



**VISION 2010**  
**A BLUEPRINT FOR EXCELLENCE IN**  
**ENGINEERING EDUCATION AND RESEARCH**

**Waterloo Engineering Strategic Plan**  
**2005/06 – 2009/10**

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Waterloo

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## **I EXECUTIVE SUMMARY**

The Vision 2010 strategic plan for Waterloo Engineering represents a commitment to improving quality. We aspire to be widely recognized as Canada's premier engineering school and counted among the leading engineering schools in North America. To achieve our aspirations, we have to take what is already a very good school of engineering, renowned for excellence in a number of areas, and move it forward. To that end, we will maintain and build on our strengths in undergraduate education, build on our existing capacity for quality graduate education, increase our research intensity and impact, and enhance our image as a multi-faceted engineering school.

Waterloo Engineering (see Appendix VI.A for an overview of the Faculty) is renowned for providing an excellent undergraduate education and operating an extremely successful integrated co-operative education program for all its undergraduate students. A long tradition of investing in our undergraduate programs has brought us to this level, and it is imperative that we maintain our current standards of excellence in our undergraduate portfolio. However, although we are also home to strong, well-subscribed graduate programs, a solid research program across disciplines, and recognized research excellence in select areas of strength, we have not yet earned the same recognition for our research and graduate activities. We must now invest strategically to further improve the quality, impact, and visibility of our graduate studies and research portfolios to bring us from a position among the leading Canadian engineering schools to a level commensurate with the top engineering schools in North America.

At the core of Waterloo Engineering's plan for 2010 is a commitment to investing in people. To improve quality and attain overall excellence we will engage high quality people. By 2010, we will have hired 83 new faculty members, bringing our total faculty to 304 and making Waterloo the largest engineering school in Canada by a significant margin. These new faculty members will contribute to our research portfolio, helping build critical mass in our areas of strength. They will further increase our capacity to provide excellent graduate programs. They will enable us to reach a desirable teaching load that will help faculty succeed in their teaching, research, and service portfolios. Most significantly for undergraduates, 46 of these new positions are not tied to undergraduate program expansion, and will therefore reduce student to faculty ratios. Since undergraduate programs normally drive the hiring process in Canada, this represents an extraordinary paradigm shift and a substantial opportunity to make significant quality improvements. Continuing our investments in excellent people, we will increase our total staff by 37.5 new full-time equivalent positions, to reach 189 by 2010. While 12 of these positions are tied to our newer undergraduate programs, the remaining 25.5 are strategically allocated in support of Faculty and departmental priorities.

To fully capitalize on the quality improvement inherent in increasing faculty, we will limit undergraduate enrolment increases to moderate, strategic growth. Significantly, we will continue the innovation of the last few years - which brought us exceptional new programs in software, mechatronics, and nanotechnology engineering - by introducing a new program in management engineering. This unique program, capitalizing on the benefits of having a management-oriented department within our Faculty, will accept 60 students a year beginning in 2007. The remaining

undergraduate enrolment increase is in international students, to bring our international enrolment to approximately 8 per cent of our undergraduate first-year class by 2010.

We'll make another investment in excellent people in graduate studies, with a projected full-time equivalent enrolment increase of over 600 students, from 868 in fall 2004 to about 1480 in fall 2010. We expect approximately 400 of these students will be Canadians or Permanent Residents, meeting a key priority currently shared by the provincial government, the University, and the Faculty. These additional students will increase graduate studies activity and impact and will further enhance our research portfolio. We aim not only to increase our enrolments, but also to offer graduate programs of the highest quality to excellent students across the Faculty. The additional faculty members we will add to our complement are central to successfully increasing our capacity for quality graduate education, as are our plans to make enhancements to our graduate program - from student recruitment and orientation to course offerings and curriculum design.

These new faculty members and graduate students will make significant contributions to our research program. They will join research groups, make scholarly contributions in their fields, and expand the impact Waterloo Engineering research has on professional and academic communities and society as a whole. And we are investing in quality not only by bringing excellent people to research at Waterloo, but also by providing services to help our researchers increase the impact of, and funding for, their research. We expect by 2009/10 to earn \$55 million in sponsored research funds per year, approximately double the \$27.75 million received in 2004/05.

To attract and retain the best, we must be recognized widely as a leading place to study and work. So, while we are improving quality, we must also work to increase our visibility as an excellent multi-faceted school of engineering. To that end, we are investing in external relations enhancements at the Faculty and department level. Similarly, our goals to attract excellent faculty, staff, graduate, and undergraduate students cannot be successful if we are missing out on the talent of half the population, so we are investing in the expansion and improvement of our women in engineering initiatives.

New resources are essential to the success of this plan. To provide financial support, an academic priorities fund (APF) equivalent to approximately 10 per cent of our operating budget has been put together in collaboration with the University. It will fund 19 of the new staff positions and 22 of the new faculty positions. Other positions are funded by our three newest undergraduate programs, release funds from chairs held by engineering faculty, and departmental allocations from special funds such as graduate expansion, graduate growth, and differential tuition fees. Another important source of funding will be philanthropic gifts. With our academic priorities in place, we have revised and focused our campaign priorities to, in effect, two: buildings and student support.

Our other pressing resource need is for space. Additional space is essential to support the growth in faculty, staff, and graduate students that is central to this plan, as well as to address current space deficits. We also must allocate resources to renovate outdated laboratory and classroom

space in existing buildings. A space plan is therefore currently being formulated. Key to this plan is the construction of additional building(s) for Engineering and the renovation and reallocation of existing space to ensure the effective use of the facilities currently available to the Faculty.

## **II THE VISION 2010 PLANNING PROCESS**

In spring 2004, Dean of Engineering Adel Sedra launched a broadly consultative planning exercise for the Faculty of Engineering, its academic departments, and service units. The Faculty's leadership team formed the engineering planning committee (see Appendix VI.B), which has met monthly and has held regular retreats to discuss all planning matters. The planning committee established key priorities and goals for the planning exercise, all aimed at improving quality. The challenge was to take a very good school that is widely regarded as excellent in some areas, particularly its undergraduate programs, and to move it toward overall excellence and international renown in all areas –undergraduate, graduate, and research.

To support implementation of the plan, a pool of resources was established in the form of an academic priorities fund (APF). The APF, equivalent to approximately 10 per cent of the Faculty's current operating budget on an ongoing basis, has been allocated selectively to fund new faculty and staff positions across the Faculty. The allocation of these positions was decided based on the quality of each unit's plan and the degree to which each would help the Faculty reach its aspirations. A detailed accounting of APF allocations is presented in Section IV.A. In addition to financial resources, another obstacle to the successful implementation of the Faculty's plan is a lack of space for the new faculty members, graduate students, and research activities that are essential to this plan. To address this critical need, a space plan is being developed for the Faculty (see Section IV.B).

### **Departmental Planning**

Each department conducted a detailed self-study, consulting with all of its constituencies for feedback and input into the exercise. These self-studies informed the development of a draft plan for each department. These draft plans were then reviewed by a team of external assessors: a group of North American discipline leaders visited each department to provide feedback on its self study and draft plan. Overall, 19 North American academics formed seven external assessment teams that visited Waterloo Engineering to review our self studies and draft plans. In total, the assessors came from fifteen different schools (10 from the United States and five from Canada). In response to the assessors' reports and ongoing consultation with their communities, each department head has prepared a plan implementation agreement (see Section V).

In addition to departmental assessors, the external assessment teams who visited the Faculty in 2005 also included two external assessors who visited the engineering computing unit in the winter. This assessment team specifically reviewed our self-study of computing, and its feedback was used in developing the draft plan for computing.

One exception to this departmental planning model was the School of Architecture. Architecture was located in a different Faculty when the Vision 2010 planning exercise was initiated, and the departmental self studies and draft plans were already completed when the School moved into the Faculty of Engineering in spring 2005. However, Architecture had already been pursuing a planning exercise of its own at that time. This process has since been integrated into the Engineering planning process through the dean of engineering and the director of Architecture, resulting in a plan implementation agreement for Architecture that is similar to the agreements reached with each engineering department.

### **Faculty Planning**

At the Faculty level, each academic support unit (undergraduate studies, graduate studies, research, computing, and advancement) also conducted a detailed self-study, consulting with its community members and clients for feedback and input into the exercise. These self-studies formed the basis of discussions at monthly meetings and retreats of the engineering planning committee. From the outcomes of these discussions, the head of each unit developed a draft plan. As noted above, an external assessment of the engineering computing unit's self study also helped inform its draft plan. Additionally, three task forces were struck at the Faculty level to address significant issues of importance to the Faculty that span departmental boundaries: women in engineering, staff issues, and faculty issues. Each task force studied the current situation, surveyed its community, and developed a final report of recommendations to the dean to inform the planning exercise.

The key recommendations of the draft plans created by each associate dean and the directors of advancement and communications have been included in the Faculty plan (see Section III), as have the recommendations of the task forces on women in engineering, staff issues, and faculty issues. Three North American leaders in engineering education visited Waterloo in early May, 2006 to conduct an external assessment of our Vision 2010 plan. Refinements resulting from the assessors' feedback have been included in the final plan, below.

To address the Faculty's critical space shortage, a Faculty-wide space planning exercise is being undertaken in parallel with the development of the final Faculty plan. Lead by external consultant Ron Venter, professor emeritus in mechanical and industrial engineering and retired vice-provost space and facilities planning for the University of Toronto, the space plan is analyzing space use and needs across the Faculty's buildings on Waterloo's main campus (the School of Architecture's new building in Cambridge was excluded from this exercise). The plan will specify the additional buildings to be constructed and the current space to be renovated to meet the Faculty's needs.

### **University Planning**

At the institutional level, the University of Waterloo is completing its Sixth Decade Plan concurrently with the Faculty's completion of its Vision 2010 plan. The Faculty of Engineering's Vision 2010 plan constitutes Engineering's submission to the Sixth Decade Plan.

While differences do exist between the process and outcomes of these two concurrent planning exercises – most notably their timelines (UW's plan extends to 2017, while Engineering's plan

extends to 2010) and the degree of tactical detail in each – the aspirations of the two plans are very synergistic. Both plans aim to pursue and support excellence in all areas in order to secure the University of Waterloo a recognized position of excellence on the global stage.

Specifically, Engineering's Vision 2010 plan will contribute to UW's Sixth Decade Plan implementation by assisting in meeting a variety of its objectives, including: achieving global leadership in selected areas of scholarly endeavours; maintaining national leadership in many aspects of academic activities; improving quality of student learning by deeper integration of experiential learning and research engagement; and increasing UW's research and scholarly contribution to society through research intensity and breadth. And while Engineering's plan does not include internationalization – a key priority in UW's plan – as a specific goal, actions to increase the international impact of our programs and the international exposure of our students permeate our plan. Currently, international connections exist across the Faculty, through undergraduate exchange programs and international co-op work terms, international student enrolment in our graduate and undergraduate classes, international agreements with a wide range of institutions, and research collaborations that connect our faculty with colleagues worldwide. We aim, across the Faculty, to further enhance this existing strength over the plan period.

### **III WATERLOO ENGINEERING STRATEGIC PLAN**

#### **Our Aspiration**

The University of Waterloo Faculty of Engineering aspires to be widely recognized as Canada's premier engineering school and counted among the leading engineering schools in North America.

#### **Our Goals**

To achieve our aspiration for 2010, we will:

- Maintain and build on our strengths in undergraduate education
- Build on our existing capacity for quality graduate education
- Increase our research intensity and impact
- Enhance our image as a multi-faceted engineering school

#### **Measuring Our Progress**

Progress toward our aspiration will be measured annually through reports from the dean, each associate dean, each department head, and the directors of advancement and communications. These reports will include performance indicators that will be calculated and reported annually, to help evaluate our progress and to establish benchmarks and trend lines for 2010. After each goal statement in the Faculty's strategic plan, below, we have indicated which performance indicators will be used to evaluate our progress toward that particular goal. Equally important as these quantitative data will be the qualitative and anecdotal measures that the narrative sections of each annual progress report will bring to bear on our understanding of our progress toward our aspirations and goals for 2010.

We have carefully selected a basket of performance indicators to help us measure and evaluate Waterloo Engineering, over time, in all our areas of endeavour. These indicators are not intended to create a single measure that summarizes our quality or ranks us among our peers, but rather to create a robust description of the Faculty and to track our progress toward our goals in all our key priority areas. Where consistent and comparable data is available, we will also include metrics that illustrate our standing among our peers as appropriate. A selection of current baseline indicators is included in Appendix VI.D.

## **A. FACULTY AND STAFF**

As of October 1, 2005, the Faculty of Engineering included 215.5 faculty members: 88 full professors, 73 associate professors, 44.5 assistant professors, and 10 lecturers. Just over 12 per cent of all faculty members were female, marking an increase of over 2.5 per cent since 2000. Between October 1, 2005 and the time this plan is published, our total faculty will have increased to 223.8.

In addition to these filled positions, 51.5 Engineering faculty positions are currently open or will be open during the Vision 2010 plan period. Of these open positions, just over 52 per cent are allocated to new undergraduate programs established in recent years (mechatronics, nanotechnology, and management engineering), and approximately 20 per cent are replacements. The remaining open positions, almost 28 per cent of the total, are not tied to existing or additional undergraduate enrolment.

In addition to these positions currently open, the Faculty of Engineering anticipates increasing its faculty complement by another 32 new positions by 2009/10 (see Goal A1, below, for details). The resulting combined growth in faculty – 46 faculty positions that are not tied to a related increase in undergraduate students – represents a significant opportunity to improve the quality of our programs.

The current staff in Engineering totals 151.4 permanent full-time equivalent (FTE) staff members paid from the operating budget, of whom approximately 50 per cent are administrative staff and 50 per cent are technical staff. In addition, approximately 14 administrative staff members and 30 technical staff members are working in the Faculty of Engineering and funded from sources outside of the operating budget. To support additional activities outlined in this plan and to ensure sufficient support is provided at all levels of the Faculty, the Engineering staff complement will also increase significantly by 2009/10 (see Goal A2, below, for details).

Equally important as increasing our faculty and staff complements is ensuring a positive, motivating, and rewarding working environment for existing and new faculty and staff. To that end, a task force on staff issues and a task force on faculty issues were struck in early 2005 to inform the planning process. These task forces were charged with providing additional insight into the quality of life for employees in the Faculty of Engineering. Their reports made a number of recommendations to improve working conditions and to better support the work of our faculty and staff, which are considered in the goals listed below.



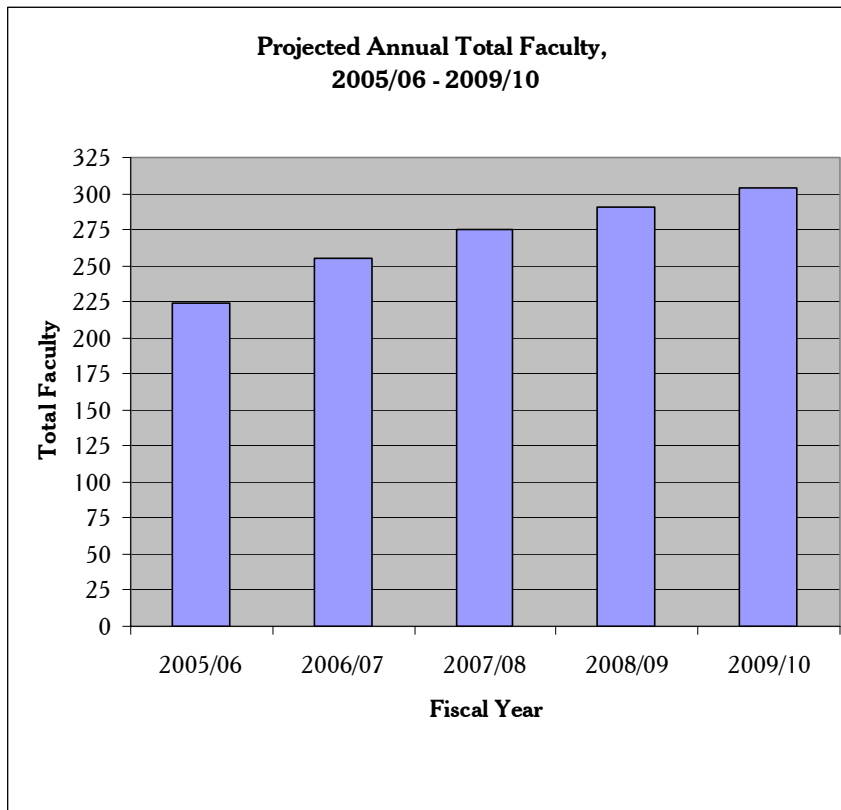
Our commitment to invest in high quality personnel is a cornerstone of the quality improvements outlined throughout this plan. The additional faculty members hired during this plan period will reduce faculty to student ratios at the undergraduate level, provide additional supervisory capacity at the graduate level, increase the critical mass and impact of our research programs, and enable departments to move toward desired teaching loads that will help faculty balance and find success in their teaching, research, and service portfolios. The additional staff members will support the necessary efforts to move the Faculty forward in its undergraduate, graduate, research, and external relations portfolios. Efforts to hire top faculty and staff and to provide them with excellent orientation, mentoring, training, and recognition opportunities will help ensure this investment in people yields the highest gains.

### **GOAL A1: Increase the Faculty Complement**

◇ Total Waterloo Engineering faculty members will reach 304.3 by 2009/10.

Figure III.A1, below, outlines the projected increase in faculty positions across the Faculty, and Figure III.A2 provides a breakdown by department. Of the 81.5 positions to be filled by 2010, 10.5 are replacements and 25 are linked to increases in undergraduate enrolment through three new undergraduate programs: mechatronics, nanotechnology, and management engineering. The remaining 46 represent positions added to improve quality across the Faculty. The funding sources of these additional positions are outlined in Figure IV.A1 (see Section IV.A) and the detailed plans for these positions are outlined in each department's plan implementation agreement (see Section V).

**Figure III.A1**



	2005/06	2006/07	2007/08	2008/09	2009/10
Current filled positions	223.8	223.8	254.8	275.3	290.3
New plan positions filled		11.0	7.0	7.0	7.0
Open positions filled <sup>1</sup>		20.0	13.5	8.0	8.0
<b>TOTAL</b>	<b>223.8</b>	<b>254.8</b>	<b>275.3</b>	<b>290.3</b>	<b>304.3</b>

**NOTE:** 1. One open position (to be filled in 2008/09) is bridged to a retirement.

**Figure III.A2**

Department	As of April 30/06		New Plan Positions	To Hire May 1/06-Apr 30/10	As of April 30/10
	Filled	Open			
Architecture	14.0	3.0	4.0	7.0	21.0
Chemical	27.0	7.0	4.0	11.0	38.0
Civil	32.0	2.0	5.0	7.0	39.0
Electrical & Computer	68.5	16.5	7.0	23.5	92.0
Management Sciences <sup>1</sup>	17.0	12.0	2.0	12.0	29.0
Mechanical	42.0	5.0	8.0	13.0	55.0
Systems Design <sup>2,3</sup>	22.3	4.0	2.0	6.0	27.3
Other <sup>4</sup>	1.0	2.0	0.0	2.0	3.0
<b>TOTAL</b>	<b>223.8</b>	<b>51.5</b>	<b>32.0</b>	<b>81.5</b>	<b>304.3</b>

- NOTES:**
1. Two open Management Sciences positions will be filled after 2010.
  2. One open Systems Design position is bridged to a retirement.
  3. Systems Design includes two Centre for Society, Technology, and Values (CSTV) faculty.
  4. Other includes two open positions yet to be allocated to departments.

◇ Accelerate hiring efforts across the Faculty.

It is a top priority for Engineering to hire faculty of the highest quality in all areas (teaching, research, and service). To that end, each unit will engage in aggressive recruitment, actively seeking exceptional candidates, encouraging all faculty members to consider recruitment opportunities through their professional organizations and scholarly and research networks, and ensuring an efficient hiring process with a reasonable time to offer. The Faculty will endeavour to offer competitive salaries and start-up grants in every discipline and to make judicious use of the University's policy on opportunity appointments where appropriate. New faculty members will be hired strategically in identified areas of competitive advantage and at the appropriate levels, including some mid-career and senior faculty members to ensure balance and to anchor new areas. Each department will seek to hire graduates from a wide diversity of schools, ensuring representation of top-ranked schools and limiting the hiring of "fresh" Waterloo PhDs (only truly exceptional cases will be considered for outstanding Waterloo PhDs who do not already have post-doctoral experience elsewhere).

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

- Total faculty, including percent female
- Total new faculty members hired and performance to target
- Distribution of new faculty members by PhD school
- Success rate on offers made
- Undergraduate student to faculty and graduate student to faculty ratios

**GOAL A2: Establish an Appropriate Staff Complement**

◇ Total Waterloo Engineering FTE staff members will reach 189 by 2009/10.

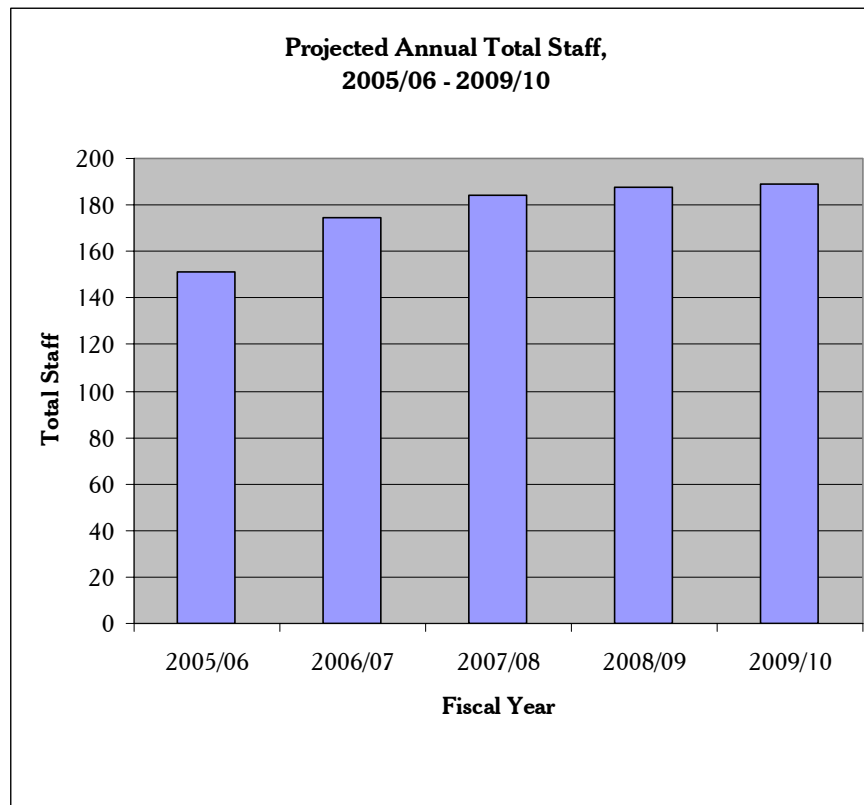
Figure III.A3, below, outlines the projected increase in staff positions across the Faculty, and Figure III.A4 provides a breakdown by department. Of the 37.5 additional positions to be established by 2010, 12 are linked to three new undergraduate programs: mechatronics, nanotechnology, and management engineering. The remaining 25.5 positions have been allocated strategically across the academic departments and support units of the Faculty to help move the Faculty and its departments forward by improving quality in priority areas. The funding sources of these additional positions are outlined in Figure IV.A2 (see Section IV.A) and the detailed plans for these positions are outlined in each department's plan implementation agreement (see Section V).

Another staff expansion is planned for the Professional Development for Engineering Students (PDEng) program; however, this expansion is currently in the planning stages and

final staff numbers are not known at this time. It is anticipated that the PDEng staff expansion figures will be included in the 2006/07 annual update to the planning process.

While the figures provided represent FTE staff positions paid from the operating budget, another group of staff members also contribute significantly to the daily operation of the Faculty. Staff positions that are not paid from the operating budget currently total 44.85 FTE (14 administrative and 30.85 technical); by 2009/10 it is anticipated this will reach 58.85 FTE staff members (18 administrative and 40.85 technical).

**Figure III.A3**



	2005/06	2006/07	2007/08	2008/09	2009/10
Current filled positions	151.4	151.4	174.9	183.9	187.4
New plan positions filled		20.5	5.0	0.0	0.0
Open positions filled		3.0	4.0	3.5	1.5
<b>TOTAL</b>	<b>151.4</b>	<b>174.9</b>	<b>183.9</b>	<b>187.4</b>	<b>188.9</b>

**Figure III.A4**

Department	As of April 30/06		New Plan Positions	To Hire May 1/06-Apr 30/10	As of April 30/10
	Filled	Open			
Architecture	9.7	0.0	2.0	2.0	11.7
Chemical	13.5	2.5	4.5	7.0	20.5
Civil	14.5	0.0	1.5	1.5	16.0
Electrical & Computer	31.5	1.0	5.0	6.0	37.5
Management Sciences	3.4	4.5	0.5	5.0	8.4
Mechanical	22.6	2.0	7.0	9.0	31.6
Systems Design	8.5	1.0	1.0	2.0	10.5
Dean's Office - admin	10.7	0.0	1.0	1.0	11.7
Dean's Office - advancement	8.0	0.0	0.0	0.0	8.0
Undergraduate Office	8.0	1.0	2.0	3.0	11.0
Eng Computing	11.0	0.0	0.0	0.0	11.0
Eng Machine Shop	10.0	0.0	0.0	0.0	10.0
WatCAR	0.0	0.0	1.0	1.0	1.0
<b>TOTAL</b>	<b>151.4</b>	<b>12.0</b>	<b>25.5</b>	<b>37.5</b>	<b>188.9</b>

- ◇ Commit to hiring staff of the highest quality for every position.

The Faculty must remain rigorous in applying standards of excellence to the hiring process for all staff. Each hiring manager will ensure that starting salaries and position classifications are at an appropriate level. The Faculty will work with Human Resources and departments to develop career paths for staff positions where applicable.

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

- Total staff, including percent female, paid from the operating budget
- Total new staff members hired and performance to target
- Faculty to staff, undergraduate student to staff, and graduate student to staff ratios
- Total staff outside of the operating budget (and the related ratios)

**GOAL A3: Orient and Mentor Faculty Members to Ensure Continuing Excellence**

- ◇ Implement the related recommendations of the task force on faculty issues.

A new full-time staff position will be created, half of which will be allocated to provide recruitment, transition, orientation, and information services to new faculty members (the other half will be allocated to women in engineering initiatives). Among the initiatives this position will support will be a regular and consistent Faculty-wide orientation program for new faculty members, co-ordinated with institutional and departmental efforts.

The Faculty will work with department heads to establish a mentoring program in each department and to limit the number of different new courses that new junior faculty normally teach in their first two to three years. Associate deans will also support mentorship efforts as

appropriate. For example, the associate dean research and external partnerships will assist through information provision related to granting agencies and proposal development, and the associate dean co-op and professional affairs will work to ensure new faculty members thoroughly understand the co-op program and its value to Waterloo and recognize the importance of registering for their PEng designation. This associate dean may also provide services to facilitate the registration process.

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

- Participation in the Faculty orientation program
- Feedback from the Faculty orientation program
- Number of faculty members with PEng designation

Annual plan updates from unit heads will also provide qualitative information about:

- Progress in establishing formal mentorship programs

#### **GOAL A4: Create an Environment Conducive to Staff Satisfaction and Success**

- ◇ Implement the related Faculty-level recommendations of the task force on staff issues.

A staff advisory committee to the dean will be struck to advise the dean on staff matters and on other Faculty issues, and staff representation will be added to Engineering Faculty Council and other committees of council as appropriate. Departments are encouraged to ensure they have an appropriate forum for staff to express views in department decision making as well. We will collect and analyze student to staff and faculty to staff ratios annually, and the Faculty will work with department heads, managers, and supervisors to monitor and address issues related to working conditions, workload, and reporting structures.

- ◇ Work with UW administration and Human Resources (HR) to address issues of an institutional nature identified through the task force on staff issues.

The Faculty has asked HR to establish an expert within the Faculty of Engineering, reporting jointly to HR and the dean of engineering, to provide information, guidance, and support services to staff, supervisors, managers, and administration. This position would provide essential support to implementing recommendations that require HR expertise, including: a Faculty-wide review of job classifications and descriptions; the development and implementation of career paths where appropriate; and the provision of information for conflict resolution. The active engagement of an HR professional could also improve communication and education across the Faculty on a broad range of topics related to staff relations and HR policies and procedures and help create a more transparent, open, and effective environment for HR activities across the Faculty. Additionally, the report of the task force on staff issues has been forwarded to UW administration for consideration of the recommendations that are exclusively at the institutional level.

- ◇ Recognize and reward staff excellence.

Staff, faculty, and administrators across the Faculty are encouraged to nominate deserving staff to the UW special recognition award program for university support staff. Additionally, an annual Faculty of Engineering staff award program will be introduced, within UW policy framework, to recognize staff excellence. The award will be presented annually at the Dean's Dinner, to complement awards currently presented to faculty. Departments are encouraged to establish similar annual staff awards as well.

- ◇ Attend to the job training and professional development needs of staff.

To ensure existing staff are qualified and up-to-date on the skills needed to succeed in their jobs, the Faculty will work with unit heads and the University to ensure sufficient job training opportunities are made available and that staff members participate as required. Each unit is encouraged to also make appropriate professional development opportunities available to staff to assist them in attaining their career goals.

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

- Faculty to staff, undergraduate student to staff, and graduate student to staff ratios (staff paid from the operating budget)
- Staff hired outside of the operating budget (and the related ratios)
- Number of Engineering staff who receive the UW special recognition award
- Total staff who were promoted, resigned, and retired

Annual plan updates from unit heads will also provide qualitative information about:

- Staff participation in job training and professional development opportunities

#### **GOAL A5: Support, Encourage, and Recognize the Success of Faculty Members**

- ◇ Work with departments to establish a consistent teaching load across the Faculty.

