engineering education, mechanical engineering was identified as the most popular engineering PhD discipline and third among engineering master's degrees. Simply put, it is a good time to be offering mechanical engineering education.

Our Aspiration
The Department of Mechanical and Mechatronics Engineering aspires to be the destination of choice for mechanical and mechatronics engineering education and research in Canada, and be recognized as having among the most innovative and progressive undergraduate and graduate programs in North America.

Our Priorities
To achieve our aspirations, we recognize that Vision 2015 should attend to the foundation of our department reputation, which is our mechanical engineering undergraduate program, and to focus on deeper learning and engagement with our students. Moreover, even though we have made significant gains in expanding our graduate programs during Vision 2010, there is still work to do to improve the quality, impact and visibility of our graduate programs.

MME will:

- build up our highly regarded undergraduate programs to reach world-class status
- commit to an enriched undergraduate experience with emphasis on student success and professional formation
- recruit the highest quality graduate research students
- further improve the quality of our students' graduate education
- broaden the target market for professional graduate training across Canada and beyond by developing innovation in online video delivery of graduate courses
- increase the proportion of faculty members with high level performance in research and graduate supervision
- develop more effective research support to improve the productivity of faculty members
- commit to and improve professional development and training of our staff

These priorities will be addressed in the various sections of the academic plan summary below.

II ACADEMIC PLAN SUMMARY

With nearly one-third of our faculty and staff hired over the past decade, MME is a rejuvenated department. It has rapidly risen in stature and recognition, and in the words of our external assessors, "The Waterloo MME department is hard "to rank", as it is quite unique: its undergraduate program is excellent….With the outstanding improvement in research and graduate studies areas in recent years, its per-faculty research funding is now very impressive, research productivity is very high, and its graduate enrolment is very significant. While we hesitate to provide a number for its ranking, it is certainly among the best mechanical engineering departments in North America." It is indeed gratifying that our assessors regarded us very highly but our faculty and staff members are committed to take the department to the next level, distinguishing itself on the world stage.

A. FACULTY AND STAFF PLAN

Goal A1: Hire New Faculty to Support New Initiatives

Table 1 outlines the MME faculty hiring plan over the next four years. Six positions will be added to the current complement of 52.5 to reach a total of 58.5. They will be filled in the following priority areas:

- A tenure-track replacement of a resignation in the area of materials engineering
- An NSERC Industrial Research Chair (IRC) in Welding of Energy Infrastructure
- Two new lecturer positions linked to the implementation of an Engineering Clinic practical component within the ME and MTE programs
- Two new lecturer positions to support the new online MEng program in mechatronics engineering.

The sequence for filling the positions and funding source are shown in Table 2.

Table 1: Faculty Hiring Plan

	Baseline: May 1, 2011							
POSITION TYPE	**Filled**	**Open**	**TOTAL**	**Faculty to be hired 2011/12**	**Faculty to be hired 2012/13**	**Faculty to be hired 2013/14**	**Faculty to be hired 2014/15**	**Total Faculty: May 1, 2015**
Current TTS	51	1	52	1				52
Current Lecturers	1.5		1.5					1.5
New TTS								0
New Lecturers					2	1	1	4
Other TTS:IRC					1			1
Other Lecturers								0
TOTAL	52.5	1	53.5	1	3	1	1	58.5

Table 2: Faculty Hiring Plan by Funding Source and Target Area

TARGET	**YEAR**	**FUNDING SOURCE**
Materials Engineering	2011/12	Resignation replacement
Director of Mechatronics MEng program	2012/13	Vision 2015 Fund
ME /MTE Engineering Clinic + capstone design	2012/13	Vision 2015 Fund
NSERC/TransCanada IRC in Welding*	2012/13	NSERC and TransCanada
ME/MTE Engineering Clinic	2013/14	Department
Mechatronics MEng	2014/15	Department

**NOTE: The position is bridged to a retirement in 2015. The Faculty of Engineering will provide transitional funding pending the award of the IRC.*

Table 3: Faculty Hiring Plan by PEng

REGISTRATION STATUS	**Baseline: May 1, 2011**	**Target: May 1, 2012**	**Target: May 1, 2013**	**Target: May 1, 2014**	**Target: May 1, 2015**
Registered	38.5	40.5	43.5	47.5	52.5
Applied	9	11	10	7	3
Not Applied	5	2	3	3	3
TOTAL	52.5	53.5	56.5	57.5	58.5
% registered of total	73.3%	75.7%	77.0%	82.6%	89.7%
% registered+applied of total	90.5%	96.3%	94.7%	94.8%	94.9%

Table 4: Faculty Hiring Plan by Gender

GENDER	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Male	43.5	44.5	46.5	47.5	47.5
Female	9	9	10	10	11
TOTAL	52.5	53.5	56.5	57.5	58.5
% female	17.1%	16.8%	17.7%	17.4%	18.8%

Goal A2: Replace Faculty Retirements with Positions in Emerging Areas

In addition to the above seven positions, we anticipate three retirements over the next 4 years:

- Dec/2013: machining (controls group)
- Dec/2015: combustion (thermal engineering group)
- Dec/2015: hygrogen storage materials (materials group)

A case will be made to retain the first two retirements, to be replaced with new hires in the emerging areas of mechatronics and energy, respectively. The third position will be used to leverage the NSERC/TransCanada IRC in Welding for Energy Infrastructure as a permanent position for the chairholder at the end of his/her term as required by the NSERC IRC program.

Goal A3: To better support the Department's new activities, increase FTE Staff Complement to 32 by 2013/14

The department operating budget currently supports a staff complement of 29 full-time positions. Another administrative position in the graduate studies office is supported by departmental income-sharing funds. Of the current total staff complement, 12 are administrative staff and 17 are technical staff. Table 5 outlines the projected increase in staff positions over the next 4 years.

- Create a new position to support research expansion plans: A mechanical laboratory engineer will be hired in 2012/13 to overhaul, replenish and maintain undergraduate laboratories, and develop and commission the facilities for the Engineering Clinic
- Fill the materials technologist position retirement with a materials engineer in 2012/13. The department has identified the need to upgrade the skill sets and scope of this position to support teaching and increasingly sophisticated research equipment in the materials area.

Table 5: Staff Hiring Plan

	Baseline: May 1, 2011			Staff to be hired 2011/12		Staff to be hired 2012/13		Staff to be hired 2013/14		Staff to be hired 2014/15		Total staff: May 1, 2015		
POSITION	ADMIN	TECH	TOTAL	A	T	A	T	A	T	A	T	A	T	TTL
Filled Staff	10	16	26									10	16	26
Open Staff	2	1	3	2	1							2	1	3
New Staff							1					0	1	1
TOTAL	12	17	29	2	1	0	1	0	0	0	0	12	18	30

Table 6: Staff Hiring Plan by Function and Funding Source

FUNCTION	YEAR	FUNDING SOURCE
Mechanical lab engineer	2012/13	Vision 2015 Fund

Goal A4: Provide Professional Development and Training for our Staff

The work and learning environment in MME is continually changing and there are increasingly more demands on staff to be knowledgeable of the operation of sophisticated equipment, systems and software. Both the administrative and technical staff members feel that they play an integral role in the education and training of undergraduate and graduate students. It is important that we look for mechanisms to engage staff in the learning environment. At the same time, the increase in staff complement has not kept pace with the rapid growth in student enrolments, which will require the department to more effectively deploy its staff resources. Therefore we will endeavour to:

- Provide more opportunities for our administrative and technical staff to participate in professional development events organized within and outside the university. They include software training, conflict management, communications, leadership development and technical upgrading.
- Engage the assistance of the university's human resources department to review job functions and to address over and under utilization of staff in some areas.
- Develop printed and online materials to communicate job functions of our staff to our students and faculty. A protocol for students and faculty to contact appropriate staff will be set up.

Evaluation Methodology:

- Total faculty and per cent female
- Number of applications and their quality
- Number of open and new plan positions filled
- Percentage of faculty who are registered professional engineers (PEng)
- On-line survey results of faculty, students of staff performance on an annual basis
- On-line survey results of administrative and technical staff job satisfaction

B. UNDERGRADUATE STUDIES PLAN

Goal B1: Establish an Engineering Clinic within our Undergraduate Programs

The Engineering Clinic has been ranked by the department as the most important priority for building up our undergraduate programs to reach world-class status. The Clinic is a new curricula component which will introduce a practicum focused "student learning environment" aimed at enhancing deeper learning, meaning and connection of theoretical concepts to practical application.

This innovative concept consists of adding a practicum spine along the curricula to connect courses through interactive lab exercises or projects involving smaller groups of students. The approach is expected to overcome a "weak link" in our curricula which is the lack of integration of content. The hands-on Clinic exercises, which will be regularly refreshed, will enable students to better appreciate the physical meaning of theoretical concepts and increase flexibility for student self-direction to prepare for a career track of their choosing, i.e. researcher, practitioner, designer or entrepreneur. By adopting a more interactive teaching approach that encourages students' active involvement in content, the department strives to enrich the quality of the undergraduate academic experience and also better prepare our undergraduates for an increasingly complex working world. We will:

- Implement the Engineering Clinic within the mechanical engineering and mechatronics engineering undergraduate programs. The Clinic will be threaded vertically and horizontally across each curriculum. Clinic content will be aimed at providing an early, systematic and sustained environment for the development of knowledge, skills, values and behaviours critical

to student success in professional practice, while at the same time engaging them towards mastery performance levels.

- The Clinic will also be the primary means for developing the desired graduate attributes collectively identified by our faculty members as the department prepares our undergraduate programs for new outcome-based assessment criteria set by the Canadian Engineering Accreditation Board.
- Hire two lecturers with significant industrial experience to teach the Clinic components of the two undergraduate programs, and to co-ordinate and record the formative and summative assessment of outcomes throughout the curricula.
- Commission new laboratory equipment to integrate course material and thread Clinic learning activities and contexts across the undergraduate programs.

Evaluation Methodology:

- Student exit surveys of the mechanical and mechatonics engineering programs
- Assess student progress towards the graduate attributes expected for each term and year as students progress through the programs
- Demonstrate that graduates have learned more deeply and can connect technical knowledge to practical application through assessment rubrics
- Progress towards establishing and implementing a process of continual improvement of the programs and student learning environment
- Annual retention rates

Goal B2: Improve the Undergraduate Experience

Interpersonal relationships and learning opportunities outside the classroom are highly valued by our undergraduate students in terms of enriching their experience. They have expressed the need to improve connection and communication at all levels, and seek more opportunities to network within the department and with engineers from industry throughout their undergraduate experience. Practical application, hands-on experience and activities that promote independent thinking, such as involvement in department research and new student teams, are considered important as they add to the quality and breadth of their education. In this regard, we aim to:

- Maintain engagement with the MME undergraduate student experience committee.
- Fill our vacant teaching chair position.
- Provide undergraduate study and communal space in the design of the MME floor in the Engineering 7 building. This will be an important step towards fostering peer-to-peer learning and will strengthen our students' attachment to the department and the Faculty of Engineering.
- Install an interactive video-conference facility within the Engineering 5 classrooms (*E5-Live)* to connect our classes with industry leaders and technology entrepreneurs, providing a forum for industry to share their perspectives on the challenges and opportunities in engineering today. The facility will be supported by a central server infrastructure in the university's information systems and technology unit.

Goal B3: Undergraduate Lab Renewal

In order to rejuvenate our current undergraduate labs and greatly enhance our student's hands-on experiences in their undergraduate program, we plan to:

- Develop new types of learning exercises in our undergraduate laboratories.
- Develop an implementation plan to overhaul lab equipment. Rather than just replace existing antiquated equipment, there is a need to refresh our laboratories with new equipment that would help integrate course material across the curricula. The lab renewal plan is expected to be implemented over a five-year period with the support of a $1.75 million investment from the Vision 2015 Undergraduate Laboratory Enhancement Fund.

- ♦ Hire a dedicated mechanical laboratory engineer to implement the equipment renewal plan, and also to develop, support and update larger project-based learning activities for the new Engineering Clinic.

Evaluation Methodology:

- Annual report of student services administrator
- Annual report of teaching chair
- Participation rate of students and faculty in URI and co-op research experiences
- Monitor effectiveness of teaching assistants (TAs)
- Analysis of course critiques and student surveys
- The number of laboratories upgraded per year
- Faculty and student assessment of relevance and use of new labs as teaching instruments and for practical hands-on experience
- Number of industrial speakers connecting via E5-Live to MME

Goal B4: Maintain Current Admission Targets

Vision 2015 will be focused on improving undergraduate engagement and experience. Accordingly, the department plans to maintain the current levels of admission targets for both undergraduate programs as shown in Table 7.

Table 7: Undergraduate Intake Plan

	FALL 2011 INTAKE			FALL 2012 TARGET			FALL 2013 TARGET			FALL 2014 TARGET			FALL 2015 TARGET		
PROGRAM	CPR	INTL	TTL	CPR	INTL	TTL	CPR	INTL	TTL	CPR	INTL	TTL	CPR	INTL	TTL
Mechanical	184	30	214	185	25	210	185	25	210	185	25	210	185	25	210
Mechatronics	112	21	133	115	15	130	110	15	125	110	15	125	110	15	125

C. GRADUATE STUDIES PLAN

Goal C1: Increase Graduate Student Funding

As in Vision 2010, there will be an emphasis to recruit domestic students for our research masters and doctoral programs over the next four years. Our junior faculty members have identified the limited availability of institutional support for research student funding as a main barrier to recruiting strong students from across Canada. In turn, the availability of high calibre students directly affects the success and excellence of our new research programs. Recent changes by the tri-council agencies to remove restrictions on student support will further heighten the competition for domestic students. Therefore, we will:

- ♦ Capitalize on all forms of funding incentives provided by the faculty and/or university as they arise. This includes supporting the engineering office of advancement in their efforts to raise funds for graduate scholarships.

Evaluation Methodology:

- Level and variability of graduate student financial support across department
- Number of graduate students receiving scholarships through faculty and university programs

Goal C2: Expand Graduate Program with Emphasis on Quality

We will increase our graduate student enrolment by 25% by the end of 2015, through gradual admission increases over the next four years, as provided in the graduate intake plan chart, Table 8. The goal will

be accomplished in two ways. First, the research student-to-faculty ratio will be increased to an average of 5:1 across the department, and second, a new professional online MEng program in mechatronics engineering will be introduced. The current mechanical engineering MEng certificate programs in green energy and fire safety engineering will also be expanded to include live streaming of courses targeted for professional development of working engineers across Canada. Our graduate program expansion will emphasize quality, while we:

- Strengthen and review graduate course offerings and introduce a mandatory research methods course.
- Develop a recruitment campaign to attract top calibre scholars such as NSERC and Ontario Graduate Scholarship recipients from outside Waterloo. We will also recruit international government scholars who have graduated from reputable schools.
- Participate in the annual "50 Grads. One Weekend. Your Future" recruitment program organized by the Faculty of Engineering.
- Use *E5 Live* as an educational video link to stream our current course-based Master of Engineering graduate certificate courses such as the green energy certificate, and the new mechatronics engineering program in 2012. This will be the first Internet live streaming of graduate engineering courses in Canada. It is targeted at working professionals who will be able to take courses in real time or on demand.

Table 8: Graduate Intake Plan

	2011 FTE INTAKE			2012 FTE TARGET			2013 FTE TARGET			2014 FTE TARGET			2015 FTE TARGET		
PROGRAM	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**
PhD	7.3	18	25.3	14	18	32	14	19	33	17	20	37	20	20	40
Rsch Master	35.5	14	49.5	40	15	55	45	15	60	49	15	64	53	15	68
Prof Master	16.6	2	18.6	25	0	25	26	0	26	27	0	27	29	0	29
Course-based Master							4	0	4	4	2	6	5	3	8
TOTAL	59.4	34	93.4	79	33	112	89	34	123	97	37	134	107	38	145

Evaluation Methodology:

- Graduate-student-to-faculty ratio
- Degrees awarded, by gender and visa status
- Acceptance rate of pre-approved admission offers to outstanding students
- Total graduate student applications
- Percentage of enrolled graduate students who are major award winners
- Percentage of international students holding external scholarships
- Number of MME undergraduates earning NSERC and OGS awards
- Number of MME undergraduates entering MME graduate studies
- Distribution of response time from receipt of an application to decision
- International student data by school and country
- Number of high quality applicants not accepted due to lack of funding support or supervisors
- Number and reach of recruitment activities
- Number of applicants to the annual recruitment program
- Number of applicants to the new MEng online program in mechatronics engineering
- Number of research graduate students receiving TA positions per year

D. RESEARCH PLAN

The current distribution of research funding, publications, and research team size (i.e. number of graduate students, post-doctoral fellows, research associates, visiting professors, etc.) across the

department faculty varies greatly. Generally, faculty with large funding incomes can afford more research personnel which results in more research output, and vice versa.

About 20% of the department faculty members have annual research income of over $250,000, while 20% have annual research income less than $25,000. The upper 20% (certainly the upper 10%) are likely operating at maximum capacity, productivity and effort, and expecting these faculty members to further increase their research output would be unreasonable. At the same time, their efforts should be recognized and rewarded. Likewise, the lowest 20% are likely operating on a single research grant, supporting one graduate student, and typically producing one or two publications per year. Whether these faculty members could be enticed to increase their research efforts was questioned, and indeed if these are individuals who enjoy teaching over research, then that opportunity should be provided to them, with the appropriate change in evaluation weights, rather than force a one-size-fits-all research expansion mandate across the department.

The group most amenable to expanding their research capacity, if presented with additional opportunities, is the middle 60% of our faculty members. Individuals in this group typically have multiple research grants and/or contracts and are seen as the most promising target group for increasing the department's overall research output. Therefore, this is where we should focus our efforts to meet our department target of increasing our research funding.

Goal D1: Increase Research Funding

MME strives to increase research funding by 5% per annum beyond 2011/12. As the external funding for 2010/11 is considered to be unusually high, projections for 2011/12 will be based on the average of the past two years. These projections are given in the research funding plan chart and per-faculty average funding, in Tables 9 and 10, respectively. In order to maintain these levels, we will:

- Facilitate the connection between research funding opportunities and individual faculty. The activities of the director of industry and government relations position should be more focused on identifying and initiating potential industrial research projects, as well as engaging provincial and federal research agencies.
- Use grant writing services provided through the engineering research office to facilitate the writing and production of research grant proposals. This is a priority seen as critical to the increased success in generating research income, and in turn increasing our research personnel.
- Increase the visibility of our research activities. The current research webpage should be overhauled to include an "R&D" webpage with listings of faculty members, major research fields and facilities. An overview page of main thematic areas such as automotive biomechanics, green energy, materials, mechatronics and micro/nanotechnology should incorporate high quality pictures and videos of current activities, and wherever possible, highlight our industry and government partnerships with timely dissemination of new research success stories.
- Provide incentives for increased research income. The possibility of adjusting teaching loads to accommodate high levels of research output should be considered on a case-by-case basis.