We aim to implement a three-course-per-year teaching load as broadly across the Faculty as possible. This load will help faculty members balance their professorial roles in teaching, research, and service. This course load should be consistent for all regular Engineering faculty members who are actively engaged in teaching, research, and service.

- ◇ Within UW's policy framework, remain vigilant in applying standards of excellence to promotion and tenure decisions.

Continue to ensure that all faculty members who are promoted or who receive tenure are meeting the required standards of excellence in their teaching, research, and service portfolios. Remain vigilant in the annual review process to recognize and reward true excellence.

- ◇ Establish an Engineering research excellence award program to complement the existing teaching excellence awards.

See Section III.D – Goal D4.

- ◇ Facilitate the recognition of faculty members through prestigious awards and honours.

A Faculty-wide honours and awards committee will be struck to identify opportunities to recognize faculty members' excellence and to nominate deserving candidates to prestigious national and international engineering honours (e.g. Canadian Academy of Engineering, Royal Society of Canada, Killam Research Prizes). Departments are encouraged to initiate similar efforts in regards to discipline-specific awards and honours (e.g. fellowship in disciplinary societies).

- ◇ Facilitate faculty member participation in enrichment opportunities and programs.

Potential enrichment programs on teaching, general management, leadership, and other topics pertinent to enhancing Engineering faculty members' job performance will be identified. This will include programs offered by units internal and external to UW and may also include opportunities on teaching development that will result from recommendations of the Faculty's teaching enhancement task force recently struck by the dean.

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

- Number of nominations made through the Faculty-wide honours and awards committee
- Number of faculty members awarded prestigious national and international honours
- Number of faculty members in each department awarded discipline-specific honours

Annual plan updates from unit heads will also provide qualitative information about:

- Progress toward reaching desired faculty teaching load
- Faculty member participation in enrichment opportunities

## **B. UNDERGRADUATE STUDIES**

As of November 1, 2005, 5109 undergraduate students – including students on official co-op work term - were enrolled in Engineering at the University of Waterloo. Just over 20 per cent of these students were female (excluding architecture students, 18 per cent were female) and 2.6 per cent were international students. Because all Waterloo Engineering undergraduates are enrolled in the co-operative education program, in which they alternate between four-month academic and work terms, they are not all enrolled in class for two terms each academic year (each year, some students will be on two work term placements and enrolled in class for only one term). This has a substantial effect on the annual full-time equivalent (FTE) undergraduate enrolment, which is calculated by adding together undergraduate enrolments (excluding students on official co-op work term) for the three terms and dividing by two. Therefore, our annual FTE undergraduate enrolment for 2004/05 was only 3906 students. This represents an increase of almost 500 FTE students since 2000/01. As our newest programs – mechatronics, nanotechnology, and management engineering – are phased in and reach steady state, our annual FTE will increase. We expect to reach steady state after the plan period, when all cohorts of the most recent program, management engineering, are enrolled.

This significant increase over the past five years is mostly the result of new programs that we have introduced to meet the evolving needs of the profession and of society. A program in



software engineering, offered jointly between the Department of Electrical and Computer Engineering and the School of Computer Science (in the Faculty of Mathematics), was introduced in 2001; mechatronics engineering, offered by Mechanical Engineering with supporting faculty in Systems Design and Electrical and Computer Engineering, was introduced in 2003; in 2005, nanotechnology engineering, a joint endeavour of Chemical and Electrical and Computer Engineering and Chemistry (in the Faculty of Science), was added. Additionally, when the School of Architecture returned to the Faculty of Engineering in May 2005, its undergraduate program joined the Faculty's offerings. These four programs join existing undergraduate programs in chemical, civil, computer, electrical, environmental, geological, mechanical, and systems design engineering, bringing the total number of undergraduate programs offered by the Faculty to 12.

Waterloo Engineering's excellent undergraduate program, and the co-operative education system of study in particular, are the foundation of its high standing and national and international reputation. To continue to build this foundation, we have recently participated in an institutional review of co-operative education, the Faculty has struck task forces on first-year engineering and admissions and the exchange program, and we have initiated the Professional Development for Engineering Students (PDEng) program. Through the PDEng program, initiated in fall 2004, during each work term students complete a mandatory course designed to help them become more successful in the professional world, to give them a leading-edge co-op experience, and to provide them with structured learning activities to develop and improve their workplace skills. Course themes range from becoming an effective employee to critical analysis in the workplace to integrating professional skills for a global workplace. Investments in our undergraduate program over the past years have resulted in a high calibre program that educates excellent students and produces successful alumni. It is therefore important that, while efforts are made to bring our graduate and research programs to a similarly high level, we continue to attend to our undergraduate program to keep our foundation strong.

As previously discussed, the planned increase in Engineering's faculty complement (see Section III.A – Goal A1) will directly improve quality in our undergraduate programs. The open positions that are allocated to new undergraduate programs, when filled, will contribute more expertise and critical mass to these new areas of study. And, the additional faculty who will be hired without a commensurate increase in undergraduate enrolment will reduce student to faculty ratios. Waterloo Engineering therefore plans to limit growth in its undergraduate programs, while continuing to strive to attract and enrol top students, in order to take full advantage of this opportunity to improve quality through the creation of new faculty positions. We will also attend to the co-operative education program and to the academic, co-curricular and extra-curricular lives of our students.

### **GOAL B1: Limit Undergraduate Enrolment Growth to a Moderate Increase**

- ◇ Consider the strategic creation of new programs in areas of competitive advantage.

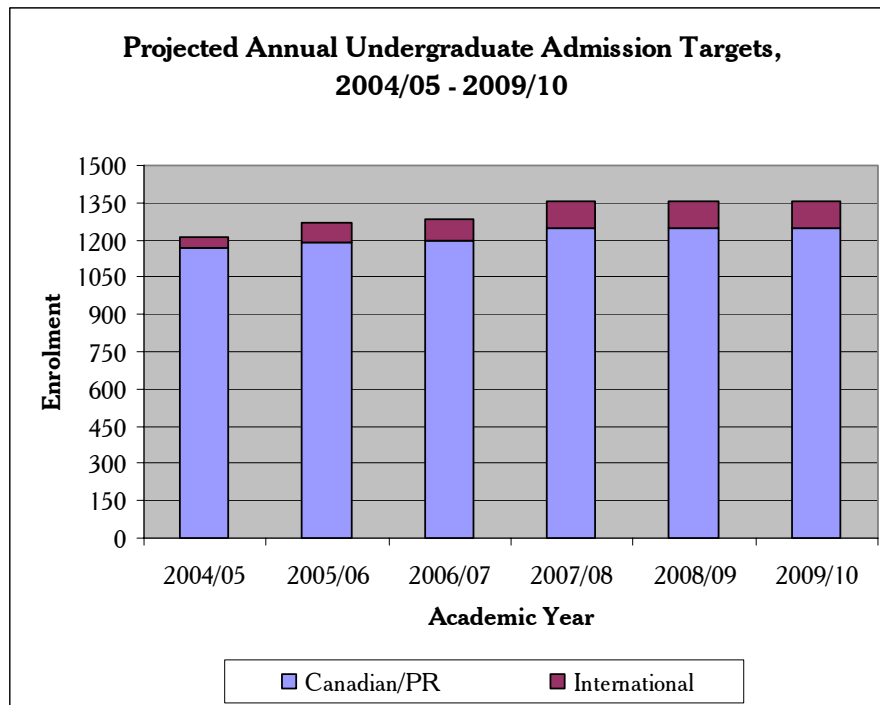
Engineering is planning to capitalize on our unique opportunity of having a management-oriented department (Management Sciences) within the Faculty by introducing a new

undergraduate program in management engineering in fall 2007. Through this program the Faculty will respond to the growing demand for experts in areas such as organizational behaviour, information systems, and the management of technology. While this new program will result in increased enrolments (see below), it will be resourced separately from the quality improvement funding available through this planning process, thereby ensuring that sufficient additional faculty will be hired to support this program specifically. Also under early consideration now is a new program in architectural engineering, which will also take advantage of interdepartmental synergies within the Faculty: between our Civil Engineering Department and the School of Architecture. This program, if implemented, will also be supported through additional faculty members and other necessary resources specific to the program.

- ◇ Annual first-year undergraduate targets will only increase by 90 students to 2009/10.

Figure III.B, below, outlines the projected increase in undergraduate first-year admissions across the Faculty. Over half of this increase is attributed to a planned new program in management engineering (see above), which expects to admit its first class of 60 students in fall 2007. The remaining increase is in international students. The Faculty aims to have an annual international student intake equivalent to approximately 8 per cent of the first-year undergraduate class by 2010. The increase in international students will be taken in addition to the fall 2005 domestic target (i.e. domestic student spaces will not be replaced with international student spaces), and therefore the overall target will increase slightly to 2010.

**Figure III.B**



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Canadian/PR	1170	1190	1194	1247	1247	1247
International	44	77	90	110	110	110
<b>TOTAL</b>	<b>1214</b>	<b>1267</b>	<b>1284</b>	<b>1357</b>	<b>1357</b>	<b>1357</b>
% International	3.62%	6.08%	7.01%	8.11%	8.11%	8.11%

- ◇ Attract and enrol the best possible students in our undergraduate programs.

The President's Scholarship, a new University initiative established in fall 2005 to guarantee a minimum \$2,000 scholarship to all students with an incoming average of over 90 per cent, has helped the Faculty offer competitive scholarships to reward excellent prospective students. In fall 2006, a \$1,000 scholarship for students with an 85-90 per cent average, and two \$1,500 vouchers to be used toward an international experience and a research internship for students with averages over 95 per cent, will be introduced to further enhance our scholarship offerings. The marketing and recruitment co-ordinator for Engineering will work with the admissions and communications teams to establish and monitor an Engineering undergraduate recruitment plan that will identify other initiatives to continue to attract and enrol top students. Among the specific goals of that plan will be ways to increase the pool of applicants, to increase the share of engineering students with averages over 95 per cent that we are enrolling, and to increase the representation of women in our undergraduate classes.

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

- Year one enrolment, by gender and visa status, and performance against targets
- Total undergraduate enrolment, by gender and visa status
- Undergraduate student to faculty ratio
- Application, offer, and yield rates
- Entering grade averages
- Percent of entering students with averages over 90 per cent and over 95 per cent
- Acceptance rate on offers to students with averages over 90 per cent and over 95 per cent

## **GOAL B2: Enrich the Quality of the Undergraduate Academic Experience**

- ◇ Ensure an ongoing curriculum review process is in place for all undergraduate programs.

The engineering undergraduate office and each department will establish an ongoing process for regular curriculum review through which each program's curriculum will be kept current and meaningful through annual review and resulting change as necessary.

- ◇ Increase flexibility in the undergraduate curriculum.

The Faculty will work with departments toward establishing a more common first year for all undergraduates in engineering disciplines. We will also make the appropriate administrative refinements to continue to offer effective and efficient first-year services through the engineering undergraduate office. A more common first year will allow students an easier transition into other disciplines if desired at the end of first year. Departments are also

encouraged to work toward offering a number of shared/inter-departmental senior courses. The engineering undergraduate office will facilitate this process for those departments that are willing to permit access to fourth-year students from other programs and to establish shared senior courses with shared teaching responsibilities. The engineering undergraduate office will also work to alleviate some logistical obstacles (e.g. scheduling and number of courses) to improve access to options for all engineering undergraduates.

- ◇ Engage undergraduate students in the Faculty's research activities.

The Faculty will work to capitalize fully on opportunities provided through the Undergraduate Research Assistantship and NSERC USRA programs to expose undergraduate students to research settings. To help make the NSERC USRA more competitive with industry co-op salaries, the Faculty will provide an additional \$2,000 to top undergraduate award holders. Departments are encouraged to use class professor hour and other similar opportunities to engage student interest in their professors' research portfolios and to help de-mystify academic life.

- ◇ Ensure all Engineering teaching assistants receive appropriate training.

To provide undergraduate classes with the best possible instructional support and to present strong graduate student role models to undergraduate students, the Faculty of Engineering established *ExpectATIONS*, a two-day intensive workshop intended for all Engineering graduate students who are assigned a TA position. *ExpectATIONS* covers topics ranging from teaching and marking to working relations and harassment and discrimination. For much of the workshop, small groups of TAs are paired with a faculty member and an experienced TA who provide guidance, feedback, and mentorship. The associate dean undergraduate studies will work with each Engineering department to ensure that only graduate students who have completed the *ExpectATIONS* workshop are assigned TAs.

- ◇ Attend to the quality of undergraduate lab equipment.

Departments are encouraged to commit to upgrading their undergraduate laboratory equipment. Many departments have allocated some of their plan budget to support this important undergraduate priority (see Section V).

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

- Degrees granted, by gender and visa status
- Student success and attrition rates
- Number of URAs held by Engineering undergraduates
- Percent of TAs who have completed *ExpectATIONS*

Annual plan updates from unit heads will also provide qualitative information about:

- Progress toward establishing shared courses and facilitating options
- Changes to the first-year curriculum and curriculum changes in each department
- Use of class professor hour to raise student awareness of research
- TA and/or lab instructor evaluations

### **GOAL B3: Enhance the Undergraduate Co-operative Education Experience**

- ◇ Continue to make improvements to the co-op experience for Engineering students.

The Faculty has recently established an associate dean for co-op and professional affairs and charged him with implementing recommendations of the Co-operative Education and Career Services (CECS) review in Engineering. Among these recommendations, the new associate dean will establish a co-operative education council comprised of students, faculty, and staff from CECS and the Faculty, and will be responsible for closely connecting CECS and the Faculty on issues of co-operative education, including job development. He will work to clarify expectations for prospective and current students regarding co-op, will seek to improve access to four- and eight-month senior work terms as appropriate, and will plan and implement operational refinements to the work term report process to improve the clarity of goals, marking quality, and feedback quality. In this capacity, consideration will also be given to the number of work term reports required. To support the continuing internationalization of our undergraduate programs, the associate dean will work with CECS to encourage and facilitate international co-op work terms. In 2004/05, 7.7 per cent of engineering undergraduate co-op work terms were outside Canada. The Faculty would like to increase this rate over the plan period. The new associate dean will also be responsible for ensuring that issues related to co-operative education are featured in the Faculty-level orientation program being developed for new faculty members (see Section III.A – Goal A3), to ensure all Engineering faculty members understand well the importance and value of the co-op program to Waterloo Engineering. One new full-time administrative staff position has been allocated to the engineering undergraduate office to support the new associate dean portfolio.

- ◇ Attend to the ongoing implementation of the PDEng program.

The director of PDEng will work to ensure the continuing development and regular assessment of the PDEng program. Formal and anecdotal input from student participants and employers will be regularly solicited and analyzed, and other indicators such as student success rates will be used to ensure PDEng meets its expressed goals for student preparation and on-the-job performance enhancements. Near the end of the plan period, after the PDEng program has been fully phased in, a full review of the program will be conducted.

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

- Co-op placement rate
- Percent of co-op work terms outside Canada
- PDEng success/completion rate

Annual plan updates from unit heads will also provide qualitative information about:

- Student satisfaction with the co-op job placement process

### **GOAL B4: Continue to Enhance the Undergraduate Student Experience**

- ◇ Enhance the Faculty's international exchange program.

In 2005, 92 Waterloo Engineering students participated in international exchange programs and 138 students from institutions with which we have agreements came here to study. The Faculty aims to increase the number of its undergraduate students participating in international exchanges in any given year to equal approximately 15 per cent of a cohort (approximately 1200 students), and to maintain a steady state of incoming students from international schools of 100 – 200 students annually. Taken together with international co-op placements, such international opportunities for our undergraduate students should reach over 20 per cent by 2010. To encourage participation in exchange, the Faculty will take steps to better promote and facilitate exchange opportunities to undergraduates, including making operational refinements to the Engineering exchange office. Among these, a new administrative staff position has been allocated to the undergraduate office in order to dedicate one full-time support position to the exchange operations. We will also seek out new exchange opportunities with leading schools abroad, whose reputations and quality are commensurate with what we aim to achieve.

- ◇ Continue to support and encourage student-directed co-curricular activities.

Waterloo Engineering is home to a large number of student teams, ranging from the alternative fuels team and the solar race car team to the concrete toboggan team and the aerial robotics group. These teams compete in national and international competitions, regularly placing in top positions and winning awards. The Faculty is also home to a very active student government, the Engineering Society (EngSoc). EngSoc provides services like the exam bank and resume critiques, co-ordinates events ranging from charitable events to dramatic plays, and sends students to leadership conferences. The Waterloo Architecture Students Association (WASA) fulfils a similar and very active role for students in the School of Architecture. Accountability and responsibility is expected of our student government bodies and it is imperative they continue to operate with the utmost integrity. Other groups and clubs on campus, such as the Engineers Without Borders Chapter and the Engineering student paper *The Iron Warrior*, also engage students from across the Faculty. The Faculty and its departments traditionally support these many student initiatives through space, faculty mentorship, staff support, and financial resources. The Faculty will continue to support these initiatives and encourages departments to do the same.

- ◇ Ensure that undergraduate students continue to have a strong voice in the Faculty.

Currently, both EngSoc presidents are ex-officio members of Engineering Faculty Council (EFC). To ensure that undergraduates are represented at EFC, the attendance and participation of these members will be more actively encouraged in future. The EngSoc presidents are also invited to comment on Faculty issues directly to the dean as necessary, and the Faculty aims to make better use of the EngSoc executive in this capacity in the future. The dean will also work with EngSoc to establish an annual town hall meeting to provide an update on the life of the Faculty to all undergraduate students. At the department level, regular meetings (typically monthly or bi-weekly) are held between the department head and student class representatives, to ensure student views are heard and concerns are addressed as required. The PDEng program is also currently working to establish similar

representation, and some departments are considering a student society or government at the departmental level to provide additional feedback to the department head.

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

- Total Engineering students participating in the exchange program, and percent of a cohort this represents
- Total international students attending Waterloo Engineering on exchange
- Exchange agreements with international schools
- National Survey of Student Engagement (NSSE) results

Annual plan updates from unit heads will also provide qualitative information about:

- Exit surveys with graduating students

### **C. GRADUATE STUDIES**

Engineering makes up approximately 40 per cent of the total graduate enrolment at the University of Waterloo. Across UW, graduate enrolment is equivalent to almost 11.5 per cent of undergraduate student enrolment (just over 10 per cent of total enrolment), while currently Waterloo Engineering's graduate student enrolment has reached over 24 per cent of its undergraduate enrolment (19.5 per cent of total enrolment). Although Engineering contributes a significant portion of the University's graduate population, we plan to further increase our graduate enrolment to help reach the status we aspire to as a research-intensive school of engineering by North American measures. By 2010, even given moderate increases to our undergraduate enrolment, we anticipate our graduate student enrolment will increase from the current figure of 24 per cent to approximately 32 per cent of undergraduate enrolment.

As of November 1, 2005, 1115 graduate students were enrolled in Engineering at the University of Waterloo. This included 116 coursework master's (MEng and MMSc) students, 418 thesis master's (MASc and MArch) students, 460 PhD students, 107 students in cost-recovery programs, and 14 non-degree students.

Approximately 21.5 per cent were studying part-time, creating a full-time-equivalent (FTE) enrolment in fall 2005 of 952 FTE. Just over 30 per cent of the fall FTE enrolment was comprised of international students. The international portion of our graduate enrolment has increased significantly in recent years, due in part to access provided through the introduction of UW's International Master's or Doctoral Student Awards (IMSA or IDSA) in fall 2004, which provide qualified students an award equivalent to half (ISMA) or all (IDSA) of the differential tuition fee for international students. Additionally, all Waterloo Engineering PhD students are guaranteed to be funded at a minimum of \$18,000, based on performance, for four years.

It is a priority of the Ontario government to significantly increase graduate enrolment in universities across the province, and to reach that goal they will fund additional positions created for domestic (Canadian and Permanent Resident) students in eligible graduate programs. To support the province's mandate, and to capitalize on the opportunity to grow its graduate enrolment with appropriate support, the University of Waterloo aims to double its graduate

enrolment by 2010. The Faculty of Engineering's projected graduate enrolment increase between 2004/05 and 2009/10 is expected to be just over 600 FTE students, of whom almost 400 will be domestic students. This 70 per cent increase in our FTE graduate enrolment, along with the projected increase in faculty complement (see Section III.A – Goal A1), will enable us to move to a level of graduate and research activity commensurate with the leading engineering schools we aspire to be counted among. Graduate students will be integral to improving quality and moving the Faculty forward, through their contributions to research, academe, and society.

In addition to our planned increase in graduate enrolment, Waterloo Engineering is also committed to strengthening our graduate programs. We will increase orientation efforts, make improvements to course offerings and scheduling, enhance comprehensive exam and degree requirements, and take steps to improve the academic experience of all Waterloo Engineering graduate students.

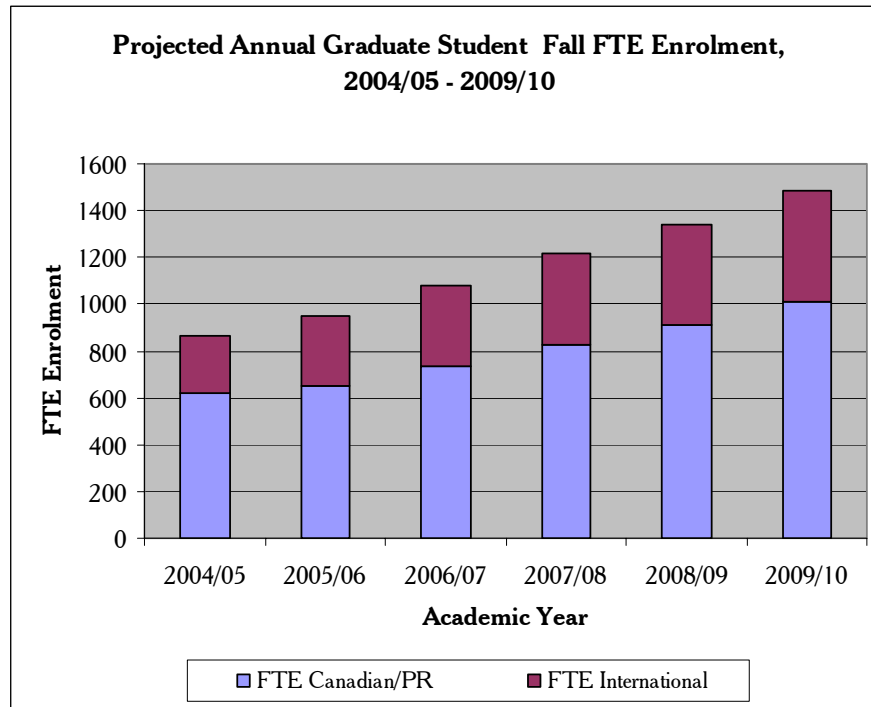
### **GOAL C1: Increase our Graduate Student Enrolment**

- ◇ Total FTE Waterloo Engineering graduate students will reach 1482 by 2009/10.

Figure III.C, below, outlines the projected increase in graduate enrolments across the Faculty. By 2010, almost 32 per cent of our graduate enrolment will be in international students, up from almost 29 per cent in fall 2004. While our percent international is projected to increase, a substantial increase in domestic students will contribute just under 400 additional students to the Province's and the University's goals for increasing domestic graduate enrolment. On an ongoing basis, the Faculty is committed to working toward reaching an average of five research (thesis masters and PhD students) graduate students per regular faculty member.



**Figure III.C**



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
FTE Canadian/PR	619.8	653.6	735.7	826.9	912.3	1012.8
FTE International	248.9	298.8	345.1	390.3	427.8	469.3
<b>TOTAL</b>	<b>868.7</b>	<b>952.4</b>	<b>1080.8</b>	<b>1217.2</b>	<b>1340.1</b>	<b>1482.1</b>
% International	28.7%	31.4%	31.9%	32.1%	31.9%	31.7%

- ◇ Attract and enrol high quality students into our graduate programs.

A graduate recruitment working group has been struck to analyze current recruitment practices and to recommend initiatives to intensify recruitment efforts at the Faculty and department level and to better collaborate on recruitment efforts made by UW’s graduate studies office. Promotional efforts aimed at the appropriate audience will be enhanced, including the development of a Faculty-wide graduate studies web site and enhancements to each department’s graduate web site. The associate dean graduate studies and international agreements will commit ongoing attention to the funding of graduate students, to ensure Waterloo’s offers are reasonable and competitive. Departments are encouraged to work to ensure a reasonable response time on applications. The Faculty and its departments will also work to better capitalize on opportunities to build awareness and interest in graduate studies among Waterloo’s undergraduate student population, including efforts to expose undergraduate students to research (see Section III.B – Goal B2), encouraging outstanding

Bachelor's graduates to enrol directly into the PhD program, and working to improve the attractiveness of an accelerated MAsc.

- ◇ Facilitate scholarship and admission applications for exceptional candidates.

Pre-approved admission offers will be made to top graduating students in each Waterloo Engineering department. Tri-council award winners from across Canada will be provided a pre-approved admission offer, information on Waterloo Engineering's top-up for these awards, and an invitation to visit campus. Interested Waterloo undergraduate students will also be provided tips for successful NSERC and OGS applications.

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

- Total graduate students, by gender and visa status, and performance against projections
- Graduate student to faculty ratio
- Degrees awarded, by gender and visa status
- Acceptance rate of pre-approved admission offers to outstanding candidates
- Total graduate student applications
- Average earnings per funded graduate student
- Percent of enrolled graduate students who are major award winners
- Percent of international students holding external scholarships
- Number of Waterloo Engineering undergraduates earning NSERC and OGS awards
- Number of Waterloo Engineering undergraduates entering Waterloo Engineering graduate studies
- Distribution of response time from receipt of an application

Annual plan updates from unit heads will also provide qualitative information about:

- International student quality, by school and country
- Number of high quality applicants that were not accepted due to lack of support available

## **GOAL C2: Improve Graduate Student Orientation**

- ◇ Offer orientation programs for graduate students.

The Faculty will work with the departments and the Graduate Student Association to ensure a thorough, consistent orientation program is offered to new students at the beginning of each term, starting in fall 2006. Topics on graduate studies will be included in the Faculty-level orientation program being developed for new faculty members (see Section III.A – Goal A3.) The associate dean graduate studies and international agreements will also work with the associate dean undergraduate studies and with department heads to encourage TA participation in *ExpecTAtions* (see Section III.B – Goal B2).

- ◇ Update and maintain the Faculty of Engineering graduate manual.

This important resource to graduate students will be updated and made available to all prospective and current graduate students before fall 2006. The manual will be reviewed annually and updated as necessary to ensure it provides current and relevant information.

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

- Participation in graduate student orientation program
- Feedback on the graduate student orientation program
- Date of most recent version of the graduate studies office web site and graduate manual

### **GOAL C3: Enhance Minimum Degree Requirements for the Faculty**

- ◇ Enhance minimum course requirements for graduate degrees at the Faculty level.

Minimum graduate course requirements for the Faculty of Engineering will be refined to specify a minimum number of core courses to be taken within the total course requirements for all degrees: two core for the MASc, four core for the MArch, MEng, and MMSc, three core for the 3-year PhD and one core for the 2-year PhD. All minimum course requirements must also be completed before the comprehensive exam. Departments are encouraged to set requirements that exceed the Faculty minimums.

- ◇ Enhance the comprehensive exam structure.

At minimum, the comprehensive exam will include the research proposal and an oral examination of the related background material; these should be separated but may be conducted in the same examination on the same day. Departments may also choose to mount an additional oral or written examination to determine the student's general background and preparedness for PhD studies.

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

- Degree completion data, including time to complete and time to withdraw
- Comprehensive exam results

Annual plan updates from unit heads will also provide qualitative information about:

- Updates to course requirements and exam structure

### **GOAL C4: Improve Course Design and Scheduling Practices Across the Faculty**

- ◇ Increase the number and consistency of graduate course offerings.

Departments will provide regular offerings of a variety of courses sufficient to provide the breadth of coverage required by graduate students. Each department will establish a set of core courses, offered each year, and course offerings will be scheduled in consultation with other departments as appropriate and published a year in advance.

- ◇ Move toward integrating research groups into graduate student and course management.

Departments are encouraged to ensure graduate students are associated with a research group or technical area, the members of which should hold a certain degree of collective responsibility for the education and well being of its students. Course design and curriculum

planning should be developed collaboratively with members of a research area and with other professors invited to participate as appropriate.

- ◇ Implement teaching evaluations of all graduate courses.

Consistent teaching evaluations of all graduate courses will be implemented and tracked at the Faculty level, in a manner consistent with the undergraduate course evaluation process.

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

- Total number of graduate courses offered by each department
- Enrolment levels by graduate course

Annual plan updates from unit heads will also provide qualitative information about:

- Apparent graduate course duplication
- Graduate course evaluations

### **GOAL C5: Enrich Graduate Students' Academic Life**

- ◇ Offer seminar series in each department.

Every department is encouraged to offer a regular seminar series, to enhance graduate students' intellectual experience and connect them to research beyond the scope of their immediate work. Seminars will be presented by students, faculty members, and high-profile external guests from industry and academe.

- ◇ Increase the frequency of supervisory committee meetings.

The expectation will be established that each PhD student will meet with his or her supervisory committee at least annually.

- ◇ Encourage graduate students to attend conferences.

Each research supervisor/department is encouraged, at minimum, to match UW's graduate studies office budget of \$300 per research graduate student per year to support students attending conferences, especially if they are presenting.