Table 9: Research Funding Projections

	2010/11 Actual Funding	2011/12 Target Funding	2012/13 Target Funding	2013/14 Target Funding	2014/15 Target Funding
Total Research Funding	$19,143,789	$14,765,131	$15,503,387	$16,278,556	$17,092,484

Table 10: Research Funding per Tenured/Tenure-Stream Faculty Member Projections

	2010/11 Actual Funding/TTS	2011/12 Target Funding/TTS	2012/13 Target Funding/TTS	2013/14 Target Funding/TTS	2014/15 Target Funding/TTS
Total Research Funding per TTS	$375,368	$283,945	$292,517	$307,143	$322,500

Goal D2: Promote Identified Focus Areas

- Target faculty hiring in the main thematic areas, i.e. automotive, biomechanics, green energy, materials, mechatronics, micro/nanotechnology. These research themes often span across our traditional research group areas. It is important when recruiting new faculty, to consider the overall research thrusts in which the department wishes to be recognized as being a leader.
- Intensify our promotional efforts to increase the visibility of our research achievements in our focused areas including updating our website, producing videos to feature faculty and students working in emerging areas of research.
- Use *E5-Live* as a tool to promote our research programs, our students' innovations and recruit research personnel. These activities coupled with graduate education will capitalize on the new $700,000 facility investment by the University of Waterloo, TransCanada Corporation, the Faculty of Engineering and the Department of Mechanical and Mechatronics Engineering. This is in addition to a substantial in-kind contribution by Cisco Canada Systems who provided the technology.

Evaluation Methodology:

- Individual and average funding and research income
- Number of major grant applications submitted and success rates
- Development of new webpages and regular updates
- Size and numbers of research groups
- Number of graduate students and research personnel
- Bibliometrics

E. PHYSICAL SPACE PLAN

The construction of the Energy Research Center (ERC) and the Engineering 5 buildings provided a 30% net increase in physical space for MME. The increase, however, is still insufficient as the department relinquished all its offices in the Engineering 2 building. Additional space, particularly office and research lab space, is required in MME to implement the Vision 2015 plan.

Goal E1: Create New Space and Explore Rental of Off-Campus Space

- Continue participation in the Faculty of Engineering building fund
  The department has committed to contributing, if possible, $200,000 per year for the next five years to build up seed funds for constructing Engineering 7. This appears to be the only viable means for overcoming its current shortage in research and graduate student space and providing our undergraduate students much needed study areas as well as the Engineering Clinic.
- Explore rental or lease of researchpark or off-campus research office and lab space.
  While the creation of space is important, Engineering 7 is not likely to be built for four to five years. In the meantime, the department has to find alternative space either on or off campus to accommodate the current shortage and expanded activities in Vision 2015.

Goal E2: Rationalize and Actively Track Space Utilization

- Plan the distribution and use of graduate and research office areas with a seating/office inventory tracking system administered by the MME graduate studies office. MME will develop a system for tracking, monitoring, and assigning the use of graduate student and research office space. This will be integrated with our graduate admissions, and PDF and visiting scholars' appointments, so that office space utilization can be optimized and planned.
- Participate in the space utilization study underway in the faculty
- Strike an MME space committee with mandate to develop utilization metrics.

III RESOURCE PLAN

Additional revenue will come about during the plan period primarily through increases in differential tuition fees, international undergraduate student enorlment , graduate growth (including the new MEng) and increased research overhead to the department.

Table 11: New Plan Expenditures

RESOURCE	FUNDING SOURCE	2011/12	2012/13	2013/14	2014/15	2015/16
1 new faculty position (IRC)	NSERC and TransCanada*			1		
2 new lecturer positions	Vision 2015 Fund		2			
2 new lecturer positions	Department			1	1	
1 new staff position	Vision 2015 Fund		1			
Staff Professional Dev't	Department		$10,000	$10,000	$10,000	
Eng Clinic and Projects	Vision 2015 Fund		$60,000	$60,000	$60,000	$60,000
Undergraduate lab upgrades	Vision 2015 Fund	$500,000	$300,000	$250,000	$350,000	$350,000
Undergraduate lab upgrades	Department	$20,000	$20,000	$20,000	$20,000	
Faculty-student events	Department		$10,000	$10,000	$10,000	
Teaching chair portfolio	Department		$20,000	$20,000	$20,000	
MEng in Mechatronics: seed and transition funding	Vision 2015 Fund		$250,000	$57,000	$86,000	$86,000
Graduate student recruitment	Department		$5,000	$5,000	$5,000	
Promotional videos	Department		$10,000	$10,000	$10,000	
Building fund	Department	$200,000	$200,000	$200,000	$200,000	

**NOTE: The Faculty of Engineering will provide transitional funding pending the award of the IRC.*

H. Department of Systems Design Engineering

PAUL FIEGUTH, CHAIR

I INTRODUCTION

The Department of Systems Design Engineering is a multifaceted department that brings together many disparate engineering activities into one program. We hold the view that the traditional division of engineering activities is becoming increasingly anachronistic and that a more holistic approach to engineering education is desirable.

Systems design engineering must maintain a vital community of scholars with high standards and expectations of excellence. We seek to attract and retain high calibre students at both the undergraduate and graduate levels, to develop and sustain an international reputation for quality research and innovation in teaching, and to provide an enjoyable and collegial environment for faculty, staff, and students.

Our aspirations are that students from the systems design undergraduate program should, at graduation, be capable of innovative design, analysis, synthesis, and communications (written, spoken and graphical/visual): educated citizens who can contribute to the social, political and economic life of Canada. Similarly students from the systems design graduate program should be intellectually creative, rigourous, and able to recognize and seek elegance in problem formulation and synthesis.

The key issues limiting the above aspirations are as follows:

- Poor undergraduate recruitment, stemming from poor communications or a lack of uniqueness and identity,
- Limited resources, both financial and infrastructure, and
- The lack of a coherent graduate program.

As a consequence of the above issues, we have identified the following corresponding priorities:

- With the undergraduate curriculum significantly revised as part of the Vision 2010 plan, we are now examining the graduate curriculum in greater detail (Section C)
- The introduction of a biomedical engineering undergraduate program, as a highly multidisciplinary area and as an important engineering activity currently not supported at Waterloo (Section E)
- A stronger focus on undergraduate design, taking the design sequence to higher expectations and outcomes through enhanced faculty participation (Section F)
- A renewed emphasis on advancement, for the purposes of student recruitment and better interaction with alumni (Section G)

II ACADEMIC PLAN SUMMARY

A. FACULTY AND STAFF PLAN

The hiring of a faculty member is a 20- to 40-year investment and commitment. The long-term success or failure of nearly every aspect of the Vision 2015 plan for systems design engineering rests on the choices made at the time of faculty hiring. Similarly, the work that department staff perform is absolutely essential to the functioning of the department.

The creation of a new undergraduate program in biomedical engineering will, for systems design engineering, lead to a one-time, unprecedented opportunity to craft a long-term vision for ourselves, in the form of a significant number of faculty and staff hires, creating a unique opportunity to define the department, its research foci, and its pedagogical competencies.

Goal A1: Faculty Mentoring and Career Development

- Two meetings per year with all untenured faculty regarding progress and career plans
- Development of interest in major service and administrative roles
- Facilitation and support of finding suitable mentors for young faculty

Evaluation Methodology:

- Fraction of untenured faculty having a documented career plan (target 100%)
- Fraction of untenured faculty having documented long-term service goals (target 100%)

Goal A2: Faculty and Teaching Assignments

- ♦ All faculty should identify five different courses that they are realistically able to teach
- ♦ Examine expectations on research output and teaching load

Evaluation Methodology:

- Number of sessional instructors hired (fewer)
- Number of graduate courses offered (more)

Goal A3: Staff Restructuring

Objectives for staff: career development, workload balancing
Objectives for department: better flexibility, further administrative support to faculty

- ♦ Restructuring exercise, with substantial staff involvement and direction

Evaluation Methodology:

- Staff satisfaction and retention
- Departmental ability to handle staff absences

Table 1: Faculty Hiring Plan

	Baseline: May 1, 2011							
POSITION TYPE	**Filled**	**Open**	**TOTAL**	**Faculty to be hired 2011/12**	**Faculty to be hired 2012/13**	**Faculty to be hired 2013/14**	**Faculty to be hired 2014/15**	**Total Faculty: May 1, 2015**
Current TTS*	21.3	3	24.3	1	1	1		24.3
Current Lecturers	2		2					2
New TTS								0
New Lecturers								0
TOTAL	21.3	3	24.3	1	1	1	0	26.3
Biomedical**						2	3	5

**NOTE: Baseline count includes a position bridged to the retirement of another, also counted in the baseline.*
***See Section E, Biomedical Plan*

Table 2: Faculty Hiring Plan by PEng

REGISTRATION STATUS	**Baseline: May 1, 2011**	**Target: May 1, 2012**	**Target: May 1, 2013**	**Target: May 1, 2014**	**Target: May 1, 2015**
Registered: PEng	12.3	13.3	14.3	16.3	16.3
Applied	2	2	2	1	1
Not Applied	6	6	6	5	5
Not Eligible	1	1	1	2	2
TOTAL*	21.3	22.3	23.3	24.3	24.3
% registered of total	57.7%	59.6%	61.4%	67.1%	67.1%
% registered+applied of total	67.1%	68.6%	70.0%	71.2%	71.2%
% registered of eligible	60.6%	62.4%	64.1%	73.1%	73.1%
% registered+applied of eligible	70.4%	71.8%	73.1%	77.6%	77.6%

**NOTE: Excludes CSTV lecturers*

Table 3: Faculty Hiring Plan by Gender

GENDER	Baseline: May 1, 2011	Target: May 1, 2012	Target: May 1, 2013	Target: May 1, 2014	Target: May 1, 2015
Male	19.3	20.3	20.3	21.3	21.3
Female	4	4	5	5	5
TOTAL	23.3	24.3	25.3	26.3	26.3
% female	17.2%	16.5%	19.8%	19%	19%

Table 4: Faculty Hiring Plan by Funding Source and Target Area

TARGET	YEAR	FUNDING SOURCE
Theoretical neuroscience	2011/12	New position
Socio-environmental area	2012/13	Resignation replacement
Human factors	2013/14	Currently definite-term
Additional hires, up to 13	2013/14 onward	Biomedical Engineering *

**See Section E, Biomedical Plan*

Table 5: Staff Hiring Plan

	Baseline: May 1, 2011			Staff to be hired 2011/12		Staff to be hired 2012/13		Staff to be hired 2013/14		Staff to be hired 2014/15		Total staff: May 1, 2015		
POSITION	ADMIN	TECH	TOTAL	A	T	A	T	A	T	A	T	A	T	TTL
Filled Staff	5	4	9									5	4	9
Open Staff												0	0	0
New Staff							1					0	1	1
TOTAL	5	4	9	0	0	0	1	0	0	0	0	5	5	10
Biomedical*								1	1	1	1	2	2	4

**See Section E, Biomedical Plan*

Table 6: Staff Hiring Plan by Function and Funding Source

FUNCTION	YEAR	FUNDING SOURCE
Design instruction	2012/13	Vision 2015 Fund
Additional hires, up to 4	2013/14 onward	Biomedical Engineering *

**See Section E, Biomedical Plan*

B. UNDERGRADUATE STUDIES PLAN

It is our goal to have an undergraduate program that is stimulating and challenging, yet flexible and accommodating in order to improve the overall undergraduate experience and enhance student learning opportunities, capitalizing on opportunities for growth in emerging areas such as biomedical systems.

Aside from engineering design (Section F), our focus on undergraduate planning revolves around questions of student retention and satisfaction. The recruitment question, attracting students into our program, will be discussed under Advancement (Section G).

Goal B1: Teaching Quality

- ♦ Appoint a teaching quality co-ordinator, as a significant departmental service task
- ♦ Better co-ordination between courses in a term, and further course development to address outcomes, as part of CEAB accreditation planning

Evaluation Methodology:
- Student promotion rates
- Student satisfaction, based on course evaluations and surveys

Goal B2: Laboratory Program

- ♦ Overhaul lab courses to be more integrated, with reduced overhead for students

Evaluation Methodology:
- Student use of related components in design projects
- Student satisfaction in laboratory courses based on surveys

Goal B3: Fractional-Load First Year Program

- ♦ Working with first-year engineering, develop reduced-load programs

Evaluation Methodology:
- Student failure rates in 1A
- Term failure rates after 1A

Goal B4: Non-Technical Curriculum Components

- ♦ Curriculum committee to examine oral and written communication
- ♦ A more explicit definition of learning objectives for each academic level

Evaluation Methodology:
- Quality of undergraduate work reports
- Quality of oral and written presentations in design projects

Also see undergraduate-related plan topics in Biomedical (Section E) and Design (Section F).

Table 7: Undergraduate Intake Plan

	FALL 2011 INTAKE			FALL 2012 TARGET			FALL 2013 TARGET			FALL 2014 TARGET			FALL 2015 TARGET		
PROGRAM	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**	**CPR**	**INTL**	**TTL**
Systems Design	86	3	89	86	4	90	86	4	90	80	5	85	76	4	80
Mechatronics	112	21	133	115	15	130	110	15	125	110	15	125	110	15	125
Biomedical*										57	3	60	66	4	70

**See Section E, Biomedical Plan*

C. GRADUATE STUDIES PLAN

The department has a graduate curriculum that has fundamentally not changed during the last 20 years. Our vision is to increase the breadth of course offerings to reflect the research capabilities of the current

faculty complement and to potentially increase the emphasis on systems engineering and design in the curriculum.

We currently have a program that primarily attracts students with international and University of Waterloo degrees. Our vision is to create a graduate program that also attracts students from high calibre institutions across Canada and the United States.

Our plan focuses on graduate growth and graduate program quality. Looking ahead, as part of the proposed biomedical engineering undergraduate program (Section E) we are also proposing a faculty-wide graduate program.

Goal C1: Graduate Growth

- A strong push to complete space renovations to make quality space available
- Explicit targets for graduate supervision by faculty
- Improved recruitment material, especially web presence and paper handouts
- Growth in MEng program, with proposed certificates

Evaluation Methodology:
- Graduate program enrollment
- Number of graduate students from North America outside of Waterloo

Goal C2: Graduate Program Quality

- Curriculum overhaul
- Overhaul of graduate course planning and teaching assignments
- More substantial contact between student and thesis committee, closer attention to program time limits
- Stronger support of Graduate Student Association

Evaluation Methodology:
- Graduate student satisfaction in surveys
- Fraction of students graduating within time limits

Table 8: Graduate Intake Plan

	2011 FTE INTAKE			2012 FTE TARGET			2013 FTE TARGET			2014 FTE TARGET			2015 FTE TARGET		
PROGRAM	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**	**CPR**	**INT**	**TTL**
PhD	3.3	9	12.3	5	8	13	6	8	14	7	8	15	7	8	15
Rsch Master	7.3	7	14.3	8	8	16	9	10	19	10	10	20	11	10	21
Prof Master	1.3	6	7.3	5	4	9	7	3	10	10	2	12	11	3	14
TOTAL	11.9	22	33.9	18	20	38	22	21	43	27	20	47	29	21	50
Biomedical*										2	0	2	3	2	5

**See Section E, Biomedical Plan*

D. RESEARCH PLAN

The Department of Systems Design Engineering sees itself at the forefront of multidisciplinary and interdisciplinary research, a uniqueness stemming from our historical legacy. Progressing along this path, accompanied with a continuous increase in the quality of cutting-edge research, will be the core vision of our future research activities.

A pivotal part of our vision is to focus departmental research into well-identified core competencies. With substantial opportunities offered by the hiring associated with a biomedical engineering program, now is the time to make significant plans to heighten our research quality and profile.

Goal D1: Research Directions

- Department committee to identify promising biomedical directions building on current departmental strengths
- Department committee to look at current and emerging directions in social and environmental systems

Evaluation Methodology:

- Departmental research publications
- Citation statistics

Goal D2: Research Funding

- Build focused research clusters in strategic areas with a senior champion
- Work closely with the industrial relations officer in the engineering research office, to promote department research and develop closer relationships with industry
- Promote greater involvement in Waterloo research centres (WIN, WISE, WatCAR, IQC), who already have writers and financial assistants on staff

Evaluation Methodology:

- Research funding per faculty member

Table 9: Research Funding Projections

	2010/11 Actual Funding	2011/12 Target Funding	2012/13 Target Funding	2013/14 Target Funding	2014/15 Target Funding
Total Research Funding	$3,491,648	$3,188,900	$3,541,600	$3,912,300	$4,131,000

Table 10: Research Funding per Tenured/Tenure-Stream Faculty Member Projections

	2010/11 Actual Funding/TTS	2011/12 Target Funding/TTS	2012/13 Target Funding/TTS	2013/14 Target Funding/TTS	2014/15 Target Funding/TTS
Total Research Funding per TTS	$163,927	$143,000	$152,000	$161,000	$170,000

E. BIOMEDICAL ENGINEERING PLAN

It is our vision to develop a new undergraduate biomedical engineering program to meet the needs of students interested in this rapidly growing field. Our program will be unique in Canada because of its strong focus on the modeling and design of biomedical systems to develop innovative technologies to solve health-related engineering problems.

Our vision is to graduate engineers with the technical skills required to model complex biomedical systems, interpret biomedical experimental results, and design and develop innovative technologies in close collaboration with the biomedical community. The graduates will have the interdisciplinary background to act as collaborators between biologists, medical professionals, and engineers in different fields. Graduates will be ideally suited to contribute directly to the biomedical and health economy of Canada, but with a well-rounded education allowing for wide range of career possibilities.

We are proposing to offer a new program, resulting in an additional stream of students in the Department of Systems Design Engineering, tapping into the strengths of the department and into the interest which we observe among students, offering a unique chance to the department to grow and shape its future.

Goal E1: Biomedical Engineering Undergraduate Program

- ♦ Active committee, industry surveys, curriculum, discussions with other departments

Evaluation Methodology:

- Successful launch of program

Goal E2: Biomedical Engineering Graduate Program

- ♦ Promote and develop inter-departmental graduate program, in collaboration with other engineering departments, along the lines of the Waterloo nanotechnology graduate program

Evaluation Methodology:

- Successful launch of program

F. DESIGN PLAN

Systems design engineering now has a design-oriented course associated with each of the eight undergraduate academic terms. The next logical step is to ensure that the enthusiasm and excitement for design that is typically seen in our first-year students continues to build through their final senior year, such that all students are motivated and have the skills to produce high quality design deliverables.

Our vision is for design to be an integral part of the undergraduate student experience, a strength whereby the uniqueness and innovativeness of the systems design curriculum is featured. Our vision is to promote the design successes of our students, with a more substantial involvement of industry and alumni.

It is systems design engineering's intention to re-establish its primacy as a department committed to teaching engineering design.

Goal F1: Design Sequence

- ♦ Clearer definition of design course outcomes, building from one course to the next
- ♦ Clearer project deliverables, higher expectations

Evaluation Methodology:

- Student satisfaction with design sequence, based on surveys
- Substance and intellectual level of senior design projects

Goal F2: Design Symposia

- ♦ Develop alumni and industry support for symposia
- ♦ Design awards to raise symposium profile among faculty and students

Evaluation Methodology:

- Symposium attendance
- Industry support of symposia

Goal F3: Design Support

- ♦ Hire a design instructor to provide direct technical support to design courses
- ♦ Change design course expectations to motivate student use of E5 project space and support of design instructor
- ♦ Create focused “incubator” space, offered competitively to senior design teams

Evaluation Methodology:

- Quality of design projects
- Student satisfaction with design sequence, based on surveys
- Number of entrepreneurial groups following up with regional high-tech support (Velocity, Communitech, Accelerator Centre, E Co-op etc.)