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

- Number of seminars held in each department
- Number of graduate students attending conferences
- Number of graduate students presenting at conferences

## **D. RESEARCH**

To be recognized as a leading North American school of engineering, Waterloo must make significant strides in its research portfolio. Research funding earned by the Faculty must

increase to support ongoing and new initiatives. Critical mass must be ensured in areas of excellence in order to increase the impact Waterloo Engineering research has on our academic and professional communities and on society at large. To that end, additional services will be provided to support research, and research excellence will be more actively encouraged and rewarded. Multi-disciplinary research centres will be developed at the Faculty level to complement existing departmental research groups in disciplinary areas of strength.

In 2004/05, research funding to Waterloo Engineering totalled \$27,745,000, of which approximately 72 per cent was in grants and 27 per cent was in contracts. Federal funding accounted for 57.5 per cent of the total, provincial funding accounted for 19 per cent, and industry provided 23.5 per cent. Since 2001/02, total annual research funding to Engineering has ranged from \$25.3 million to \$38.3 million, with much of the difference from year to year attributed to significant funding from sources such as the Canada Foundation for Innovation (CFI), the Ontario Research Fund (ORF) - formerly the Ontario Innovation Trust (OIT), and the Ontario Research Development and Challenge Fund (ORDCF).

By fall 2007, Waterloo Engineering will be home to 14 official research centres and institutes: the Biotechnology and Health Engineering Centre; the Centre for Advancement of Trenchless Technologies; the Centre for Pavement and Transportation Technology; the Institute for Advancement of Fire Safety; the Institute for Risk Research; the Institute for Innovation Research; the Green Energy Research Institute; the Institute for Computer Research; the Institute for Polymer Research; the NSERC Cell Factory Bioprocessing Research Network; the Waterloo Centre for Automotive Research; the Waterloo Nanotechnology Research Institute; and groups in Pattern Analysis and Machine Intelligence and in Giga-to-Nano Electronics.

While significant improvements have been made to Waterloo Engineering's research support from grants and contracts in the past three years, other engineering schools across Canada have also improved their performance during this period. In terms of total NSERC funding compared to the top nine engineering schools in Canada, Waterloo sits in the middle tier. In terms of our average NSERC Individual Discovery Grants, Waterloo sits in the bottom tier.

Across UW, Engineering had received 36.5 per cent of all CFI funding and 45 per cent of all OIT (now ORF) funding received by UW to 2004. Engineering researchers have earned 20 Premier of Ontario Research Excellence Awards (PREA) and six of its successor, the Early Researcher Award (ERA). Currently 14 Canada Research Chairs (CRC), six NSERC Industrial Research Chairs, and one NSERC Design Chair are held in Engineering. Engineering also has three endowed chairs: the Val O'Donovan Chair; the Eyton Chair in Entrepreneurship; and the recently awarded Ontario Research Chair in Environment and Sustainable Energy.

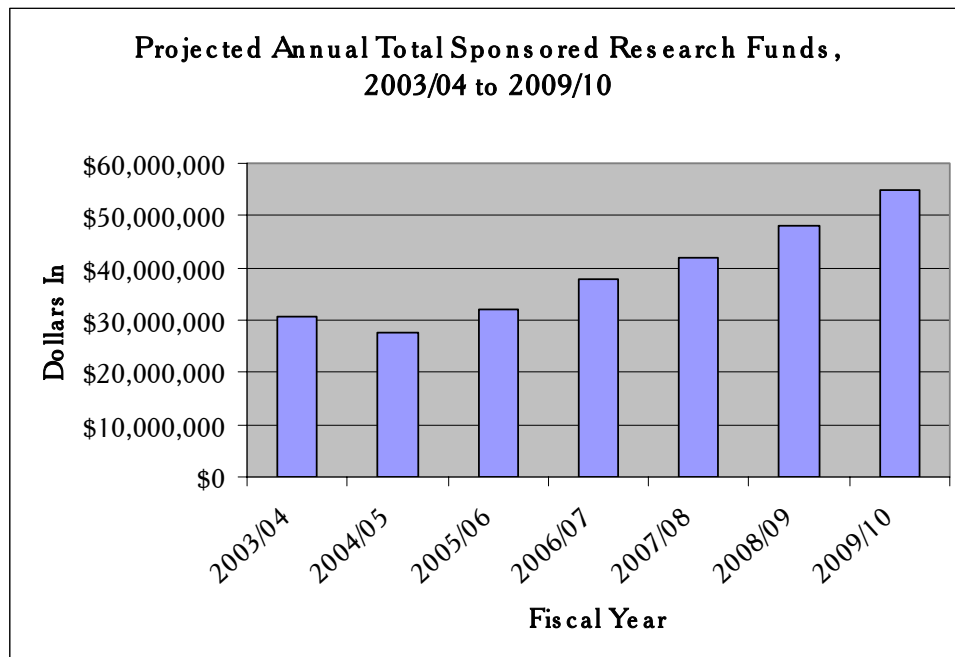
### **GOAL D1: Increase Engineering Research Activity, Impact, and Funding Levels**

◇ Research funding to the Faculty will reach \$55 million by 2009/10.

Figure III.D, below, outlines the projected year-over-year increase in research funding to the Faculty from 2003/04 to 2009/10. To reach this goal, departmental hiring plans will ensure

sufficient senior faculty with track records of excellent research are hired in our areas of competitive advantage. Funding from industry will specifically be targeted for increase, through improved external relationships fostered by the engineering research office, dean’s advisory council, and external relations officers (see Section III.E – Goal E1). Efforts to increase the profile of our research – including the production of an externally-focused web presence for the engineering research office and the development of a searchable online database of all Engineering researchers – will also aid in outreach to industry. We will also work to increase the broad impact Waterloo Engineering research has, through publications, technology transfer, and other outreach activities to our professional and academic communities and to society at large. Organizational and operational changes to be made within the Faculty, as outlined in goals two through four below, will also improve the impact, success, and funding of Waterloo Engineering research.

**Figure III.D**



	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
<b>Dollars In</b>	30,751,000	27,745,000	32,000,000	38,000,000	42,000,000	48,000,000	55,000,000

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

- Total sponsored research funds, by source (e.g. grants, contracts)
- Research funding per tenured/probationary faculty member
- Research funding to operating budget ratio
- Total tri-council funding, by program
- Average tri-council discovery grant, and ratio to national average
- Total number of faculty involved in infrastructure programs (e.g. CFI, ORF)
- Total recipients of ERA funding

- Total Canada Council funding
- Total publications
- Total citations

## **GOAL D2: Provide Services to Support Research Across the Faculty of Engineering**

- ◇ Establish an Engineering Research Office as a service unit to support research.

The Engineering Research Office was established as a result of the creation of an associate dean portfolio for research and external partnerships, separate from the associate dean for graduate studies and international agreements (prior to 2004, research and graduate studies were combined in one associate dean portfolio.) Through the associate dean and administrative assistant, the engineering research office provides structured information, advice, and counselling on available grants, matching, and industrial contract opportunities. Additionally, fifty per cent of the Faculty of Engineering writer position is allocated to research priorities, providing support in the development of high-level proposals of strategic importance to the Faculty.

- ◇ Establish a research standing committee of Engineering Faculty Council.

The Faculty of Engineering Research Committee will be established as a new committee of EFC, separate from the Faculty of Engineering Graduate Studies Committee. The mandate of this committee is to improve our research visibility and increase research opportunities for individual faculty members, departments, and centres. The committee will share and provide information to faculty and departments and will support and co-ordinate strategic areas of research and recommend action on tri-council and other federal and provincial funding opportunities to Academic Policy Committee.

- ◇ Establish a research grants advisory committee.

Chaired by the research grants advisory co-ordinator, the Faculty of Engineering Research Grants Advisory Subcommittee will work with other department mechanisms to support faculty members in grant application preparation and submission to the tri-council funding agencies. This will ensure that the applications will be of the highest quality and will provide an important research mentoring service to faculty members.

- ◇ Encourage faculty membership on tri-council Grant Selection Committees (GSC).

In recognition of the significant service provided to our academic and professional community through membership on GSCs, and the exposure this brings Waterloo Engineering and its researchers, the Faculty will provide one teaching task reduction for each year that a faculty member is a member of a discovery grant or strategic grant GSC.

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

- Year-over-year increase in discovery grant awards

- Total proposals supported through the engineering research office and committees
- Success rate of proposals supported by the engineering research office and committees
- Number of faculty members serving on tri-council GSCs
- Annual client survey(s) conducted by the Engineering Research Office

### **GOAL D3: Establish Faculty of Engineering Interdisciplinary Research Centres**

- ◇ Establish and provide start-up support to select research centres in priority interdisciplinary areas that involve researchers from across the Faculty and beyond.

To complement the broad selection of strong discipline-specific research groups that exist in every department across the Faculty, we will also establish Faculty-wide multi-disciplinary, inter-departmental, and inter-Faculty centres in priority areas. While each department will continue to set priorities and directions for its research, department heads will also work collaboratively with the dean and associate dean research and external partnerships to determine these multi-disciplinary priority areas that will take the Faculty as a whole into new areas of partnership-based research.

Excellent opportunities are currently being created in strategic cluster areas that encapsulate many of Waterloo Engineering's research areas of competitive advantage. These centres will benefit the Faculty and its researchers through broader access to research partnerships and opportunities, and through the more cost-effective use of resources. Some initial support will be provided to these centres; however, they will be expected to become self-sustaining in a reasonable time frame. Centre directors will be empowered to work with the associate dean to find grant opportunities and external partnerships and will be provided some teaching reduction to assist in these efforts. Those centres that provide services to researchers should receive a share of their generated overheads, to help sustain their activities.

At the time of publishing this plan, a multi-disciplinary centre in automotive research (WatCAR) has been established. The Faculty has committed \$125,000 per year, which includes an administrative staff person, to WatCAR for its first five years. Other multi-disciplinary centres and institutes that will be presented to the University of Waterloo Senate for approval this year will include the UW Nanotechnology Institute, Green Energy Research Institute, and the Biotechnology and Health Engineering Centre.

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

- New grants and contracts generated through interdisciplinary centres and initiatives
- Success rate of proposals generated through interdisciplinary centres and initiatives
- Percent of total research grant and contract dollars generated by research centres and institutes

### **GOAL D4: Encourage, Support, and Reward Research Excellence**

- ◇ Encourage departments to establish functional research technical groups.



Well-defined functional research technical groups at the department level support the creation of critical mass in areas of competitive advantage to the Faculty and its departments. The members of each research group will collaborate to make the best use of shared resources and infrastructure and will have collective responsibility for graduate students, seminars, and outreach activities related to their group.

- ◇ Establish a research excellence award program in the Faculty.

A new research excellence award program will mirror the existing teaching excellence awards for Engineering faculty members. Three awards, valued at \$2,500 each and including two Undergraduate Research Assistantships to be funded by the dean, will be presented each year at the Dean's Dinner to recognize outstanding researchers.

## **E.    ADVANCEMENT**

The Faculty of Engineering received a total of \$10,633,474 in philanthropic donations in fiscal year 2004/05, and averaged approximately \$7.5 million annually over the three-year period from 2003/04 to 2005/06. As of December 31, 2005, Engineering alumni totaled 27,135, of whom over 1250 (4.6 per cent) participated in an alumni event in 2005.

Over the past two years, the advancement team in the dean of engineering office has been restructured and significantly expanded. From four members in 2003, the team grew to include 11 individuals (some of whom are cross-appointed outside of advancement) in 2005. Restructuring has resulted in a director responsible for development and alumni affairs and another responsible for communications and academic planning. Additional team members ensure that a development officer is raising funds for each department, that co-op placements are actively sought for new programs, and that efforts continue to attract top prospective undergraduate students to Waterloo Engineering.

To reach our aspirations for 2010, the support and advocacy of our many constituent bodies is essential. Our increased advancement efforts will therefore result in a variety of contributors to Waterloo Engineering's success. Philanthropic gifts from our alumni, friends, and corporate partners will help provide the financial resources that are essential to implementing many of our plans to move the Faculty forward. Alumni and friends who are engaged in the life of the Faculty will help cultivate prospective students, co-op positions, and industrial relationships. And the way we present the Faculty publicly and the way our alumni speak about their alma mater will influence the Faculty's reputation and therefore its attractiveness to prospective faculty, graduate students, undergraduate students, and research partners.

To fully realize the potential benefits of a strong advancement program, we must work to enhance our external relations efforts across the Faculty, building and improving relationships with alumni, industry, government, and prospective students and faculty members. We will increase our total philanthropic funding in support of the Faculty's priorities for 2010, we will make improvements to the engineering alumni program, and we will work to enhance Waterloo Engineering's visibility as a multi-faceted engineering school.

## **GOAL E1: Enhance External Relations Efforts Across the Faculty**

- ◇ Establish external relations officers in the larger Engineering departments.

These new staff positions will work with the Faculty's advancement and research offices to leverage faculty member knowledge, expertise, and relationships for more successful external relations initiatives and programming. They will co-ordinate internal and external communications (electronic and print) for their department and will act as an industrial and government liaison for their department. At the time of plan publication, it is anticipated that Chemical Engineering, Electrical and Computer Engineering, and Mechanical Engineering will hire an external relations officer in the coming year. Management Sciences is planning to create a similar position that will also be involved in co-op job development for its new undergraduate program.

- ◇ Establish a dean's advisory council.

The Dean's Advisory Council (DAC) is currently being struck, with some two dozen members and an inaugural chair already named. The DAC will be comprised of alumni, friends, and supporters of the Faculty from industry and academe. Their mandate will be to provide advice to the dean, to share their perspectives with the Faculty, to act as advocates for the Faculty, and to help the Faculty effectively connect with its external constituents.

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

- DAC membership and meetings

Annual plan updates from unit heads will also provide qualitative information about:

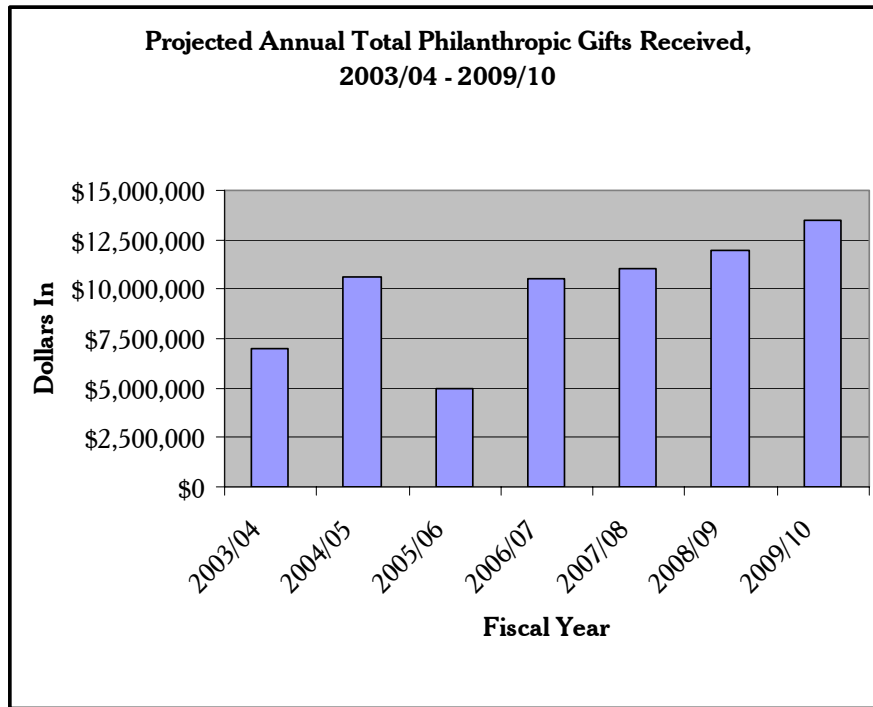
- Impact and outcomes of external relations officer positions

## **GOAL E2: Increase Total Philanthropic Funding to the Faculty**

- ◇ Philanthropic funding to the Faculty will reach \$13.5 million annually by 2009/10.

Figure III.E, below, outlines the projected year-over-year increase in philanthropic support to the Faculty from 2003/004 to 2009/10. To reach this goal, the activities of the development team have shifted from a significant emphasis on major corporate fundraising to a renewed effort in major individual fundraising. To that end, the Faculty of Engineering's top prospect list is dominated by alumni and friends of the Faculty. The development team will increase its efforts to identify individuals who may be capable of making major contributions to the Engineering campaign.

**Figure III.E1**



	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
<b>Dollars In</b>	7,022,300	10,633,474	5,000,000	10,500,000	11,000,000	12,000,000	13,500,000
	<b>3-year average = \$7,551,925</b>						

- ◇ Establish fundraising priorities that are closely linked to the needs identified through the Faculty’s academic planning process.

From the Vision 2010 planning exercise, five key fundraising priorities have been identified. These priorities will support the Faculty’s vision by providing much needed space and infrastructure to accommodate the planned growth of the graduate program and the faculty complement, and through the creation of graduate scholarships to allow the Faculty to attract and support outstanding students to the program. Figure III.E2, below, outlines the Faculty’s fundraising priorities for the plan period (from 2005/06 to 2009/10). Naming opportunities exist for major donors to each of these key priorities. To recognize major donors to Waterloo Engineering, naming opportunities are also available for the Faculty as a whole and for each of its departments.

**Figure III.E2**

<b>Priority Project</b>	<b>Fundraising Goal</b>
<b>Buildings</b>	
Engineering Building	\$10,000,000
Systems Design Building	\$15,000,000
Nanotechnology Building	\$10,000,000
<b>Scholarships</b>	
Graduate	\$9,000,000
Undergraduate	\$6,000,000
<b>TOTAL</b>	<b>\$50,000,000</b>

- ◇ Institute a Faculty-centered stewardship program.

The development team will establish a Faculty-based stewardship program to ensure that donors to the Faculty are stewarded properly. The overall goal of the stewardship program will be to demonstrate to donors that their donations are being used as intended and in support of the Faculty's priorities. An element of the stewardship program will be the launch of an Engineering donor report in 2006/07.

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

- Total donations to the Faculty of Engineering
- Total alumni donors
- Total endowment

### **GOAL E3: Make Improvements to the Engineering Alumni Program**

- ◇ Establish new alumni programs.

Engineering Alumni Affairs plans to introduce an Engineering gala: an exclusive annual event supported by alumni volunteers and corporate sponsorships. The event will be introduced in 2007 to correspond with and help celebrate UW's 50<sup>th</sup> anniversary, and will continue annually. We will also establish a graduating class reception to introduce young alumni to the services and programs we provide. Research will also take place to explore the feasibility of establishing a student mentorship program with alumni participation.

- ◇ Enhance existing alumni programming.

The Engineering Alumni Affairs annual class reunion program is a very successful aspect of our alumni programming. To further enhance this program, in 2006 we will combine all engineering reunions on Homecoming weekend. By 2010, we will increase alumni

attendance at reunions by 15 to 20 per cent per class and will work to significantly increase faculty member attendance at reunions and receptions.

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

- Total alumni
- Percent of alumni for whom we have valid addresses and valid e-mail addresses
- Reunion and major event attendance
- Client survey(s) conducted by the Engineering Alumni Affairs Office

#### **GOAL E4: Enhance Waterloo's Visibility as a Multi-faceted Engineering School**

- ◇ Establish a recognizable profile for the Faculty.

Key messages for the Faculty will be developed, based on the objectives set through the planning exercise and consistent with the reputation the Faculty seeks to promote as a multi-faceted engineering school. A style guide and visual identity standards will be developed for the Faculty and shared to help achieve consistency across its various communications pieces.

- ◇ Improve the web presence of the Faculty and all its units.

Across the Faculty, web sites require improvement to provide a web presence that enhances the Faculty's image and that works as an effective communications tool, providing timely, meaningful, engaging, and accurate information to our key audiences. Those web sites that do not yet conform to the most recent University web standard will be updated, and all sites will be updated and regularly reviewed in order to ensure that meaningful and engaging online content is easily located, current, and accurate.

- ◇ Ensure a professional suite of print publications for the Faculty.

Through the ongoing analysis of existing publications, our print publications will regularly be improved to better reinforce the Faculty's reputation. New vehicles, supplemental to the Faculty's existing suite of publications, may also be created (by external relations officers in the departments and/or the communications team) to complement and enhance existing print communications.

- ◇ Promote Faculty of Engineering news.

The communications team will work to encourage all its constituencies (undergraduate students, graduate students, staff, faculty, alumni, and partners) to share their news with the Faculty's various audiences. News received will be actively promoted through vehicles available to the Faculty –its own print and electronic publications, other UW publications and, working with UW's media relations office, media outlets as appropriate.

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

- Most recent update to all Faculty-level web sites

- Traffic to Faculty-level web sites
- Most recent update to departmental web sites
- Traffic to departmental web sites
- New communications and promotional materials developed

## **F. COMPUTING**

In a technology-driven discipline like engineering, computing support and services to all sectors must be strong. And to maintain Waterloo's reputation as an innovative technology-oriented school, our use and provision of computing facilities and services must be exceptional.

In the Faculty of Engineering, computing support and services are provided by staff in the Engineering Computing (EC) unit, which is directed by the associate dean computing, and by staff in each department. Currently, EC is comprised of 12 computing support staff, including one who is funded by the UW Information Systems and Technology (IST) service unit and one who is funded by LT3 and partly allocated to the Faculty of Engineering. Additionally, there are 14 - 17 system administrators (SAs) in the departments. EC mostly supports the undergraduate environment (through Nexus), public computer labs, computing infrastructure like networks, and Faculty administrative offices including the dean's office, undergraduate office, and PDEng. Departmental SAs support department computer labs and the research and administrative activities in their individual departments. At the institutional level, IST provides computing support and services across the University. IST manages a diverse set of technologies and services, including the business systems (e.g. financial, student, co-op), campus network backbone, telephone systems, software licensing, and classroom podium machines. IST also assists with problems such as detecting compromised systems.

The undergraduate campus-wide computing environment, Nexus, was designed by EC in 2001. Nexus is now used in all six Faculties, with approximately 3,400 Nexus workstations across campus. Of those, 1,700 are in Engineering. Nexus provides approximately 60 per cent of all workstations in Engineering. Computing lab facilities across the Faculty are currently comprised of eight EC labs with 373 Nexus workstations and 11 departmental computer labs with 187 Nexus workstations.

To ensure that our use and provision of computing facilities and services is as excellent as it can be across the Faculty, we must make improvements to our computing environment. Engineering computers should be managed, ideally through the Nexus environment, to ensure security, currency, and operational effectiveness. The organization and operation of computing in Engineering needs to be assessed and improved, in order to provide the best possible services and support to all end-users. And, to provide the right services for today's environment, EC must continue to monitor the use of laptops, wireless devices, and emerging technologies and respond proactively to these changes.

## **GOAL F1: Aim to Establish a Managed Environment for All Faculty Computers**

- ◇ Encourage all units to move to the Nexus environment.

All desktop computers across the Faculty and all Faculty-owned laptop computers should be managed, to ensure system security and software currency. A move to the Nexus environment to manage computers would be done in such a way that departments will have the greatest say in the management and software issues pertinent to their users. The use of Nexus across the Faculty will provide scale efficiencies, will free departmental SAs' time for higher-value activities, and will allow EC staff to back up departmental SAs in their absence.

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

- Percent of desktop and laptop computers across the Faculty that are managed
- Percent of Engineering desktop and laptop computers managed in the Nexus environment

## **GOAL F2: Improve the Organization and Operation of Computing Across the Faculty**

- ◇ Improve communications and strengthen working relationships among computing staff.

The Engineering Systems Administrators Group (ESAG) will hold regular formal meetings, chaired by the associate dean. The reporting structures of departmental computing staff will be refined so that the associate dean computing provides input into their annual performance evaluations to provide insight into the individuals' collaboration and teamwork efforts. In addition to EC staff providing backup to Nexus-managed departmental workstations during an SA's absence, ESAG will seek additional opportunities for interaction, teamwork, and skills sharing between EC and the departmental SAs.

- ◇ Ensure a fair and transparent compensation structure for computing staff.

The associate dean will work with Human Resources to establish career paths to be implemented for all existing and new technical staff in EC. He will also work with department heads to support the implementation of career paths for SAs in interested departments as appropriate.

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

- Percent of computing staff job descriptions moved to a career path structure
- Annual plan updates from unit heads will also provide qualitative information about:
- Frequency of, and attendance at, ESAG meetings
  - Degree of collaboration and co-operation among computing staff and offices

## **GOAL F3: Monitor and Attend to Changes in Computing Use and Needs**

- ◇ Continue to monitor and attend to the use of laptop computers.

Student laptop use will be measured each term, and decisions related to student laptop use will be formally revisited annually. This includes the statement to students outlining preferred configuration and the decision as to whether laptop use should be mandatory for undergraduate students. Engineering will continue to provide wireless access across all its buildings. And, per goal F1, the administration of all Faculty-owned laptops should be moved to Nexus to ensure security. The need for additional services and facilities – including power outlets, secure storage, and enhanced classroom and laboratory space – will be evaluated and analyzed every year along with the formal measurement of student laptop use.

- ◇ Continue to monitor and attend to the use of wireless devices and other emerging technologies within the Faculty.

Staff and faculty use of wireless devices such as BlackBerrys will be formally tracked each year, and appropriate support and services will be provided to users. This may entail developing expertise within EC to meet the needs of these users, or collaborating with IST to ensure Engineering users can access the necessary support and services through that unit.

- ◇ Provide leadership on the use of computing to address Faculty needs and priorities.

EC will take a leading role in the Faculty to plan, co-ordinate, develop, and implement technical and functional tools to support new Faculty initiatives or to make existing Faculty activities more efficient and accurate. This may include the development or enhancement of teaching tools, databases, online tools, videoconferencing equipment, and other technical solutions to be shared by units and individuals across the Faculty.

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

- Number of unique userIDs on the wireless network per term
- Percent of Engineering space with wireless access
- Annual client survey(s) conducted by EC

Annual plan updates from unit heads will also provide qualitative information about:

- Analysis of services and facilities provided to support laptop and wireless device use
- New projects initiated by EC in support of Faculty activities and priorities

## **G. WOMEN IN ENGINEERING**

The participation of women at all levels of the Faculty– as faculty members, undergraduate students, graduate students, and staff – is a very important issue for Waterloo Engineering, as it is for all Canadian schools of engineering. In 1991, we established the Women in Engineering (WIE) Committee as a standing committee of Engineering Faculty Council on women-related issues. In early 2005, as part of the Vision 2010 planning exercise, the dean struck a task force on women in engineering to review statistical data, analyze current initiatives, and survey women students and faculty in order to make recommendations to increase the participation of women across the Faculty and to enhance the experience of those women who are part of our community.



Over the early part of the past decade, the participation of women as engineering undergraduates at Waterloo increased. By 2001, 24 per cent of the first-year class and 23 per cent of the undergraduate population as a whole was comprised of women. In 2005, 22.4 per cent of our bachelor's degrees granted in engineering disciplines were to women. This compares very favorably to North American levels – member schools of the American Society for Engineering Education (ASEE) in 2004 averaged 20.3 per cent of undergraduate degrees awarded to women. However, in recent years this progress has been eroding, reflecting a national discipline-wide trend. By 2004, only 13 per cent of the entering class was female; in 2005, this had improved to 15 per cent, while the total undergraduate population was approximately 18 per cent female. Since academic and professional bodies across Canada are noting this trend, collaborative and co-operative efforts are being made to improve these participation rates. And Waterloo recognizes we must do more, as some top Ontario schools are exceeding our performance in this area. To be the premier engineering school in Canada, we cannot miss out on the talent of this half of the population.

While the decline in women's participation noted at the undergraduate level has not been mirrored in graduate participation rates (which have remained relatively stable at 19 to 21 per cent since 2000) or faculty member participation rates (which have increased from 8 per cent in 1999 to 12 per cent in 2005), both of these areas of our community also merit additional efforts to increase women's participation and to enhance their experience here. In 2005, 22.4 per cent of master's degrees and 17.9 per cent of PhD degrees awarded in engineering disciplines at Waterloo were to women, compared with ASEE averages of 21.9 per cent and 17.8 per cent respectively.

The mission of Waterloo's WIE Committee is to review and monitor existing policies and practices; improve visibility and exposure; work with other groups on campus and elsewhere; make recommendations as necessary; and report annually on admissions, learning, teaching, research, and the general working environment at UW. However, the WIE Committee has met challenges in the fulfillment of its mission as it relies almost solely on the availability of its members and operates with minimal administrative support. The level of activity and consistency of initiatives it undertakes varies substantially from term to term and year to year. The WIE Committee has also made limited outreach connections with external individuals and groups such as the Canadian Council of Professional Engineers, Professional Engineers Ontario, the Ontario Network for Women in Engineering, and Waterloo Engineering alumnae. Since 2004, Waterloo has had chapter status in the IBM K-12 program, through which the chapter leader organizes IT workshops led by volunteer facilitators aimed at Grade 7/8 girls.

We must increase our efforts to encourage women's participation and to enhance their experience at Waterloo. The role and function of the WIE Committee will be improved to address women's issues among our students and faculty; we will increase our efforts to promote Waterloo Engineering to prospective women students and faculty; we will continue to contribute to efforts to promote the engineering discipline to school-aged girls; and we will work to capitalize more fully on opportunities and initiatives to recognize and reward excellence among our women students, faculty members, and alumnae.

## **GOAL G1: Enhance the Role and Function of the Women in Engineering Committee**

- ◇ Establish a new administrative staff role in support of the WIE Committee and its initiatives.