G. ADVANCEMENT PLAN

The department recognizes the need to expand its efforts in order to strengthen relationships with prospective students, with alumni, and with research partners. We recognize that our relationship with our students should extend beyond graduation: we want to re-engage with our alumni and take advantage of the expertise and experiences they can provide. Furthermore we wish to leverage the engagement which our current students have with our program and to empower them to act as our ambassadors.

Our vision is of a vibrant and recognizable systems design engineering “brand”. We will regularly adapt our communication strategies to respond to technology changes and will use those technologies to more broadly share our successes in order to attract the next generation of students.

Feedback from recruitment events shows a significant misunderstanding of systems design engineering and what we offer, yet there is tremendous interest once the program is explained. Consequently, it is clear that recruitment and communications are among our key tasks.

- ♦ Better promotion of systems design events
- ♦ Regular review and update of website, clear understanding of target audience
- ♦ Opportunities for involvement of systems design alumni, at symposia, as design judges, and in professional development for undergraduate and graduate students

Evaluation Methodology:

- Web site access statistics
- Number of alumni involved in departmental activities

III RESOURCE PLAN

Two relatively modest sources of additional revenue are anticipated during the plan period: increased international undergraduate enrolment; and increased overhead generation, motivated by increased overhead return to faculty who generate it.

By far the most significant plan expenses are those associated with the proposed biomedical engineering program. These program expenses should be budgeted to be covered by the income associated with the increased enrollment, and are therefore not considered here.

The remaining expenses are dominated by the salary of a design instructor, funded as part of the Vision 2015 Plan, and ongoing space renovations. Timely renovation is absolutely essential for increases in graduate student enrollment, research output, and overall morale.

Table 11: New Plan Expenditures

RESOURCE	FUNDING SOURCE	2011/12	2012/13	2013/14	2014/15	2015/16
1 new staff position	Vision 2015 Fund		1			
TAs for design studio	Vision 2015 Fund		$5,000	$5,000	$5,000	
Sessional for lab overhaul	Vision 2015 Fund	$4,000	$4,000	$4,000		
Design studio lab equipment	Vision 2015 Fund	$2,500	$2,500			
Research lab upgrades	Department	$20,000	$20,000			
DWE space renovation	Department	$10,000	$10,000			
TAs for design studio	Department		$5,000	$5,000	$5,000	
Sessional for lab overhaul	Department	$4,000	$4,000	$4,000		
Design studio lab equipment	Department	$2,500	$2,500			

VI. APPENDICES

A. WATERLOO ENGINEERING OVERVIEW

The University of Waterloo has its foundation in engineering: over 50 years ago, a few enterprising teachers of engineering and basic science began providing university education to 75 young men who wanted to be engineers. In place from the first day was a co-operative system of education – the first co-op program in Canada – designed to give students practical experience.

From 75 students taught in two prefabricated tin-roofed classrooms, Waterloo Engineering has grown into a multi-faceted engineering school with eight academic units, home to more than 1800 graduate students, 6500 undergraduate students, over 270 faculty and about 200 staff. Over 34,500 Waterloo Engineering alumni have made their mark in industry, academe, and the public sector, both in Canada and around the world.

Waterloo's undergraduate engineering program, Canada's largest and best, offers degrees in a wide range of disciplines, including chemical, civil, electrical, computer, environmental, geological, management, mechanical, mechatronics, nanotechnology, software, and systems design engineering, and in architecture. Waterloo Engineering is recognized internationally for its co-op program, in which all undergraduates alternate between academic and work terms. This hands-on experience makes students strong leaders, both on campus and off. Fittingly, one of the faculty's newest buildings, Engineering 5, both fosters and showcases remarkable undergraduate student achievements in the world-class student design centre at its core.

The Faculty of Engineering is also home to an active and growing graduate student community: more than 1800 exceptional students learn, teach, work, and research here. Each of our eight academic units offers graduate programs; there are well over two dozen programs in all. Waterloo Engineering graduate students study with renowned experts, work in world-class laboratories, and fuel the university's drive to expand the frontiers of knowledge and technology.

Waterloo Engineering faculty members work to generate new knowledge through research and to disseminate that knowledge through teaching, mentorship and technology transfer. They have an impressive record of achievement that includes 19 Canada Research Chairs, 9 NSERC Industrial Research Chairs, five endowed research chairs, and an NSERC Design Chair. Waterloo's unique inventor-owned policy on intellectual property makes us leaders in the transfer of ideas and technology.

Much has changed since 1957, but Waterloo Engineering's outward-looking philosophy of education has not. The faculty continues to work to integrate research with education, providing students hands-on experience with a solid academic foundation. The research conducted by the Faculty of Engineering benefits people today and shapes the future. The faculty is proud of its reputation for leadership, innovation, and excellence, which has earned Waterloo Engineering global recognition as an excellent engineering school.

Mission Statement

Waterloo Engineering offers professional education of the highest quality across a comprehensive set of engineering and architecture disciplines. We engage in internationally recognized research and design. We build knowledge and intellectual rigour through scholarship, graduate, and undergraduate teaching. Our outward-looking philosophy sets us apart: it is reflected in our commitment to co-operative education, in our extensive regional, national, and international partnerships, and in our research to meet the challenges of today and to shape the future.

Academic Units

Waterloo Engineering is home to the following eight academic units:

- School of Architecture
- Conrad Business, Entrepreneurship & Technology Centre (CBET)
- Department of Chemical Engineering
- Department of Civil & Environmental Engineering
- Department of Electrical & Computer Engineering
- Department of Management Sciences
- Department of Mechanical & Mechatronics Engineering
- Department of Systems Design Engineering

Undergraduate Programs

Waterloo Engineering offers 13 undergraduate programs:

- Architecture
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Environmental Engineering
- Geological Engineering
- Management Engineering
- Mechanical Engineering
- Mechatronics Engineering
- Nanotechnology Engineering
- Software Engineering
- Systems Design Engineering

Graduate Programs

Waterloo Engineering offers doctoral programs in:

- Chemical Engineering (PhD)
- Civil & Environmental Engineering (PhD)
- Electrical & Computer Engineering (PhD)
- Management Sciences (PhD)
- Mechanical & Mechatronics Engineering (PhD)
- Nanotechnology Engineering (PhD)
- Systems Design Engineering (PhD)

Waterloo Engineering offers research master's programs in:

- Architecture (MArch)
- Chemical Engineering (MASc)
- Civil & Environmental Engineering (MASc)
- Electrical & Computer Engineering (MASc)
- Management Sciences (MASc)
- Mechanical & Mechatronics Engineering (MASc)
- Nanotechnology Engineering (MASc)
- Systems Design Engineering (MASc)

Waterloo Engineering offers professional master's programs in:

- Business, Entrepreneurship & Technology (MBET)
- Chemical Engineering (MEng)
- Civil & Environmental Engineering (MEng)
- Electrical & Computer Engineering (MEng)

- Management Sciences (MMSc)
- Mechanical & Mechatronics Engineering (MEng)
- Systems Design Engineering (MEng)

Major Research Centres and Institutes

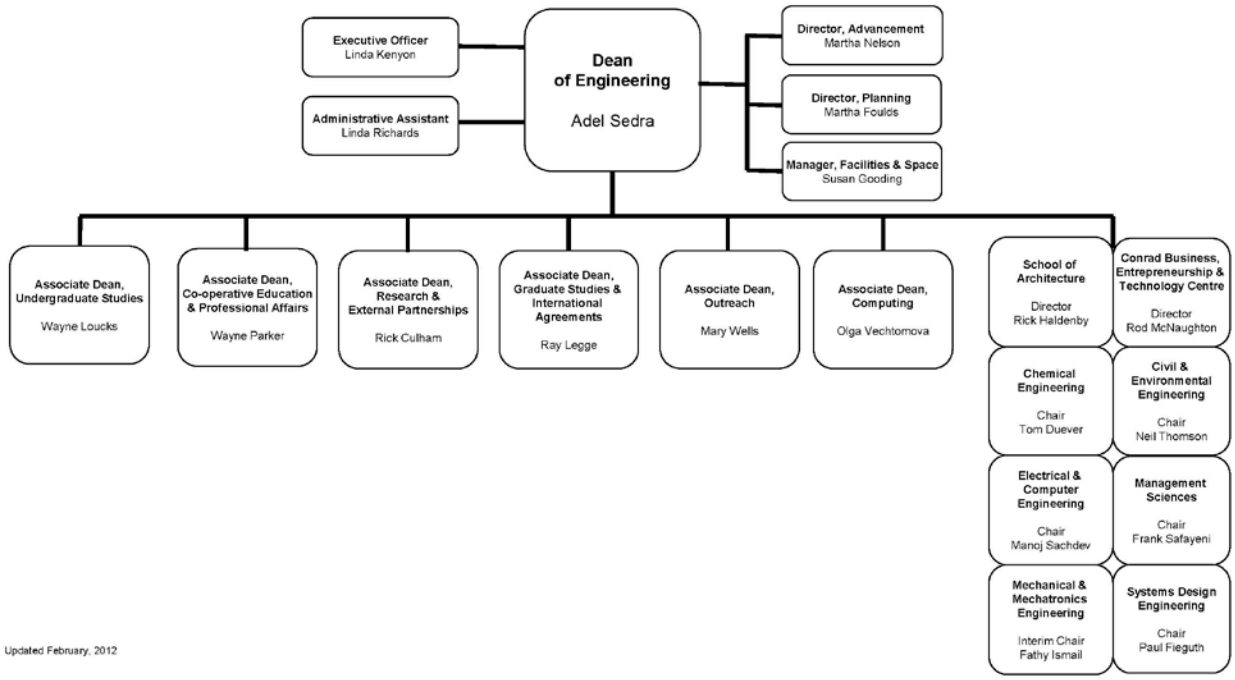
Waterloo Centre for Automotive Research (WatCAR)
Executive Director: Dr. Amir Khajepour, Mechanical and Mechatronics Engineering

Centre for Bioengineering and Biotechnology
Director: Dr. Catherine Burns, Systems Design Engineering

Waterloo Institute for Nanotechnology (WIN)
Executive Director: Dr. Arthur Carty, Chemistry (Faculty of Science), Special Advisor to the President on International Science and Technology Collaboration

Waterloo Institute for Sustainable Energy (WISE)
Executive Director: Dr. Jatin Nathwani, Ontario Research Chair in Public Policy and Sustainable Energy, Faculty of Engineering (Civil Engineering and Management Sciences) and Faculty of Environment

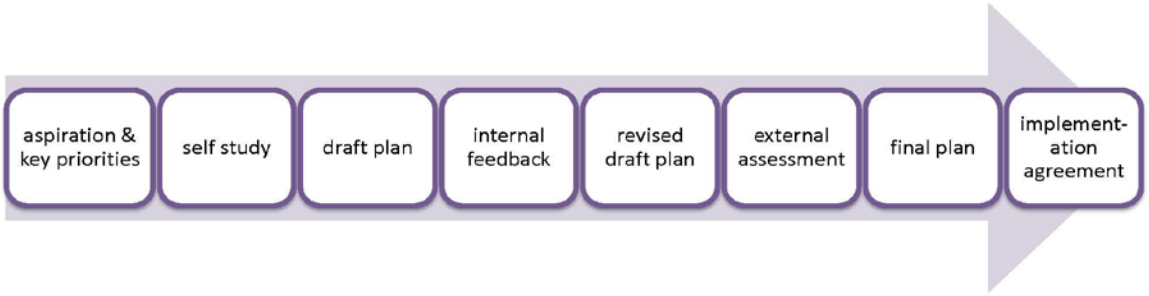
Organization Chart



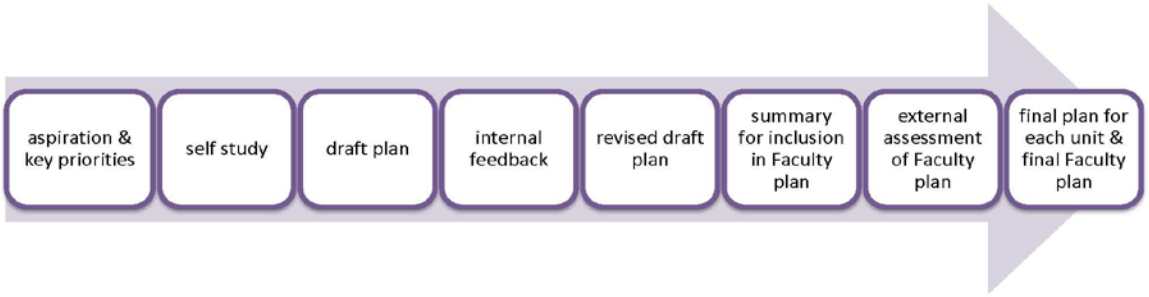
B. PLANNING MATERIALS

Vision 2015 Plan Process and Integration

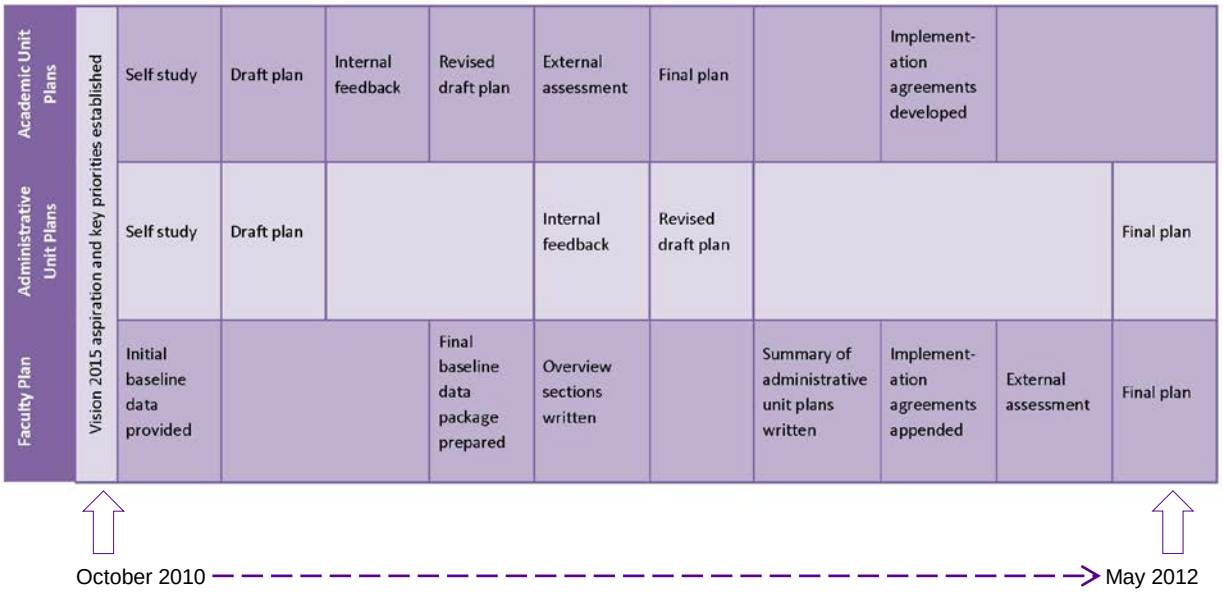
(A) Major Planning Stages: Academic Units



(B) Major Planning Stages: Administrative Units



(C) Integration of Major Planning Stages



Engineering Planning Committee

Committee Member	Position
Adel Sedra	Dean, Faculty of Engineering Committee Chair
Wayne Loucks	Associate Dean Undergraduate Studies
Wayne Parker	Associate Dean Co-operative Education and Professional Affairs
Ray Legge	Associate Dean Graduate Studies and International Agreements
Richard Culham	Associate Dean Research and External Partnerships
Mary Wells	Associate Dean Outreach
Olga Vechtomova	Associate Dean Computing
Rick Haldenby	Director School of Architecture
Rod McNaughton	Director Conrad Centre for Business, Entrepreneurship & Technology
Thomas Duever	Chair Department of Chemical Engineering
Neil Thomson	Chair Department of Civil & Environmental Engineering
Manoj Sachdev	Chair Department of Electrical & Computer Engineering
Frank Safayeni	Chair Department of Management Sciences
Pearl Sullivan (to January 31, 2012)	Chair Department of Mechanical & Mechatronics Engineering
Fathy Ismail (from February 1, 2012)	Interim Chair, Department of Mechanical & Mechatronics Engineering
Paul Fieguth	Chair Department of Systems Design Engineering
Linda Kenyon	Executive Officer Faculty of Engineering
Martha Nelson (from October, 2011)	Director, Advancement Faculty of Engineering
Nenone Donaldson	Associate Director, Development and Alumni Affairs Faculty of Engineering
Martha Foulds	Director, Planning Faculty of Engineering
Sue Nelson	Faculty Secretary, Engineering Committee Secretary

Vision 2015 External Assessors

Thirteen respected academics from 12 institutions across North America visited Waterloo Engineering from July to October, 2011 to review and provide feedback on our academic units' self studies and draft plans. Only the School of Architecture was excluded from this exercise, as it had an extensive review for professional accreditation in January, 2011. In April, 2012 two North American academic leaders visited the Faculty as a whole, to provide their feedback on the draft of this plan.

Conrad Business, Entrepreneurship & Technology Centre

Dr. Jeffrey T. Glass
Hogg Family Chair in Engineering Management & Entrepreneurship
Director, Master of Engineering Management
Duke University

Department of Chemical Engineering

Dr. John Grace
Professor and Canada Research Chair, Department of Chemical & Biological Engineering
University of British Columbia

Dr. F. Joseph Schork
Professor Emeritus, School of Chemical & Biomolecular Engineering
Georgia Institute of Technology

Department of Civil & Environmental Engineering

Dr. Brenda McCabe
Chair, Department of Civil Engineering
University of Toronto

Dr. Andrew Scanlon
Hankin Chair of Residential Building Construction
Professor, Department of Civil & Environmental Engineering
Penn State University

Department of Electrical & Computer Engineering

Dr. H. Vincent Poor
Dean, School of Engineering and Applied Science
Princeton University

Dr. Gordon W. Roberts
James McGill Professor, Department of Electrical & Computer Engineering
McGill University

Department of Management Sciences

Dr. Lawrence M. Seiford
Goff Smith Co-Director of the Tauber Institute for Global Operations
Professor, Department of Industrial & Operations Engineering
University of Michigan

Dr. Saeed Zolfaghari
Professor, Department of Mechanical & Industrial Engineering
Director, Industrial Engineering
Ryerson University

Department of Mechanical & Mechatronics Engineering

Dr. Patrick H. Oosthuizen
Professor, Department of Mechanical & Materials Engineering
Queen's University

Dr. Heui Peng
Professor, Department of Mechanical Engineering
University of Michigan

Department of Systems Design Engineering

Dr. Mehrdad Saif
Dean, Faculty of Engineering
University of Windsor

Dr. James M. Tien
Dean, College of Engineering
University of Miami

Faculty of Engineering

Dr. Cristina Amon
Dean, Faculty of Engineering
University of Toronto

Dr. Vijay Dhir
Dean, Henry Samueli School of Engineering and Applied Science
University of California, Los Angeles

Other Vision 2015 Documents

Interested parties may contact the applicable unit's main office to make arrangements to view the full Vision 2015 self study and plan prepared by each of the following:

- Conrad Business, Entrepreneurship & Technology Centre
- Department of Chemical Engineering
- Department of Civil & Environmental Engineering
- Department of Electrical & Computer Engineering
- Department of Management Sciences
- Department of Mechanical & Mechatronics Engineering
- Department of Systems Design Engineering
- Engineering Computing
- Engineering Co-operative Education & Professional Affairs Office
- Engineering Graduate Studies Office
- Engineering Outreach Office
- Engineering Research Office
- Engineering Undergraduate Office

The following detailed plans, informed by the priorities and strategies outlined in our Vision 2015 plan, will be produced in 2012:

- Engineering Communications & Marketing Plan
- Engineering Development & Alumni Affairs Plan
- Engineering Space Plan

C. FACULTY AND STAFF DATA

1 Total Regular Faculty, 2009/10

Department	Prof	Assoc Prof	Asst Prof	Lect	Total	# Female	% Female
Architecture	1.0	11.0	3.0	1.0	16.0	6.0	37.5%
CBET	1.0	0.0	0.0	2.0	3.0	0.0	0.0%
Chemical	18.0	7.0	6.0	0.0	31.0	2.0	6.5%
Civil & Environmental	18.3	6.5	8.5	2.0	35.3	3.0	8.5%
Electrical & Computer	29.0	26.0	18.0	4.5	77.5	8.0	10.3%
Management Sciences	7.3	6.0	6.0	1.0	20.3	5.0	24.7%
Mechanical & Mechatronics	26.0	7.0	17.0	1.0	51.0	9.0	17.6%
Systems Design	9.0	10.3	4.0	2.0	25.3	4.0	15.8%
Support Unit Offices	0.0	0.0	0.0	1.0	1.0	0.0	0.0%
TOTAL	**109.5**	**73.8**	**62.5**	**14.5**	**260.3**	**37.0**	**14.2%**

Total Regular Faculty, 2010/11

Department	Prof	Assoc Prof	Asst Prof	Lect	Total	# Female	% Female
Architecture	1.0	11.0	3.0	1.0	16.0	6.0	37.5%
CBET	2.0	0.0	0.0	1.0	3.0	0.0	0.0%
Chemical	21.0	6.0	6.0	2.0	35.0	2.0	5.7%
Civil & Environmental	20.3	6.0	8.0	2.0	36.3	3.0	8.3%
Electrical & Computer	31.0	26.0	20.0	4.5	81.5	9.0	11.0%
Management Sciences	7.3	4.0	9.0	2.0	22.3	5.0	22.5%
Mechanical & Mechatronics	25.0	11.0	15.0	1.5	52.5	9.0	17.1%
Systems Design	10.0	6.3	5.0	2.0	23.3	4.0	17.2%
Support Unit Offices	0.0	0.0	0.0	1.5	1.5	0.0	0.0%
TOTAL	**117.5**	**70.3**	**66.0**	**17.5**	**271.3**	**38.0**	**14.0%**

2 Distribution of Regular Faculty by PEng Status, 2010/11

Department	Registered	Applied	Not Applied	Not Eligible	Total
Chemical	20.0	7.0	8.0	0.0	35.0
Civil & Environmental	27.8	1.0	7.5	0.0	36.3
Electrical & Computer	45.5	12.0	24.0	0.0	81.5
Management Sciences	2.3	11.0	4.0	5.0	22.3
Mechanical & Mechatronics	38.5	9.0	5.0	0.0	52.5
Systems Design	12.3	2.0	7.0	0.0	21.3
Other	1.5	0.0	0.0	0.0	1.5
TOTAL	**147.8**	**42.0**	**55.5**	**5.0**	**250.3**

3 Total Tenured and Tenure-Stream Faculty, 2009/10

Department	Prof	Assoc Prof	Asst Prof	Total	# Female	% Female
Architecture	1.0	11.0	3.0	15.0	6.0	40.0%
CBET	1.0	0.0	0.0	1.0	0.0	0.0%
Chemical	18.0	7.0	6.0	31.0	2.0	6.5%
Civil & Environmental	18.3	6.5	8.5	33.3	3.0	9.0%
Electrical & Computer	29.0	26.0	18.0	73.0	8.0	11.0%
Management Sciences	7.3	6.0	6.0	19.3	5.0	26.0%
Mechanical & Mechatronics	26.0	7.0	17.0	50.0	9.0	18.0%
Systems Design	9.0	10.3	4.0	23.3	4.0	17.2%
TOTAL	**109.5**	**73.8**	**62.5**	**245.8**	**37.0**	**15.1%**

Total Tenured and Tenure-Stream Faculty, 2010/11

Department	Prof	Assoc Prof	Asst Prof	Total	# Female	% Female
Architecture	1.0	11.0	3.0	15.0	6.0	40.0%
CBET	2.0	0.0	0.0	2.0	0.0	0.0%
Chemical	21.0	6.0	6.0	33.0	2.0	6.1%
Civil & Environmental	20.3	6.0	8.0	34.3	3.0	8.8%
Electrical & Computer	31.0	26.0	20.0	77.0	9.0	11.7%
Management Sciences	7.3	4.0	9.0	20.3	4.0	19.8%
Mechanical & Mechatronics	25.0	11.0	15.0	51.0	9.0	17.6%
Systems Design	10.0	6.3	5.0	21.3	4.0	18.8%
TOTAL	**117.5**	**70.3**	**66.0**	**253.8**	**37.0**	**14.6%**

4 Total Non-Regular Faculty Appointments, November 2011

Department	Adj-uncts	Rsch Profs	Post Docs	Rsch Assocs	Visitors	Def-term Profs	Total
Architecture	17.0	0.0	0.0	0.0	0.0	0.0	17.0
CBET	4.0	0.0	0.0	0.0	0.0	0.0	4.0
Chemical	28.0	1.0	23.0	11.0	40.0	1.5	104.5
Civil & Environmental	67.0	3.0	10.0	4.0	10.0	0.0	94.0
Electrical & Computer	30.0	2.0	36.0	21.0	28.0	0.0	117.0
Management Sciences	17.0	0.0	0.0	0.0	2.0	0.0	19.0
Mechanical & Mechatronics	43.0	1.0	30.0	7.0	15.0	0.0	96.0
Systems Design	34.0	1.0	12.0	1.0	1.0	1.0	50.0
Other	4.0	0.0	0.0	0.0	0.0	0.0	4.0
TOTAL	**244.0**	**8.0**	**111.0**	**44.0**	**96.0**	**2.5**	**505.5**

5 Selected Major Faculty Awards and Honours, 2010 & 2011

Department	Faculty Member	Award
Architecture	Philip Beesley	RAIC Allied Arts Award 2011
	Maya Przybylski	Faculty Design Award, Association of Collegiate Schools of Architecture 2011/12
	Lola Sheppard	ACSA Faculty Design Award 2011
	Lola Sheppard	Canada Council Prix 2010
	Lola Sheppard	Faculty Design Award, Association of Collegiate Schools of Architecture 2011/12
	Lola Sheppard	Holcim Gold Award 2011
	Geoff Thun	Ontario Association of Architects Design Excellence Award 2010
	Ekaterina Velikov	Ontario Association of Architects Design Excellence Award 2010
Chemical Engineering	Zhongwei Chen	Waterloo Engineering Research Excellence Award 2011
	Tom Fahidy	Canadian Academy of Engineering Fellow
	Michael Fowler	Waterloo Engineering Teaching Excellence Award 2010
	Christine Moresoli	Waterloo Engineering Teaching Excellence Award 2011
	Alex Penlidis	En-hui Yang Engineering Research Innovation Award 2011
	Alex Penlidis	UW Award of Excellence in Graduate Supervision 2010
	Garry Rempel	Ashland Padma Vibhushan Professor C.N.R. Rao Medal (Indian Institute of Chemical Engineers)
	Peter Silveston	Canadian Academy of Engineering Fellow
	Leonardo Simon	Canada's Top 40 Under 40 2009
Civil & Environmental Engineering	Wayne Brodland	Waterloo Engineering Research Excellence Award 2011
	James Craig	Early Researcher Award
	Ralph Haas	Fellow of the American Society of Civil Engineers
	Elmer Matyas	Fellow of the American Society of Engineering
	Bob McKillop	Waterloo Engineering Teaching Excellence Award 2011
	Susan Tighe	En-hui Yang Engineering Research Innovation Award 2010
	Susan Tighe	Women of Waterloo (WOW) Award 2010
	Susan Tighe	The UK Royal Academy of Engineering Fellowship

Department	Faculty Member	Award
Electrical & Computer Engineering	Hany Aziz	Waterloo Engineering Research Excellence Award 2011
	Slim Boumaiza	Waterloo Region Record's 40 Under 40
	Savvas Chamberlain	Academy of Science of the Royal Society of Canada Fellow
	Andrew Heunis	Waterloo Engineering Teaching Excellence Award 2010
	Mohamed Kamel	UW Award of Excellence in Graduate Supervision 2010
	Mohamed Kamel	IEEE Canada Computer Medal 2010
	Raafat Mansour	Canadian Academy of Engineering Fellow
	Omar Ramahi	UW Award of Excellence in Graduate Supervision 2011
	Catherine Rosenberg	Fellow of IEEE
	Sherman Shen	Engineering Institute of Canada Fellow
	Murat Uysal	Waterloo Engineering Research Excellence Award 2010
	Weihua Zhuang	Canadian Academy of Engineering Fellow
Mechanical & Mechatronics Engineering	Rick Culham	Fellow of the American Society of Mechanical Engineers
	Roydon Fraser	National Science Foundation Outstanding Long Term Faculty Advisor Award (EcoCar Challenge)
	Hamid Jahed	Waterloo Engineering Teaching Excellence Award 2010
	Amir Khajepour	Fellow of the American Society of Mechanical Engineers
	Alan Plumtree	Canadian Academy of Engineering Fellow
	Carolyn Ren	Waterloo Engineering Research Excellence Award 2010
	Ehsan Toyserkani	Waterloo Engineering Teaching Excellence Award 2011
	Robert Varin	Science Technology Transfer Award (from the World Association for innovative Technologies) 2011
	Steve Waslander	Ontario Centres of Excellence Mind to Market Award 2011
	David Weckman	American Welding Society Charles H. Jennings Memorial Award 2011
	Michael Worswick	Canadian Academy of Engineering Fellow
	Michael Yovanovich	Royal Society of Canada Fellow
	Norman Zhou	Fellow of the American Society for Metals
Systems Design Engineering	Keith Hipel	IEEE Canada outstanding Engineering Educator Award 2011
	Keith Hipe	Ontario Professional Engineers Engineering Medal for Research and Development 2010
	Keith Hipel	Royal Society of Canada Sir John William Dawson Medal 2011
	Keith Hipel	Water 2010 Lifetime Achievement Award
	John McPhee	Canadian Academy of Engineering Fellow
	Daniel Stashuk	Waterloo Engineering Research Excellence Award 2010

6 FTE Staff, 2009/10

Department	Tech	Admin	Total	# Female	% Female
Architecture	4.0	6.0	10.0	6.0	60.0%
CBET	0.0	3.0	3.0	3.0	100.0%
Chemical	10.0	5.0	15.0	7.0	46.7%
Civil & Environmental	9.0	7.0	16.0	8.0	50.0%
Electrical & Computer	26.0	15.6	41.6	21.6	51.9%
Management Sciences	1.0	6.0	7.0	6.0	85.7%
Mechanical & Mechatronics	17.0	12.0	29.0	12.0	41.4%
Systems Design	4.0	5.0	9.0	5.0	55.6%
Dean's Office-administration	0.0	13.8	13.8	11.8	85.5%
Dean's Office-advancement	0.0	11.8	11.8	8.8	74.6%
Dean's Office-research institutes	0.0	6.0	6.0	4.0	66.7%
Undergraduate Office	2.0	8.5	10.5	9.5	90.5%
Undergraduate Office-PDEng	0.0	8.0	8.0	5.0	62.5%
Engineering Computing	9.0	1.0	10.0	2.0	20.0%
Engineering Machine Shop	9.0	2.5	11.5	0.5	3.9%
TOTAL	**91.0**	**111.1**	**202.1**	**110.1**	**54.5%**

FTE Staff, 2010/11

Department	Tech	Admin	Total	# Female	% Female
Architecture	5.0	6.0	11.0	6.0	54.5%
CBET	0.0	4.0	4.0	4.0	100.0%
Chemical	9.5	5.0	14.5	7.0	48.3%
Civil & Environmental	9.0	7.0	16.0	8.0	50.0%
Electrical & Computer	27.0	16.0	43.0	22.0	51.2%
Management Sciences	1.0	6.0	7.0	6.0	85.7%
Mechanical & Mechatronics	16.0	10.0	26.0	10.0	38.5%
Systems Design	4.0	5.0	9.0	5.0	55.6%
Dean's Office-administration	0.0	8.0	8.0	8.0	100.0%
Dean's Office-advancement	0.0	9.8	9.8	7.8	79.6%
Engineering Computing	10.0	1.0	11.0	2.0	18.2%
Engineering Machine Shop	9.0	2.5	11.5	0.5	3.9%
Graduate Office	0.0	2.0	2.0	2.0	100.0%
Outreach Office	0.0	1.0	1.0	0.0	0.0%
Research Office	0.0	2.0	2.0	1.0	50.0%
Research Institutes	0.0	6.0	6.0	4.0	66.7%
Undergraduate Office	2.0	9.5	11.5	9.5	82.6%
WatPD-Engineering	0.0	1.0	1.0	1.0	100.0%
TOTAL	**92.5**	**101.8**	**194.3**	**103.8**	**53.4%**

7 Dean of Engineering Outstanding Staff Performance Award

Year	Award Recipient	Department
2007	Ken Bowman	Civil & Environmental
2007	Jeff Lederer	Architecture
2008	Linda Lyman	Dean of Engineering Office
2008	Terry Ridgway	Civil & Environmental
2009	Liz Bevan	Chemical
2009	Fred Bakker	Engineering Machine Shop
2010	Mary McColl	Electrical & Computer
2010	Erick Engelke	Engineering Computing
2011	Donna Woolcott	Architecture
2011	Robert Kraemer	Engineering Machine Shop

8 Faculty:Staff Ratios, 2009/10

Department	Faculty to Admin Staff	Faculty to Tech Staff	Faculty to Total Staff
Architecture	2.64	4.00	1.60
CBET	1.00	n/a	1.00
Chemical	6.20	3.10	2.07
Civil & Environmental	5.04	3.92	2.20
Electrical & Computer	4.97	2.98	1.86
Management Sciences	3.38	20.25	2.89
Mechanical & Mechatronics	4.25	3.00	1.76
Systems Design	5.06	6.33	2.81
FACULTY TOTAL	**2.34**	**2.86**	**1.29**
Academic Units Only	**4.35**	**3.65**	**1.99**

Faculty:Staff Ratios, 2010/11

Department	Faculty to Admin Staff	Faculty to Tech Staff	Faculty to Total Staff
Architecture	2.67	3.20	1.45
CBET	0.75	n/a	0.75
Chemical	7.00	3.68	2.41
Civil & Environmental	5.18	4.03	2.27
Electrical & Computer	5.09	3.02	1.90
Management Sciences	3.71	22.25	3.18
Mechanical & Mechatronics	5.25	3.28	2.02
Systems Design	4.66	5.83	2.59
FACULTY TOTAL	**2.66**	**2.93**	**1.40**
Academic Units Only	**4.57**	**3.77**	**2.07**

D. UNDERGRADUATE STUDIES DATA

1 Total Undergraduate Enrolment (head count), Fall 2009

Program	Total	# Female	% Female	# Visa	% Visa
Architecture	346	189	54.6%	9	2.6%
Chemical	591	203	34.3%	49	8.3%
UAE: Chemical	8	1	12.5%	7	87.5%
Civil	490	114	23.3%	29	5.9%
UAE: Civil	14	0	0.0%	14	100.0%
Computer	571	53	9.3%	41	7.2%
Electrical	901	85	9.4%	66	7.3%
Environmental	185	93	50.3%	10	5.4%
Geological	73	18	24.7%	2	2.7%
Management	158	49	31.0%	16	10.1%
Mechanical	832	64	7.7%	43	5.2%
Mechatronics	522	34	6.5%	42	8.0%
Nanotechnology	439	87	19.8%	17	3.9%
Software	442	38	8.6%	23	5.2%
Systems Design	370	95	25.7%	7	1.9%
TOTAL	**5942**	**1123**	**18.9%**	**375**	**6.3%**

Total Undergraduate Enrolment (head count), Fall 2010

Program	Total	# Female	% Female	# Visa	% Visa
Architecture	368	200	54.3%	8	2.2%
Chemical	588	206	35.0%	59	10.0%
UAE: Chemical	30	6	20.0%	28	93.3%
Civil	506	109	21.5%	31	6.1%
UAE: Civil	22	3	13.6%	19	86.4%
Computer	611	58	9.5%	43	7.0%
Electrical	946	89	9.4%	69	7.3%
Environmental	223	104	46.6%	13	5.8%
Geological	81	26	32.1%	1	1.2%
Management	211	61	28.9%	23	10.9%
Mechanical	845	61	7.2%	55	6.5%
Mechatronics	538	44	8.2%	41	7.6%
Nanotechnology	494	93	18.8%	32	6.5%
Software	491	45	9.2%	30	6.1%
Systems Design	392	92	23.5%	10	2.6%
TOTAL	**6346**	**1197**	**18.9%**	**462**	**7.3%**

Total Undergraduate Enrolment (head count), Fall 2011

Program	Total	# Female	% Female	# Visa	% Visa
Architecture	352	204	58.0%	7	2.0%
Chemical	594	198	33.3%	69	11.6%
UAE: Chemical	56	17	30.4%	49	87.5%
Civil	527	125	23.7%	41	7.8%
UAE: Civil	46	9	19.6%	35	76.1%
Computer	625	53	8.5%	48	7.7%
Electrical	921	91	9.9%	84	9.1%
Environmental	245	116	47.3%	15	6.1%
Geological	88	22	25.0%	2	2.3%
Management	257	83	32.3%	34	13.2%
Mechanical	878	80	9.1%	74	8.4%
Mechatronics	562	52	9.3%	54	9.6%
Nanotechnology	488	97	19.9%	36	7.4%
Software	503	52	10.3%	35	7.0%
Systems Design	412	101	24.5%	11	2.7%
TOTAL	**6554**	**1300**	**19.8%**	**594**	**9.1%**

2 FTE Undergraduate Enrolment, 2009/10

Program	Total	# Female	% Female	# Visa	% Visa
Architecture	276.0	153.3	55.5%	6.5	2.4%
Chemical	472.8	161.8	34.2%	35.8	7.6%
UAE: Chemical	8.0	1.0	12.5%	7.0	87.5%
Civil	383.3	91.9	24.0%	22.0	5.7%
UAE: Civil	13.5	0.0	0.0%	13.5	100.0%
Computer	447.9	43.8	9.8%	29.0	6.5%
Electrical	718.1	69.4	9.7%	48.6	6.8%
Environmental	140.7	71.4	50.7%	6.5	4.6%
Geological	61.9	15.4	24.9%	1.0	1.6%
Management	130.3	37.0	28.4%	13.0	10.0%
Mechanical	678.2	52.9	7.8%	33.1	4.9%
Mechatronics	410.1	29.8	7.3%	30.5	7.4%
Nanotechnology	351.6	69.9	19.9%	13.0	3.7%
Software	351.8	30.8	8.8%	17.5	5.0%
Systems Design	296.5	74.1	25.0%	5.5	1.9%
TOTAL	**4740.7**	**902.5**	**19.0%**	**282.5**	**6.0%**