A new full-time staff position will be created, half of which will be allocated to support the WIE Committee and women's initiatives in general across the Faculty (the other half will be allocated to faculty recruitment, orientation, and retention.) This position will work with the WIE co-chairs to ensure all positions on the committee are filled every term and that the committee meets regularly. This position will: support enhanced and increased WIE programming for undergraduate students, graduate students, and faculty members; provide support and continuity to the IBM K-12 program leader; help promote Waterloo Engineering and its women faculty and students, through the WIE web site and other new or existing vehicles; and work to improve communications among all constituencies, internal and external to the Faculty of Engineering.

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

- WIE Committee membership and number of meetings each term
- Number of WIE events hosted and attendance and feedback from each
- New promotional materials developed and the circulation of each

## **GOAL G2: Promote Waterloo Engineering to Prospective Women Students and Faculty**

- ◇ Enhance recruitment strategies aimed at prospective women students.

The undergraduate marketing and recruitment co-ordinator for Engineering will consult the report of the task force on women in engineering and will work with the WIE Committee to develop promotional materials or programming aimed specifically at prospective women undergraduate students. The report of the task force on women in engineering has been shared with the associate dean graduate studies and international agreements for consideration by his working group on graduate recruitment. The task force recommendations will act as a basis for the working group to implement potential improvements to the recruitment of women graduate students. The Engineering graduate studies office will also work to ensure that information of potential interest to women graduate students (e.g. the Provost's Doctoral Entrance Award for Women and other scholarships for women; policies and services related to maternity leave, parental leave, and daycare facilities) is shared with prospective and current women students.

- ◇ Consider the needs and interests of prospective women faculty in recruitment efforts.

Departments will be mindful of the need to attract and engage high quality women faculty when recruiting for their new plan positions. The new staff position for women in engineering initiatives and new faculty support will be ideally positioned to ensure that prospective and new women faculty receive information on UW policies and practices of interest to many women faculty members (e.g. granting programs for women in science and engineering; policies and services related to maternity leave, parental leave, and daycare

facilities) during the recruitment/hiring phase and through orientation programs. This new staff position will also act as a resource to facilitate the use of the NSERC Faculty Award program for qualified candidates.

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

- Female percent of first-year undergraduate class
- Female percent of total undergraduate enrolment
- Female percent of total graduate enrolment
- Female percent of faculty members
- Female percent of staff members (administrative and technical)

### **GOAL G3: Contribute to Efforts to Promote Engineering to School-aged Girls**

- ◇ Provide continuity and support to the IBM K-12 initiative.

A graduate student will be selected as chapter leader of the IBM K-12 initiatives at Waterloo, to maintain continuity in this program's activities.

- ◇ Work with peer institutions and other organizations to continue existing initiatives and to develop new ideas as appropriate.

Since the issue of women's participation in engineering is a shared concern, collaboration with peer institutions and interested organizations is essential. This was witnessed through the collaboration of all Ontario engineering schools, through the Ontario Network of Women in Engineering (ONWie), on the very successful *GoEngGirl!* event inaugurated in 2005. The WIE Committee will continue to actively participate in this initiative and to seek out and help develop others as possible.

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

- Number of IBM K-12 workshops offered and attendance at each
- Other initiatives aimed at school-aged girls and attendance and feedback from each

### **GOAL G4: Recognize and Reward Excellence among Women Faculty, Students, and Alumnae**

- ◇ Facilitate participation in scholarship competitions and conferences for women students.

The undergraduate and graduate offices will identify and promote initiatives such as conference opportunities and scholarships available to female undergraduate and graduate students. Where applicable, qualified candidate(s) will be identified and nominated as appropriate.

- ◇ Facilitate participation in award competitions and conferences for women faculty members.

The Faculty-wide honours and awards committee (see Section III.A – goal 5) will identify and promote programs available to women faculty members, and will identify and nominate suitable candidates where required.

- ◇ Promote the successes of Waterloo Engineering alumnae.

The alumni and communications officer will identify outstanding women graduates of Waterloo Engineering and recognize and promote their achievements to internal and external audiences through Faculty communications vehicles, appropriate awards programs, and opportunities to act as role models to current students.

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

- Number of women students attending specialized conferences
- Number of women students nominated to and receiving specialized scholarships
- Number of women faculty members attending specialized conferences
- Number of women faculty members nominated to and receiving awards
- Number of alumnae nominated to and receiving awards
- Number of alumnae participating as role models

## **H. GOVERNANCE & ORGANIZATIONAL STRUCTURES**

The Faculty of Engineering is governed by the Engineering Faculty Council (EFC) and its standing committees. The operating and academic units of the Faculty each have their own leadership and organizational structures, many of which have been evolving through this planning process – as has the Faculty organizational structure itself (see Appendix VI.A). It is important, as part of the planning process, that each unit look carefully at its leadership and organizational structures to ensure that they will be sufficient and effective for implementing its plan for 2010. Key to reaching many of our goals will be the presence of a strong leadership team across the Faculty and its units, comprised of individuals who are empowered and expected to make leadership decisions and take the necessary actions to move the Faculty forward.

### **GOAL H1: Implement the Changes to Faculty Governance Necessitated by the Faculty's Strategic Plan for 2010**

- ◇ Establish staff representation on EFC.

See Section III.A – Goal A4.

- ◇ Create a staff advisory committee to the dean.

See Section III.A – Goal A4.

- ◇ Create an associate dean co-op and professional affairs for Engineering.

See Section III.B – Goal B3.

- ◇ Establish separate portfolios for graduate studies and research.

See Section III.D – Goal D3.

- ◇ Establish a Faculty of Engineering Research Committee as a new committee of EFC.

See Section III.D – Goal D3.

- ◇ Create a dean’s advisory council.

See Section III.E – Goal E1.

- ◇ Move the annual Engineering Faculty Assembly to June.

The EFC constitution will be reviewed and revised as required to change the timing of the annual Engineering Faculty Assembly from January to June in order to capitalize on the annual planning update reports to be developed by unit heads each May.

## **GOAL H2: Work to Ensure Organizational Structures Support the Effective Leadership, Administration, and Operation of the Faculty**

- ◇ The dean empowers department heads, as leaders, to assume responsibility, accountability, and decision-making for their departments.
- ◇ Departments are empowered and supported by the Faculty to make required changes to their organizational and management structures.
- ◇ Roles and reporting structures should be clearly defined.
- ◇ To create operational efficiencies across the Faculty, each associate dean will work to identify and disseminate best practices across departments and to facilitate resource and information sharing among departments and with the institution as a whole.

## **IV SUPPORTING THE PLAN: RESOURCES**

To support implementation of the Vision 2010 plan, a pool of resources has been established in the form of an academic priorities fund (APF). The APF, equivalent to approximately 10 per cent of the Faculty’s current operating budget on an ongoing basis, has been allocated selectively to fund new faculty and staff positions across the Faculty. The allocation of these positions was

decided based on the quality of each unit's plan and the degree to which each would help the Faculty reach its aspirations.

Along with the APF positions allocated by the Faculty, departments have also made strategic decisions on the use of special funds in their annual budgets in order to move their top planning priorities forward. This may include the creation of new faculty or staff positions and/or the allocation of one-time-only or ongoing funds to priority projects important to the directions set under their plan implementation agreements. See Section A, below, for more details.

In addition to financial resources, another essential requirement for the successful implementation of the Faculty's plan is the need for additional space in the Engineering complex. More space is needed to address current space shortages and to accommodate the new faculty members, graduate students, and research activities that are essential to our plan for improving quality. To address this critical need, a plan is being developed to determine the best use of existing and new space in the Engineering complex, including two anticipated new buildings. See Section B, below, for more details.

## **A. FISCAL PLAN**

To support the implementation of the Faculty's Vision 2010 plan, 22 new faculty positions and 19 new staff positions have been allocated from the APF. In addition to APF funding, departments are funding the creation of an additional 10 new faculty positions and 6.5 new staff positions. Figures IV.A1 and IV.A2, below, outline the funding sources for new faculty and staff positions, respectively. Through the APF, \$125,000 has also been committed to the new Waterloo Centre for Automotive Research (WatCAR) annually for five years. This includes funding for one staff position to provide administrative support to WatCAR (included above). Departments are also making significant financial commitments in support of other special projects and initiatives integral to their plans. Each department's plan implementation agreement (see Section V) outlines these funding commitments in detail.

Special funds available to departments to help them fund initiatives aimed at their individual top priorities include: differential tuition fees (DTF) - much of which has already been allocated to new faculty and staff positions; their share of international undergraduate tuition fees; and their graduate expansion funding from UW's original funding agreement for graduate expansion. This original agreement will now be replaced with an agreement resulting from the provincial government's recent commitment to provide additional funding for all additional domestic graduate students in eligible programs. With this new graduate growth funding, the agreement with the Provost will see the Faculty receive \$15,000 per year for each incremental PhD student and \$10,000 per year for each incremental master's student. In addition, the Provost has agreed to provide \$5,000 one-time-only funding for each newly admitted eligible student to help provide transitional funding support for these new graduate students. While some departments are using some of their graduate growth funding for operating purposes, all are investing considerable portions of it, especially in the early years, to student support. This idea is predicated on the fact that it will take some time for the newly hired faculty members to establish their research programs and external funding which will then be deployed to support graduate students.

**Figure IV.A1**

<b>Department</b>	<b>New Faculty from APF Funding</b>	<b>New Faculty from Department Funding</b>
Architecture	0.0	4.0
Chemical	3.0	1.0
Civil	3.0	2.0
Electrical & Computer	7.0	0.0
Management Sciences	2.0	0.0
Mechanical	5.0	3.0
Systems Design	2.0	0.0
<b>TOTAL</b>	<b>22.0</b>	<b>10.0</b>

**Figure IV.A2**

<b>Department</b>	<b>New Staff from APF Funding</b>	<b>New Staff from Department Funding</b>
Architecture	1.0	1.0
Chemical	2.0	2.5
Civil	1.5	0.0
Electrical & Computer	5.0	0.0
Management Sciences	0.5	0.0
Mechanical	4.0	3.0
Systems Design	1.0	0.0
Dean's Office – admin	1.0	0.0
Undergraduate Office	2.0	0.0
WatCAR	1.0	0.0
<b>TOTAL</b>	<b>19.0</b>	<b>6.5</b>

## **B. SPACE PLAN**

Additional space is required in the Engineering complex to implement the Vision 2010 plan, and the allocation of this space to our various departments must be carefully planned. To that end, a space plan is being formulated for Waterloo Engineering by an external consultant. The space plan is analyzing space use and needs across the Faculty's buildings on Waterloo's main campus (the School of Architecture's new building in Cambridge was excluded from this exercise) and will specify the additional buildings to be constructed and the current space to be renovated to meet the Faculty's needs.

Fundamental to the implementation of this plan will be the creation of new space. It is anticipated that this plan will include two new buildings – a building dedicated to Systems Design Engineering, for which private fundraising is currently underway, and the creation of a new building for the Faculty of Engineering, for which the Faculty has committed to acquiring the requisite resources. This building is expected to be approximately 100,000 gross square feet in size. It is anticipated that this new building will cost approximately \$30 million, which we

expect to meet equally through contributions from the institution, the government, and private funding (as outlined in Figure IV.B). The institutional share of this cost (\$10 million) will be shared among the University, the Faculty, and its departments.

**Figure IV.B**

<b>Funding Source</b>	<b>Contribution</b>
Ontario Gov't: grad expansion capital funding <sup>1</sup>	\$10 million
Private Funding	\$10 million
University: Provost's commitment	\$5 million
University: Faculty's commitment	\$2.5 million
University: Departments' commitments	\$2.5 million
<b>TOTAL</b>	<b>\$30 million</b>

**NOTE:** 1. \$39,000 per new domestic graduate student

## **V DEPARTMENT PLAN IMPLEMENTATION AGREEMENTS**

### **A. Architecture**

#### **I INTRODUCTION**

##### **Vision**

The quality of the students, faculty, graduates, facilities, program, profile, international presence, and connections to professional offices in Canada and elsewhere provide the foundation for the School of Architecture to become one of the top 10 schools in the world. The success of the School stems from the fact that education is a project in which all faculty, staff, students, graduates, the profession, institutional partners, and the Cambridge community are all directly involved.

##### **Mission**

We are a School of Architecture. Design is our culture and our practice. Excellence and innovation in design are the goals of activity, critical discourse, and speculation from the moment a student becomes involved with the School until the end of his or her professional career.

The program, including co-operative education, international experience, and a research-based graduate program, provides an enriched professional formation unavailable at any other institution.



Through teaching, research, and speculative design activity we advance the quality and sustainability of the built environment, improve the effectiveness and the conditions of architectural practice, develop new design technologies, and raise the overall level of appreciation of the built environment in local, national, and global culture.

We are full members and advocates for design quality and academic innovation in the Faculty of Engineering and the University Waterloo.

## **II ARCHITECTURE STRATEGIC PLAN**

### **GOAL 1: Increase the Faculty Complement**

At present the School has 17 faculty members in its complement: 14 filled and three open positions. In fall 2005, four positions were advertised; two were replacements and two were new positions to be funded from international student fees. Since that time another faculty member has retired. One more retirement will take place in August, 2006.

◇ Hire additional faculty.

In order to accommodate the proposed increase in graduate enrolment (see Goal 2), including launching two new graduate degree programs, it is imperative that these four positions and two new positions be filled as soon as possible, bringing the complement to 19. In addition, once the funding for graduate expansion is finalized, the School proposes to create two new positions in design in 2007/2008, raising the complement to 21. This increase will contribute to the quality of education by reducing teaching loads in line with other Engineering departments, increasing the number of elective graduate and undergraduate courses, and reducing the student to faculty ratio in design studios as required by the Canadian Architectural Certification Board. The increase will also reduce the load of graduate supervision that was added to the previous heavy teaching load in the professional program. This step will make a tremendous contribution to the research enterprise by freeing faculty members' time.

#### Evaluation Methodology

- Total new faculty hires and performance against targets
- Success rate on offers made

### **GOAL 2: Expand and Enhance the Graduate Program**

The existing professional program is producing extraordinary work, expanding the field of architecture and, most importantly, developing modes of documentation, analysis, and interpretation that improve the relevance and effectiveness of the architectural profession. The recent revision of the professional practice courses has created a new pole of discussion around the conditions and options for practice and the business of design.

◇ Increase graduate enrolment.

The end of the Bachelor of Architecture degree will bring about a significant increase in graduate student enrolment starting in 2005/2006. By 2008/2009, the base enrolment in the professional MArch will reach 96 students. In addition, the School proposes to launch a non-professional master's of advanced studies in architecture in 2007/2008 and a PhD in architecture in 2008/2009, bringing total graduate enrolment to 111 in 2009/2010. Of these it is anticipated that 11 will be international students; the vast majority will be Canadians (see Section III.B). This graduate enrolment expansion, including the launch of two new programs, depends on increased graduate student funding, increased faculty complement, increased faculty with doctoral degrees, and increased space in graduate studios.

Additionally, with colleagues in the Faculty of Engineering the School will investigate the feasibility of launching new master's programs in urban design and industrial design.

◇ Enhance the graduate student experience.

The increase in the faculty complement will increase the capacity of the School to supervise graduate work and improve students' access to supervisors, not only because there is a larger complement, but also because undergraduate teaching loads will be reduced. The School is also supporting a variety of approaches to graduate study, with students able to select a more directed or a more open approach to their research topics. Support for research activity, identification of topics, and preparation of the thesis document will be put in place in spring 2006. External contact and discourse will be improved. Graduate seminars involving recognized scholars and practitioners and graduate students from other disciplines and other universities began in winter 2005. The program will be continued and expanded.

◇ Increase financial support for graduate students.

While it is anticipated that the School of Architecture will not be able to provide funding from grants and contracts to every graduate student, it has been, from the outset, a goal to provide every grad student with an opportunity to teach through teaching assistantships (TAs). Only 31 TA tasks are funded at this point, although 92 are required to properly support the undergraduate program. This allocation is based on two TAs for every 0.5 credit course, three TAs for every 1.0 credit course, and three TAs for every 1.5 credit design studio. This increased allocation addresses a very well-documented concern from current grad students that TA workloads are far too heavy, especially when TAs are split between two students. This tactic will require \$195,200 in additional funding annually. To further support graduate students, once fundraising for the Cambridge project is complete graduate scholarships will be elevated to the highest priority in the School of Architecture's advancement program. The associated goal will be \$1,000,000. The School is also setting up a workshop for fourth-year students to help prepare applications for Ontario Graduate Scholarships, SSHRC graduate scholarships and other available scholarship funding.

◇ Promote dissemination through publication and presentation.

Visitors to the School, including external examiners and critics, have consistently commented on the quality and originality of the research carried out by the graduate students in Architecture. Though the culture of architectural education has not focused on academic presentation and the publication of research results, it is of the utmost importance that the

research done in Architecture be widely disseminated if the School is to be recognized as one of the best in the world. The School will support graduate students' presentations at scholarly and professional conferences. The School will work in conjunction with the Design at Riverside Gallery to identify the chapters in student theses that should be submitted for review to scholarly and professional journals. The Design at Riverside curator will also produce a feasibility study on expanding the existing publication program of the Gallery to include a pamphlet series on graduate design work, case studies, and faculty projects. She will evaluate the potential to publish conference proceedings and monographs. An immediate \$40,000 investment is required.

#### Evaluation Methodology

- Total graduate enrolment and performance against projections
- Total graduate student applications
- Number of undergraduate students earning NSERC, SSHRC, and OGS awards
- Student satisfaction surveys carried out by SWAG (Society of Waterloo Architecture Graduates)
- Success in efforts to increase dissemination of graduate student work: articles published in scholarly and professional journals, papers given at scholarly and professional conferences, exhibitions and awards

### **GOAL 3: Enhance Technical Support in Computing and Media**

The computing environment is one of the strengths of the School. Basic network access is very good, both wired and wireless. Most students already own laptops and use them habitually in their academic and design courses. The curriculum provides an extremely effective introduction to computer tools, especially 3D modeling and rendering, preparing the students for both the job market and advanced design explorations. Computing and media touch all aspects of the curriculum. Digital tools are used in virtually every course. Advanced digital tools are available currently in the area of video and, to a lesser extent, in direct fabrication. Output devices are limited to small format colour and black and white printing. Similarly, small format input devices are available at several points in the design studios. The School's plan for computing proposes to build on this strength to maintain a position of leadership. Despite these strengths there are key areas in which the School is lagging and, if not resolved immediately, will put us far behind our peers in the realm of support for innovative design and teaching. The School established a Computing Advisory Committee in July 2005, the recommendations of which inform our tactics below. Student members of the committee have been active in pursuing support from WEEF for the purchase of equipment.

#### ◇ Acquire input/output devices.

The closing of the architect's supply store near the School has left the students without close access to large-scale graphic output. This need is acute. The Computing Advisory Committee has made recommendations on the purchase and operation of necessary equipment, established an operational plan, obtained partial financial support from WEEF, and received four quotes from suppliers. The School also requires a large-format scanning device and a laser cutter for undergraduates.

- ◇ Expand computer lab space.  
A second general use computer lab running PCs is required for undergraduate and graduate student use. The present school facility cannot accommodate this need. It will be a component of the proposed addition.
- ◇ Complete the electronic classroom.  
The plan for the present School of Architecture in Cambridge contains an electronic lecture room directly adjacent to the main atrium. This space will provide facilities for digital projection, networking of student-owned laptops, and web-based broadcast and conferencing. The electronic classroom must be completed for the School to offer its curriculum in a professional manner and to take advantage of advanced teaching technology.
- ◇ Construct a digital fabrication lab.  
The current CFI application, if successful, will provide a suite of advanced tools for the exploration of materials, processes, construction methods, design technology, and direct fabrication. The cost of constructing the lab space to accommodate this equipment is included in the application. This space will be created in an addition to the current facility.
- ◇ Improve computing and media administration.  
Since the computing and media operation has become an increasingly demanding administrative area, complex and key to the success of the School, an associate director computing and media will be created. The new associate director will chair the Computing Advisory Committee and join the School executive.

#### Evaluation Methodology

- New computing and media tools and facilities created annually

#### **GOAL 4: Acquire Additional Space**

- ◇ The most urgent need and first priority in the Architecture plan remains the completion of the existing building, the electronic classroom, four faculty offices, the Founders' Room and a storage facility. The cost of this work is \$400,000.
- ◇ The expansion of the graduate population, the need for an additional computer lab, and the fabrication facilities anticipated in the CFI application lead to a proposal to add to the Architecture building in Cambridge. An addition of approximately 20,000 gross square feet is anticipated, immediately to the south of the current building.

#### Evaluation Methodology

- Completion of outstanding space requirements and commitments
- Progress toward the building addition

## **GOAL 5: Increase Flexibility in the Undergraduate Curriculum**

The undergraduate curriculum is based on a balance and integration of the academic themes: culture, technology, and environment. In addition to skills development, the academic program fosters critical thought, theoretical rigour, cultural literacy, creative process, open investigation, research, social and cultural imagination, environmental stewardship, and technological innovation. All of these, in turn, inform and inspire the design program. Professional and technical content teaching begins in first year to prepare students for co-op work terms starting after the 2A term. The co-op placement rate in Architecture is 100 per cent, and 98.5 per cent of the placements are with private architectural design firms. Most remarkable is the international profile of Architecture co-op: the percentage of international placements has risen steadily since 2002, to the point that over half of the work terms are now outside Canada. This not only provides invaluable international experience to Waterloo students, but also provides the School of Architecture with a truly international profile and platform of operation which, with the other changes anticipated in this plan, provide the basis for the School to become known as one of the best in the world.

### ◇ Refine the undergraduate curriculum.

The curriculum was revised in conjunction with the launch of the MArch in 2000. After one full cycle it has become clear that refinement is required. Limited human and financial resources made the undergraduate program less flexible than it should be to fulfill the broad interests of the architecture students and to prepare them for the independent research required in the graduate program. The proposed modifications are in line with the recommendations made by the visiting team that carried out the professional accreditation review in October, 2005. They represent a significant enhancement of the quality of the undergraduate program and are made possible by the new faculty hires in 2006 and 2007. The parameters for the revision of the undergraduate program are: provide more options in the upper years of the BAS; diversify the cultural history offering in fourth year; reorganize the technical stream to reduce duplication between courses and improve its effectiveness and connection with design; create elective opportunities in the 2A and 4B terms; a larger market for electives will make possible a more diverse offering and allow the School to develop options in areas related to creative practice: photography, digital media, fabrication, print making; implement an option studio in the undergraduate program; and strengthen the Rome experience with better administrative support, improved facilities, and additional library and computing resources.

### ◇ Consider establishing a new undergraduate program.

Discussions have begun on establishing a new undergraduate program in architectural engineering in collaboration with the Civil Engineering Department. This program could draw from the very large pool of highly qualified applicants who are not accepted into Architecture, but wish to be involved in design and construction. The program must meet professional accreditation requirements in Engineering, but also maintain a focus on design, culture, and creativity. There is evidence that a market exists for both co-op students and graduates. The projected intake is 50 to 60 students per year.

### Evaluation Methodology

- Refinements to the undergraduate curriculum
- Progress toward the creation of an architectural engineering program

### **GOAL 6: Increase Research and Creative Activity**

Research activity in the School is understood in the broadest terms. While some faculty members are involved in humanistic research, others are in technical fields, education, and archaeology. Many faculty members are active in design, winning national and international competitions and awards for their work. With the launch of the graduate program in 2001, faculty members are now obliged not only to carry out research and innovative design work but also to support graduate students by attracting grants and contracts.

- ◇ Encourage and facilitate research activity and collaborations among faculty members. With a relatively large number of new faculty arriving in the next two years, it is anticipated that a cultural shift will take place with younger faculty more attuned to establishing a research program and working with graduate students. Several small research groups have also been formed, grouping and guiding graduate students and engaging in collaborative research, at least some of it funded. The School aims to build on this activity, developing groups in urban design in mid-sized cities, design technology, design practice, and cultural sites. The School also sees great potential for participation in interdisciplinary Engineering centres in areas such as green energy and automotive research.
- ◇ Set benchmarks for research activity in the School. The School aims to have every faculty member with a grant by 2007/2008; for faculty to earn five major design awards per year; and for total research income to Architecture to reach \$1,500,000 per year by 2009/2010.

### Evaluation Methodology

- Total sponsored research funds, by source (e.g. grants, contracts)
- Number and percentage of faculty members with research grants
- Research funding per faculty member
- Major design awards earned by faculty members

### **GOAL 7: Continue, and Enhance, International Programs**

The School's program in Rome is now 27 years old. Ours is the only institution to maintain a permanent international program and location, and only one of three international experiences offered by North American architecture schools in which the entire student body can be accommodated. Rome is an absolutely integral element of the School's curriculum, often cited by graduates as a turning point in their careers and lives. Over 98 per cent of BAS graduates have participated in the Rome Program. The School has also been part of two HRDC-funded trilateral consortia with institutions in the United States and Mexico. Each year the School receives and sends out 8 to 10 students on exchanges with institutions around the world. We

anticipate the number of students involved in exchange will increase as the changes to the undergraduate curriculum introduce additional flexibility.

- ◇ Enhance the Rome facility to accommodate growth.  
Undergraduate enrolment in Architecture has risen since 2002 and attrition rates have declined, requiring the expansion of the facility in Rome. The School is also establishing opportunities for graduate students from Architecture to use the facility and would welcome the participation of other academic units in the Faculty of Engineering and elsewhere in the University of Waterloo. To use the new space properly, several capital projects at a total cost of \$85,000 must be undertaken: a washroom is required in the Prix de Rome Studio and permanent fixtures are required in the library/computing lab. The School also needs to hire a permanent part-time administrative assistant in Rome to manage its finances, operational aspects, and academic administration.

Evaluation Methodology

- Progress on improvements to the Rome facility

### III ENROLMENT PLAN

#### A. Undergraduate Enrolment Plan

The size of the undergraduate student body has grown because of the increase in first year admissions and the attrition rate reduction. The facilities in Cambridge will not accommodate additional undergraduate students and larger classes also make design teaching far less effective. It is, therefore, not desirable to increase class size beyond 72.

The first-year class will be made up of 62 Canadian students (86%) and 10 international students (14%). This overall proportion was established in agreement with the vice president academic in 2002. The Canadian and international applicant pools continue to expand. The quality of students admitted is very high and the attrition rate is very low. While the School will continue to market itself to prospective Canadian students via the web, recruitment fairs, trade shows, open houses and visits, there must be an enhanced effort to attract the best international students.

**TABLE 1: Undergraduate First-year Target Plan**

Degree Program	2004/05			2005/06			2006/07			2007/08			2008/09			2009/10		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
Architecture	70	5	75	65	7	72	62	10	72	62	10	72	62	10	72	62	10	72

## B. Graduate Enrolment Plan

Plans to expand the graduate program, enhance student funding, and increase dissemination of graduate work are outlined in Goal 2, above. Table 2, below, outlines the School's enrolment growth projections.

**TABLE 2: Graduate Enrolment Plan**

Degree Program	2004/05 Actual Fall FTE			2005/06 Actual Fall FTE			2006/07 Projected Fall FTE			2007/08 Projected Fall FTE			2008/09 Projected Fall FTE			2009/10 Projected Fall FTE		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
PhD													2.0	1.0	3.0	4.0	2.0	6.0
Masters -thesis	61.9	1.7	63.6	74.9	1.7	76.6	88.0	4.0	92.0	92.0	2.0	94.0	92.0	2.0	94.0	92.0	5.0	97.0
Masters -post-professional										2.0	2.0	4.0	4.0	4.0	8.0	4.0	4.0	8.0
Full-cost Recovery																		
<b>TOTAL</b>	61.9	1.7	63.6	74.9	1.7	76.6	88.0	4.0	92.0	94.0	4.0	98.0	98.0	7.0	105.0	100.0	11.0	111.0



## IV COMPLEMENT PLAN

### A. Faculty Complement Plan

The present faculty complement of 17 has not expanded since the time of the negative accreditation report in 2002. In 2002, a plan was established with the vice president academic to enrol international undergraduate students, thereby providing funding for three new faculty positions. Because the move to Cambridge increased the School's operating costs and the endowment that was supposed to have covered most of these costs has not been raised yet, the revenue from international students has been used to fund additional staff and other operating costs during the start-up in Cambridge. Table 3 shows our plan to increase our faculty complement and Section V details the funding sources for these positions.

**TABLE 3: Faculty Complement Plan**

Position Type	Baseline: April 30/06			Faculty to be hired 2006/07	Faculty to be hired 2007/08	Faculty to be hired 2008/09	Faculty to be hired 2009/10	Total Faculty to be Hired 2006/07-2009/10	Total Faculty: April 30/10
	Filled	Open	TOTAL						
faculty positions	14.0	3.0	17.0	2.0	1.0			3.0	17.0
new plan positions	0.0	4.0	4.0	2.0	2.0			4.0	4.0
<b>TOTAL</b>	14.0	7.0	21.0	4.0	3.0			7.0	21.0

### B. Staff Complement Plan

The current staff complement in Architecture is 9.7: 6 positions in administration (including two established in association with the move to Cambridge and the switch to Engineering) and 3.7 in technical support. Table 4, below, outlines our plans to increase our staff complement to 11.7 by filling two technical support positions that were part of the plan for operating in Cambridge. Creating a new staff position for a properly qualified, full-time workshop manager is the School's highest staffing priority, followed closely by the need to establish and fill the fourth position in computing and media. Furthermore, the move to Cambridge and the operation of a free-standing facility means Architecture students depend on the on-site staff for virtually all their interaction with the University. The School is in the midst of a thorough review of its operations. To that end the general manager will submit a revised organizational chart, operations guide, and job descriptions in spring 2006.

**TABLE 4: Staff Complement Plan**

Position Type	Baseline: April 30/06			Staff to be hired 2006/07		Staff to be hired 2007/08		Staff to be hired 2008/09		Staff to be hired 2009/10		Total Staff to be hired 2006/07- 2009/10		Total Staff: April 30/2010		
	Admin	Tech	TOTAL	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	TOTAL
staff positions	6.0	3.7	9.7											6.0	3.7	9.7
new plan positions					2.0								2.0		2.0	2.0
<b>TOTAL</b>	6.0	3.7	9.7		2.0								2.0	6.0	5.7	11.7

## V BUDGET

The proposed financial basis for the expansion of the staff and faculty rests in the expansion of the graduate program (see Table 5), the growth of international student enrolment (see Table 6), and the establishment of the operating endowment for the School of Architecture. It is anticipated that the income derived from international student enrolment will provide the salaries of two new faculty members to be hired in 2006/2007 and that the income from graduate expansion will allow the School to add an additional two faculty members in 2007/2008. The building addition will be financed through grad expansion (\$1,000,000), the CFI allocation (\$1,500,000), and a contribution from the City of Cambridge (\$500,000) anticipated in the CFI application.

The current fundraising campaign associated with the Cambridge project lost some momentum since the move and the pressures of start up. The focus will be restored and the final \$2,500,000 will be raised. When the existing campaign is concluded, the emphasis will switch to graduate student support with a goal of \$1,000,000. The benchmarks for Architecture fundraising are 10 per cent of the annual Engineering total raised and 50 per cent of graduates contributing by 2010.

**TABLE 5: Budget Projections: Graduate Expansion**

	Baseline 2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010
Canadian and PR Students	62	75	88	94	98	100
Increase from Baseline:Master's		13	26	32	34	34
Increase from Baseline:PhD					2	4
Additional Funding Available		130,000	260,000	320,000	370,000	400,000
Faculty Salary Expenses		0	60,000	180,000	180,000	180,000
Graduate TA Expenses		0	96,000	125,000	150,000	195,200
Additional Funds Available		130,000	104,000	15,000	40,000	24,800

**TABLE 6: Budget Projections: International Undergraduate Enrolment**

	<b>Intake</b>	<b>FTE</b>	<b>Tuition Income</b>	<b>New Faculty Appointments</b>	<b>Salary Costs</b>	<b>Available Budget</b>
2003/2004	4	4	48,000			
2004/2005	0	3	18,000			
2005/2006	6	9	76,500			
2006/2007	10	18	153,000	2	150,000	3,000
2007/2008	10	27	229,500		157,500	72,000
2008/2009	10	36	306,000		165,375	140,625
2009/2010	10	38	323,000		173,643	149,357

## **B. Chemical Engineering**

### **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 and Computer Engineering, a new program in nanotechnology engineering. It has a total faculty complement of 26, a staff complement of 13.5, an undergraduate population of about 400 (annual intake of 120) and a graduate student population of about 110 (annual intake of 30-40). The undergraduate program uses the co-op system in which students alternate between eight academic terms and six work term placements. A subjective assessment would rank the Department's undergraduate and graduate programs in the top five in Canada. In the North American context the undergraduate program is likely to be competitive; however, in research the Department is likely not among the top 10 at the present time. The Department 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.

The quality of the space occupied by Chemical Engineering is generally low. This has a serious impact on our ability to achieve the aspirations mentioned above. There is a strong and urgent need to renovate to improve the functionality and appearance of our existing research laboratories, teaching laboratories, and office space as well as to develop new space.

Faculty teaching loads are high compared to other research-intensive departments. This adversely impacts the research program, graduate program, and our ability to attract top faculty applicants. A key priority therefore is to hire new faculty, especially through new positions not directly tied to increasing undergraduate enrolment.

The Department has a very good graduate program with strong graduate enrolment, a high PhD/MASc ratio, and a large number of international students. The average graduate student per

faculty ratio is relatively high but below the Faculty target of five. All PhD and most MASc students are fully funded. To achieve our aspirations involves having an excellent graduate program. The positive aspects of the current operation notwithstanding, several enhancements related to graduate enrolment, course offerings, and student academic life are yet required.

The Department currently has a strong research program covering a broad range of multidisciplinary research projects in seven thematic areas. The Department ranks third in Canada in terms of the number of publications and has been very successful in the past in attracting a relatively high level of research funding. However, in order to boost the Department to the level of excellence that will be needed for recognition as one of the leading North American departments and the leader in Canada, the research program needs to be intensified.

The Department attracts among the best applicants to chemical engineering into its undergraduate program. The strong reputation of the University of Waterloo and its renowned integrated co-op education program help in this respect. It operates one of the largest chemical engineering undergraduate programs, producing about 10 per cent of all Canadian chemical engineering graduates. In order to maintain this position, however, several improvements must be made.

## **II CHEMICAL ENGINEERING STRATEGIC PLAN**

### **GOAL 1: Work Toward Creating New Space and Renovating Existing Space**

- ◇ Participate in the Faculty of Engineering building fund.  
The Faculty is embarking on a campaign to create a fund for a new building. Chemical Engineering has committed to contributing \$200K/year for the next three years to help achieve the Faculty's objective. New research space is essential in order for the Department to reach the level of excellence required to meet our aspirations.
- ◇ Create a renovation fund for annual renovation projects.  
While the creation of new space is important, such a building is not likely to come online for four to five years. In the meantime it is imperative that the Department embark on a renovation campaign for its existing space. To do so, funds for renovations have been set aside annually in the budget. It is expected that these funds will be matched 3:1 by the Faculty and the University. In addition to the funding, the Department will establish a priority renovations project list.

#### Evaluation Methodology

- Total dollars invested in the Faculty's building fund
- Total dollars invested in renovations

### **GOAL 2: Hire New Faculty**

- ◇ Establish a proactive search process to recruit and hire a mix of senior and junior faculty.

To achieve its goals and aspirations, four new faculty positions that are not tied to undergraduate enrolment increases will be created in the Department and a position currently open will be filled. The Department must now go on an aggressive hiring campaign to ensure that these positions are filled with the highest quality individuals. To achieve this goal, we must offer competitive salaries and start-up grants and the required space must be created.

- ◇ Reduce turnaround time in handling faculty applications.  
Currently the turnaround time in responding to faculty applicants, creating shortlists, and bringing candidates in for interviews is too long. This process must be streamlined to avoid missing out on potential high quality hires.
- ◇ Hire a staff instructor.  
To help reduce teaching loads for regular faculty, the Department will hire a staff member to give courses primarily in the first and second years. This person will also participate in the grading of workterm reports and can act as liaison to the LT3 office and similar teaching related initiatives.

#### Evaluation Methodology

- Number of open and new plan positions filled
- Nominal teaching load
- Undergraduate student to faculty ratio

### **GOAL 3: Enhance the Graduate Program**

- ◇ Increase graduate student enrolment.  
In order to attract more of the highest quality graduates from our own undergraduate program to pursue graduate studies in our department, pre-offers of admission will be made to students in their 4A term who have a high GPA (the exact level of which is yet to be determined). We will also admit more students directly from the BAsC into the three-year PhD program. In the past, the Department has in general required students to obtain a master's degree before going on to complete a PhD. To admit high quality domestic and foreign applicants into our PhD program, more use will be made of the three-year PhD program, thereby bypassing the master's degree. To take advantage of the graduate growth fund it will be important to grow the number of graduate students that are Canadian and Permanent Residents. This funding has a substantial impact on the budget, rising to approximately \$500K by 2009/10. To that end, we will develop an active recruiting plan aimed at increasing the number of Canadian and Permanent Resident applicants. Furthermore, at this point the Department does very little proactive recruiting. We will develop a proactive recruitment campaign, including approaching students at other Canadian universities, and develop better advertising materials. Finally, in order to grow the graduate enrolment some of the graduate growth funding will initially be used to provide incentives to hire Canadian/Permanent Resident graduate students.

#### Evaluation Methodology

- Actual enrolment compared to targets set out in the enrolment plan
- Acceptance rate on offers to UW graduates
- Number of direct admits to the PhD program
- Number of scholarship holders (NSERC, OGS, other) enrolled

#### ◇ Improve graduate course offerings.

At this point in time our graduate course offering is insufficient. To improve this situation, each research technical group will be asked to develop a set of core courses for their graduate students. In addition, the Department will increase the number of graduate courses overall to 15, outside of those held with senior undergraduate courses. In order to help students select their courses, graduate courses will be scheduled one year in advance. And, to monitor the quality of our course offerings, evaluations will be implemented for all graduate courses.

#### Evaluation Methodology

- Number of graduate courses offered annually
- Enrolment levels by graduate course

#### ◇ Establish a departmental seminar series.

In the past, the Department did have a regular seminar series. Recently this has been reduced to a rather adhoc series of infrequent seminars. A regular seminar series is vital to the education of graduate and undergraduate students by exposing them to all areas of chemical engineering. The objective will be to offer a seminar once every two weeks during the fall and winter terms (September – April), with the seminar schedule published at the beginning of September. Six to eight of the seminars will be given by invited, distinguished speakers and each PhD student will give a departmental seminar during their tenure. The remainder of the seminars will be given by faculty and other visitors to the Department. Attendance will be mandatory for all graduate students.

#### Evaluation Methodology

- Number of seminars given
- Number of distinguished seminar speakers
- Number of seminars given by PhD students
- Attendance statistics

#### ◇ Enrich graduate students' academic life.

The Department will encourage graduate students to attend conferences and present their work by matching the GSO's contribution of \$300 per research graduate student to attend a major research conference to present their work. We will improve the office space available for graduate students. To connect with students, the chair and associate chair graduate studies will meet each term with the Chemical Engineering Graduate Student Association executive, and the chair will have an annual town hall meeting with all graduate students.

#### Evaluation Methodology

- Number of graduate student presentations at major research conferences

◇ Restructure the PhD comprehensive exam.

The following refinements will be made to the current exam structure: the background preparation of the candidate will be examined early in the student's program through either a written or oral exam (yet to be determined); the research proposal will be examined within the first 16 months of the student's program; and the PhD committee will meet with the student approximately one year after the comprehensive exam to judge the progress.

Evaluation Methodology

- Number of students taking the background exam and relevant statistics
- Number of students presenting the research proposal and relevant statistics

**GOAL 4: Intensify the Research Program**

◇ Establish and focus primary research themes.

Through the planning process, the Department has restructured its research into seven themes. As a next step each technical group should carefully define its goals and solidify its direction. The Department will then focus, through its hiring plans, on the development and/or reinforcement of critical mass and research infrastructure for each of the research groups.

◇ Create research engineering positions.

Some of the larger groups in the Department have expressed the need to hire individuals who can provide continuity to the laboratory operations and specialized training of graduate students on equipment and procedures. The Department has committed funds toward the hiring of such individuals on a match-funding basis.

Evaluation Methodology

- Number of research engineering positions created

◇ Enhance the Department's visibility, particularly in its graduate and research programs.

The Department will hire an external relations officer to focus on issues related to the Department's visibility. This position will include a communications role to develop and maintain print and electronic promotional material such as websites and brochures, as well as a liaison role to assist with increasing the Department's interaction with industry and alumni. A half-time administrative position will also be created to support this individual. We will consider establishing an industrial advisory board to give feedback on aspects of the undergraduate and graduate programs, research, and industry co-operation and to help promote the Department and its activities.

Evaluation Methodology

- Age of promotional material
- Website traffic
- Number of industrial visits
- Percent of alumni that become donors

◇ Increase research funding.

Teaching loads reductions will give faculty more time to write grant applications and to concentrate on their research program. Faculty members involved in preparing major grant applications will be given some teaching reduction time. The Department will also make significant efforts to apply to alternative funding venues including industry-based contracts and grants.

Evaluation Methodology

- Number of grant applications made and success rate
- Teaching loads
- Total research funding and number of awards, by category: per capita and ratio to national average
- Papers and citations

**GOAL 5: Enhance the Undergraduate Program**

◇ Upgrade undergraduate laboratory facilities.

The Department will set aside funds to commit toward the continuous improvement and upgrading of undergraduate laboratory facilities. We will establish a laboratory committee to make recommendations about laboratory improvements and new laboratory experiments. A third laboratory demonstrator will be hired to assist with lab instruction and the development of new laboratories.

Evaluation Methodology

- Total dollars spent each year on undergraduate laboratory upgrades

◇ Enhance the undergraduate curriculum.

The Department will review the first year curriculum with two specific goals: making junior students more employable with co-op employers, and moving toward a more common first year curriculum across the Faculty. To better address specific interests of students, we will introduce new specializations within the undergraduate program. It is anticipated that the availability of these specializations will positively impact recruitment and act as a marketing tool. We will also encourage a research culture in the Department for undergraduate students through faculty supervised research projects.



### III ENROLMENT PLANS

#### A. Undergraduate Enrolment Plan

**TABLE 1: Undergraduate First-year Target Plan**

Degree Program	2004/05			2005/06			2006/07			2007/08			2008/09			2009/10		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
Chemical	150	5	155	115	10	125	115	10	125	115	15	130	115	15	130	115	15	130
Nanotechnology				95	5	100	102	8	110	100	10	110	100	10	110	100	10	110

#### B. Graduate Enrolment Plan

As noted above, we plan to expand our graduate enrolment significantly during the plan period. Table 2, below, outlines our growth projections. These projections assume that the Department will move toward a 50:50 ratio of International to Canadian/Permanent Resident PhD students by 2008/09 and that international master's enrolment will be capped at 10 students. These projections also reflect our hiring plans and our goal to move toward five full-time research students per regular faculty member by 2008/09. The expectation is that the number of thesis research students per new faculty members will ramp up to five over their first five years.

**TABLE 2: Graduate Enrolment Plan**

Degree Program	2004/05 Actual Fall FTE			2005/06 Actual Fall FTE			2006/07 Projected Fall FTE			2007/08 Projected Fall FTE			2008/09 Projected Fall FTE			2009/10 Projected Fall FTE		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
PhD	25.3	38.0	63.3	25.3	39.0	64.3	27.6	42.0	69.6	34.0	41.0	75.0	42.6	42.0	84.6	47.6	46.0	93.6
Masters -thesis	24.3	9.0	33.3	25.0	12.0	37.0	36.3	10.0	46.3	40.0	10.0	50.0	46.3	10.0	56.3	52.3	10.0	62.3
Masters -coursework	7.3		7.3	6.3		6.3	10.0		10.0	12.0		12.0	15.0		15.0	20.0		20.0
Full-cost Recovery																		
<b>TOTAL</b>	56.9	47.0	103.9	56.6	51.0	107.6	73.9	52.0	125.9	86.0	51.0	137.0	103.9	52.0	155.9	119.9	56.0	175.9

## IV COMPLEMENT PLANS

### A. Faculty Complement Plan

Per Table 3, below, we will hire 11 new faculty members over the plan period: one is the result of chair release funds; six are part of the nanotechnology program; three are new plan positions funded by the Faculty’s Vision 2010 academic priorities fund (APF); and one is a new plan position funded by the Department. These positions are targeted per Table 4, below. Position targets identified as “open” are being held for opportunistic hiring.

**TABLE 3: Faculty Complement Plan**

Position Type	Baseline: April 30/06			Faculty to be hired 2006/07	Faculty to be hired 2007/08	Faculty to be hired 2008/09	Faculty to be hired 2009/10	Total Faculty to be Hired 2006/07-2009/10	Total Faculty: April 30/10
	Filled	Open	TOTAL						
faculty positions <sup>1</sup>	26.0	1.0	27.0	1.0				1.0	27.0
> nanotechnology <sup>2</sup>	1.0	6.0	7.0	2.0	1.0	1.0	2.0	6.0	7.0
new plan positions	0.0	4.0	4.0	1.0	1.0	1.0	1.0	4.0	4.0
<b>TOTAL</b>	27.0	11.0	38.0	4.0	2.0	2.0	3.0	11.0	38.0

**NOTES:**

1. Open faculty positions include: 1 position funded from chair release funds
2. Filled nanotechnology positions include: 1 position who has not yet started

**Table 4: Faculty Hiring Targets**

TARGET	YEAR	FUNDING SOURCE
Industrial Biotechnology	2006/07	Chair release funds
Nano Biosystems	2006/07	Nanotechnology
Molecular Catalysis	2006/07	Nanotechnology
Biopolymers	2006/07	New plan position: APF
Nano Materials	2007/08	Nanotechnology
Open	2007/08	New plan position: APF
Nano Materials	2008/09	Nanotechnology
Open	2008/09	New plan position: Department
Nano Biosystems	2009/10	Nanotechnology
Polymers	2009/10	New plan position: APF
Nano/Environment/Aerosols	2009/10	Nanotechnology

**B. Staff Complement Plan**

Per Table 5 below, we will hire 7 new FTE positions over the plan period: 2.5 are part of the nanotechnology program; 2 are new plan positions funded by the APF; and 2.5 are new plan positions funded by the Department. The hiring areas for these positions are outlined in Table 6, below.

**TABLE 5: Staff Complement Plan**

Position Type	Baseline: April 30/06			Staff to be hired 2006/07		Staff to be hired 2007/08		Staff to be hired 2008/09		Staff to be hired 2009/10		Total Staff to be hired 2006/07- 2009/10		Total Staff: April 30/2010		
	Admin	Tech	TOTAL	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	TOTAL
staff positions	5.0	7.5	12.5											5.0	7.5	12.5
> nanotechnology	1.0		1.0				1.0	1.0	0.5			1.0	1.5	2.0	1.5	3.5
new plan positions				1.5	2.0		1.0					1.5	3.0	1.5	3.0	4.5
<b>TOTAL</b>	6.0	7.5	13.5	1.5	2.0		2.0	1.0	0.5			2.5	4.5	8.5	12.0	20.5

**Table 6: Staff Hiring Targets**

TARGET	FTE	YEAR	FUNDING SOURCE
Instructor	1.0	2006/07	New plan position: Department
External Relations Officer	1.0	2006/07	New plan position: APF
Administrative Assistant	0.5	2006/07	New plan position: Department
Lab Instructor	1.0	2006/07	New plan position: Department
Research Engineer	1.0	2007/08	New plan position: APF
Lab Instructor, Nano	1.0	2007/08	Nanotechnology
Lab Instructor, Nano	0.5	2008/09	Nanotechnology
Technical Secretary	1.0	2009/10	Nanotechnology

## V BUDGET

The Chemical Engineering plan budget in Table 7 outlines our projected additional income and expenditures over the plan period. Graduate growth fund projections are based on two important assumptions: (1) that CPR growth is sustained (i.e. a graduating CPR student is replaced by a CPR student entering the program; and (2) to account for uncertainty in our graduate enrolment projections, 60 per cent of the calculated value for this fund is used in the plan budget. In addition, only 50% of the calculated value for income due to foreign undergraduate enrolment has been used in the plan budget, due to the uncertainty in our ability to attract sufficient students of high calibre in this category.

**TABLE 7: Plan Agreement Budget Projection**

<b>SOURCE</b>	05/06	06/07	07/08	08/09	09/10
<b>Income:</b>					
Operating Budget Allocation	42	42	42	42	42
Overhead	86	70	80	85	90
Differential Fees	104	91	91	91	91
Foreign Undergraduate	68	85	127	170	170
Graduate Expansion Fund	38	0	0	0	0
Graduate Growth Fund	6	117	206	340	446
Indirect Research	150	150	150	150	150
Salary Release (Chairs)	72	67	167	162	162
Alumni - unrestricted	50	50	75	85	100
Teaching Equipment Fund	16	16	16	16	16
Carry Forward	450	272	-77	-117	44
Total:	1082	960	877	1024	1311
<b>Expenses:</b>					
Operating expenses	140	145	150	155	160
Additional TA's	30	30	30	30	30
UG Related expenses	100	100	100	100	100
Graduate Related expenses	50	70	70	90	90
Graduate incentive fund	0	60	60	60	60
Startup	50	100	50	50	50
<b>New Plan commitments:</b>					
Faculty position	0	100	100	100	200
Lab Instructor	0	60	60	60	60
Instructor	60	60	60	60	60
PT Admin Staff	0	18	18	18	18
UG Lab Renovations	0	30	30	40	40
Overhead returns	0	14	16	17	18
Building fund	200	200	200	0	0
Renovations	180	50	50	200	200
Total:	810	1037	994	980	1086
<b>Balance:</b>					
	272	-77	-117	44	225

## **C. Civil Engineering**

### **I INTRODUCTION**

The Civil Engineering Department's activities touch the daily lives of all people. We educate civil, environmental, and geological engineers who provide the infrastructure that adds to quality of life. Our research frequently deals with issues affecting the well-being of civilization. This includes the environment, natural resources, and the state of our physical infrastructure: roads and railways, airports and harbours, hospitals and schools, drinking water and shelter.

The recent revival of interest in civil engineering disciplines reflects the growing realization amongst the general public and professionals that the sustainability of existing infrastructure can no longer be taken for granted in the developed world. This message emerges clearly from international agencies and national governments that partner with the private sector to ensure alternate funding for infrastructure renewal. The "ReNew Ontario" plan, which includes \$2.3 billion in financing for joint infrastructure projects, signals changes in the public policy that will have a major positive impact on the employment trends in civil engineering and related areas.

The opportunities offered by a markedly improved public profile of our undergraduate programs are uniquely aligned with the fundamental emphasis on quality in the Faculty of Engineering Vision 2010 plan. While we have always aspired to be among the best civil engineering departments in North America, much remains to be done to fulfill all our aspirations. This includes our commitment to provide the highest quality graduate and undergraduate education and to conduct internationally recognized basic and applied research to support and advance civil engineering and related professions.

To achieve these aspirations we will maintain the strength of our undergraduate programs and build on their success as well as explore synergies that may expand the range of our undergraduate offerings; improve the quality of graduate education and expand the range of graduate offerings in the professional area; and increase our research intensity and its international impact. In pursuing these priorities within the context of the Vision 2010 plan, we will contribute to one of its main objectives: to be counted among the best in North America.

### **II CIVIL ENGINEERING STRATEGIC PLAN**

The Civil Engineering faculty and staff is a dedicated group committed to excellence. Being among the leading civil engineering departments in Canada, and, in the words of our external assessors, "arguably the best in undergraduate studies," is no small achievement for a department where virtually all faculty members received their doctoral degrees in the 1990s. While we were happy our assessors compared us with civil departments at Minnesota and Penn State, ranked 13<sup>th</sup> and 20<sup>th</sup> in the *US News and World Report* 2005 poll, our aspiration is to reach higher.

### **GOAL 1: Improve Quality in all Areas of the Department's Activities by Increasing the Faculty Complement without Increasing Undergraduate Enrolment**

- ◇ Our aspirations might not be attainable due to high teaching loads, which were identified by our external assessors as the “biggest issue facing the Department.” Our Vision 2010 plan addresses this issue through an increase in faculty complement that will lead to the overall reduction of teaching loads. With the planned increase of the faculty complement to 39 (see Section IV.A), the Department will be able to reduce teaching loads to three courses per year. This will help us mobilize the “unrealized potential in the Department to increase its research intensity and as a result to improve and increase the Department's profile.”
- ◇ To achieve this, we will need to hire the best faculty. Our recent experience of hiring graduates from excellent schools in the USA and Europe clearly suggests that we are capable of attracting the best.

#### Evaluation Methodology

- Annual progress report on hiring activities
- Detailed analysis of the applicant pool
- Success rate of offers to the top candidates

### **GOAL 2: Create an Environment in Which Faculty Members are Encouraged to be Creative and Become Internationally Recognized for their Research Contributions**

- ◇ While the increased faculty complement is a prerequisite for sustained improvements in quality, more is needed to achieve international prominence. A number of strategies in the Faculty plan, including orientation and mentoring new faculty members, recognizing success and rewarding excellence, and other activities identified by the task force on faculty issues will certainly contribute toward a climate that promotes excellence.
- ◇ In addition, the departmental merit review process should evolve toward recognition of an extra effort required to publish in top rated peer-reviewed journals where the publication impact is *a priori* higher. To move in this direction, top peer-reviewed journals must be identified in all research areas within the Department, and faculty members must be encouraged to submit manuscripts into these journals. This strategy to pursue international recognition by such means must be widely discussed in the Department.
- ◇ Faculty members will also be encouraged to pursue international collaborations that increase the visibility of our research activities.

#### Evaluation Methodology

- Measures developed to promote awareness of bibliometric methods of increasing the impact of scholarly contributions
- Active international collaborations

### **GOAL 3: Continue Improving Existing Undergraduate Programs Through Curriculum Improvements, Capitalizing on the Increased Academic Quality of Incoming Students**

- ◇ We intend to maintain enrolment in all our existing programs and work on improving co-ordination among courses, keeping the existing curriculum modern and relevant. In consultation with the Faculty, we also intend to work toward establishing a more common first year.
- ◇ With the number of high quality applicants in our civil engineering program continuously increasing, we will work to better promote our environmental and geological engineering programs, emphasizing their academic merit and societal relevance. New and improved web sites for all our programs are expected to contribute to this effort.

#### Evaluation Methodology

- Acceptance rate of our offers. Currently, this indicator is considerably below the Faculty average. This indicator will be closely monitored to assess the effectiveness of our promotional efforts.
- We will report on the state of our undergraduate program using key performance indicators provided by the Faculty.

#### **GOAL 4: Establish an Undergraduate Option in Architectural Engineering**

- ◇ As part of exploring opportunities for a new joint program with the School of Architecture, the Department is considering an option in architectural engineering, consisting of a set of civil, mechanical, and architecture courses. This set of courses will provide extended exposure to building engineering concepts and will add a significant breadth and professional value to the existing civil engineering program. The option may also be attractive to Engineering students from other programs.
- ◇ The external assessors remarked that the "...new undergraduate program with the School of Architecture is potentially one area that could differentiate Waterloo from other top schools." However, they expressed concerns about the program's logistical difficulties and extensive space requirements. Despite these concerns, we will continue to explore the opportunity.

#### Evaluation Methodology

- We will review the progress of this effort annually

#### **GOAL 5: Improve the Quality of the Graduate Program and Promote Growth of Research-Oriented Degree Programs Through Increased Research Intensity**

- ◇ Our graduate enrolment continues to increase. It has been increasing steadily over the years, reaching about 3.7 graduate students per faculty member in MASc and PhD programs. The number of PhD students has been increasing at an almost constant rate of six per year over the past three to four years, while the number of MASc students remains practically constant.
- ◇ We plan to increase our fall FTE graduate enrolment by over 100 students between 2004/05 and 2009/10. Details on this increase and on other graduate studies initiatives are discussed in Section III.B.
- ◇ The major limiting factor constraining growth in graduate research programs is the availability of funding. Therefore, issues of research intensity and graduate growth are



intimately related. The number of applicants from Canadian schools remains low. About 30 Canadian/PR students are enrolled in the MEng program that was introduced in 2002.

- ◇ We have addressed the sporadic offering of graduate courses in the Department, with a set of 12 core 600-level courses to be offered regularly starting in fall 2006. The Department teaches about 20 graduate courses per year in addition to a large number of 500-level courses.
- ◇ To increase domestic enrolments, we are making a significant effort to recruit our top undergraduates and monitor the success of this effort. A Faculty-wide campaign to recruit top students from other Canadian schools is needed to address the issue.
- ◇ We are working with the recently established Civil Engineering Graduate Student Association (CEGA) to improve the working environment of our graduate students.
- ◇ Department research funding, according to the latest data, exceeded the operating budget for the first time. All faculty members understand the significance of the effort to increase graduate enrolment and research intensity.

#### Evaluation Methodology

- Number of graduate courses offered annually
- Year-to-year changes in discovery grant awards
- Success rate of other grant applications
- Other data to be provided centrally

### III ENROLMENT PLAN

#### A. Undergraduate Enrolment Plan

The enrolment plan proposed below envisages constant enrolment starting from 2005/06 with 6.5 per cent visa students. The number of visa students admitted reflects the availability of quality applicants.

**TABLE 1: Undergraduate First-year Target Plan**

Degree Program	2004/05			2005/06			2006/07			2007/08			2008/09			2009/10		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
Civil	90	5	95	95	5	100	95	5	100	95	5	100	95	5	100	95	5	100
Environmental	35	3	38	35	3	38	35	3	38	35	3	38	35	3	38	35	3	38
Geological	15	2	17	15	2	17	15	2	17	15	2	17	15	2	17	15	2	17

## **B. Graduate Enrolment Plan**

### **Research Programs**

The graduate enrolment plan includes uniform growth in graduate enrolment of six PhD and five MASc students per year. While the PhD growth corresponds to the natural trend with the 50/50 split between Visa and Canadian/PR students, the proposed increase in MASc would require a considerable effort.

To support the recruitment program, a Graduate Scholarship Fund will be established using financial resources generated by graduate growth in research degrees. The Graduate Scholarship Fund will also provide an institutional match for external graduate scholarships. Undergraduate students applying for NSERC scholarships will receive priority offers at the time of application. The priority in making offers to other students will be governed by their academic ranking. Faculty members supervising students receiving support from the Graduate Scholarship Fund are expected to contribute one half of the support package. The program will be cost-neutral to the Department.

### **Professional MEng**

We believe that the employment trends related to infrastructure renewal in Ontario will result in a strong demand for a well-educated and qualified workforce that will need specialized training in the infrastructure area. We therefore propose to transform the existing MEng program into a more focused MEng in infrastructure engineering. This will be achieved by offering specialty courses taught by industry experts and faculty members with specialized expertise in the infrastructure area.

It is anticipated that, in time, the program will evolve into a cost-recovery program for engineering professionals. At initial stages, financial support for the program will be provided by the Department using graduate growth funds generated by increased enrolment in the existing MEng program. It is expected that some of the courses in infrastructure engineering will be accessible to MASc and PhD students. Two faculty positions in the infrastructure and related areas will be created using funds generated by the expanded MEng program. A new staff position in the Vision 2010 plan will be allocated to support the program. The program budget is described in Section V.