FTE Undergraduate Enrolment, 2010/11

Program	Total	# Female	% Female	# Visa	% Visa
Architecture	290.4	160	55.1%	6.5	2.2%
Chemical	471.9	164.8	34.9%	48.2	10.2%
UAE: Chemical	25.0	5.0	20.0%	23.0	92.0%
Civil	410.0	85.4	20.8%	26.1	6.4%
UAE: Civil	19.0	3.0	15.8%	16.0	84.2%
Computer	490.7	46.2	9.4%	31.0	6.3%
Electrical	725.9	71.3	9.8%	52.8	7.3%
Environmental	166.4	79.3	47.7%	9.5	5.7%
Geological	61.6	20.3	33.0%	1.0	1.6%
Management	167.0	50.6	30.3%	18.6	11.1%
Mechanical	668.5	48.5	7.3%	44.3	6.6%
Mechatronics	419.9	30.6	7.3%	31.7	7.5%
Nanotechnology	401.6	75.5	18.8%	26.2	6.5%
Software	392.7	36.8	9.4%	23.6	6.0%
Systems Design	315.9	74.5	23.6%	7.8	2.5%
TOTAL	**5026.5**	**951.8**	**18.9%**	**366.3**	**7.3%**

3 Undergraduate Degrees Granted, 2009

Program	Total	# Female	% Female	# Visa	% Visa
Architecture	64	33	51.6%	0	0.0%
Chemical	84	30	35.7%	3	3.6%
Civil	84	18	21.4%	1	1.2%
Computer	144	10	6.9%	6	4.2%
Electrical	92	9	9.8%	2	2.2%
Environmental	20	7	35.0%	1	5.0%
Geological	13	2	15.4%	1	7.7%
Mechanical	134	17	12.7%	2	1.5%
Mechatronics	88	9	10.2%	5	5.7%
Software	52	3	5.8%	3	5.8%
Systems Design	74	17	23.0%	2	2.7%
TOTAL	**849**	**155**	**18.3%**	**26**	**3.1%**

Undergraduate Degrees Granted, 2010

Program	Total	# Female	% Female	# Visa	% Visa
Architecture	56	32	57.1%	3	0.0%
Chemical	116	34	29.3%	3	2.6%
Civil	76	20	26.3%	3	3.9%
Computer	95	4	4.2%	2	2.1%
Electrical	117	10	8.5%	5	4.3%
Environmental	23	12	52.2%	0	0.0%
Geological	10	0	0.0%	0	0.0%
Mechanical	149	15	10.1%	7	4.7%
Mechatronics	97	8	8.2%	6	6.2%
Nanotechnology	64	11	17.2%	0	0.0%
Software	62	8	12.9%	0	0.0%
Systems Design	53	12	22.6%	1	1.9%
TOTAL	**918**	**166**	**18.1%**	**30**	**3.3%**

Undergraduate Degrees Granted, 2011

Program	Total	# Female	% Female	# Visa	% Visa
Architecture	76	40	52.6%	1	0.0%
Chemical	106	42	39.6%	4	3.8%
Civil	92	21	22.8%	4	4.3%
Computer	101	14	13.9%	4	4.0%
Electrical	154	15	9.7%	10	6.5%
Environmental	28	15	53.6%	1	3.6%
Geological	12	5	41.7%	0	0.0%
Mechanical	153	9	5.9%	5	3.3%
Mechatronics	83	5	6.0%	4	4.8%
Nanotechnology	87	18	20.7%	1	1.1%
Software	70	4	5.7%	2	2.9%
Systems Design	64	14	21.9%	1	1.6%
TOTAL	**1026**	**202**	**19.7%**	**37**	**3.6%**

4 Undergraduate Year One New Admissions, Fall 2009

Program	New Admissions					% of total target	% of int'l target	Total 1A Enrol't
	Cdn/ PR	Int'l	Total	# women	% women			
Architecture	69	1	70	35	50.0%	97.2%	10.0%	74
Chemical	106	11	117	38	32.5%	90.0%	73.3%	122
UAE: Chemical	1	7	8	1	12.5%	n/a	n/a	8
Civil	101	9	110	22	20.0%	104.8%	90.0%	112
UAE: Civil	0	14	14	0	0.0%	n/a	n/a	14
Electrical & Computer	302	36	338	33	9.8%	102.4%	120.0%	345
Environmental	45	4	49	26	53.1%	102.1%	133.3%	51
Geological	16	1	17	5	29.4%	100.0%	50.0%	17
Management	63	8	71	23	32.4%	118.3%	160.0%	72
Mechanical	182	16	198	14	7.1%	101.5%	106.7%	204
Mechatronics	105	16	121	8	6.6%	110.0%	160.0%	122
Nanotechnology	93	4	97	22	22.7%	88.2%	40.0%	99
Software	105	8	113	7	6.2%	102.7%	80.0%	114
Systems Design	80	3	83	30	36.1%	92.2%	n/a	83
TOTAL	**1268**	**138**	**1406**	**264**	**18.8%**	**102.1%**	**115.0%**	**1437**

Undergraduate Year One New Admissions, Fall 2010

Program	New Admissions					% of total target	% of int'l target	Total 1A Enrol't
	Cdn/ PR	Int'l	Total	# women	% women			
Architecture	75	1	76	45	59.2%	105.6%	16.7%	78
Chemical	109	18	127	39	30.7%	97.7%	120.0%	128
UAE: Chemical	2	21	23	5	21.7%	92.0%	91.3%	23
Civil	90	12	102	18	17.6%	97.1%	120.0%	103
UAE: Civil	3	8	11	3	27.3%	44.0%	34.8%	11
Electrical & Computer	336	39	375	38	10.1%	111.9%	111.4%	380
Environmental	60	4	64	24	37.5%	110.3%	50.0%	64
Geological	19	0	19	7	36.8%	111.8%	0.0%	22
Management	63	10	73	19	26.0%	121.7%	100.0%	74
Mechanical	177	18	195	15	7.7%	97.5%	90.0%	200
Mechatronics	118	11	129	14	10.9%	112.2%	73.3%	132
Nanotechnology	128	15	143	21	14.7%	130.0%	150.0%	144
Software	118	10	128	16	12.5%	116.4%	100.0%	130
Systems Design	97	5	102	21	20.6%	113.3%	100.0%	104
TOTAL	**1395**	**172**	**1567**	**285**	**18.2%**	**107.9%**	**89.6%**	**1593**

Undergraduate Year One New Admissions, Fall 2011

Program	New Admissions					% of total target	% of int'l target	Total 1A Enrol't
	Cdn/ PR	Int'l	Total	# women	% women			
Architecture	72	2	74	45	60.8%	102.8%	33.3%	75
Chemical	120	18	138	47	34.1%	98.6%	90.0%	139
UAE: Chemical	5	28	33	12	36.4%	103.1%	93.3%	34
Civil	98	15	113	38	33.6%	98.3%	100.0%	121
UAE: Civil	8	22	30	7	23.3%	166.7%	146.7%	30
Electrical & Computer	297	44	341	28	8.2%	96.1%	110.0%	349
Environmental	60	5	65	31	47.7%	95.6%	62.5%	67
Geological	18	1	19	5	26.3%	111.8%	50.0%	20
Management	55	11	66	24	36.4%	110.0%	110.0%	69
Mechanical	184	30	214	27	12.6%	103.4%	136.4%	225
Mechatronics	112	21	133	19	14.3%	110.8%	140.0%	130
Nanotechnology	107	9	116	26	22.4%	105.5%	90.0%	116
Software	108	13	121	18	14.9%	100.8%	86.7%	123
Systems Design	86	3	89	23	25.8%	101.1%	100.0%	95
TOTAL	**1330**	**222**	**1552**	**350**	**22.6%**	**102.0%**	**105.2%**	**1593**

5 Undergraduate Students:Faculty Ratio, 2009/10

Department	Undergraduate Students:Faculty
Architecture	17.3
Chemical	19.3
Civil & Environmental	17.0
Electrical & Computer	19.9
Management Sciences	6.4
Mechanical & Mechatronics	18.1
Systems Design	17.0
TOTAL	**17.6**

Undergraduate Students:Faculty Ratio, 2010/11

Department	Undergraduate Students:Faculty
Architecture	18.2
Chemical	18.0
Civil & Environmental	18.1
Electrical & Computer	20.0
Management Sciences	7.5
Mechanical & Mechatronics	17.5
Systems Design	18.8
TOTAL	**17.7**

6 Co-op Employment Statistics, 2009

Discipline	Seeking Employment	Employed	Unemployed	% Employed	% Int'l Placements
Architecture	331	323	8	97.6%	21.4%
Chemical	697	661	36	94.8%	4.5%
Civil	531	518	13	97.6%	7.5%
Computer	653	643	10	98.5%	11.8%
Electrical	1016	972	44	95.7%	9.6%
Environmental	207	200	7	96.6%	7.5%
Geological	80	78	2	97.5%	0.0%
Management	131	125	6	95.4%	8.0%
Mechanical	927	856	71	92.3%	5.7%
Mechatronics	592	568	24	95.9%	8.6%
Nanotechnology	486	478	8	98.4%	11.1%
Systems Design	447	439	8	98.2%	20.5%
Software	491	479	12	97.6%	12.3%
TOTAL	**6589**	**6340**	**249**	**96.2%**	**10.0%**

Co-op Employment Statistics, 2010

Discipline	Seeking Employment	Employed	Unemployed	% Employed	% Int'l Placements
Architecture	396	362	34	91.4%	27.4%
Chemical	683	649	34	95.0%	7.0%
Civil	599	577	22	96.3%	6.1%
Computer	663	650	13	98.0%	13.4%
Electrical	1085	1040	45	95.9%	8.1%
Environmental	228	214	14	93.9%	10.7%
Geological	80	75	5	93.8%	1.4%
Management	189	171	18	90.5%	9.1%
Mechanical	950	901	49	94.8%	6.8%
Mechatronics	602	595	7	98.8%	11.9%
Nanotechnology	536	512	24	95.5%	16.6%
Systems Design	429	421	8	98.1%	25.3%
Software	540	530	10	98.1%	11.6%
TOTAL	**6980**	**6697**	**283**	**96.0%**	**11.8%**

Co-op Employment Statistics, 2011

Discipline	Seeking Employment	Employed	Unemployed	% Employed	% Int'l Placements
Architecture	367	350	17	95.4%	39.9%
Chemical	673	633	40	94.1%	6.0%
Civil	582	561	21	96.4%	3.0%
Computer	687	680	7	99.0%	13.4%
Electrical	1157	1110	47	95.9%	9.8%
Environmental	272	259	13	95.2%	5.1%
Geological	102	90	12	88.2%	1.1%
Management	281	271	10	96.4%	9.5%
Mechanical	971	945	26	97.3%	7.9%
Mechatronics	647	637	10	98.5%	10.2%
Nanotechnology	536	515	21	96.1%	15.6%
Systems Design	470	461	9	98.1%	30.4%
Software	554	550	4	99.3%	6.8%
TOTAL	**7299**	**7062**	**237**	**96.8%**	**12.1%**

7 Co-op earnings, 2009/10

	Co-op Earnings
Faculty of Engineering	**$71.7 million**

Co-op earnings, 2010/11

	Co-op Earnings
Faculty of Engineering	**$80.6 million**

8 Undergraduate Scholarships & Bursaries, 2009/10

	Scholarships		Bursaries	
	Amount	Count	Amount	Count
Entrance Awards	$2,957,759	1725	$606,200	374
Upper-Year Awards	$2,669,798	1837	$1,705,221	1249
TOTAL	**$5,627,557**	**3562**	**$2,311,421**	**1623**

Undergraduate Scholarships & Bursaries, 2010/11

	Scholarships		Bursaries	
	Amount	Count	Amount	Count
Entrance Awards	$3,333,198	1873	$638,750	370
Upper-Year Awards	$2,888,837	1933	$3,167,463	1825
TOTAL	**$6,222,035**	**3806**	**$3,806,213**	**2195**

E. GRADUATE STUDIES DATA

1 Total Graduate Enrolment (Head Count), Fall 2009

Department	PhD	Rsch Master	Prof Master	Non Deg	Total	# Female	% Female	# Visa	% Visa
Architecture	n/a	144	n/a	3	147	74	50.3%	7	4.8%
CBET	n/a	n/a	62	56	118	37	31.4%	73	61.9%
Chemical	84	59	17	0	160	54	33.8%	68	42.5%
Civil & Environmental	89	85	60	3	237	55	23.2%	66	27.8%
Electrical & Computer	264	132	140	4	540	87	16.1%	197	36.5%
Management Sciences	31	33	153	2	219	68	31.1%	49	22.4%
Mechanical & Mechatronics	105	115	69	2	291	44	15.1%	62	21.3%
Systems Design	56	33	11	5	105	23	21.9%	34	32.4%
TOTAL	**629**	**601**	**512**	**75**	**1817**	**442**	**24.3%**	**556**	**30.6%**

Total Graduate Enrolment (Head Count), Fall 2010

Department	PhD	Rsch Master	Prof Master	Non Deg	Total	# Female	% Female	# Visa	% Visa
Architecture	n/a	119	n/a	3	122	61	50.0%	6	4.9%
CBET	n/a	n/a	47	17	64	20	31.3%	33	51.6%
Chemical	90	52	13	0	155	50	32.3%	60	38.7%
Civil & Environmental	85	79	38	2	204	52	25.5%	59	28.9%
Electrical & Computer	296	140	191	2	629	99	15.7%	258	41.0%
Management Sciences	31	32	188	1	252	86	34.1%	94	37.3%
Mechanical & Mechatronics	119	108	73	2	302	50	16.6%	78	25.8%
Systems Design	59	40	12	5	116	23	19.8%	38	32.8%
TOTAL	**680**	**570**	**562**	**32**	**1844**	**441**	**23.9%**	**626**	**33.9%**

Total Graduate Enrolment (Head Count), Fall 2011

Department	PhD	Rsch Master	Prof Master	Non Deg	Total	# Female	% Female	# Visa	% Visa
Architecture	n/a	116	n/a	3	119	62	52.1%	8	6.7%
CBET	n/a	n/a	33	0	33	9	27.3%	16	48.5%
Chemical	106	64	14	0	184	56	30.4%	90	48.9%
Civil & Environmental	108	85	41	0	234	58	24.8%	75	32.1%
Electrical & Computer	297	157	198	4	656	118	18.0%	302	46.0%
Management Sciences	33	31	131	1	196	63	32.1%	49	25.0%
Mechanical & Mechatronics	118	115	57	2	292	51	17.5%	90	30.8%
Systems Design	63	41	9	2	115	27	23.5%	52	45.2%
TOTAL	**725**	**609**	**483**	**12**	**1829**	**444**	**24.3%**	**682**	**37.3%**

2 FTE Graduate Enrolment, Fall 2009

Department	PhD	Rsch Master	Prof Master	Total	# Female	% Female	# Visa	% Visa
Architecture	n/a	126.5	n/a	126.5	63.9	50.5%	4.0	3.2%
CBET	n/a	n/a	55.0	55.0	13.3	24.2%	17.0	30.9%
Chemical	80.5	56.9	14.9	152.3	52.6	34.5%	68.0	44.6%
Civil & Environmental	82.7	79.4	48.8	210.9	49.8	23.6%	64.0	30.3%
Electrical & Computer	247.2	112.4	74.9	434.5	69.5	16.0%	188.4	43.4%
Management Sciences	26.1	29.5	88.6	144.2	49.8	34.5%	44.9	31.1%
Mechanical & Mechatronics	96.6	106.6	44.5	247.7	36.3	14.7%	59.3	23.9%
Systems Design	55.3	31.6	8.9	95.8	20.6	21.5%	29.0	30.3%
TOTAL	**588.4**	**542.9**	**335.6**	**1466.9**	**355.8**	**24.3%**	**474.6**	**32.4%**

FTE Graduate Enrolment, Fall 2010

Department	PhD	Rsch Master	Prof Master	Total	# Female	% Female	# Visa	% Visa
Architecture	n/a	102.9	n/a	102.9	48.2	46.8%	4.0	3.9%
CBET	n/a	n/a	40.7	40.7	11.3	27.8%	16.0	39.3%
Chemical	87.2	48.5	10.9	146.6	47.2	32.2%	60.0	40.9%
Civil & Environmental	81.5	74.1	24.7	180.3	47.2	26.2%	58.3	32.3%
Electrical & Computer	280.6	124.6	109.1	514.3	82.9	16.1%	251.0	48.8%
Management Sciences	26.1	27.1	127.8	181.0	63.6	35.1%	90.2	49.8%
Mechanical & Mechatronics	108.9	97.5	43.6	250.0	44.4	17.8%	75.3	30.1%
Systems Design	57.6	36.5	9.2	103.3	20.6	19.9%	30.9	29.9%
TOTAL	**641.9**	**511.2**	**366.0**	**1519.1**	**365.4**	**24.1%**	**585.7**	**38.6%**

FTE Graduate Enrolment, Fall 2011

Department	PhD	Rsch Master	Prof Master	Total	# Female	% Female	# Visa	% Visa
Architecture	n/a	92.9	n/a	92.9	52.2	54.4%	8.0	8.3%
CBET	n/a	n/a	30.9	30.9	9.0	29.1%	16.0	51.8%
Chemical	100.4	59.1	13.3	172.8	52.5	30.4%	89.3	51.7%
Civil & Environmental	101.0	76.6	26.3	203.9	53.1	26.0%	75.0	36.8%
Electrical & Computer	280.2	142.3	115.4	537.9	100.5	18.6%	296.4	55.0%
Management Sciences	26.0	25.4	68.7	120.1	39.2	32.4%	77.4	63.9%
Mechanical & Mechatronics	107.5	101.7	29.7	238.9	47.0	19.6%	151.2	63.1%
Systems Design	60.2	36.1	6.2	102.5	24.9	23.8%	50.6	48.4%
TOTAL	**675.3**	**534.1**	**290.5**	**1499.9**	**376.8**	**25.0%**	**665.9**	**44.2%**

3 Graduate Degrees Granted, 2009

Department	PhD	Rsch Master	Prof Master	Total	# Female	% Female	# Visa	% Visa
Architecture	0	32	0	32	23	71.9%	0	0.0%
CBET	0	0	42	42	24	57.1%	16	38.1%
Chemical	13	28	0	41	13	31.7%	10	24.4%
Civil & Environmental	12	27	28	67	8	11.9%	7	10.4%
Electrical & Computer	36	46	39	121	19	15.7%	28	23.1%
Management Sciences	8	12	45	65	20	30.8%	17	26.2%
Mechanical & Mechatronics	17	29	14	60	10	16.7%	3	5.0%
Systems Design	10	9	1	20	6	30.0%	4	20.0%
TOTAL	**96**	**183**	**169**	**448**	**123**	**27.5%**	**85**	**19.0%**

Graduate Degrees Granted, 2010

Department	PhD	Rsch Master	Prof Master	Total	# Female	% Female	# Visa	% Visa
Architecture	0	49	0	49	24	49.0%	1	2.0%
CBET	0	0	52	52	13	25.0%	17	32.7%
Chemical	12	25	10	47	15	31.9%	14	29.8%
Civil & Environmental	18	31	33	82	15	18.3%	11	13.4%
Electrical & Computer	37	61	49	147	28	19.0%	39	26.5%
Management Sciences	6	15	50	71	23	32.4%	17	23.9%
Mechanical & Mechatronics	10	46	43	99	11	11.1%	7	7.1%
Systems Design	11	11	4	26	4	15.4%	4	15.4%
TOTAL	**94**	**238**	**241**	**573**	**133**	**23.2%**	**110**	**19.2%**