**TABLE 2: Graduate Enrolment Plan**

Degree Program	2004/05 Actual Fall FTE			2005/06 Actual Fall FTE			2006/07 Projected Fall FTE			2007/08 Projected Fall FTE			2008/09 Projected Fall FTE			2009/10 Projected Fall FTE		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
PhD	22.8	25.0	47.8	27.1	28.3	55.4	30.5	30.5	61.0	33.5	33.5	67.0	36.5	36.5	73.0	39.5	39.5	79.0
Masters -thesis	50.1	3.0	53.1	45.5	10.0	55.5	50.0	11.0	61.0	54	12.0	66.0	58.0	13.0	71.0	62.0	14.0	76.0
Masters -coursework	21.8	1.0	22.8	29.2	1.0	30.2	36.5	0.0	36.5	50.0	0.0	50.0	60.0	0.0	60.0	70.0	0.0	70.0
Full-cost Recovery				0.3		0.3												
<b>TOTAL</b>	94.7	29	123.7	102.1	39.3	141.4	117.0	41.5	158.5	137.5	45.5	183.0	154.5	49.5	204.0	171.5	53.5	225.0

## IV COMPLEMENT PLAN

### A. Faculty Complement Plan

The Department complement plan includes five new faculty positions, with three positions funded from the Faculty’s Vision 2010 academic priorities fund (APF) and two positions funded by the Department with funds resulting from increased graduate enrolment in the MEng program. The priority hiring areas identified in the course of the planning process include:

- Civil infrastructure management, financing, and public policy
- Transport, environment, and sustainability
- Building physics
- Spatial analysis (GIS, image processing, remote sensing, and photogrammetry)

The fifth position, not listed above, is to fund an already made appointment bridged to a retirement in the geotechnical area.

**TABLE 3: Faculty Complement Plan**

Position Type	Baseline: April 30/06			Faculty to be hired 2006/07	Faculty to be hired 2007/08	Faculty to be hired 2008/09	Faculty to be hired 2009/10	Total Faculty to be Hired 2006/07-2009/10	Total Faculty: April 30/10
	Filled	Open	TOTAL						
faculty positions <sup>1,2</sup>	32.0	2.0	34.0	2.0				2.0	34.0
new plan positions	0	5.0	5.0	2.0	2.0	1.0		5.0	5.0
<b>TOTAL</b>	32.0	7.0	39.0	4.0	2.0	1.0		7.0	39.0

**NOTES:**

1. Open faculty positions include: 1 replacement; 1 funded from chair release funds
2. Filled faculty positions include: 2 positions filled, funded from chair release funds, who will be joining on May 1, 2006

**B. Staff Complement Plan**

As a result of the Vision 2010 plan, the Department’s staff complement will increase by 1.5. Full funding in the operating budget will be provided for a technician in the structures lab, half of whose salary is now paid from departmental funds. An administrative staff position will be added to support the proposed expansion of the MEng program.

**TABLE 4: Staff Complement Plan (from operating funds)**

Position Type	Baseline: April 30/06			Staff to be hired 2006/07		Staff to be hired 2007/08		Staff to be hired 2008/09		Staff to be hired 2009/10		Total Staff to be hired 2006/07- 2009/10		Total Staff: April 30/2010		
	Admin	Tech	TOTAL	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	TOTAL
staff positions	6.0	8.5	14.5													14.5
new plan positions	1	0.5	1.5	1	0.5							1	0.5			1.5
<b>TOTAL</b>	7.0	9.0	16.0	1	0.5							1	0.5			16.0

Table 5, below, summarizes various appointments outside of the operating budget.

**TABLE 5: Staff Complement Plan (from outside operating funds)**

Position Type	Baseline: April 30/06			Total Staff: April 30/10		
	Funded by the Department	Funded by Faculty Member(s)	TOTAL	Funded by the Department	Funded by Faculty Member(s)	TOTAL
administrative		2.0	2.0		2.0	2.0
technical		12.0	12.0		14.0	14.0
post-doctoral fellows		5.0	5.0		7.0	7.0
research associates		2.0	2.0		4.0	4.0
research professors		3.0	3.0		3.0	3.0
visitors		4.0	4.0		7.0	7.0
active adjuncts	14.0		14.0	14.0		14.0
<b>TOTAL</b>	14.0	28.0	42.0	14.0	37.0	51.0

## V BUDGET

The projected budget is based on a number of conservative assumptions:

- Cumulative budget cuts will continue to 2010 at a rate of 1.5% per year
- DTF growth will continue for the next two years due to tuition increases of 4%
- Revenue from visa students assumes that half of visa students will not register past 1B
- Funds for graduate expansion associated with the previous program will continue at an estimated 2005/06 rate
- Federal indirect cost program funding will continue at the 2005/06 rate

Under these assumptions, the sum of extra-budgetary revenue and budget cuts will continue to decline from \$145,710 in 2005/06 to \$33,000 in 2009/10. Operating difficulties (without funds associated with graduate growth) are expected in 2007/08.

### Revenue associated with the projected MEng growth

Assuming that the MEng program will consist of eight technical courses plus a technical writing course, and all teaching for the program will be carried out by sessional instructors earning \$10,000 per course, a permanent increase in the number of MEng students by 10 will make the program sustainable and cost-neutral to the Department. With projected growth averaging 10 students per year, the program enrolment will reach 70 by 2009/10, proving sufficient funds for two faculty positions.

### Revenue associated with graduate growth in research programs

It is expected that revenue from graduate growth in research programs will increase from about \$100,000 in 2006/07 to \$300,000 in 2009/10. All these funds will be used to support graduate students.

**TABLE 6: Plan Agreement Budget Projection**

		2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
<b>Base Budget</b>									
	Faculty increment (APF)					1	1	1	
	Staff increment					1	0.5		
	Base budget	\$3,121,873	\$3,146,950	\$3,378,200	\$3,580,892	\$3,945,746	\$4,307,490	\$4,665,940	\$4,945,896
	Annual cut (%)	1.0%	2.0%	2.0%	1.0%	1.50%	1.50%	1.50%	1.50%
	Annual cut	DTF	DTF	\$67,564	\$35,809	\$59,186	\$64,612	\$69,989	\$74,188
	Cumulative Cut	0	0	(\$67,564)	(\$103,373)	(\$162,559)	(\$227,171)	(\$297,161)	(\$371,349)
<b>Special Funds</b>									
	DTF	-	\$113,311	\$59,430	\$15,205	\$36,793	\$58,381	\$60,000	\$60,000
	Grad Expansion	\$42,261	\$99,824	\$101,158	\$101,158	\$101,158	\$101,158	\$101,158	\$101,158
	Visa students	-	-	-	\$55,250	\$82,875	\$110,500	\$138,125	\$165,750
	Spec. Funds, Total	\$42,261	\$213,135	\$160,588	\$171,613	\$220,826	\$270,039	\$299,283	\$326,908
	Federal Ind. Costs (Restricted use)	-	\$94,112	\$77,033	\$77,470	\$77,470	\$77,470	\$77,470	\$77,470
	Extra-budgetary funds, total	\$42,261	\$307,247	\$237,621	\$249,083	\$298,296	\$347,509	\$376,753	\$404,378
	Extra-budgetary funds + budget cuts			\$170,057	\$145,710	\$135,737	\$120,337	\$79,593	\$33,029
<b>Professional MEng</b>									
	MEng enrolment	22.1	23.5	22.8	30.2	36.5	50	60	70
	Gross revenue			0	\$74,000	\$137,000	\$272,000	\$372,000	\$472,000
	Sessional Stipends				\$0	\$100,000	\$100,000	\$100,000	\$100,000
	Net revenue				\$74,000	\$37,000	\$172,000	\$272,000	\$372,000
<b>Operating surplus</b>					\$219,710	\$172,737	\$292,337	\$351,593	\$405,029
	Faculty increment (Dept)						1	1	
<b>Graduate growth</b>									
	Research degrees								
	PhD			47.8(22.8)	55.4(27.1)	61(30.5)	67(33.5)	73(36.5)	79(39.5)
	MAsc			53.1(50.1)	55.5(45.5)	60.5(49.5)	65.5(53.5)	70.5(57.5)	75.5(61.5)
	Growth funds			\$0	\$18,500	\$109,500	\$194,500	\$279,500	\$364,500

## D. Electrical and Computer Engineering

### I INTRODUCTION

Waterloo Engineering's Department of Electrical and Computer Engineering (ECE) aspires to be a leader, not only in Canada but also in the world, for education and research in the broad discipline of electrical and computer engineering, including related interdisciplinary areas such as software engineering, nanotechnology, and mechatronics. The Department is centered on our undergraduate and graduate students to whom we provide a professional and diverse environment in which they can develop the knowledge, values, and tools to innovate, excel, and lead in their professions. Our faculty members are committed to high quality teaching and excel at fundamental and applied research. They are visible internationally and have major impact in their areas of research. The Department also plays an important role within society. Our staff members are committed to this mission.

The **ECE Vision 2010** is to be the top ECE department in Canada in terms of both academic and research programs. This will make it one of the top ECE departments in North America.

Implementing the ECE Vision 2010 will entail major changes and growth. It is important to restate the **fundamental values** at the core of the Department and to reaffirm the necessity for everyone in the Department, from the students to the chair, to respect them:

- Responsibility
- Transparency
- Accountability
- Collegiality
- Fairness
- Professionalism
- Commitment to quality and excellence
- Diversity
- Respect

The ECE key priority areas are:

- Recruiting the best faculty
- Enhancing the graduate program
- Recruiting high quality graduate students
- Increasing our research enterprise

In implementing the above we will:

- Implement **transparency, best practices**, and the recognition of **excellence everywhere** (faculty, staff, students).
- **Restructure** the Department to make its operation more efficient and conducive to implementing our values and objectives.
- Remain focused on all our **undergraduate** programs.
- Acquire sufficient **space** to support our growth, upgrade our teaching laboratory equipment, and undertake a number of renovations.
- **Market** ourselves to enhance the visibility of our department in Canada and abroad.

This document summarizes the overall ECE plan, which can be obtained by sending an e-mail to the department chair at [cath@ece.uwaterloo.ca](mailto:cath@ece.uwaterloo.ca).

## II ECE STRATEGIC PLAN

### GOAL 1 - Hire the Best Faculty

Launch a proactive and aggressive hiring campaign to attract the best faculty.

- ◇ The current vision and anticipated outcomes for faculty hiring are detailed in Section IV.
- ◇ The Department is committed to hiring excellent candidates and is not ready to compromise quality even if our needs are urgent.
- ◇ The Department has identified areas to be strengthened and will have annual meetings to discuss hiring strategy.
- ◇ A number of senior faculty will be hired to provide leadership in the creation of new areas.
- ◇ The Department will act quickly to select candidates, interview them, and make them an offer. The goal is to achieve a turnaround time, from the reception of an outstanding file to an offer, of about one month.
- ◇ The Department will make attractive offers in terms of salaries, start-up packages, and initial teaching reduction.
- ◇ To attract the best possible applicants, the Department will advertise in the best places and make use of our existing faculty members' scholarly networks.

#### Evaluation Methodology

- Number of applications and their quality
- Number of new hires
- Number of candidates interviewed, the number of offers made, and the percentage of offers accepted

### GOAL 2 - Enhance the Graduate Program

Continually enhance the quality of our graduate program. In particular, bring about substantial improvements in its structure and its delivery.

- ◇ Establish and revamp mechanisms for program monitoring and assessment.  
The Graduate Studies Committee (GSC) will initiate and conduct a curriculum review on a regular basis—once every five years. It should meet regularly to discuss not only the addition, revision, and deletion of individual courses, but also to take an active part in long-term planning, development, and oversight of the program. ECE will also address its need for systematic graduate course evaluations.
- ◇ Standardize course loads and increase course diversity.  
We will make each course load about 12 hours a week, so that a full-time graduate student can take three courses per term. We will also increase the number of graduate courses offered annually to at least 60 by 2010. This would be co-ordinated by the GSC in consultation with the theme areas.



- ◇ Create an MEng program.  
This new program will be targeted to (1) the large number of engineering professionals in the Waterloo region who wish to augment their credentials and acquire advanced knowledge through a part-time program, and (2) overseas students interested in a professional degree.
- ◇ Revamp our PhD exams.  
Introduce a two-step PhD qualification procedure that is in line with those of all top North American schools.
- ◇ Increase course requirements to improve the breadth and depth of our students.
- ◇ Develop an improved information system for the departmental graduate office.

#### Evaluation Methodology

- Annual progress reports on all these items

### **GOAL 3 - Recruit High Quality Graduate Students**

Increase our enrolment of Canadian and Permanent Resident (CPR) graduate students and attract outstanding international students, especially from under-represented world regions.

- ◇ Target our own undergraduate students and undergraduate students from other Canadian universities through advertisement and e-mail campaigns.
- ◇ Offer excellent admission packages to NSERC and OGS scholars and publicize this effort.
- ◇ Admit students only in fall, allowing very few exceptions, to allow the sequencing of courses proposed above to be effective. Be very quick to deal with outstanding applications. Give priority to CPR applicants.
- ◇ Create graduate fellowships and target them to outstanding domestic students and outstanding international students from under-represented world regions (e.g. Europe, South America, Indian sub-continent).
- ◇ The admission process should be changed to include the awarding of fellowships.

#### Evaluation Methodology

- Number of CPR students we attract
- Number of CPR students with NSERC and OGS scholarships
- Origin (countries and universities) of the international students we attract

### **GOAL 4 - Increase our Research Enterprise**

Promote an environment conducive to excellence in research while recognizing the need for diversity in research profiles and outlook ranging from the fundamental to the applied. Facilitate inter-disciplinary research and provide incentives to high performing researchers, including returning part of their overheads, creating research awards, and pursuing the establishment of additional research chairs.

- ◇ Enhance research excellence.  
Encourage research excellence. Promote a positive attitude toward excellence in research, in all its diversity, at all levels in the Department, including tenure & promotion, merit, and search committees. Publish an annual ECE research report to circulate to relevant industry and ECE alumni. Consider giving teaching or service reduction to faculty members initiating major research proposals (e.g. a proposal for a centre of excellence or a research network) to allow sufficient time to prepare strong, successful proposals. Pursue the establishment of additional research chairs.
- ◇ Improve and measure research capacity and impact.  
Encourage faculty members and graduate students to publish in high quality journals. Graduate students play a key role in research. Increase exposure of graduate students to the research environment through departmental seminars. Establish department research awards for students.
- ◇ Expand or create research areas, including interdisciplinary areas.  
Build awareness of the research performed by other groups. Establish a department retreat at least once a year at which each group will present the progress, trends, and new directions in their field (with examples from top universities worldwide). Create an industry/academic advisory board to visit the Department and advise us on new directions and trends in industry.  
Establish a formal process for joint proposals (e.g. memorandum of understanding among investigators).
- ◇ Improve the research environment in the Department.  
Each research laboratory should have a faculty member in charge as well as a technician overseeing it. The technician doesn't need to be full time and should be paid by research funds. When selecting particular faculty members for funding competitions such as CRCs, discuss the issues with all other faculty and make decisions with fairness to all. Give other faculty members the opportunity to compete.

#### Evaluation Methodology

- National ranking in NSERC Discovery Grants, total NSERC grants, and CFI grants
- Increase in total research funding per faculty member
- Average number of research-oriented graduate students per faculty member
- Number of research chairs held in the Department
- Number of journal papers published annually by the Department
- Number of faculty members who are IEEE or ACM Fellows, etc.

### III ENROLMENT PLANS

#### A. Undergraduate Enrolment Plan

By 2010, our five undergraduate programs (three of them in partnership with other departments in the university) will be fully up and running, yielding a steady state fall enrolment (not including attrition) of about **2220 undergraduate students** (note this is not an FTE number, but rather a fall term enrolment count), including 50% of the software class, 33% of the

nanotechnology class, and 20% of the mechatronics class. By then, we will also have increased the number of international students to represent about 10% of the number of domestic students in each class while keeping the domestic student population the same.

**TABLE 1: Undergraduate First-year Target Plan**

Degree Program	2004/05			2005/06			2006/07			2007/08			2008/09			2009/10		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
Computer	217	7	224	100	10	110	300	30	330	300	30	330	300	30	330	300	30	330
Electrical	115	3	118	200	10	210	See Computer (combines electrical and computer)											
Mechatronics	105	5	110	100	10	110	100	10	110	100	10	110	100	10	110	100	10	110
Nanotechnology				95	5	100	102	8	110	100	10	110	100	10	110	100	10	110
Software	100	4	104	100	5	105	100	7	107	100	10	110	100	10	110	100	10	110

**B. Graduate Enrolment Plan**

By 2010, we expect to have 92 faculty members, of whom four will be lecturers. Hence, assuming an average of five graduate students per faculty member (not including lecturers), the steady state graduate population should be 440. One of our objectives is to increase the number of Canadian/Permanent Resident (CPR) students. The numbers included in Table 2 on the next page are slightly conservative since they do not show a large increase of MEng students. However, the Department is committed to try to revamp and better market the existing MEng program to attract more CPR students.

**TABLE 2: Graduate Enrolment Plan**

Degree Program	2004/05 Actual Fall FTE			2005/06 Actual Fall FTE			2006/07 Projected Fall FTE			2007/08 Projected Fall FTE			2008/09 Projected Fall FTE			2009/10 Projected Fall FTE		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
PhD	82.3	84.0	166.3	99.7	92.0	191.7	105.0	97.0	202.0	115.0	112.0	227.0	122.0	122.0	244.0	135.0	135.0	270.0
Masters -thesis	61.3	26.0	87.3	62.7	40.3	103.0	65.0	45.0	110.0	75.0	50.0	125.0	80.0	55.0	135.0	90.0	62.0	152.0
Masters -coursework	1.0	2.0	3.0			0.0			0.0			0.0			0.0	7.0		7.0
Full-cost Recovery	7.7		7.7	8.0		8.0	5.0		5.0	8.0		8.0	10.0		10.0	12.0		12.0
<b>TOTAL</b>	152.3	112.0	264.3	170.4	132.3	302.7	175.0	142.0	317.0	198.0	162.0	360.0	212.0	177.0	389.0	244.0	197.0	441.0

## IV COMPLEMENT PLAN

### A. Faculty Complement Plan

Currently we have 16.5 faculty positions open in the Department. With the seven positions to be funded through the Faculty's Vision 2010 academic priorities fund (APF) and one retirement, we will have to hire **24.5 faculty** members in the next four years. This is a great challenge and an enormous opportunity.

**TABLE 3: Faculty Complement Plan**

Position Type	Baseline: April 30/06			Faculty to be hired 2006/07	Faculty to be hired 2007/08	Faculty to be hired 2008/09	Faculty to be hired 2009/10	Total Faculty to be Hired 2006/07-2009/10	Total Faculty: April 30/10
	Filled	Open	TOTAL						
faculty positions <sup>1,2,3</sup>	63.5	10.5	74.0	2.0	6.5	3.0		11.5	74.0
> mechatronics	2.0	2.0	4.0	2.0				2.0	4.0
> nanotechnology	3.0	4.0	7.0	1.0			3.0	4.0	7.0
new plan positions	0	7.0	7.0			3.0	4.0	7.0	7.0
<b>TOTAL</b>	68.5	23.5	92.0	5.0	6.5	6.0	7.0	24.5	92.0

**NOTES:**

1. Faculty position hires includes: 1 replacement for an anticipated retirement in 2007/08.
2. Open faculty positions include: 2 quantum computing; 1 security; 3 funded from chair release funds; 4.5 replacements
3. Filled faculty positions include: 1 position filled who will be joining on May 1

Out of the 16.5 original positions listed, a minimum of 1 is still targeted for nanotechnology (3 positions have already been filled in NE), 1 for large area electronics (LSE), 1 for security, 2 for quantum computing. The remaining 11.5 have been left untargeted. Hence, in total, we could target through this exercise 19.5 further positions. As part of this plan, we propose the following:

- Target one position to software engineering (SE)
- Target one position to VLSI/electronics
- Target one position to control/mechatronics (CM)
- Target one position to MEMS
- Target one position to photonics (PH)
- Target two of the positions to signal processing, image processing, and applications (SIP)
- Target two of the positions to computer engineering
- Target one position to analog-mixed signals and integrated circuits design (as part of VLSI)
- Target three more positions to nanotechnology
- This would leave **6.5 positions for opportunistic hiring.**

We do not put any restrictions on the rank at which hiring should be done or on specific timelines for a given area. The 6.5 opportunistic positions will be allocated on the basis of candidate excellence and the Department’s strategic directions.

In summary, out of 24.5 positions, 18 are targeted (see Table 4, below) and 6.5 are left for opportunistic hiring. If a faculty member leaves/retires, there will be no commitment from the Department to replace him/her by someone in the same area. This would be decided by the

Executive Committee after broad consultation. Some of the opportunistic positions could be targeted at any time by the Executive Committee after broad consultation.

**TABLE 4: Faculty Hiring Targets**

Area	NE	QC	Sec	SE	VLSI	CM	MEMS	PH	LSE	SIP	CE
<b>Total Positions</b>	4	2	1	1	2	1	1	1	1	2	2

**B. Staff Complement Plan**

The six new positions (one from the NE program and 5 from the APF) that will be created to support the growth of the Department will be: 1 administrative staff member devoted to communications, 1 technical secretary, 1 computer support staff member, 1 lab instructor, 1 graduate office staff, and 1 technical staff (tbd).

**TABLE 5: Staff Complement Plan**

Position Type	Baseline: April 30/06			Staff to be hired 2006/07		Staff to be hired 2007/08		Staff to be hired 2008/09		Staff to be hired 2009/10		Total Staff to be hired 2006/07- 2009/10		Total Staff: April 30/2010		
	Admin	Tech	TOTAL	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	TOTAL
staff positions	11.5	17.0	28.5											11.5	17.0	28.5
> mechatronics <sup>1</sup>		1.0	1.0						1.0				1.0	0.0	1.0	1.0
> nanotechnology		2.0	2.0							1.0		1.0		1.0	2.0	3.0
new plan positions				2.0	2.0		1.0					2.0	3.0	2.0	3.0	5.0
<b>TOTAL</b>	11.5	20.0	31.5	2.0	2.0	1.0	0.0	0.0	1.0	1.0	0.0	3.0	4.0	14.5	23.5	37.5

**NOTES:**

1. Mechatronics hires include one replacement for an anticipated retirement in 2008/09.

Table 6, below, describes the status and the projections for staff paid on soft money as well as other categories of people not hired through the operating budget.

**TABLE 6: Complement Plan for Positions Funded Outside of the Operating Budget**

Position Type	Baseline: April 30/06			Total Staff: April 30/10		
	Funded by the Department	Funded by Faculty Member(s)	TOTAL	Funded by the Department	Funded by Faculty Member(s)	TOTAL
administrative	2.0	4.0	6.0	2.0	7.0	9.0
technical	2.0	4.0	6.0	2.0	7.0	9.0
post-doctoral fellows		22.0	22.0		35.0	35.0
research associates		6.0	6.0		8.0	8.0
research professors		3.0	3.0		6.0	6.0
visitors			38.0			40.0
active adjuncts			25.0			35.0
<b>TOTAL</b>	4.0	39.0	106.0	4.0	63.0	142.0

## V RESOURCES

The Department is ready to invest in its future by allocating operating budget and targeting all new revenues to its plan.

### A. Budget

We have planned a set of initiatives that will create new revenue streams for the Department. Existing revenue streams will also be increased through our projected growth. All these numbers are projections and some may be more optimistic than others. Several assumptions underlie the budget presented in this section. An important one is that our current operating budget is not cut. Regular updates and changes are to be expected as these assumptions are refined.

#### Increase in Revenue due to New Initiatives

1. **Increasing our international (visa) undergraduate pool:** We expect to increase the number of full fee paying international equivalent undergraduate students substantially, as can be seen in Section III, Table 1. This is not a replacement of domestic students by international students but an addition to the existing classes. The Department is to receive about \$9K per year in tuition fees for each of these additional students. This revenue will be used to upgrade teaching lab equipment and to finance other undergraduate-related activities such as increasing the TA budget.
2. **Creation of a professional master's (MEng) program:** This is yet to be planned in detail. The revenue resulting from this program will be used to create graduate fellowships.
3. **Fundraising:** We do not plan to quantify this fund at this time, but the Department is actively involved in the Faculty's fundraising effort to support a new building and graduate fellowships.

**Increase in Revenue due to Growth**

1. **Graduate expansion:** We assume the government will fund each incremental graduate student who is Canadian or a Permanent Resident (CPR) and that the baseline is going to be 2003/04. We expect that the Department will receive approximately \$10K per year for each incremental CPR student, as well as some capital budget. We also assume that a non-CPR student who becomes a permanent resident will bring the Department \$10K as soon as the change of status is known. We expect the number of research-oriented CPR graduate students to increase from 150 in 2003/04 to about 240 in 2009/10. However, since not all FTE are eligible, we prefer being conservative in our projections (see Table 7). We will use the capital budget to finance the ECE share of the Faculty building plan and the non-capital revenue to finance our proactive campaign to attract exceptional graduate students (includes the creation of graduate fellowships).
2. **Differential Tuition Fee fund:** Increases in tuition fees should increase this fund. We do not plan to quantify this increase at this point.

We expect to increase other sources of revenues such as the federal indirect cost and overhead returns, but those will not have a major impact on the department budget.

Table 7, below, summarizes projected new funding resulting from the initiatives and expansions described above. The last column corresponds to the projected steady state which will be reached in 2012, when we reach a plateau in the number of graduate students and international undergraduate students. Graduate expansion capital budget is not included here. See Section V.B for further details. Table 7 indicates that we project an increase of about \$1M in our operating budget based on the new initiatives discussed above.

**TABLE 7: Projected New Funding**

<b>Funds (in K\$)</b>	<b>2005/06</b>	<b>2006/07</b>	<b>2007/08</b>	<b>2008/09</b>	<b>2009/10</b>	<b>Steady State</b>
Intl u/g students fund <sup>1</sup>	180	360	540	540	540	540
Graduate expansion operating budget <sup>2</sup>	100	150	250	350	500	500
<b>Total</b>	280	510	790	890	940	1040

**NOTES:**

1. These numbers are computed based on the increase of international undergraduate students, taking 2004/05 as a baseline. We received \$247K in 2004/05. These numbers were obtained assuming that some of these students will become CPR before the end of their studies and by being conservative.
2. These numbers are computed taking 2003/04 as the baseline and taking into account that not all FTE are eligible.

A summary of the resources (excluding space and renovations, which are discussed in Section V.B) that are needed to achieve the Department’s Vision 2010 appears below in Table 8.



**TABLE 8: Resources (Excluding Space) Needed**

<b>Resources</b>	<b>Costs in K\$</b>
20.5 commensurate start-up packages <sup>1</sup>	20.5x55=1,128
Upgrades to teaching laboratories and IT equipment for staff <sup>2</sup>	To ramp up to 300 (recurring)
Undergraduate program enhancement <sup>3</sup>	To ramp up to 150 (recurring)
Graduate fellowships fund and proactive recruitment campaign <sup>4</sup>	To ramp up to 700 (recurring)
Research seeding and enhancement <sup>5</sup>	To ramp up to 150 (recurring)
Funds for organizing departmental-wide activities, such as retreats, staff training, social events (for students, staff, faculty, and alumni), and seminar series	To ramp up to 50 (recurring)

**NOTES:**

1. We will hire a minimum of 24.5 new faculty in the plan period. The start-up packages for four of them will come out of the nanotechnology fund. In order to be competitive, we have to offer a start-up package of at least \$85K per faculty member. The Provost and the Faculty currently each contribute \$15K. Hence, we need to find a minimum of \$55K per new faculty member. Part of this amount will hopefully be paid by the Faculty and the Provost. This needs to be negotiated. The rest will be covered by the Department.
2. No major upgrades have happened in the past several years and the ECE teaching labs are in poor condition. In the departmental plan, we indicate what should be done to make our teaching labs commensurate with our reputation. However, this is far more than we can afford on an operating budget and hence we only include in Table 8 what we can afford by using a major part of the increase in revenue resulting from increased international undergraduate enrolment. We also plan to add this to the departmental list of fundraising priorities.
3. Undergraduate program enhancement includes funds to increase the TA-to-student ratio, to organize competitions and seminars for undergraduate students, etc.
4. Our goal is to offer 20 fellowships a year in steady state to attract outstanding graduate students.
5. This includes funds for seed money for new research projects, matching funds for chairs and other research projects, graduate student research awards, incentives, etc.

Table 9, below, summarizes how we plan to spend the new revenues listed in Table 7. The following assumptions were made in creating Table 9:

- The Department will have to pay \$30K for each start-up package.
- Hiring will be done according to the schedule listed in Table 3.
- Each graduate fellowship is \$35K for one year.
- The totals in Table 9 coincide with the totals in Table 7 by construction (we are trying to show how we would spend the extra revenues). Hence if we have more revenues (e.g. by having more CPR graduate students or by creating a professional master's program), we would spend more to reach the goals stated in Table 8. If we receive fewer revenues, we would modify Table 9 accordingly.
- The last column of the table lists our steady state needs for each item as described in Table 8.