Graduate Degrees Granted, 2011

Department	PhD	Rsch Master	Prof Master	Total	# Female	% Female	# Visa	% Visa
Architecture	0	44	0	44	27	61.4%	1	2.3%
CBET	0	0	43	43	12	27.9%	16	37.2%
Chemical	20	25	7	52	14	26.9%	19	36.5%
Civil & Environmental	8	27	24	59	14	23.7%	10	16.9%
Electrical & Computer	50	44	82	176	29	16.5%	37	21.0%
Management Sciences	7	17	85	109	40	36.7%	45	41.3%
Mechanical & Mechatronics	20	44	36	100	11	11.0%	13	13.0%
Systems Design	11	10	8	29	5	17.2%	8	27.6%
TOTAL	**116**	**211**	**285**	**612**	**152**	**24.8%**	**149**	**24.3%**

4 FTE Graduate Student Intake, 2010

Department	Degree Type	New Admissions			% of total target	% of Cdn/PR target
		Cdn/PR	Int'l	Total		
Architecture	PhD	0.0	0.0	0.0	n/a	n/a
	Research Master	31.0	2.0	33.0	50.8%	51.7%
	Professional Master	0.0	0.0	0.0	n/a	n/a
	Total	**31.0**	**2.0**	**33.0**	**50.8%**	**51.7%**
CBET	PhD	0.0	0.0	0.0	n/a	n/a
	Research Master	0.0	0.0	0.0	n/a	n/a
	Professional Master	22.0	18.0	40.0	80.0%	62.9%
	Total	**22.0**	**18.0**	**40.0**	**80.0%**	**62.9%**
Chemical	PhD	5.3	12.0	17.3	69.2%	53.0%
	Research Master	16.0	5.0	21.0	70.0%	80.0%
	Professional Master	7.0	1.0	8.0	80.0%	70.0%
	Total	**28.3**	**18.0**	**46.3**	**71.2%**	**70.8%**
Civil & Environmental	PhD	6.0	11.0	17.0	56.7%	60.0%
	Research Master	21.5	8.3	29.8	85.1%	107.5%
	Professional Master	10.9	0.0	10.9	36.3%	36.3%
	Total	**38.4**	**19.3**	**57.7**	**60.7%**	**64.0%**
Electrical & Computer	PhD	19.2	62.0	81.2	128.9%	106.7%
	Research Master	25.5	43.3	68.8	134.9%	91.1%
	Professional Master	48.5	33.6	82.1	112.5%	88.2%
	Total	**93.2**	**138.9**	**232.1**	**124.1%**	**92.3%**
Management Sciences	PhD	2.6	2.0	4.6	92.0%	65.0%
	Research Master	1.3	2.0	3.3	66.0%	65.0%
	Professional Master	28.2	19.3	47.5	73.1%	70.5%
	Total	**32.1**	**23.3**	**55.4**	**73.9%**	**69.8%**
Mechanical & Mechatronics	PhD	11.6	16.3	27.9	69.8%	77.3%
	Research Master	27.6	10.0	37.6	87.4%	78.9%
	Professional Master	31.2	1.0	32.2	100.6%	104.0%
	Total	**70.4**	**27.3**	**97.7**	**85.0%**	**88.0%**
Systems Design	PhD	8.3	7.0	15.3	102.0%	92.2%
	Research Master	6.3	6.3	12.6	84.0%	57.3%
	Professional Master	5.3	1.0	6.3	37.1%	75.7%
	Total	**19.9**	**14.3**	**34.2**	**72.8%**	**73.7%**
TOTAL	PhD	53.0	110.3	163.3	91.7%	80.3%
	Research Master	129.2	76.9	206.1	84.5%	73.4%
	Professional Master	153.1	73.9	227.0	81.9%	74.0%
	TOTAL	**335.3**	**261.1**	**596.4**	**85.3%**	**74.7%**

FTE Graduate Student Intake, 2011

Department	Degree Type	New Admissions			% of total target	% of Cdn/PR target
		Cdn/PR	Int'l	Total		
Architecture	PhD	0.0	0.0	0.0	n/a	n/a
	Research Master	39.0	1.0	40.0	91.3%	92.0%
	Professional Master	0.0	0.0	0.0	n/a	n/a
	Total	**39.0**	**1.0**	**40.0**	**91.3%**	**92.0%**
CBET	PhD	0.0	0.0	0.0	n/a	n/a
	Research Master	0.0	0.0	0.0	n/a	n/a
	Professional Master	14.0	17.0	31.0	68.9%	56.0%
	Total	**14.0**	**17.0**	**31.0**	**68.9%**	**56.0%**
Chemical	PhD	6.3	23.0	29.3	200.7%	100.0%
	Research Master	19.3	12.0	31.3	136.1%	107.2%
	Professional Master	4.3	9.0	13.3	166.3%	53.8%
	Total	**29.9**	**44.0**	**73.9**	**162.1%**	**92.6%**
Civil & Environmental	PhD	5.3	18.0	23.3	136.3%	66.3%
	Research Master	27.2	11.0	38.2	126.1%	111.9%
	Professional Master	19.0	0.0	19.0	95.0%	95.0%
	Total	**51.5**	**29.0**	**80.5**	**119.4%**	**98.5%**
Electrical & Computer	PhD	19.6	37.0	56.6	78.5%	88.3%
	Research Master	24.2	35.3	59.5	76.9%	48.5%
	Professional Master	35.3	43.0	78.3	88.9%	58.4%
	Total	**79.1**	**115.3**	**194.4**	**81.8%**	**59.7%**
Management Sciences	PhD	1.9	5.0	6.9	130.2%	52.8%
	Research Master	4.6	0.0	4.6	102.2%	153.3%
	Professional Master	23.0	17.3	40.3	69.4%	52.4%
	Total	**29.5**	**22.3**	**51.8**	**76.3%**	**58.4%**
Mechanical & Mechatronics	PhD	7.3	18.0	25.3	100.0%	57.9%
	Research Master	35.5	14.0	49.5	100.0%	82.6%
	Professional Master	16.6	2.0	18.6	74.4%	66.4%
	Total	**59.4**	**34.0**	**93.4**	**93.6%**	**73.7%**
Systems Design	PhD	3.3	9.0	12.3	81.5%	35.5%
	Research Master	7.3	7.0	14.3	105.9%	73.7%
	Professional Master	1.3	6.0	7.3	115.9%	28.3%
	Total	**11.9**	**22.0**	**33.9**	**97.1%**	**50.0%**
TOTAL	PhD	43.7	110.0	153.7	102.8%	70.5%
	Research Master	157.1	80.3	237.4	98.1%	82.5%
	Professional Master	113.5	94.3	207.8	83.0%	60.7%
	TOTAL	**314.3**	**284.6**	**598.9**	**93.3%**	**71.5%**

5 Graduate Students:Faculty Ratio, 2009/10

Department	PhD	Rsch Master	Prof Master	Non Deg	All Students	Rsch Students
Architecture	0.0	8.4	0.0	0.0	8.6	8.4
CBET	0.0	0.0	55.0	56.0	111.0	0.0
Chemical	2.6	1.8	0.5	0.0	4.9	4.4
Civil & Environmental	2.5	2.4	1.5	0.1	6.4	4.9
Electrical & Computer	3.4	1.5	1.0	0.0	6.0	4.9
Management Sciences	1.4	1.5	4.6	0.1	7.6	2.9
Mechanical & Mechatronics	1.9	2.1	0.9	0.0	5.0	4.1
Systems Design	2.4	1.4	0.4	0.2	4.3	3.7
TOTAL	**2.4**	**2.2**	**1.4**	**0.3**	**6.3**	**4.6**

Graduate Students:Faculty Ratio, 2010/11

Department	PhD	Rsch Master	Prof Master	Non Deg	All Students	Rsch Students
Architecture	0.0	6.9	0.0	0.1	7.0	6.9
CBET	0.0	0.0	20.4	8.5	28.9	0.0
Chemical	2.6	1.5	0.3	0.0	4.4	4.1
Civil & Environmental	2.4	2.2	0.7	0.0	5.3	4.5
Electrical & Computer	3.6	1.6	1.4	0.0	6.7	5.3
Management Sciences	1.3	1.3	6.3	0.0	9.0	2.6
Mechanical & Mechatronics	2.1	1.9	0.9	0.0	4.9	4.0
Systems Design	2.7	1.7	0.4	0.2	5.1	4.4
TOTAL	**2.5**	**2.0**	**1.4**	**0.1**	**6.1**	**4.5**

6 Graduate Proportion of Total FTE Enrolment, 2009/10

Department	Total Student FTE	Proportion Graduate
Architecture	402.5	31.4%
CBET	55.0	100.0%
Chemical	808.9	18.8%
Civil & Environmental	810.3	26.0%
Electrical & Computer	2210.1	19.7%
Management Sciences	274.5	52.5%
Mechanical & Mechatronics	1171.9	21.1%
Systems Design	474.3	20.2%
TOTAL	**6207.6**	**23.6%**

Graduate Proportion of Total FTE Enrolment, 2010/11

Department	Total Student FTE	Proportion Graduate
Architecture	393.3	26.2%
CBET	40.7	100.0%
Chemical	844.3	17.4%
Civil & Environmental	837.3	21.5%
Electrical & Computer	2408.4	21.4%
Management Sciences	348.0	52.0%
Mechanical & Mechatronics	1170.4	21.4%
Systems Design	503.2	20.5%
TOTAL	**6545.6**	**23.2%**

7 Graduate Financial Support, 2009/10

Research Master's Students

	Total Income	% of FTE's Supported	Avg $ Supported FTE's	% FTE's with TA	% FTE's with Ext Schlp
Architecture	815,371	50.2%	13,643	16.5%	6.5%
Chemical	1,270,595	91.1%	24,388	27.6%	14.0%
Civil & Environmental	1,678,710	92.8%	24,282	24.2%	19.6%
Electrical & Computer	2,817,825	91.5%	28,744	34.5%	29.0%
Management Sciences	511,488	91.6%	20,137	54.3%	9.7%
Mechanical & Mechatronics	2,263,415	94.7%	23,985	28.2%	24.4%
Systems Design	689,076	93.9%	24,320	27.6%	36.5%
TOTAL	**10,046,481**	**82.9%**	**23,521**	**27.5%**	**19.3%**

Doctoral Students

	Total Income	% of FTE's Supported	Avg $ Supported FTE's	% FTE's with TA	% FTE's with Ext Schlp
Chemical	2,636,063	96.0%	34,838	35.1%	31.3%
Civil & Environmental	2,423,345	93.5%	32,719	25.2%	27.3%
Electrical & Computer	8,029,297	95.9%	33,363	35.3%	24.7%
Management Sciences	782,292	83.9%	36,330	26.0%	40.5%
Mechanical & Mechatronics	3,009,167	94.4%	34,040	32.1%	27.8%
Systems Design	1,786,981	97.6%	33,318	35.7%	29.1%
TOTAL	**18,667,144**	**95.0%**	**33,697**	**33.0%**	**27.5%**

Graduate Financial Support, 2010/11

Research Master's Students

	Total Income	% of FTE's Supported	Avg $ Supported FTE's	% FTE's with TA	% FTE's with Ext Schlp
Architecture	686,942	49.7%	13,434	17.8%	7.8%
Chemical	1,002,248	87.4%	23,751	29.2%	12.2%
Civil & Environmental	1,645,759	90.4%	26,530	34.1%	33.1%
Electrical & Computer	2,997,804	93.0%	28,236	35.4%	24.8%
Management Sciences	514,403	83.1%	21,735	46.8%	17.9%
Mechanical & Mechatronics	2,116,708	93.6%	24,035	30.1%	18.4%
Systems Design	702,033	88.5%	25,072	29.5%	19.9%
TOTAL	**9,665,896**	**82.2%**	**24,088**	**30.2%**	**19.2%**

Doctoral Students

	Total Income	% of FTE's Supported	Avg $ Supported FTE's	% FTE's with TA	% FTE's with Ext Schlp
Chemical	2,904,779	93.6%	34,871	33.4%	32.8%
Civil & Environmental	2,588,636	94.5%	33,445	36.6%	30.8%
Electrical & Computer	9,170,810	96.2%	35,110	39.8%	25.1%
Management Sciences	873,167	82.9%	40,994	27.2%	40.5%
Mechanical & Mechatronics	3,303,225	95.3%	32,901	32.4%	25.5%
Systems Design	1,770,248	94.7%	33,027	35.5%	35.3%
TOTAL	**20,610,865**	**94.8%**	**34,513**	**36.3%**	**28.5%**

F. RESEARCH DATA

1 Total Sponsored Research Funds, 2009/10

Department	Tri-Council	Federal (excl Tri-Council)	Provincial	Industry	Other	Total
Architecture	$105,410	$20,000	$0	$280,000	$38,504	$443,914
CBET	$0	$0	$0	$0	$0	$0
Chemical	$2,618,800	$772,670	$304,665	$1,877,210	$930,961	$6,504,305
Civil & Environmental	$1,932,133	$706,670	$1,496,630	$1,026,518	$1,498,766	$6,660,717
Electrical & Computer	$6,042,813	$2,280,595	$6,118,167	$1,991,613	$1,504,411	$17,937,599
Management Sciences	$552,356	$124,865	$50,000	$40,000	$43,741	$810,962
Mechanical & Mechatronics	$2,466,593	$1,747,321	$4,401,193	$1,019,023	$923,061	$10,557,190
Systems Design	$1,802,965	$832,250	$356,207	$1,121,660	$175,737	$4,288,819
Other	$19,016	$1,394,714	$2,244,462	$0	$157,462	$3,815,654
TOTAL	**$15,540,086**	**$7,879,085**	**$14,971,324**	**$7,356,023**	**$5,272,643**	**$51,019,162**

Total Sponsored Research Funds, 2010/11

Department	Tri-Council	Federal (excl Tri-Council)	Provincial	Industry	Other	Total
Architecture	$221,982	$0	$0	$0	$28,660	$250,642
CBET	$0	$0	$0	$39,000	$0	$39,000
Chemical	$2,221,387	$812,848	$219,583	$952,314	$815,379	$5,021,511
Civil & Environmental	$2,414,791	$1,603,848	$2,228,456	$1,510,391	$1,416,115	$9,173,601
Electrical & Computer	$5,975,556	$2,175,059	$5,345,258	$3,111,081	$1,818,713	$18,425,667
Management Sciences	$620,620	$86,535	$50,000	$50,000	$16,000	$823,155
Mechanical & Mechatronics	$3,282,552	$4,298,188	$6,755,400	$1,985,028	$2,822,621	$19,143,789
Systems Design	$1,286,526	$681,246	$457,608	$614,340	$504,428	$3,544,148
Other	$18,000	$1,597,353	$2,244,462	$0	$79,282	$3,939,097
TOTAL	**$16,041,414**	**$11,255,077**	**$17,300,767**	**$8,262,154**	**$7,501,198**	**$60,360,610**

2 Total Tri-Council Grants Awarded, 2009/10

Department	CIHR	SSHRC	NSERC	Total
Architecture	$0	$105,410	$0	$105,410
CBET	$0	$0	$0	$0
Chemical	$58,550	$0	$2,560,250	$2,618,800
Civil & Environmental	$57,717	$0	$1,874,416	$1,932,133
Electrical & Computer	$70,360	$0	$5,972,453	$6,042,813
Management Sciences	$0	$298,598	$253,758	$552,356
Mechanical & Mechatronics	$0	$0	$2,466,593	$2,466,593
Systems Design	$0	$0	$1,802,965	$1,802,965
Other	$0	$0	$19,016	$19,016
TOTAL	**$186,627**	**$404,008**	**$14,949,451**	**$15,540,086**

Total Tri-Council Grants Awarded, 2010/11

Department	CIHR	SSHRC	NSERC	Total
Architecture	$0	$221,982	$0	$221,982
CBET	$0	$0	$0	$0
Chemical	$135,684	$0	$2,085,703	$2,221,387
Civil & Environmental	$57,717	$0	$2,357,074	$2,414,791
Electrical & Computer	$0	$0	$5,975,556	$5,975,556
Management Sciences	$0	$311,598	$309,022	$620,620
Mechanical & Mechatronics	$0	$0	$3,282,552	$3,282,552
Systems Design	$0	$0	$1,286,526	$1,286,526
Other	$0	$0	$18,000	$18,000
TOTAL	**$193,401**	**$533,580**	**$15,314,433**	**$16,041,414**

3 NSERC Grants by type, 2009/10

Department	Discovery	RTI	Strategic	Industry	Other	Total
Architecture	$0	$0	$0	$0	$0	$0
CBET	$0	$0	$0	$0	$0	$0
Chemical	$1,152,604	$446,745	$188,380	$635,701	$136,820	$2,560,250
Civil & Environmental	$867,922	$149,939	$0	$720,949	$135,606	$1,874,416
Electrical & Computer	$2,366,464	$359,970	$1,694,504	$1,353,015	$198,500	$5,972,453
Management Sciences	$253,758	$0	$0	$0	$0	$253,758
Mechanical & Mechatronics	$1,186,299	$299,275	$98,065	$712,235	$170,719	$2,466,593
Systems Design	$645,761	$336,223	$126,656	$489,525	$204,800	$1,802,965
Other	$0	$0	$0	$0	$19,016	$19,016
TOTAL	**$6,472,808**	**$1,592,152**	**$2,107,605**	**$3,911,425**	**$865,461**	**$14,949,451**

NSERC Grants by type, 2010/11

Department	Discovery	RTI	Strategic	Industry	Other	Total
Architecture	$0	$0	$0	$0	$0	$0
CBET	$0	$0	$0	$0	$0	$0
Chemical	$1,049,519	$315,091	$96,064	$486,709	$138,320	$2,085,703
Civil & Environmental	$963,600	$328,838	$0	$955,576	$109,060	$2,357,074
Electrical & Computer	$2,410,571	$300,687	$1,780,950	$1,314,348	$169,000	$5,975,556
Management Sciences	$290,355	$0	$0	$18,667	$0	$309,022
Mechanical & Mechatronics	$1,251,441	$292,482	$74,000	$1,513,810	$150,819	$3,282,552
Systems Design	$549,241	$0	$0	$509,465	$227,820	$1,286,526
Other	$0	$0	$0	$0	$18,000	$18,000
TOTAL	**$6,514,727**	**$1,237,098**	**$1,951,014**	**$4,798,575**	**$813,019**	**$15,314,433**

4 Provincial Funding by type, 2010/11

Department	ORF:RE	ORF:RI	OCE	ERA	Other	Total
Architecture	$0	$0	$0	$0	$0	$0
CBET	$0	$0	$0	$0	$0	$0
Chemical	$58,339	$36,080	$56,970	$68,194	$0	$219,583
Civil & Environmental	$813,520	$468,909	$148,001	$28,000	$770,026	$2,228,456
Electrical & Computer	$3,800,713	$150,000	$719,273	$327,242	$348,030	$5,345,258
Management Sciences	$0	$0	$50,000	$0	$0	$50,000
Mechanical & Mechatronics	$3,679,831	$1,813,350	$928,190	$191,404	$142,625	$6,755,400
Systems Design	$0	$0	$429,608	$28,000	$0	$457,608
Other	$0	$2,244,462	$0	$0	$0	$2,244,462
TOTAL	**$8,352,403**	**$4,712,801**	**$2,332,042**	**$642,840**	**$1,260,681**	**$17,300,767**