**TABLE 9: Timeline for Spending Revenues Listed in Table 7**

<b>Resources (in K\$)</b>	<b>2005/06</b>	<b>2006/07</b>	<b>2007/08</b>	<b>2008/09</b>	<b>2009/10</b>	<b>Steady State</b>	<b>Needs at Steady State</b>
Start-up packages	120	195	180	120	tbd	tbd	tbd
Equipment upgrade	100	150	200	250	300	300	<b>300</b>
U/G program enhancement	30	40	55	75	125	135	<b>150</b>
Research enhancement	20	40	55	70	100	120	<b>150</b>
Graduate fellowships	-	70	280	350	385	455	<b>700</b>
New initiatives and dept activities	10	15	20	25	30	30	<b>50</b>
<b>Total</b>	<b>280</b>	<b>510</b>	<b>790</b>	<b>890</b>	<b>940</b>	<b>1,040</b>	<b>1,350</b>

## **B. Space**

During the departmental planning exercise, the space needs of the Department were discussed. In particular, we tried to quantify the need for renovations of existing space as well as the need for new space to support our planned growth. It was estimated that we require about 12,000 square feet of extra space and \$1,200K for renovations of existing space. The Department took the following steps to solve these two issues:

1. **Renovations:** A set of renovations will be done. Renovation funding is planned assuming that the Provost will match renovations by giving \$2 for each \$1 brought by the Department and \$1 by the Faculty. This cost would then be shared \$300K by the Department, \$300K by the Faculty and \$600K by the Provost. We will stagger the renovations so that we can invest \$100K of the departmental operating budget in each of the next three years to pay for our share of the renovations. If renovations have to be done in a research laboratory, at least 50% of the Department's share of the cost should be covered by the researcher(s)
2. **New space:** The Department is committed to invest in the Faculty initiative on space by allocating \$200K this year and in the next two years to this project.

## **E. Management Sciences**

### **I EXECUTIVE SUMMARY**

The Vision 2010 strategic plan for the Department of Management Sciences mirrors that of the Faculty of Engineering: it is a commitment to improving the quality of our activities. We aspire to be widely recognized as a premier management sciences department in Canada and counted among the leading management sciences departments in North America. To achieve this

aspiration, we wish to take our department, which is well known in Canada for the quality of its graduate programs, and move it forward to establish a unique new undergraduate program in management engineering, to enhance the quality of our graduate education, to increase our research intensity and impact, and to elevate the visibility of our department by increased communications and advancement activities.

The improvements planned for our programs will help us attract and retain excellent faculty and staff, and the enhancement of our external relations efforts will improve the visibility of our activities. Resources to support this growth will come from a combination of the Faculty's Vision 2010 academic priorities fund (APF), new funds created through the proposed undergraduate program, and increased graduate enrolment.

The cornerstone of our plan is to launch an undergraduate engineering program, management engineering, in 2007. The program represents a significant opportunity for the Department to build critical mass in strategic research areas, to increase our capacity to offer high quality graduate programs, and to facilitate growth and impact in our research activities. It is the foundation upon which our other initiatives will be built.

## **II MANAGEMENT SCIENCES STRATEGIC PLAN**

### **GOAL 1 - Establish an Undergraduate Management Engineering Program**

Management Sciences does not currently have an undergraduate degree program, but it does, nevertheless, devote a significant portion of its activities to undergraduate teaching. It offers a designated option in management sciences within the Faculty of Engineering. Our research and academic programs cover the traditional areas of operations research, economics, and organizational behaviour, as well as multidisciplinary areas that reflect the use and impact of information systems, the management of technology, and other emerging cross-functional areas of concern to organizational decision-makers.

- ◇ The primary goal for the Department is to introduce a CEAB accredited management engineering program with an initial annual enrolment of 60 students. The program is unique in Canada, and as such will enhance the Faculty's competitive advantage in terms of offering high quality, innovative, engineering programs.
- ◇ The management engineering program will provide the Department 11 additional faculty members and 4.5 additional staff members by 2011. See Section IV for details.

#### Evaluation Methodology

- Year one enrolment and performance against targets
- Percent female and percent international students
- Student to faculty ratio
- Application, offer, and yield rates
- Entering grade averages
- Percent of entering students with averages over 90 per cent and over 95 per cent

## **GOAL 2 - Build Upon Our Existing Capacity for Quality Graduate Education**

Management Sciences has full degree programs at the graduate level, leading to MMSc (coursework masters), MASc (thesis masters) and PhD degrees. The MMSc program is offered in two formats: an on campus program with classes shared with our other graduate students and MOT@Distance. The MOT@Distance program is a global online education package intended primarily for engineers and scientists who need to deal with technology management in their jobs. Delivery is by an enhanced online learning method, with live tutorials using the online education technologies of the Internet. As of November 1, 2005, the Department had enrolled 167 full and part-time students, 26.3% female, and 15% visa students.

- ◇ It is a priority for Management Sciences to increase its graduate enrolments to move to a level of graduate and research activity commensurate with the leading engineering schools we aspire to be counted among. These students are an integral part of the Faculty aspirations.
- ◇ Total FTE on-campus graduate enrolments will increase from 76 to 127 FTEs by 2010. We aspire to increase on-campus graduate enrolments overall and to increase the number of research students per faculty member toward five over the 2006-2010 period. We intend to accomplish this by increased recruiting efforts (e.g. promotional materials and information sessions for UW students, updated print and web materials, testimonials from graduates), and by developing a financial support mechanism that will use graduate growth funds to assist professors with financial support of students.
- ◇ For MOT@D, we aspire to increase graduate enrolments from 23 to 41 FTEs by 2010. This will entail improvements to the MOT web and print communications, changes to marketing campaigns, and enhancements to curriculum and delivery mechanisms. We will seek more consistent feedback from students and employers to ensure the program is timely and relevant.
- ◇ It is a department priority to increase the quality of its programs to enrich the students' academic experience. To accomplish this goal, it is essential for us to hire the highest quality faculty members and to establish an environment where they have sufficient time to devote to student supervision, research, and teaching activities. We will increase the number of graduate courses offered annually from 16 to 22 over the plan period. The increase in our faculty complement due to management engineering will help us with this goal. In addition, the Department will review its curriculum to assess the depth and variety of courses offered. We will direct students to appropriate courses in other departments and co-ordinate scheduling of our own courses to make best use of Faculty resources.
- ◇ For the MOT@D program, increased quality will be accomplished via an assessment of course materials and delivery mechanisms, increasing the amount and frequency of student and employer feedback, and engaging more faculty members in the Department with the delivery of the program. Toward this goal, we have recently hired a faculty member who is responsible for marketing and promoting the program, as well as working with other faculty to ensure the program's ongoing academic development.

### Evaluation Methodology

- Total and FTE enrolments and performance to target, by program
- Total graduate student applications, by program

- Graduate student to faculty ratio
- Average earnings per funded student
- Percent of full-time graduate students who hold major awards (e.g. NSERC, SSHRC, OGS)
- Total number of graduate courses offered
- Enrolment levels per graduate course
- Course evaluation results

### **GOAL 3 - Develop a Strategic Research Plan**

The Department carries out research in three broad areas: operations research, information systems, and management of technology. Our faculty members attract research funding from both NSERC and SSHRC, making our department somewhat unique in the Faculty. In 2004/2005, total sponsored research funding for Management Sciences was \$280,000. In addition to this we received \$73,000 in Bell University Labs funding, and several researchers in the Department were successful recipients of CFI and MITACS funding as co-applicant. Because the principal investigator was in another department, the figures reported here do not include these amounts but we will do so in future reports.

- ◇ To be recognized as a leading North American department of management sciences, we must make significant strides in our research portfolio. It is vital that we develop critical mass in areas of excellence in order to increase the impact our research has upon our academic communities and society at large. In order to accomplish this, particularly in light of the potential inherent in our upcoming growth, it is imperative that we carefully and clearly define strategic research focus areas in the Department, increase our overall funding levels, and improve interactions with industry. This should be done with the viewpoint of building strong, integrated research groups within the Department and within the Faculty of Engineering as a whole.
- ◇ This goal will be accomplished by establishing a departmental task force charged with developing such a plan in 2006. The task force will assess factors such as societal need, supply of high quality faculty and students, opportunities for funding, and opportunities for interdepartmental collaborations, as well as our existing strengths, weaknesses, opportunities, and threats. Potential application areas for development are health care and energy systems.

#### Evaluation Methodology

- The existence of a written strategic research plan by July, 2006

### **GOAL 4 - Increase our Research Funding and Research Impact**

- ◇ To increase our research impact and our research funding, it will be vital that the Department focus on areas contained within its strategic research plan. Hiring the best faculty and providing them with mentorship and orientation will support our plans. Establishing a means by which faculty have the time to devote to pursuing additional research funds will also be important. The Faculty goal of three teaching tasks per year will go some distance toward this goal, as will providing adequate teaching assistant support for both undergraduate and

graduate courses. Our current teaching load is 4 courses; the introduction of management engineering will permit us to move to an average of 3.5 courses over a five year period.

- ◇ Our goal is to increase funding per faculty member by 40 per cent over the plan period. In 2004/05, our research funding per tenured and tenure-stream faculty member was \$23,533 (including Bell University Labs funding).

#### Evaluation Methodology

- Total number of awards, and total dollar value: (a) contracts (b) grants, (c) tri-council grants, (d) total sponsored research funding
- Total research funding per tenured and tenure-stream faculty member
- Research funding to operating budget ratio

### **GOAL 5 - Increase Interaction with Industry**

Industrial relationships are essential to research success for funding contracts and other forms of industrial research, for programs such as the NSERC partnerships programs and collaborative research and development grants, and for other programs such as Industrial Research Chairs that require industrial support or partners for large grants. A much higher degree of industrial collaboration is required for the Department to improve our research portfolio. A strong set of industry contacts will take time to develop; hence establishing and developing contacts of long term mutual benefit will be key to achieving our goals.

- ◇ Faculty recruitment efforts will not only be linked to our strategic research plan, but will also target mid-career and senior faculty who have an established record of research support and who are comfortable and experienced in developing research projects with industry. They will also be able to mentor younger faculty members to do likewise.
- ◇ The need to increase our interaction with industry goes beyond research or advancement activities; it should reflect the needs and interests of the communities with which the Department interacts. Accordingly, the Department will establish an external advisory board. The board will provide advice to the chair, share its views with the Department, and help the Department connect with its external constituents.
- ◇ We will seek out industry-based projects with graduate students to establish external relationships.
- ◇ We will work to conduct more applied research that is demonstrably of impact to industry.
- ◇ We will seek out opportunity for collaboration with faculty in other departments who have industry contacts.

#### Evaluation Methodology

- Number of industry projects initiated per year (supported or otherwise)
- Number of interdepartmental collaborative industry projects
- Creation of an external advisory board and the frequency of its meetings
- Analysis of the quantity and quality of contacts made with industry each year

### **GOAL 6 - Increase the Quality and Quantity of Information Disseminated to Various Stakeholders about the Department of Management Sciences**

This goal will contribute to our aspirations in that it will raise awareness of and support for Management Sciences' endeavours. An externally-focused and consistent set of communications materials will influence opinions about our reputation and therefore the attractiveness of our programs and activities to potential students, faculty, and research partners. Promoting our successes plays a strong role in enhancing the knowledge others have about what we do and the value we provide.

- ◇ One of the staff positions in the management engineering program will be responsible for external relations: promoting departmental activities, cultivating co-op jobs for management engineering students, and promoting our alumni relations activities.
- ◇ The departmental computing representative will be responsible for co-ordinating an annual review and update of the departmental website materials.
- ◇ We will encourage faculty to be mindful of communications opportunities so that it becomes more a part of departmental culture.

#### Evaluation Methodology

- Date of most recent update to department web pages and print materials
- Traffic to department web sites
- Analysis of the quality and quantity of promotional materials developed each year

### **GOAL 7 - Enhance our Advancement Activities**

The Department recognizes the need for increased philanthropic support and the need to build stronger relationships with its alumni. We are at some disadvantage due to our current lack of industry interaction; however, we should not overlook the potential of alumni from our graduate programs and those who have completed the management sciences option.

- ◇ Establishing an external advisory board and an external relations staff member will assist the Department with enhancing relationships with our constituencies in the next few years. In the short term, we still require considerable support from the Faculty advancement team.
- ◇ To increase its advancement activities, the Department will develop an advancement plan to further the goals of the Department. It should be reviewed annually for appropriateness and relevancy. We have identified space (for growth of our new programs), graduate scholarships, and chaired faculty positions as initial goals (Industrial Research Chairs may be easier to obtain than the endowed chairs we initially identified in our draft plan).
- ◇ We will work more closely with the Faculty advancement team to identify and begin to cultivate possible fundraising prospects. To contribute to this goal we will increase the frequency of alumni events, involve alumni in promoting our programs (e.g. via testimonials), and consider alumni for membership on our advisory board. Within the Department, we must work to heighten awareness of the importance of building these relationships.

#### Evaluation Methodology

- Preparation of written advancement plan by July, 2006
- Results of annual development plan assessments

- Frequency of alumni events and attendance at each
- Total philanthropic contributions
- Number of philanthropic initiatives undertaken annually

### **GOAL 8 – Increase Management Sciences Option Enrolment**

The management sciences option is, by far, the most popular of the Faculty's 11 designated options, accounting for approximately 50% of all options taken. In recent years, up to 20% of graduating engineering students obtain the option. Management Sciences courses may be taken by undergraduate engineering students to help them fulfill their CEAB requirements (whether or not they are registered for the option). As well, a number of Management Sciences courses are taken by students from outside the Faculty of Engineering. Several of our courses have very high enrolments (over 600 students per year); a number of upper year courses have lower enrolments (20-50).

- ◇ The Department aspires to increase enrolments in upper year courses and in the management sciences option overall. This will be accomplished through increased promotional efforts such as in-class presentations, improved website materials, and print advertising, through continued curriculum enhancements, and through increased course variety created by the management engineering program.
- ◇ Demonstrable benefits of the option need to be captured and communicated to students; this will be accomplished by conducting a survey of graduates who will help us quantify how the option improves employment prospects, types of employment option graduates obtain, and if possible any salary benefits from taking the option. Testimonials from successful option graduates can also provide evidence of the option's relevancy.

#### Evaluation Methodology

- Number of graduating students, by department, who obtain the option
- Enrolment in Management Sciences courses at all levels
- Curriculum changes made in each academic year
- Data on demonstrable benefits of taking the option, as collected by survey or other scientific method, updated on a periodic basis



### III ENROLMENT PLAN

**Table 1: Undergraduate First-Year Target Plan**

Degree Program	2004/05			2005/06			2006/07			2007/08			2008/09			2009/10		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
Management										55	5	60	55	5	60	55	5	60

**Table 2: Graduate Enrolment Plan**

Degree Program	2004/05 Actual Fall FTE			2005/06 Actual Fall FTE			2006/07 Projected Fall FTE			2007/08 Projected Fall FTE			2008/09 Projected Fall FTE			2009/10 Projected Fall FTE		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
PhD	10.8	6.0	16.8	17.8	4.0	21.8	18.5	6.2	24.7	22.8	7.6	30.4	27.3	9.1	36.4	31.8	10.6	42.4
Masters -thesis	17.8	6.0	23.8	16.1	7.0	23.1	18.5	6.2	24.7	22.8	7.6	30.4	27.3	9.1	36.4	31.8	10.6	42.4
Masters -coursework	12.5	7.0	19.5	20.8	10.0	30.8	23.8	6.2	30.0	22.8	7.6	30.4	27.3	9.1	36.4	31.8	10.6	42.4
Full-cost Recovery	22.5	0.6	23.1	22.2	0.9	23.1	25.0	1.0	26.0	30.0	1.0	31.0	35.0	1.0	36.0	40.0	1.0	41.0
<b>TOTAL</b>	63.6	19.6	83.2	76.9	21.9	98.8	85.8	19.6	105.4	98.4	23.8	122.2	116.9	28.3	145.2	135.4	32.8	168.2

## IV COMPLEMENT PLAN

### A. Faculty Complement Plan

As of October 1, 2005, the Department included 16 faculty members, plus one open position: 7 full professors, 2 associate professors, 6 assistant professors and 1 lecturer. Two of the 16 faculty are female. Over the plan period, the number of faculty positions will increase by 12 (see Table 3). The increased faculty complement represents a significant opportunity for the Department to build critical mass in strategic research areas, to increase our ability to offer high quality graduate programs, and to begin to reduce teaching loads towards the nominal Faculty goal (three per year). It is key to our aspiration that we hire the best faculty, and provide them with excellent orientation, mentoring, training and recognition opportunities.

**Table 3: Faculty Complement Plan**

Position Type	Baseline: April 30/06			Faculty to be hired 2006/07	Faculty to be hired 2007/08	Faculty to be hired 2008/09	Faculty to be hired 2009/10	Total Faculty to be Hired 2006/07-2009/10	Total Faculty: April 30/10
	Filled	Open	TOTAL						
faculty positions <sup>1,2</sup>	17.0	1.0	18.0	1.0				1.0	18.0
> management <sup>3</sup>	0.0	11.0	11.0	0.0	3.0	3.0	3.0	9.0	9.0
new plan positions <sup>4</sup>	1.0	1.0	2.0	1.0				1.0	2.0
<b>TOTAL</b>	18.0	13.0	31.0	2.0	3.0	3.0	3.0	11.0	29.0

#### NOTES:

1. Open faculty positions include: 1 replacement
2. Filled faculty positions include: Eyton Chair; 1 CRC who will be joining on July 1, 2006
3. Two additional management engineering positions will be hired by 2011
4. New plan positions include: 1 new lecturer position (director of MOT@D) filled before May 1, 2006

#### Evaluation Methodology

- Total faculty and percent female
- Total new faculty members hired, performance to target, and distribution by PhD school
- Number of faculty members who have a PEng designation
- Success rate of offers made

### B. Staff Complement Plan

Our current staff complement paid from operating funds is three full-time administrative support staff, and a portion (40%) of a computing technician. In addition, we have one administrative staff position and the balance of the computing technician (60%) supported by the MOT@D

program, and one research assistant staff position supported by research funding. Over the plan period, staffing levels in the Department will also increase to provide comprehensive support for our new endeavours (see Tables 4a and 4b). With this significant change to staffing in the department, it will be important to carefully plan for new job duties and ensure that the most capable and well trained staff are sought.

**Table 4a: Staff Complement Plan (Operating Budget)**

Position Type	Baseline: April 30/06			Staff to be hired 2006/07		Staff to be hired 2007/08		Staff to be hired 2008/09		Staff to be hired 2009/10		Total Staff to be hired 2006/06- 2009/10		Total Staff: April 30/2010		
	Admin	Tech	TOTAL	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	TOTAL
staff positions	3.0	0.4	3.4											3.0	0.4	3.4
> management <sup>1</sup>						2.0		1.0	1.0	0.5		3.5	1.0	3.5	1.0	4.5
new plan positions				0.5								0.5		0.5	0.0	0.5
<b>TOTAL</b>	3.0	0.4	3.4	0.5		2.0		1.0	1.0	0.5		4.0	1.0	7.0	1.4	8.4

**NOTES:**

1. Administrative staff includes one business development/external relations staff member.

**Table 4b: Staff Complement Plan (Outside - Operating Budget)**

Position Type	Baseline: April 30/06			April 30/10
	Filled	Open	Total	Total
administrative	2.0	0.0	2.0	2.0
technical	0.6	0.0	0.6	0.6
post doctoral fellows	1.0	0.0	1.0	3.0
visitors	0.0	0.0	0.0	4.0
<b>TOTALS</b>	3.6	0	3.6	9.6

Evaluation Methodology

- Total staff
- Total new staff members hired and performance to target
- Staff training opportunities made available and courses taken

## V BUDGET

**Table 5: Management Sciences Plan Budget**

<b>Sources of New Funds (000's)</b>	<b>Base</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Old Graduate expansion	108	108	108	108	108	108
New Graduate Expansion	0	46	184	322	459	551
MOT overheads	65	86	97	114	131	154
<b>Total</b>	<b>173</b>	<b>240</b>	<b>389</b>	<b>544</b>	<b>699</b>	<b>813</b>

<b>Uses of New Funds (000's)</b>	<b>Base</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>From New Graduate Expansion Funding:</b>						
Support to graduate students (1/3 new grad expansion)		15	61	107	153	184
Op. exp. for Mgmt Eng'g (2/3 new grad expansion)		31	122	214	306	367
Set Aside for new building		60	60	60	60	60
Graduate Student support (from 'old' Grad Expansion \$)		70	70	70	70	70
Grad TA's (large classes)		12	15	18	21	25
New Undergrad TA's (help with teaching load)		6	9	12	12	13
Minor renovations		3	5	6	8	9
Research Seminar Series		2	3	4	5	5
Marketing Graduate Programs		5	5	5	5	5
Starter Grants (may need to be funded through cash flow)		45	45	45	60	30
Contingency		5	5	5	5	5
<b>Total New Uses</b>		<b>249</b>	<b>396</b>	<b>542</b>	<b>700</b>	<b>768</b>
<b>Total New Sources less New Uses:</b>		<b>-9</b>	<b>-7</b>	<b>2</b>	<b>-2</b>	<b>45</b>

<b>Flow Through Items: (000's)</b>	<b>Base</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
APF faculty positions (2)	100	200	200	200	200	200
APF staff salary (1/2)	17	17	17	17	17	17
DTF (budget cuts, salary anomalies, tech salary.)	90	90	90	90	90	90

### **NOTES:**

The current departmental operating budget is not included as it remains largely unchanged. The steady-state budget for Management Engineering appears on the next page.

**Table 6: Management Engineering Undergraduate Program Budget**

<b>Summary: Total Revenues</b>	<b>\$3,974,325</b>
UW Overheads (50% of Revenues)	-\$1,987,162
Operating expenses	-\$2,276,737
FOE Overheads (10% of Operating expenses):	-\$227,674
Add Back Revenues from Graduate Expansion (see below Operating Expenses)	\$481,250
<b>Net Revenues (long run)</b>	<b>-\$35,998</b>

<b>Revenues:</b>					
Undergraduate	Intake	Stu-terms/year	Term Tuition		
Domestic Tuition	54	432	<b>\$4,072</b>	(= 8% incr/yr	\$1,759,104
Domestic Grant				for each of 2 yrs)	\$1,648,080
Intl' tuition	6	48	\$11,815		\$567,141
<b>Total Undergraduate Revenue</b>					<b>\$3,974,325</b>

<b>Operating Expenses:</b>	Msci	Other	Tot	Unit Cost	Total
Faculty (includes all faculty)	11	2	13	110,000	\$ 1,430,000
Stipends to other Faculties for teaching (Science 2 tasks, Accounting 1 task)					\$ 50,000
Technical Staff			1	65,000	\$ 65,000
Administrative Staff			2.5	38,000	\$ 95,000
Business Development/External Relations			1	80,000	\$ 80,000
Graduate Student Support (1/3 of new Revenues)					\$ 160,417
Teaching Assistants					\$ 166,320
<b>Total Salaries</b>					<b>\$ 2,046,737</b>
Scholarships	25% of intake		15	2,000	\$ 30,000
Supplies					\$ 75,000
Equipment/Software					\$ 125,000
<b>Total Operating expenses</b>					<b>\$ 2,276,737</b>

## F. Mechanical Engineering

### I INTRODUCTION

The Mechanical Engineering Department aspires to be a centre of excellence for mechanical engineering research and teaching. The Department very consciously made the decision that it wishes to be the best in Canada in both teaching and research. The Department expects that it will be counted among the top mechanical engineering departments in North America.

The Department considered five key support areas in order to achieve its aspirations: space and identity, advancement, research, teaching (undergraduate and graduate), and a much richer and more predictable graduate program. From all of the planning activity, there resulted many recommendations and action items. Many of these require action but not a significant investment of new resources. As a consequence, these will be compiled under separate cover for future action. In some cases the precise action is not clear but will emerge from future discussion and deliberation within the Department. There are, however, five key strategic elements required for the Department to achieve its objectives: developing a departmental identity (a place to call “The Department”); hiring an external relations officer; establishing a research chair; establishing a teaching chair; and developing increased and more structured graduate course offerings. Each of these key strategic elements, and the resources required to implement them, are included in the Department’s strategic plan, below.

## **II MECHANICAL ENGINEERING STRATEGIC PLAN**

### **GOAL 1: Attend to Needs for Space and a Physical Departmental Identity**

- ◇ Provide an area that will easily be identified as, and associated with, the administration of the Mechanical Engineering Department.

The need for a departmental identity is the Department’s highest priority. The Department does not currently have a recognizable place on campus, and this is exacerbated by the fact our faculty and staff are spread across five buildings. We have faculty and/or staff in E2, CPH, CIM, E3, E3X, and a classroom in DWE. To achieve a departmental identity and to provide space needs for future faculty, staff, and graduate students, it is estimated that a minimum of about 7500 square feet of net assignable space will be required. At 60 per cent net assignable space, the cost to create this space is estimated at \$4,000,000. Clearly, this amount of capital is not immediately available. Also, this is a minimum amount and the actual share of a proposed 60,000 net assignable square feet new building would be substantially larger.

- ◇ Increase the net assignable space for Mechanical Engineering.

As noted above, the Department requires a minimum of 7500 square feet, which will include a mix of identity space, faculty office space, research associate and visitor space, graduate student space, and laboratory space. In following the Faculty’s move forward on an initiative to fund a building, Mechanical Engineering plans to contribute \$200,000 per year to the Faculty’s building fund, as outlined in the Faculty plan. We calculate construction can begin on the building in about three years. Alternatively, with a similar leverage for the departmental contribution, a smaller departmental enterprise might be undertaken in three years in the form of renovations and/or building additions. To supply the departmental contributions, the Mechanical Engineering general trust can be used for \$65,000 for each of three years, the equipment fund can be used for \$65,000 for each of two years, returned overhead can be used for \$70,000 for each of the three years, and a third year contribution of \$65,000 will have to be obtained from other departmental resources such as grad expansion (old version) and differential tuition fees.

### Evaluation Methodology

- Total dollars contributed to the Faculty building fund
- Progress toward the creation of a departmental identity

## **GOAL 2: Enhance External Relations Efforts**

To establish Mechanical Engineering at Waterloo as best in Canada, it must be recognized throughout Canada, and more broadly, as the best. This includes recognition by industry, government, professional societies, and other institutions of education. It also requires that research effort, collaboration, volume, and significance are deserving of being the best. For the plan contained within this document to unfold in a meaningful way, tremendous advancement challenges must be met and significant efforts are required to achieve recognition through the promotion of faculty members, research programs, and graduate and undergraduate teaching. The significance and effort required of this activity should not be underestimated. While there are faculty members currently undertaking external relations activities, with considerable success, this is a misuse of resources, expertise, talent, and knowledge. The appropriate level of faculty involvement in external relations is currently being considerably exceeded.

### ◇ Hire an external relations officer.

Currently the department has an advancement officer whose responsibilities include Mechanical Engineering and Systems Design Engineering. However, the reporting line for this officer is to the Dean of Engineering Office; the Department needs a direct reporting structure and accountability in this area. The external relations officer will work closely with the advancement officer and with the research chair (see Goal 3), as advancement activity encompassing philanthropic support and research funding has blurred boundaries. This position will be funded through the Faculty's Vision 2010 academic priorities fund (APF). Support staff and operating resources for this portfolio will also be required.

It is expected the external relations officer will be central to the implementation of the following tactics aimed at enhancing our external relations efforts:

- Developing a Department advancement plan and identifying philanthropic opportunities, in close collaboration with the Faculty's advancement office
- Promoting large Department research initiatives with industry, government, and other academic institutions, to actively market and increase the visibility of the Department and its faculty with industry and government
- Developing a strategy to promote research achievements and recognition

### Evaluation Methodology

- Creation and use of a Department advancement plan
- New philanthropic opportunities identified
- Promotional materials developed
- Industrial and government relationships fostered through the external relations officer

### **GOAL 3: Expand and Enhance the Department's Research Program**

To become the best research department in Canada, we must engage in the highest quality research, attract the highest quality researchers and graduate students, and attract the level of funding that will support world-class research. It is insufficient to rely solely on the professoriate to effect this change. We need to be proactive in seeking out research funding, writing proposals, assisting faculty members with grant and contract applications, and in matching researchers with funding opportunities. We need to provide leadership in research.

◇ Establish a research chair.

A research chair will provide the required leadership, guidance, and assistance in the Department's research activities. While the department chair and the relevant associate chairs provide operational and management leadership for the Department, we require a leader to facilitate research, advocate strong research themes, help establish partnership with industry and government on issues of research grants and contracts, assist with proposal preparation, and identify research opportunities. The research chair will also contribute to strong interaction between the graduate program and our various and several research programs. It is also expected that the research chair would work closely with the external relations officer on matters related to the promotion of our research programs. While the chair will be an administrative faculty appointment, support staff and operating resources will be required for this portfolio.

It is expected the research chair will be central to the implementation of the following tactics aimed at expanding and enhancing our research program:

- Promoting and marketing large and multidisciplinary research initiatives between the Department and industry, government, and other academic institutions
- Working with faculty members to formulate research plans and to help develop, review, and edit grant and contract proposals
- Identifying potential sources of research funding and investigator/industry partnerships in complementary or interdisciplinary research, and developing strategic alliances with external organizations
- Conveying information on research processes and procedures to faculty members
- Co-ordinating with the Faculty and University research offices on all grant programs, research applications, and proposals
- Developing departmental research policies and contributing to discussions on Faculty research policies

#### Evaluation Methodology

- Total supported research funding, by source
- New research partnerships established

### **GOAL 4: Provide Leadership in Teaching Across the Department**

The Department must engage in the highest quality education, attract the highest quality students, and attract funding that will support world-class education. It is insufficient to rely



solely on the professoriate to effect this change. To be the best in the country in education, the Department needs to be proactive and provide leadership in teaching in the undergraduate mechanical engineering and mechatronics engineering programs, in the graduate program, in curriculum development, in curriculum integration, in teaching methods and mentoring, and in laboratory and design development.

◇ Establish a teaching chair.

The teaching chair will provide necessary leadership in teaching to move the Department's teaching portfolio forward to be the best in Canada. The teaching chair will provide leadership, guidance, and assistance in the education activities of the Department, acting as advocate for teaching, teaching innovation, thinking skill development, and curriculum integration in a purely pedagogical context. The teaching chair will not direct teaching or curriculum directions but will facilitate teaching in the Department so that it will have the best education programs in the country. It is expected that the teaching chair will work closely with the research chair and the external relations officer. While the chair will be an administrative faculty appointment, support staff and operating resources will be required for this portfolio.