5 Industry Funding by source, 2010/11

Department	Canada	US	Int'l	Total
Architecture	$0	$0	$0	$0
CBET	$39,000	$0	$0	$39,000
Chemical	$369,205	$172,520	$410,589	$952,314
Civil & Environmental	$1,474,639	$35,752	$0	$1,510,391
Electrical & Computer	$2,504,637	$540,679	$65,765	$3,111,081
Management Sciences	$50,000	$0	$0	$50,000
Mechanical & Mechatronics	$1,561,010	$286,366	$137,652	$1,985,028
Systems Design	$315,741	$298,599	$0	$614,340
TOTAL	**$6,314,232**	**$1,333,916**	**$614,006**	**$8,262,154**

6 Total Sponsored Research Funds:Faculty Ratio, 2009/10

Department	Research Funding per Faculty
Architecture	$29,594
CBET	n/a
Chemical	$209,816
Civil & Environmental	$200,322
Electrical & Computer	$245,721
Management Sciences	$42,128
Mechanical & Mechatronics	$211,144
Systems Design	$184,069
TOTAL	**$207,564**
Excluding Architecture & CBET	**$220,084**

Total Sponsored Research Funds:Faculty Ratio, 2010/11

Department	Research Funding per Faculty
Architecture	$16,709
CBET	$19,500
Chemical	$152,167
Civil & Environmental	$267,921
Electrical & Computer	$239,294
Management Sciences	$40,650
Mechanical & Mechatronics	$375,368
Systems Design	$166,392
TOTAL	**$237,837**
Excluding Architecture & CBET	**$253,689**

7 Total Sponsored Research Funds:Budget, 2009/10

	Research Funding to Budget
TOTAL	**0.82**
Excluding Architecture & CBET	**0.88**

Total Sponsored Research Funds:Budget, 2010/11

	Research Funding to Budget
TOTAL	**0.94**
Excluding Architecture & CBET	**1.01**

8 Research Chair Holders, 2011

Canada Research Chairs, Tier 1

Chair Holder	Title
Carl Haas, CEE	CRC in Infrastructure Construction and Management
Amir Khajepour, MME	CRC in Mechatronic Vehicle Systems
Amir Khandani, ECE	CRC in Wireless Systems
Dongqing Li, MME	CRC in Micro-Fluidics and Nano-Fluidics
Raafat Mansour, ECE	CRC in Micro and Nano Integrated RF Systems
Alexander Penlidis, CHEM	CRC in Engineering of Polymers with Tailor-made Properties
Catherine Rosenberg, ECE	CRC in the Future Internet
Michael Worswick, MME	CRC in Light Weight Materials under Extreme Deformation: Forming and Impact
En-hui Yang, ECE	CRC in Information Theory and Multimedia Data Compression
Weihua Zhuang, ECE	CRC in Wireless Communication Networks

Canada Research Chairs, Tier 2

Chair Holder	Title
Pu Chen, CHEM	CRC in Nano-Bio-Materials
C. Perry Chou, CHEM	CRC in Novel Strategies for High-Level Recombinant Protein Production
Ehab El-Saadany, ECE	CRC in Energy Systems
Chris Eliasmith, SDE	CRC in Theoretical Neuroscience
Carolyn Ren, MME	CRC in Lab-on-a-Chip Technology
Khaled Soudki, CEE	CRC in Innovative Structural Rehabilitation
Susan Tighe, CEE	CRC in Pavements and Infrastructure Management
John Yeow, SDE	CRC in Micro and Nano Devices
Norman Zhou, MME	CRC in Microjoining

NSERC Industrial Research Chairs

Chair Holder	Title
Hany Aziz, ECE	NSERC/Dalsa Chair in organic Light Emitting Devices and Related Electronic Technologies
Krzystof Czarnecki, ECE	NSERC/Bank of Nova Scotia Chair in Requirements Engineering of Service-Oriented Software
Peter Huck, CEE	NSERC Chair in Water Treatment
Amir Khandani, ECE	NSERC/Nortel Chair in Advanced Telecommunications Technologies
Raafat Mansour, ECE	NSERC/Com Dev Chair in Filter and Switch Technologies
John McPhee, SDE	NSERC/Toyota/Maplesoft Chair in Mathematics-Based Modelling and Design
Mahesh Pandey, CEE	NSERC/UNENE Chair in Risk-Based Life Cycle Management of Engineering Systems
Gary Rempel, CHEM	NSERC/Lanxess Deutscheland GMBH Chair in Advanced Rubber Technologies
Ali Safavi-Naeini, ECE	NSERC/Research in Motion Chair in Intelligent Integrated Radio/Antenna Systems

Endowed Chairs

Chair Holder	Title
Claudio Canizares, ECE	Hydro One Research Chair
Sujeet Chaudhuri, ECE	Val O'Donovan Chair in RF/Microwaves and Photonics
Rod McNaughton,CBET	Eyton Chair in Entrepreneurship
Jatin Nathwani, CEE/MSci	Ontario Research Chair in Public Policy and Sustainable Energy Management
Susan Tighe, CEE	Norman W. McLeod Professor in Sustainable Pavement Engineering

Other Research/Design Chairs

Chair Holder	Title
Steve Lambert, MME	NSERC Design Chair in Collaborative Design
Siva Sivoththaman, ECE	Ontario Research Chair in Renewable Energy Technologies and Health

University Research Chairs and University Professors

Chair Holder	Title
Rick Culham, MME	University Research Chair
Keith Hipel, SDE	University Professor
Mohamed Kamel, ECE	University Research Chair
Fakhri Karray, ECE	University Research Chair
Ravi Mazumdar, ECE	University Research Chair
Flora Ng, CHEM	University Professor
Flora Ng, CHEM	University Research Chair
Gary Rempel, CHEM	University Professor
Manoj Sachdev, ECE	University Research Chair
Magdy Salama, ECE	University Research Chair
Xuemin Shen, ECE	University Research Chair
Michael Tam, CHEM	University Research Chair
Robert Jan van Pelt, ARCH	University Professor

G. DIVERSITY DATA

1 Women in Engineering Disciplines, 2009

	# Women	% Women
Undergraduate First-year Class	229	17.1%
All Undergraduate Students	934	16.7%
Undergraduate Degrees Granted	122	15.5%
All Graduate Students	368	22.0%
All Graduate Degrees Granted	100	22.5%
PhD Degrees Granted	20	20.8%
Faculty Members	27.5	11.9%

Women in Engineering Disciplines, 2010

	# Women	% Women
Undergraduate First-year Class	240	16.1%
All Undergraduate Students	997	16.7%
Undergraduate Degrees Granted	134	15.5%
All Graduate Students	380	22.1%
All Graduate Degrees Granted	109	20.8%
PhD Degrees Granted	14	14.9%
Faculty Members	31	12.7%

Women in Engineering Disciplines, 2011

	# Women	% Women
Undergraduate First-year Class	305	20.6%
All Undergraduate Students	1096	17.7%
Undergraduate Degrees Granted	162	17.1%
All Graduate Students	382	22.2%
All Graduate Degrees Granted	125	22.0%
PhD Degrees Granted	17	14.7%
Faculty Members	32	12.5%

2 Women in Architecture, 2009

	# Women	% Women
Undergraduate First-year Class	35	50.0%
All Undergraduate Students	189	54.3%
Undergraduate Degrees Granted	33	51.6%
All Graduate Students	74	49.7%
All Graduate Degrees Granted	23	71.9%
Faculty Members	6	35.3%

Women in Architecture, 2010

	# Women	% Women
Undergraduate First-year Class	45	59.2%
All Undergraduate Students	200	54.3%
Undergraduate Degrees Granted	32	57.1%
All Graduate Students	61	50.0%
All Graduate Degrees Granted	24	49.0%
Faculty Members	6	37.5%

Women in Architecture, 2011

	# Women	% Women
Undergraduate First-year Class	45	60.8%
All Undergraduate Students	204	58.0%
Undergraduate Degrees Granted	40	52.6%
All Graduate Students	62	52.1%
All Graduate Degrees Granted	27	61.4%
Faculty Members	6	37.5%

H. INTERATIONALIZATION DATA

1 International Students, 2010

	# International	% International
Undergraduate Year One New Admissions	172	11.0%
All Undergraduate Students	462	7.3%
Undergraduate Degrees Granted	30	3.3%
Undergraduate Co-op Work Terms	801	11.8%
All Graduate Students	626	33.9%
All Graduate Degrees Granted	110	19.2%
Outgoing Exchange Students	89	n/a
Incoming Exchange Students	204	n/a

International Students, 2011

	# International	% International
Undergraduate Year One New Admissions	222	14.3%
All Undergraduate Students	594	9.1%
Undergraduate Degrees Granted	37	3.6%
Undergraduate Co-op Work Terms	847	12.1%
All Graduate Students	682	37.3%
All Graduate Degrees Granted	149	24.3%
Outgoing Exchange Students	96	n/a
Incoming Exchange Students	205	n/a

I. ADVANCEMENT DATA

1 Total Alumni, 2009

Department	Total Alumni	Valid Alumni*	% Valid
Architecture	1,817	1,600	88.1%
CBET	198	197	99.5%
Chemical Engineering	3,883	3,448	88.8%
Civil & Environmental Engineering	6,049	5,417	89.6%
Electrical & Computer Engineering	8,659	7,885	91.1%
Management Sciences	1,308	1,094	83.6%
Mechanical & Mechatronics Engineering	6,939	6,301	90.8%
Systems Design Engineering	2,901	2,682	92.5%
TOTAL	**31,754**	**28,624**	**90.1%**

Total Alumni, 2010

Department	Total Alumni	Valid Alumni*	% Valid
Architecture	1,871	1,665	89.0%
CBET	250	249	99.6%
Chemical Engineering	4,067	3,636	89.4%
Civil & Environmental Engineering	6,195	5,580	90.1%
Electrical & Computer Engineering	9,088	8,340	91.8%
Management Sciences	1,387	1,181	85.1%
Mechanical & Mechatronics Engineering	7,195	6,568	91.3%
Systems Design Engineering	2,979	2,762	92.7%
TOTAL	**33,032**	**29,981**	**90.8%**

Total Alumni, 2011

Department	Total Alumni	Valid Alumni*	% Valid
Architecture	1,948	1,747	89.7%
CBET	293	291	99.3%
Chemical Engineering	4,248	3,813	89.8%
Civil & Environmental Engineering	6,365	5,740	90.2%
Electrical & Computer Engineering	9,607	8,850	92.1%
Management Sciences	1,521	1,312	86.3%
Mechanical & Mechatronics Engineering	7,455	6,816	91.4%
Systems Design Engineering	3,074	2,855	92.9%
TOTAL	**34,511**	**31,424**	**91.1%**

*"Valid" alumni are those for whom the Alumni Affairs Office has at least one current method of contact.

2 Engineering Alumni Donating to University of Waterloo, 2009

Department	Valid Alumni	Alumni Who Donated	% Donating
Architecture	1,600	103	6.4%
CBET	197	11	5.6%
Chemical Engineering	3,448	240	7.0%
Civil & Environmental Engineering	5,417	357	6.6%
Electrical & Computer Engineering	7,885	464	5.9%
Management Sciences	1,094	55	5.0%
Mechanical & Mechatronics Engineering	6,301	406	6.4%
Systems Design Engineering	2,682	164	6.1%
TOTAL	**28,624**	**1800**	**6.3%**

Engineering Alumni Donating to University of Waterloo, 2010

Department	Valid Alumni*	Alumni Who Donated	% Donating
Architecture	1,665	55	3.3%
CBET	249	4	1.6%
Chemical Engineering	3,636	264	7.3%
Civil & Environmental Engineering	5,580	399	7.2%
Electrical & Computer Engineering	8,340	556	6.7%
Management Sciences	1,181	71	6.0%
Mechanical & Mechatronics Engineering	6,568	471	7.2%
Systems Design Engineering	2,762	248	9.0%
TOTAL	**29,981**	**2068**	**6.9%**

Engineering Alumni Donating to University of Waterloo, 2011

Department	Valid Alumni*	Alumni Who Donated	% Donating
Architecture	1,747	87	5.0%
CBET	291	8	2.7%
Chemical Engineering	3,813	340	8.9%
Civil & Environmental Engineering	5,740	472	8.2%
Electrical & Computer Engineering	8,850	662	7.5%
Management Sciences	1,312	87	6.6%
Mechanical & Mechatronics Engineering	6,816	581	8.5%
Systems Design Engineering	2,855	246	8.6%
TOTAL	**31,424**	**2483**	**7.9%**

*"Valid" alumni are those for whom the Alumni Affairs Office has at least one current method of contact.

3 Engineering Alumni Donating to University of Waterloo, lifetime (as of December 31, 2011)

Department	Valid Alumni*	Alumni Who Donated	% Donating
Architecture	1,747	588	33.7%
CBET	291	30	10.3%
Chemical Engineering	3,813	1,858	48.7%
Civil & Environmental Engineering	5,740	2,792	48.6%
Electrical & Computer Engineering	8,850	3,631	41.0%
Management Sciences	1,312	452	34.5%
Mechanical & Mechatronics Engineering	6,816	3,329	48.8%
Systems Design Engineering	2,855	1,401	49.1%
TOTAL	**31,424**	**14,081**	**44.8%**

*"Valid" alumni are those for whom the Alumni Affairs Office has at least one current method of contact.

4 Funds Raised for the Faculty of Engineering, 2010/11

	Total Received	Total Raised
TOTAL	**$5.24 million**	**$10.6 million**

5 Vision 2010 Campaign Progress to May 1, 2011

Priority Project	Goal	$ Raised	% of Goal
Facilities	$61.5 M	$44.0 M	71.5%
Grad Scholarships	$23.0 M	$14.0 M	60.9%
Chairs	$30.0 M	$10.1 M	33.7%
Other	$5.5 M	$12.3 M	223.6%
TOTALI	**$120 M**	**$80.4 M**	**67.0%**

6 Engineering Endowments, 2009/10

Endowment	Principal
Eng Scholarship Fund	$2,509,201
Eyton Chair	$2,520,054
Col H Heasley Scholarship Fund	$2,001,614
Carl A Pollock Scholarship Fund	$565,953
Waterloo Engineering Endowment Foundation (WEEF)	$9,073,236
Equipment Fund	$1,461,286
Nortel Networks Scholarship Fund	$948,767
Chandrashekar Memorial Scholarship Fund	$259,797
Iron Ring Scholarship Fund	$139,222
Hydro One Chair	$300,000
Madter Scholarship Fund	$1,238,205
O'Donovan Chair	$2,813,169
Ontario Graduate Fellowships	$202,422
School of Architecture Maintenance Endowment	$6,205,520
Sustainable Energy Chair	$3,078,841
Nanotechnology Chairs	$9,000,000
EH Yang Engineering Research Innovation Award	$202,422
The Best Young Minds Grad Scholarships	$27,093
Norman W McLeod Chair in Sustainable Pavement Eng	$335,000
Endowments held in UW Grad Office	$14,780,071
Endowments held in UW Student Awards Office	$12,806,007
TOTAL	**$70,467,880**

Engineering Endowments, 2010/11

Endowment	Principal
Eng Scholarship Fund	$2,117,835
Eyton Chair	$2,520,054
Col H Heasley Scholarship Fund	$2,002,605
Carl A Pollock Scholarship Fund	$565,953
Waterloo Engineering Endowment Foundation (WEEF)	$9,693,096
Equipment Fund	$1,469,181
Nortel Networks Scholarship Fund	$948,767
Chandrashekar Memorial Scholarship Fund	$259,797
Iron Ring Scholarship Fund	$149,222
Hydro One Chair	$300,000
Madter Scholarship Fund	$1,238,205
O'Donovan Chair	$2,813,169
Ontario Graduate Fellowships	$202,422
School of Architecture Maintenance Endowment	$6,236,096
Sustainable Energy Chair	$3,078,841
Nanotechnology Chairs	$9,000,000
EH Yang Engineering Research Innovation Award	$202,422
The Best Young Minds Grad Scholarships	$30,834
Norman W McLeod Chair in Sustainable Pavement Eng	$1,033,549
Endowments held in UW Grad Office	$14,660,761
Endowments held in UW Student Awards Office	$15,654,032
TOTAL	**$74,176,841**

7 Alumni Attending Selected Class Reunions, 2009

	Reunion Year								
Department	5	10	15	20	25	30	35	40	45
Chemical Engineering	1.5%	4.8%	0.0%	16.2%	5.7%	48.0%	2.0%	26.9%	0.0%
Civil & Environmental Engineering	4.1%	2.9%	6.8%	13.7%	8.8%	16.0%	2.9%	13.8%	16.7%
Electrical & Computer Engineering	1.3%	7.5%	3.5%	3.0%	9.5%	1.1%	7.3%	23.0%	0.0%
Mechanical & Mechatronics Engineering	4.7%	1.1%	2.4%	7.0%	0.0%	10.9%	5.4%	15.9%	11.1%
Systems Design Engineering	0.0%	8.8%	1.5%	17.5%	8.7%	28.3%	12.0%	0.0%	0.0%
OVERALL PARTICIPATION	**2.4%**	**5.1%**	**3.3%**	**10.0%**	**5.7%**	**18.1%**	**5.2%**	**19.2%**	**8.7%**

Alumni Attending Selected Class Reunions, 2010

	Reunion Year								
Department	5	10	15	20	25	30	35	40	45
Chemical Engineering	1.4%	5.1%	1.4%	0.0%	4.2%	9.5%	13.0%	27.5%	0.0%
Civil & Environmental Engineering	0.0%	0.0%	2.8%	6.9%	27.2%	4.5%	14.3%	16.0%	6.7%
Electrical & Computer Engineering	0.3%	3.3%	0.7%	2.9%	11.3%	5.7%	12.4%	23.4%	14.3%
Mechanical & Mechatronics Engineering	0.0%	4.6%	6.6%	0.8%	13.0%	6.4%	21.2%	0.0%	0.0%
Systems Design Engineering	6.8%	9.0%	14.3%	10.0%	29.0%	19.4%	0.0%	0.0%	0.0%
OVERALL PARTICIPATION	**1.0%**	**4.3%**	**4.0%**	**3.4%**	**14.2%**	**6.7%**	**14.0%**	**16.3%**	**6.3%**

Alumni Attending Selected Class Reunions, 2011

	Reunion Year								
Department	5	10	15	20	25	30	35	40	45
Chemical Engineering	2.8%	2.6%	1.4%	1.4%	39.5%	6.5%	3.0%	0.0%	26.3%
Civil & Environmental Engineering	0.0%	0.0%	0.0%	0.8%	17.2%	9.6%	6.1%	1.8%	0.0%
Electrical & Computer Engineering	0.4%	2.9%	3.2%	9.4%	25.8%	2.9%	6.3%	13.9%	37.0%
Mechanical & Mechatronics Engineering	0.0%	0.0%	4.5%	2.9%	14.3%	7.1%	9.5%	0.0%	5.6%
Systems Design Engineering	8.6%	9.9%	0.0%	0.0%	24.3%	17.1%	0.0%	0.0%	0.0%
OVERALL PARTICIPATION	**1.6%**	**2.8%**	**1.9%**	**3.1%**	**21.2%**	**7.1%**	**5.4%**	**3.5%**	**14.5%**

8 Alumni Events, 2009-2011

Event	City	Date
Waterloo Engineering Alumni & Friends Reception at TRB	Washington, DC	13-Jan-09
Waterloo Engineering Alumni Ski Day	Collingwood, ON	16-Jan-09
Waterloo Engineering Alumni & Friends Reception at the IEEE ISSCC	San Francisco, CA	10-Feb-09
Waterloo Engineering Alumni & Friends Reception at Facebook	Palo Alto, CA	11-Feb-09
Waterloo Engineering Alumni & Friends Reception at the SAE World Congress	Windsor, ON	22-Apr-09
Waterloo Architecture Alumni Reception at the OAA Conference	Toronto, ON	07-May-09
Engineering Class of 2009 Post Convocation Receptions (2 receptions total)	Waterloo, ON	13-Jun-09
Reunion Class Rep Reception	Waterloo, ON	24-Sep-09
Reunions (1989, 1994, 1994, 2004)	Waterloo, ON	26-Sep-09
Reunions (1963, 1968, 1673, 1978, and 1983)	Waterloo, ON	26/27-Sept-09
Waterloo Engineering Alumni Luncheon at Imperial Oil	Calgary, AB	21-Oct-09
Waterloo Engineering Alumni Networking Reception at Calgary Petroleum Club	Calgary, AB	21-Oct-09
Engineering Class of 2009 Post Convocation Receptions	Waterloo, ON	24-Oct-09
Alumni Reception in Hong Kong	Hong Kong	06-Nov-10
A Poetry Recital for Waterloo Engineering Alumni with Barney Lawrence	Waterloo, ON	19-Nov-09
Waterloo Engineering Alumni & Friends Reception at TRB	Washington, DC	12-Jan-10
Waterloo Engineering Alumni Ski Day	Collingwood, ON	22-Jan-10
Waterloo Engineering Alumni & Friends Reception at the IEEE ISSCC	San Francisco, CA	2-Feb-10
Waterloo Engineering Alumni & Friends Reception at Google	Mountain View, CA	11-Feb-10
Designing the Future: 4th Year Student Design Project Showcase	Waterloo, ON	29-Apr-10
Waterloo Architecture (and Civil) Alumni Reception at the OAA Conference	Windsor, ON	6-May-10
Waterloo Engineering Alumni Reception	Seattle, WA	19-May-10
Waterloo Engineering Alumni Dinner	St. Johns, NF	3-Jun-10
Waterloo Engineering Alumni Networking Reception	Montreal, QC	14-Jun-10
Engineering Class of 2010 Post Convocation Receptions (2 receptions total)	Waterloo, ON	19-Jun-10
Waterloo Engineering Alumni Event at "Harry Potter: The Exhibition"	Toronto, ON	25-Jul-10
Reunions (1990, 1995, 2000, 2005)	Waterloo, ON	25-Sept-10
Reunions (1965, 1970, 1975, 1980, and 1985)	Waterloo, ON	25/26-Sept-10
Waterloo Engineering Alumni Networking Reception	Calgary, AB	13-Oct-10
Engineering Class of 2010 Post Convocation Reception	Waterloo, ON	24-Oct-10
Alumni Reception in Hong Kong	Hong Kong	15-Nov-10
Waterloo Engineering Alumni Reception in Dubai, UAE	Dubai, UAE	22-Nov-10
Waterloo Engineering Alumni Reception in New Delhi, India	New Delhi, India	25-Nov-10
Waterloo Engineering Alumni Ski Day	Collingwood, ON	21-Jan-11
Waterloo Engineering Alumni & Friends Reception at TRB	Washington, DC	25-Jan-11
Waterloo Engineering Alumni & Friends Reception at the IEEE ISSCC	San Francisco, CA	21-Feb-11
Waterloo Engineering Alumni & Friends Reception at Microsoft Xbox	Mountain View, CA	24-Feb-11
Waterloo Engineering Curling Social	Toronto, ON	26-Feb-11
Designing the Future: 4th Year Student Design Project Showcase	Waterloo, ON	27-Apr-11
Waterloo Architecture (and Civil) Alumni Reception at the OAA Conference	Toronto, ON	19-May-11
Engineering Class of 2011 Post-Convocation Receptions (2 receptions total)	Waterloo, ON	18-Jun-11
Reunions (1991, 1996, 2001, 2006)	Waterloo, ON	24-Sept-11
Reunions (1966, 1971, 1676, 1981, and 1986)	Waterloo, ON	24/25-Sept-11
David Roulston Celebration Event at the University Club	Waterloo, ON	21-Oct-11
Engineering Class of 2011-Post Convocation Reception	Waterloo, ON	22-Oct-11
Waterloo Engineering Alumni Reception at Stantec Architecture	Toronto, ON	10-Nov-11

9 Dean's Advisory Council Members

Rahul Bhatia	Managing Director, InterGlobe Enterprises Ltd.
Doug Beynon	President & CEO, Beynon Enterprises
Catherine Booth	CIO, Plexxus
Thomas Brzustowski	Professor for the Commercialization of Innovations, University of Ottawa
Savvas Chamberlain	CEO & Chairman, EXEL Research Inc.
Arthur Church	President & Chief Executive Officer, Mancor Industries
Rod Coutts	Chairman, Navcast Inc.
Anthony Franceschini	Former President & CEO, Stantec Inc.
Murray Gamble	President and CEO, The C3 Group
Frederick Grigsby	Former Senior V.-P. & CIO, Canadian National Railway
Adrian Hartog	CEO, MySpark Technologies
Tom Jenkins	Executive Chairman and Chief Strategy Officer, Open Text Corporation
Patrick Lamarre	President, SNC Nuclear
Norman Lockington	Vice-Present Technology, Dofasco
Robert Magee	President & Chief Executive Officer, Woodbridge Foam Corporation
Kevin Murai	CEO & Member of the Board of Directors, Synnex Corporation
Mike Pascoe	President and CEO, Magor Communications
Paul Spafford	Vice Chairman and Managing Director, CIBC World Markets Inc.
Ray Tanguay	President, Toyota Motor Manufacturing Canada Inc.
Glenn Turchan	Executive Vice President, Conestoga-Rovers & Associates
Don Walker	Co-Chief Executive Officer, Magna International Inc.
Douglas Wright	Founding Dean, Faculty of Engineering and Former President, University of Waterloo
Morden Yolles	Director, Halcrow Yolles

10 Dean's Development Council Members

Erin Chapple	Group Program Manager, Microsoft Corporation
Savvas Chamberlain	CEO & Chairman, EXEL Research Inc.
Jason Chiu	CEO, The Cherrypicks Group
David Cornfield	President, Adelpha Systems
Rod Coutts	Chairman , Navcast Inc.
Dan Daviau	Managing Director, Head of Canadian Investment, Genuity Capital Markets
Murray Gamble	President and CEO, The C3 Group
Fred Grigsby	Former Senior V.-P. & CIO, Canadian National Railway
Paul Moynihan	Managing Director and Partner, Mustang Capital Partners
Chamath Palihapitiya	Director, Social Capital Partnership, LP
Mike Panayi	President, Pinnacle Consultants Inc.
Mike Pascoe	President and CEO, Magor Communications
John Saabas	President, Pratt & Whitney Canada Corporation
Paul Spafford	Vice Chairman and Managing Director, CIBC World Markets Inc.
Lucas Skoczkowski	CEO, Redknee Inc.
Gerry Sullivan	CEO, Energent Inc.
Bill Tatham	Chairman and CEO, NexJ Systems Inc.
Hugh Thompson	President, Cambridge Towels Corporation

J. DATA NOTES

Acronyms and Abbreviations

Acad	Academic Unit (department, school or centre)
Admin	Administrative Unit or Administrative Staff
ARCH	Architecture (school or program)
Assoc Prof	Associate Professor
Asst Prof	Assistant Professor
CBET	Conrad Business, Entrepreneurship & Technology Centre
CEE	Civil & Environmental Engineering Department
CHEM	Chemical Engineering (school or program)
CIHR	Canadian Institutes for Health Research
CIV	Civil Engineering (program)
COMP	Computer Engineering (program)
CPR	Canadian or Permanent Resident
Def Term	Definite Term
ECE	Electrical & Computer Engineering Department
ELE	Electrical Engineering (program)
Enrol't	Enrolment
ENVIRO	Environmental Engineering (program)
FTE	Full-time equivalent
GENE	Undergraduate students not registered in an academic program (e.g. exchange students and students registered in the Qualifying Program for Readmission)
GEO	Geological Engineering (program)
IAP	University of Waterloo Institutional Analysis and Planning Office
Int'l	International
Lect	Lecturer
MECH	Mechanical Engineering (program)
MCTR	Mechatronics Engineering (program)
MGMT	Management Engineering (program)
MME	Mechanical & Mechatronics Engineering Department
MSCI	Management Sciences Department
MTCU	Ministry of Training, Colleges and Universities
NANO	Nanotechnology Engineering (program)
NSERC	Natural Sciences and Engineering Research Council
PR	Permanent Resident
PostDoc	Post-doctoral Fellow
Prof	Professor
Prof Master	Professional Master (i.e. coursework; without a thesis)
Rsch Assoc	Research Associate
Rsch Master	Research Master (i.e. with a thesis)
Rsch Prof	Research Professor
SDE	Systems Design Engineering (department or program)
SE	Software Engineering (program)
SSHRC	Social Sciences and Humanities Research Council
TA	Teaching Assistant
Tech	Technical Staff
T/TS	Tenured and tenure-stream faculty
UAE	United Arab Emirates (where Waterloo has a campus, in Dubai)

Notes on Tables

1 Key Metrics

Space Holdings excludes Architecture and CBET

Total Annual Budget includes permanent recurring budget as well as one-time only funds

2 Key Performance Indicators

Undergraduate Students/Faculty excludes CSTV faculty (included elsewhere in Systems Design) and excludes proportion of students in joint programs with other faculties

Graduate Students/Faculty includes only tenured and tenure-stream faculty

Space Holdings/Student, Sponsored Research Funds/Faculty and *Sponsored Research Funds/Budget* exclude Architecture and CBET

Budget/Student is widely considered an acceptable measure of the richness of a unit's educational program and is not intended to represent the amount of money spent directly on each student

Endowment/Student is not restricted to endowments whose funding is available directly to students; rather, it is a normalized indicator to measure the principal in all endowed funds to which the faculty has access

3 Institutional Context

Source for each metric is consistent with its measurement described below

4 Provincial and National Context

Source: Engineers Canada enrolment and degrees report (2010 is most recent available)

Per Engineers Canada guidelines, excludes Architecture and new undergraduate programs yet to be accredited (in 2010, Management Sciences)

Data Definitions and Sources

C1 Total Regular Faculty

Source: IAP data extract | As of: May 1

Excludes definite-term, research and visiting professors; excludes faculty members in full-time senior university administrative positions (e.g. president, vice-provost)

Systems Design includes CSTV

C2 Distribution of Regular Faculty by PEng Status

Source: Associate Dean, Co-operative Education & Professional Affairs | As of: May 1

Excludes faculty in Architecture, CBET and CSTV

C3 Total Tenured and Tenure-Stream Faculty

Source: IAP data extract | As of: May 1

Excludes lecturers and definite-term, research and visiting professors

C4 Total Non-Regular Faculty Appointments, 2011

Source: Dean of Engineering Office | As of: November 1, 2011

Count of current appointments

C5 Selected Major Faculty Awards and Honours

Source: Engineering Communications Office | As of: Dec. 31

C6 FTE Staff

Source: Waterloo Human Resources data extract | As of: May 1

Full-time equivalent filled positions paid from the operating budget

Research institutes include WatCAR, WIN and WISE; in previous years' reports, Graduate, Research and Outreach Offices were included in Dean's Office-admin

Excludes positions recently vacated which were under recruitment/not yet filled on May 1

C7 Dean of Engineering Outstanding Staff Performance Award

Source: Engineering Communications Office | As of: Dec. 31

Includes recipients since award's inception

C8 Faculty:Staff Ratios

Total regular faculty:FTE staff paid from the operating budget

Faculty Total includes staff and faculty in administrative units (e.g. Dean's Office, Machine Shop, Undergraduate Office, etc.); *Academic Units Only* excludes support units

D1 Total Undergraduate Enrolment (head count)

Source: IAP Student Registration cube | As of: Nov.1

All undergraduates registered in the fall term (in class or on co-op) on MTCU count date

Includes students on official co-op work term; includes all students in programs offered jointly with other faculties (i.e. software and nanotechnology); excludes part-time students; excludes students in GENE

D2 FTE Undergraduate Enrolment

Source: IAP Student Registration cube | As of: March 1

Equivalent student registrations in two academic terms in a year; this counters the impact of our co-op program, due to which a significant proportion of our students will have two work terms and one academic term in a given year

Annual FTE: (spring + fall + winter registrations, excluding students on co-op)/2

Includes all students in programs offered jointly with other faculties (i.e. software and nanotechnology); excludes part-time students; excludes students in GENE

D3 Undergraduate Degrees Granted

Source: IAP Degrees Granted cube | As of: Dec. 31

Total engineering undergraduate students graduating in the calendar year

Includes all students in programs offered jointly with other faculties (i.e. software and nanotechnology); count by first major (double-major degrees are counted only once)

D4 Undergraduate Year One New Admissions

Source: IAP ADR applications, offers and registrations cube | As of: Nov. 1

Total new engineering undergraduates registered in the fall term on MTCU count date

Includes all students in programs offered jointly with other faculties (i.e. software and nanotechnology); *Total 1A Enrolment* includes continuing students returning to 1A

D5 Undergraduate Students:Faculty Ratio

FTE undergraduate students:regular faculty members

Regular faculty here excludes CSTV faculty (included elsewhere in Systems Design); FTE students here exclude ½ of software students and ⅓ of nanotechnology students; mechatronics students are allocated 60% to MME, 20% to ECE and 20% to SDE

D6 Co-op Employment Statistics

Source: Waterloo Co-operative Education & Career Action Office | As of: Dec 31

Excludes students who advised CECA that they were not seeking employment or who did not participate in the interview process and did not provide information on their status

% international placements is share of "employed" terms outside of Canada

D7 Co-op earnings

Source: Waterloo Co-operative Education & Career Action Office | As of: May 1

Total student earnings are estimated using average salaries

D8 Undergraduate Scholarships & Bursaries

Source: IAP ADR student awards cube | As of: May 1

E1 Total Graduate Enrolment (head count)

Source: Waterloo Graduate Studies Office term report | As of: Nov.1

All graduate students registered in fall term (full-time or part-time) on MTCU count date

Nanotechnology students are counted in the department in which they are registered ; non-degree students include diploma and certificate programs

E2 FTE Graduate Enrolment

Source: Waterloo Graduate Studies Office term report | As of: Nov.1

All graduate students registered in the fall term : FT+(PT*0.3) on MTCU count date

Nanotechnology students are counted in the department in which they are registered ; non-degree students are excluded

E3 Graduate Degrees Granted

Source: IAP Degrees Granted cube | As of: Dec. 31

Total engineering graduate students graduating in the calendar year

Nanotechnology students are counted in the department in which they are registered ; count by first major (double-major degrees are counted only once)

E4 FTE Graduate Student Intake

Source: Waterloo Graduate Studies Office term report | As of: Nov 1

Total of FTE (FT+(PT*0.3)) of all new graduate students admits in 3 terms (calendar year)

Nanotechnology students are counted in the department in which they are registered ; non-degree students are excluded

E5 Graduate Students:Faculty Ratio

FTE graduate students:tenured and tenure-stream faculty members

All Students includes non-degree students; *Research Students* includes PhD+Research Master students only; totals might not add precisely due to rounding

E6 Graduate Proportion of Total FTE Enrolment

FTE graduate students/(FTE graduate students+FTE undergraduate students)

E7 Graduate Financial Support

Source: Waterloo Graduate Studies Office annual report | As of: May 1

F1 Total Sponsored Research Funds

Source: Waterloo Office of Research | As of: May 1

Other includes $3.6 million in joint science/engineering funding to equip the Quantum Nano Centre
2010/11 research data totals do not match institutional totals (from InfoEd) precisely due to the availability of funding details at the department level.

F2 Total Tri-Council Grants Awarded

Source: Waterloo Office of Research | As of: May 1

F3 NSERC Grants by type

Source: Waterloo Office of Research | As of: May 1

Discovery includes Accelerator Supplements; *Industry* includes CRC, CDE, I2I, IRC, Engage, Interact and CHRP

F4 Provincial Funding by type

Source: Waterloo Office of Research | As of: May 1

Other includes Ministry, FedDev and Ontario Research Chair funding

F5 Industry Funding by type

Source: Waterloo Office of Research | As of: May 1

F6 Total Sponsored Research Funds:Faculty Ratio

Sponsored research funds:tenured and tenure-stream faculty members

F7 Total Sponsored Research Funds:Budget

Sponsored research funds:permanent recurring budget

F8 Research Chair Holders, 2011

Source: Engineering Research Office & Engineering Dean's Office | As of: Dec. 31

G1 & G2
Women in Engineering Disciplines and Women in Architecture
Undergraduate year one new admissions excludes continuing students, Nov. 1
All undergraduate students = head count, Nov. 1
Undergraduate degrees granted in the calendar year, Dec. 31
All graduate students = head count, Nov. 1
Graduate degrees granted for the calendar year, Dec. 31
Professors = regular faculty, May 1

H1
International Students
Undergraduate year one new admissions excludes continuing students, Nov. 1
All undergraduate students = head count, Nov. 1
Undergraduate degrees granted in the calendar year, Dec. 31
Undergraduate Co-op Work Terms = # and % of "employed" terms outside Canada, Dec. 31
All graduate students = head count, Nov. 1
Graduate degrees granted for the calendar year, Dec. 31
Outgoing Exchange Students = Waterloo students on exchange elsewhere, Dec. 31
Incoming Exchange Students = Students studying at Waterloo on exchange, Dec. 31

I1
Total Alumni
Source: Waterloo Office of Alumni Affairs | As of: Dec. 31
Total of all alumni who have graduated with a degree from Waterloo Engineering
Includes all Architecture, CBET, and software engineering alumni; includes deceased and honorary alumni; count by preferred major (each alumnus is counted only once)

I2
Engineering Alumni Donating to the University of Waterloo in the year
Source: Waterloo Office of Alumni Affairs | As of: Dec. 31

I3
Engineering Alumni Donating to the University of Waterloo in their lifetime
Source: Waterloo Office of Alumni Affairs | As of: Dec. 31

I4
Funds Raised for the Faculty of Engineering
Source: Waterloo Office of Development | As of: May 1
Total Received includes all donations receipted, including cash, gifts-in-kind and other gifts; *Total Raised* includes all pledges, cash, gifts-in-kind and other gifts raised

I5
Vision 2010 Campaign Progress to Date
Source: Waterloo Office of Development | As of: May 1
Other priority projects include the Rome Program and CBET, for which minimal funds have been raised, and other donations received for projects outside the identified priorities

I6
Engineering Endowments
Source: Waterloo Finance Office | As of: May 1
Principal in all endowment funds to which the Faculty of Engineering has access

I7
Alumni Attending Selected Class Reunions
Source: Engineering Alumni Office | As of: Dec. 31
Includes only departments with an undergraduate program in the given reunion year

I8
Alumni Events
Source: Engineering Alumni Office | As of: Dec. 31

I9 & I10
Dean's Advisory Council Members and Dean's Development Council Members
Source: Engineering Advancement Office | As of: Dec. 31