It is expected the teaching chair will be central to the implementation of the following tactics aimed at providing leadership in teaching:

- Advocating for strong teaching in the Department
- Contributing to class, lab, and project development
- Guiding faculty and teaching staff with the goal of ensuring that each candidate for tenure and promotion has a well-documented and established case for their teaching excellence
- Developing a plan for continual curriculum renewal and, in so doing, leading the integration of curriculum material throughout the Department's programs
- Instituting a comprehensive student and faculty feedback mechanism
- Fostering excellence by nominating faculty and teaching staff for awards, by nominating students for national and international awards, and by taking a leading role in the preparation of the associated dossiers
- Co-ordinating departmental teaching activities with the University's TRACE and LT3 offices

Evaluation Methodology

- Curriculum refinements within and across programs
- Feedback received through student and faculty feedback mechanism(s)
- Number of faculty, teaching staff, and students receiving awards

**GOAL 5: Establish an Expanded and More Predictable Graduate Program**

The mechanical and mechatronics engineering undergraduate programs at Waterloo have a large number of core courses: 24 in mechanical and 27 in mechatronics. The undergraduate programs in mechanical engineering and mechatronics engineering total 44 and 42 courses, respectively. This has a negative impact on the quantity and quality of the graduate program by limiting the available teaching tasks for graduate course offerings, and thereby limiting the number of

graduate courses offered. In addition to the inadequate number of courses currently offered, and partly as a consequence of the inadequate number, the Department is unable to offer a structure and regularity to its graduate program offerings. Without such a regularity and structure, graduate students cannot effectively plan their academic program and progress.

◇ Increase faculty complement in strategic research areas.

To achieve an acceptable graduate program in terms of quantity, quality, and reliability will require additional faculty members to be hired over the plan period. In addition to the need for additional faculty to increase our teaching task and supervisory capacity for graduate studies, and to optimize our graduate course sizes, the Department also has needs in terms of new technology required by a first-rate graduate program. The Department has identified new initiatives and research focus areas to pursue to be the world-class institution that it aspires to be. To that end, five strategic research areas for these hires have been identified: manufacturing, nanotechnology, green energy, fire engineering, and automotive engineering. The manufacturing position is a high priority, due to departmental retirements and teaching needs, and will be advertised first. The others will be spread over the next several years as detailed in Section IV.A.

◇ Offer consistent and increased graduate course offerings.

We will increase the number of graduate courses offered to mechanical engineering students, both within the Department's offerings and from other sources, and provide core graduate course offerings in the five research thrust areas of green energy, automotive engineering, nanotechnology, manufacturing, and fire engineering. We will regularize the graduate course offerings so that students can effectively plan their course selections from the onset of their graduate tenure in the Department.

◇ Increase graduate student activity in academic research.

Graduate students will be encouraged to participate more in academic research through conferences, journal publication, and seminar presentations. One way to encourage graduate students to participate more in the publication arena is to provide travel support for attendance at scholarly conferences. Support in the amount of \$500 per student per year, in conjunction with support from the supervisor, would allow each of the anticipated 128 MASc and 128 PhD students to attend at least one conference per year with the proviso that he or she will be presenting at the conference. This would require a \$128,000 annual budget but would provide great dividends through improved quality of our graduate student product. It would have a secondary, equally important, impact of increasing the quality of graduate student intake through the recruiting benefits resulting from increased visibility due to conference participation.

◇ Improve graduate student supervision.

One activity that faculty members report detracts from research and quality supervision is the time spent editing theses, reports, and papers. While some editing may help clarify research concepts and is thus best performed by the faculty supervisor, much of the editing results from the low level of student writing ability. A departmental staff position in technical writing has been recommended to address this issue. It is envisioned that the technical writer

hired for this position would run writing workshops that all our graduate students would have to complete (somewhat like ExpecTAtions currently run to train teaching assistants) and perhaps provide some one-on-one interaction at the beginning of thesis writing for each student. This activity is consistent with the mandates of the teaching chair and the research chair, described earlier, and could be undertaken as part of their terms of reference.

The efficiency of supervision might also be enhanced by an increase in technician support. Workshops on the use of data acquisition programs (LabView) and one-on-one support for apparatus design are considered very desirable. Such activities would require an additional staff position to allow our current technical staff the time to develop such programs. The result would be less time spent by faculty members trying to co-ordinate graduate student education in laboratory technical practice and would allow our graduate students to perform research more efficiently. This activity is consistent with the mandate of the research chair and could be undertaken as part of his/her terms of reference.

Evaluation Methodology

- New faculty hires and performance against hiring targets
- Graduate enrolment and performance against projections
- Number of graduate courses offered each year and enrolment by class

### III ENROLMENT PLAN

**TABLE 1: Undergraduate First-year Target Plan**

Degree Program	2004/05			2005/06			2006/07			2007/08			2008/09			2009/10		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
Mechanical	183	5	188	180	10	190	180	10	190	180	10	190	180	10	190	180	10	190
Mechatronics	105	5	110	100	10	110	100	10	110	100	10	110	100	10	110	100	10	110

**TABLE 2: Graduate Enrolment Plan**

Degree Program	2004/05 Actual Fall FTE			2005/06 Actual Fall FTE			2006/07 Projected Fall FTE			2007/08 Projected Fall FTE			2008/09 Projected Fall FTE			2009/10 Projected Fall FTE		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
PhD	30.7	13.3	44.0	35.1	23.0	58.1	40.0	26.0	66.0	46.0	29.0	75.0	50.0	33.0	83.0	55.0	36.0	91.0
Masters -thesis	66.8	8.3	75.1	59.1	9.3	68.4	64.0	35.0	99.0	67.0	45.0	112.0	70.0	45.0	115.0	73.0	45.0	118.0
Masters -coursework	27.4		27.4	28.0		28.0	30.0	0.0	30.0	30.0	0.0	30.0	30.0	0.0	30.0	30.0	0.0	30.0
Full-cost Recovery	2.7		2.7	1.5		1.5	3.0	0.0	3.0	5.0	0.0	5.0	5.0	0.0	5.0	5.0	0.0	5.0
<b>TOTAL</b>	127.6	21.6	149.2	123.7	32.3	156.0	137.0	61.0	198.0	148.0	74.0	222.0	155.0	78.0	233.0	163.0	81.0	244.0

## IV COMPLEMENT PLAN

### A. Faculty Complement Plan

In 2006/2007 the Department anticipates hiring two faculty members provided by the Faculty's Vision 2010 academic priorities fund (APF). The first of these is in the area of manufacturing, has been approved, and is currently being advertised. This position is in one of the five research thrust areas and is a critical hire for the Department as three faculty members in this area have retired.

The second, third, and fourth positions in 2006/07 and 2007/2008 will be in the areas of green energy, nanotechnology, and fire engineering. The need for the nanotechnology and fire engineering positions will, to some extent, depend on the success of the

nanotechnology graduate and undergraduate programs and on the success of the CRC being proposed in fire engineering. The final thrust area position in automotive engineering is expected to be filled in 2008/2009.

In addition to the above, there are three grad expansion positions in the faculty complement plan. It remains to be seen if the applicant pool and advertising efforts can support our projected growth in Canadian and Permanent Resident graduate students. However, if this is the case, these three positions will be welcome additions to the Mechanical Engineering complement and would further augment our graduate program offerings.

**TABLE 3: Faculty Complement Plan**

Position Type	Baseline: April 30/06			Faculty to be hired 2006/07	Faculty to be hired 2007/08	Faculty to be hired 2008/09	Faculty to be hired 2009/10	Total Faculty to be Hired 2006/07-2009/10	Total Faculty: April 30/10
	Filled	Open	TOTAL						
faculty positions <sup>1,2</sup>	34.0	1.0	35.0	1.0				1.0	35.0
> mechatronics	8.0	3.0	11.0	1.0	2.0			3.0	11.0
> management	0.0	1.0	1.0			1.0		1.0	1.0
new plan positions	0.0	5.0	5.0	2.0	2.0	1.0		5.0	5.0
> grad expansion <sup>3</sup>	0.0	3.0	3.0			1.0	2.0	3.0	3.0
<b>TOTAL</b>	42.0	13.0	55.0	4.0	4.0	3.0	2.0	13.0	55.0

**NOTES:**

1. Open faculty positions include: 1 replacement
2. Filled faculty positions include: 2 positions who will be joining on May 1
3. Grad expansion positions include: 3 positions that will be funded by the Department, dependent on graduate expansion funds

## B. Staff Complement Plan

**TABLE 4: Staff Complement Plan (from operating funds)**

Position Type	Baseline: April 30/06			Staff to be hired 2006/07		Staff to be hired 2007/08		Staff to be hired 2008/09		Staff to be hired 2009/10		Total Staff to be hired 2006/07- 2009/10		Total Staff: April 30/2010		
	Admin	Tech	TOTAL	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	TOTAL
staff positions	7.0	11.6	18.6											7.0	11.6	18.6
> mechatronics	2.0	2.0	4.0		1.0		1.0						2.0	2.0	4.0	6.0
new plan positions <sup>1,2</sup>				2.0	2.0	2.0	1.0					4.0	3.0	4.0	3.0	7.0
<b>TOTAL</b>	9.0	13.6	22.6	2.0	3.0	2.0	2.0					4.0	5.0	13.0	18.6	31.6

**NOTES:**

1. New plan positions do not include one administrative position for WatCAR, which will be located in Mechanical Engineering
2. New plan positions include three positions that will be funded by the Department, which may increase to four, dependent on cash flow

**TABLE 5: Staff Complement Plan (from outside operating funds)**

Position Type	Baseline: April 30/06			Total Staff: April 30/10		
	Funded by the Department	Funded by Faculty Member(s)	TOTAL	Funded by the Department	Funded by Faculty Member(s)	TOTAL
administrative	1.0	1.0	2.0	1.0	1.0	2.0
technical		9.0	9.0		10.0	10.0
post-doctoral fellows <sup>1</sup>		8.0	9.0		15.0	15.0
research professors		1.0	1.0		2.0	2.0
visitors <sup>2,3</sup>		10.0	19.0		15.0	15.0
active adjuncts <sup>4</sup>	1.0		24.0			25.0
<b>TOTAL</b>	2.0	29.0	64.0	1.0	43.0	69.0

**NOTES:**

1. One PDF is not funded
2. Nine visitors are not funded through the University
3. One visitor is funded by the Dean for a sessional
4. Twenty-three active adjuncts are not funded

## V BUDGET

The Department has been allocated five faculty positions and five staff positions, one of which is dedicated to the WATCAR activity, from the APF. In addition to the above, the Department has approximately \$200,000 of continuing cash flow (including a Differential Tuition Fee contribution for fiscal 2006/2007).

This value includes three main contributions:

1.	Differential Tuition Fees	
	Current NET after ALL budget cuts	\$ 00,000
2.	Grad Expansion Fund (old, GREO)	\$100,000
3.	NSERC Indirect Costs	\$100,000
	TOTAL	\$200,000

The differential tuition fees, while a net zero above, are included because as we go forward the new tuition increases that have been allowed by the Province will again provide a moderate contribution to this cash flow, as will the flow through to steady state of the mechatronics engineering program.

The departmental ongoing budget, exclusive of the new grad expansion allocations, will be largely used for staff hires in support of the various initiatives in the Department. It is anticipated that this departmental cash flow will fund three staff members (in addition to those provided by the APF), and will provide operating funds for the research chair, teaching chair, and external relations officer.

If the grad expansion for CPR students can be realized, there will be an additional \$315,000 in the long-term steady state. This will be used to fund additional faculty positions, to help support graduate students, and to provide scholarships in support of the maintenance of increased participation by CPR graduate students. This enterprise is contingent on the success of the CPR recruitment exercise.

## G. Systems Design Engineering

### I INTRODUCTION

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.

Graduates from the Systems Design Engineering undergraduate program should, at graduation, be competent at design, analysis, synthesis, communication (written, spoken and graphical/visual), and the interpretation of analytical, numerical and experimental results; educated citizens who can contribute to the social, political, and economic life of Canada.

Graduates from the Systems Design Engineering graduate program should be intellectually creative and rigorous and should be able to recognize and seek elegance in problem formulation and synthesis. They should enhance the reputation of the Department in conferences, in the workplace, and in academic contexts.

The Systems Design Engineering self-study raised a large number of issues needing examination and addressing. In particular, five stand out:

1. Undergraduate recruitment to address dropping application rates
2. The loss of focus and direction of the undergraduate program
3. Fragmentation and lack of a critical mass in some research areas
4. A lack of and an uneven distribution of graduate courses
5. Fragmented, inferior, and insufficient space

## **II SYSTEMS DESIGN ENGINEERING STRATEGIC PLAN**

### **A. Undergraduate Recruitment**

#### **GOAL A1 - Improve Undergraduate Recruitment, as Measured by the Number of Applicants per Place and the Quality of Those Applicants**

- ◇ Improving our recruitment results is strongly coupled to the planned changes in our undergraduate program; changes which are, in part, designed to bolster our recruitment of high quality applicants. Additionally, greater recruiting efforts through contact with high schools are planned.

#### Evaluation Methodology

- Number of applicants per place
- Percentage of applicants with high school averages greater than 95 per cent
- Percentage of applicants with high school averages greater than 90 per cent
- Acceptance rates on offers
- Acceptance rates on offers made to students with high school averages greater than 95 per cent
- Acceptance rates on offers made to students with high school averages greater than 90 per cent
- Entering grade averages
- Number of students with major external awards



## **B. Undergraduate Program**

**GOAL B1 - Graduate People Competent at Design, Analysis, Synthesis, Communication, and the Interpretation of Analytical, Numerical, and Experimental Results; People Who Will be Educated Citizens Who Can Contribute to the Social, Political, and Economic Life of Canada**

**GOAL B2: Make Design the Dominant, Overarching Theme of the Undergraduate Program**

**GOAL B3: Revise the Curriculum to Make it Relevant and Exciting to High Calibre Applicants**

- ◇ Just as our recruitment results depend on our undergraduate program the converse is also true: the planned revisions to our undergraduate program have as one of their goals an increase in the size and quality of the applicant pool. The Department was founded as the Department of Design and over the years we have kept that notion as part of our undergraduate activity. While we have more design-related courses in our curriculum than many other engineering departments, there is ample room to improve. It is the Department's intention to re-establish our primacy as a department committed to teaching engineering design; to that end our long term goal is to make design the dominant, overarching theme of the undergraduate program. At the same time, we remain committed to a systems-level view of engineering: our design education will be focused primarily on teaching good design methodology, practices, evaluation, and management and less on the minute design issues associated with very specific and specialized engineering disciplines. The Department's commitment to being design centric must be understood to mean "design of systems" as opposed to a more narrow or focused view of engineering design.
- ◇ The principal tenets of the revision process will be to establish visible and meaningful connections between courses (both within and across terms) and to create connections between the lecture courses and the design courses. We will bring more design into the engineering science courses, particularly adding design elements to the undergraduate laboratory components, and bring more engineering science into the design courses, requiring design projects to integrate and build on course material. To further enhance our design offerings we plan to introduce a design course into second year. Specifically we will introduce, with co-operation and participation from the Centre for Society, Technology, and Values, a compulsory Society and Design course into the second year curriculum. The remainder of the design courses will be organized into a coherent progression with clear milestones and objectives for each course. We have an agreement in principle to collaborate with the School of Architecture whereby they provide us with experienced design instructors whose primary focus is teaching design methodologies, principles, evaluation, and documentation. In return we are committed to provide them with engineering courses, yet to be determined, of interest to their students. Collaborative design projects between systems design engineering students and architecture students have also been discussed.
- ◇ We propose to modify our elective structure, committing ourselves to having a well defined coherent and co-ordinated set of electives that can, within the undergraduate program,

provide a depth of knowledge and experience or a breadth of knowledge to facilitate free inquiry and independent thinking.

- ◇ The Department has a long history of activity in human factors engineering and we are committed to expanding our undergraduate and graduate program activities in this field. Specifically, we intend to expand our focus to include elements of biomedical engineering that are consistent with the other activities in the Department. We believe that this will attract more high quality high school applicants to Systems Design Engineering.
- ◇ Similarly, the Department has an additional focus on system analysis, modeling, simulation, and design. We aim to offer our undergraduates the opportunity of preliminary exposure to systems analysis ideas, methods, and tools covering topics such as multi-agent decision making, game theory, design optimization, conflict resolution, stochastic and discrete system modeling, and remote sensing, to name a few. At present this field is understaffed and it captures attention in our hiring plan.

#### Evaluation Methodology

- In the belief that there is demand for quality, the measures used to assess our recruitment efforts will to a large degree also measure our progress toward improving our undergraduate program.
- Student success/failure/attrition rates
- Number of students in a cohort who go on exchange
- Co-op placement rates
- International co-op placement rates

### **C. Research**

#### **GOAL C1 - Focus Departmental Research into Well-Identified Core Competencies and Revise the Structure of Our Research Activities to Explicitly Acknowledge That Researchers may be Working in Multiple Disciplines, Some Methodological and Some Application Oriented**

#### **GOAL C2 - Increase Research Intensity and Productivity**

- ◇ The departmental research fields are organized and identified in a manner that is irregular, excessively divided, and out of date. This creates problems in forming meaningful departmental divisions and ambiguities in individual affiliations, and it presents a confusing impression to prospective graduate students, negatively affecting recruitment. The intent of the reorganization of the research activities is to provide a clearer picture of the research within the Department for recruiting purposes and to foster a healthier research environment. Revising the structure of our identified research areas will resolve this.
- ◇ The overall research output of a department is, in large measure, a determinant in the department's overall presence and reputation. For this reason, and in pursuit of an overall goal of increasing research intensity, we are setting a target of five graduate students per faculty member. As we currently already exceed four students per faculty this goal is within reach. However, approximately 20 per cent of our graduate students currently have no office or desk, and with research space in very short supply and an intention to increase the number

of faculty members, the graduate student target will not be attainable without additional space (see Section II.E).

#### Evaluation Methodology

- Graduate student application rates

Notoriously difficult to measure, improvements in research intensity and productivity may be assessed annually by:

- Number of journal paper pages accepted per dollar of research funding per faculty member
- Number of conference paper pages accepted per dollar of research funding per faculty member
- Number of thesis program graduate students (FTE) supervised per faculty member
- Number of applications per faculty member received for thesis-based graduate degrees

### **D. Graduate Program**

#### **GOAL D1 - Increase the Number of Graduate Courses Regularly Offered to 20**

#### **GOAL D2 - Educate Graduate Students who Enhance the Reputation of the Department in Conference, Workplace, and Academic Settings**

#### **GOAL D3 - Increase Graduate Student Enrolment**

- ◇ It is our vision that all graduates from the Systems Design Engineering graduate program should be intellectually creative and rigorous, and that they should be able to recognize and seek elegance in problem formulation and synthesis.
- ◇ The number of graduate courses to offer is a subtle matter, requiring a balance between three competing criteria: the need to limit, to three, the number of courses taught by a faculty member each year; a desire for undergraduate electives and course variety; and a desire for graduate electives and course variety. As a target, the Department seeks to have a total of 20 graduate courses at the 600-level, more or less evenly distributed across the research fields. The plan is to improve our graduate course offerings both in terms of quantity and quality.

#### Evaluation Methodology

- Number of graduate courses regularly offered per year
- Number of external prizes, scholarships, and awards to graduate students (e.g. NSERC, CIHR, SSHRC, OGS) received during the year per FTE thesis-based graduate student
- Number of graduate student applications
- Graduate student enrolment, compared to projections
- Graduate student to faculty ratio

### **E. Space**

#### **GOAL E1 - Finance and Build Our Own Dedicated Departmental Building**

## GOAL E2 - Do the Best Possible With What We are Provided Through the Faculty Space Plan

- ◇ The Department is disadvantaged in almost all aspects of space. Our long-term goal is highly ambitious: to build a dedicated building of the highest quality, very carefully designed to consider the needs of an interdisciplinary undergraduate program, supporting significant design elements, and with the foresight and flexibility to support future research needs. Because this building is not associated with a significant expansion of our current program or introduction of a new undergraduate program, it is likely ineligible to receive significant government funding. The working assumption therefore is that most of the money has to be raised through fundraising. A fundraising committee has been established and a campaign is underway.

### Evaluation Methodology

- Total pledges and donations received for the building

## III ENROLMENT PLAN

### A. Undergraduate Enrolment Plan

There is no realistic opportunity to grow our undergraduate enrolment over the next five years. With the Faculty's recent introduction of three new programs and, correspondingly, a growing first year admission target for the Faculty with a nearly static applicant pool, we are struggling to maintain our current class size and quality. Our undergraduate enrolment chart is shown in Table 1. Our annual target is 90 students comprised of an unspecified mix of Canadian/PR and International students that will yield the highest quality students regardless of status.

**Table 1: Undergraduate First-Year Target Plan**

Degree Program	2004/05			2005/06			2006/07			2007/08			2008/09			2009/10		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
Systems Design	90		90	90		90	90		90	90		90	90		90	90		90

### B. Graduate Enrolment Plan

Our graduate enrolment plan, shown in Table 2 (next page), is based primarily on maintaining our current graduate student to faculty member ratio and adding additional students as new faculty are hired.

**Table 2: Graduate Enrolment Plan**

Degree Program	2004/05 Actual Fall FTE			2005/06 Actual Fall FTE			2006/07 Projected Fall FTE			2007/08 Projected Fall FTE			2008/09 Projected Fall FTE			2009/10 Projected Fall FTE		
	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL	Canadian/PR	International	TOTAL
PhD	32.9	13.0	45.9	28.5	10.0	38.5	31.0	11.0	42.0	34.0	13.0	47.0	36.0	15.0	51.0	38.0	16.0	54.0
Masters -thesis	32.0	5.0	37.0	23.8	10.0	33.8	27.0	13.0	40.0	29.0	15.0	44.0	31.0	16.0	47.0	33.0	18.0	51.0
Masters -coursework					0.3	0.3	1.0	1.0	2.0	2.0	2.0	4.0	5.0	2.0	7.0	8.0	2.0	10.0
Full-cost Recovery																		
<b>TOTAL</b>	64.9	18.0	82.9	52.3	20.3	72.6	59.0	25.0	84.0	65.0	30.0	95.0	72.0	33.0	105.0	79.0	36.0	115.0

## IV COMPLEMENT PLAN

### A. Faculty Complement Plan

**Table 3: Faculty Complement Plan**

Position Type	Baseline: April 30/06			Faculty to be hired 2006/07	Faculty to be hired 2007/08	Faculty to be hired 2008/09	Faculty to be hired 2009/10	Total Faculty to be Hired 2006/07-2009/10	Total Faculty: April 30/10
	Filled	Open	TOTAL						
faculty positions <sup>1,2</sup>	18.3	4.0	22.3	3.0	1.0			4.0	21.3
> mechatronics	4.0	0.0	4.0						4.0
new plan positions	0.0	2.0	2.0		1.0	1.0		2.0	2.0
<b>TOTAL</b>	22.3	6.0	28.3	3.0	2.0	1.0		6.0	27.3

#### **NOTES:**

1. Open faculty positions include: 3 replacements currently open, and 1 replacement that is bridged to a retirement
2. Filled faculty positions include: 2 CSTV faculty, and a 0.3 joint appointment with another Faculty

**Faculty Position Hires 2006/2007:** [1] This position is due to the Department in return for surrendering a Tier II Canada Research Chair. This position will be used to add a faculty member to the human factors engineering area. [2] These positions are to be used to replace two of the faculty members who transferred to ECE in 2004. One of the positions will be used to increase the faculty complement in the societal and environmental systems area and the other will be used to either restore our faculty complement in the intelligent systems and software area or to take advantage of a unique opportunity to add to the human factors engineering area.

**Faculty Position Hires 2007/2008:** [1] This position is to be used to replace one of the faculty members who transferred to ECE in 2004. This position will be used to increase the faculty complement in the human factors engineering area with specific focus on biomedical engineering applications. A candidate has been identified and depending on his availability this position may be changed with one of the faculty position hires in 2006/2007. Therefore it may be that, depending on the hiring outcomes from 2006/2007, this position will go to restore our complement in the intelligent systems and software area.

**New Plan Position Hires 2007/2008:** [1] This position will be used to restore the faculty complement in the intelligent systems and software area. This position is to be fully funded from the Faculty's Vision 2010 academic priorities fund (APF). Tentatively, a second position will be added in the human factors engineering area with specific focus on biomedical engineering applications and in an area that is complementary to the faculty position that is to be filled this

year (possibly in 2006/2007). A qualified female candidate has been identified. This position will be funded partially by NSERC, partially by the Provost, and partially by the Department.

**Faculty Position Hires 2008/2009: [-1]** A retirement from the physical systems and mechatronics area is anticipated this year but will not be replaced because there is an existing appointment bridged to that retirement.

**New Plan Position Hires 2008/2009: [1]** This position will be used to increase the faculty complement in the societal and environmental systems area. The position is to be funded from the APF.

**B. Staff Complement Plan**

The proposed increase in the number of faculty positions necessitates corresponding hires in the departmental staff complement. In particular, an increase in the number of faculty and graduate students requires additional overall support from a departmental secretary, and the increase in research activity and the heightened design content at the undergraduate level will require additional technical support, as shown in Table 4.

**Table 4: Staff Complement Plan**

Position Type	Baseline: April 30/06			Staff to be hired 2006/07		Staff to be hired 2007/08		Staff to be hired 2008/09		Staff to be hired 2009/10		Total Staff to be hired 2006/07- 2009/10		Total Staff: April 30/2010		
	Admin	Tech	TOTAL	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	Admin	Tech	TOTAL
staff positions	4.5	4.0	8.5											4.5	4.0	8.5
> mechatronics					1.0								1.0		1.0	1.0
new plan positions				1.0								1.0		1.0		1.0
<b>TOTAL</b>	4.5	4.0	8.5	1.0	1.0							1.0	1.0	5.5	5.0	10.5

**New Plan Position Hires 2006/2007: [1]** New secretary (research support) position to be funded from the APF.

**New Mechatronics Hires 2006/2007: [1]** New technician (computer support) position to be funded from the mechatronics program budget.

## **V BUDGET**

The non-salary portion of our departmental budget is reported in Table 5, next, where the numbers represent thousands of dollars. The row labeled “Draw on Carry Forward” represents where the values are positive, the need to spend some of the Department’s financial reserves and, where the values are negative, a growth in the Department’s financial reserves. The costs of moving to a new building have not been accounted for here.



**Table 5: Systems Design Plan Budget**

	<b>Budget Year 2006/2007</b>	<b>Budget Year 2007/2008</b>	<b>Budget Year 2008/2009</b>	<b>Budget Year 2009/2010</b>
	(\$1,000)	(\$1,000)	(\$1,000)	(\$1,000)
<b>Expenses</b>				
Department Operations	55	57	58	60
Start-up Grants	60	40	20	20
Undergraduate Teaching Support	14	14	15	15
Undergraduate Competition Project Support	5	5	5	5
Undergraduate Support -- Other	3	3	3	3
TA Budget Supplement	14	14	15	15
Grad Student Conference Travel Subsidy	6	7	7	7
Graduate Financial Assistance	27	28	29	29
Estimated Budget Reduction	91	130	131	132
<b>Total Expenses</b>	<b>272</b>	<b>294</b>	<b>279</b>	<b>285</b>
<b>Revenue</b>				
Operating Budget	39.3	40.5	41.7	43
Indirect Research Support	49.7	51.2	52.8	54.4
DTF (Net)	54.9	56.6	58.3	60.0
Graduate Expansion Funding	73.1	75.3	77.6	79.9
<b>Total Estimated Operating</b>	<b>217</b>	<b>223.6</b>	<b>230.3</b>	<b>237.2</b>
Estimated Overhead	26.0	30.0	33.0	36.3
Foreign Undergraduate Fees	8.5	8.5	8.5	8.5
Grad Growth	0	1	71	141
Draw on Carry Forward	20.2	30.8	-64.0	-139.0
<b>Total Revenue</b>	<b>271.7</b>	<b>293.8</b>	<b>278.8</b>	<b>284.1</b>

## **VI APPENDIX A: FACULTY OVERVIEW**

### **Faculty of Engineering Description**

The University of Waterloo began with engineering: almost 50 years ago, enterprising teachers of engineering and basic science built a single laboratory, constructed a pair of prefabricated classrooms, and began providing university education for 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 system in Canada – designed to give students practical experience.

From 75 students taught in tin-roofed classrooms, the Faculty of Engineering has grown into a multi-faceted engineering school with seven academic departments, home to more than 200 faculty, 1000 graduate, and 5000 undergraduate students. Over 27,000 alumni have made their mark in industry, academe, and the public sector, both in Canada and around the world.

Our undergraduate program, Canada's largest and best, offers degrees in a wide range of engineering disciplines, including chemical, civil, electrical, computer, environmental, geological, mechanical, mechatronics, nanotechnology, software, and systems design, and in architecture. The Faculty is now recognized internationally for our co-op program, in which all undergraduates alternate between four-month academic and work terms. This hands-on experience makes students leaders both on campus and off: Engineers without Borders was founded here, and teams of students are consistently among the frontrunners in national and international engineering and design competitions.

The Faculty of Engineering is also home to an active and growing graduate student community: more than a thousand exceptional students learn, teach, work, and research here. Each of our seven departments offers graduate programs; there are more than two dozen programs in all. Graduate students at Waterloo study with world-renowned experts, work in state-of-the-art laboratories, and fuel the University's drive to expand the frontiers of knowledge and technology.

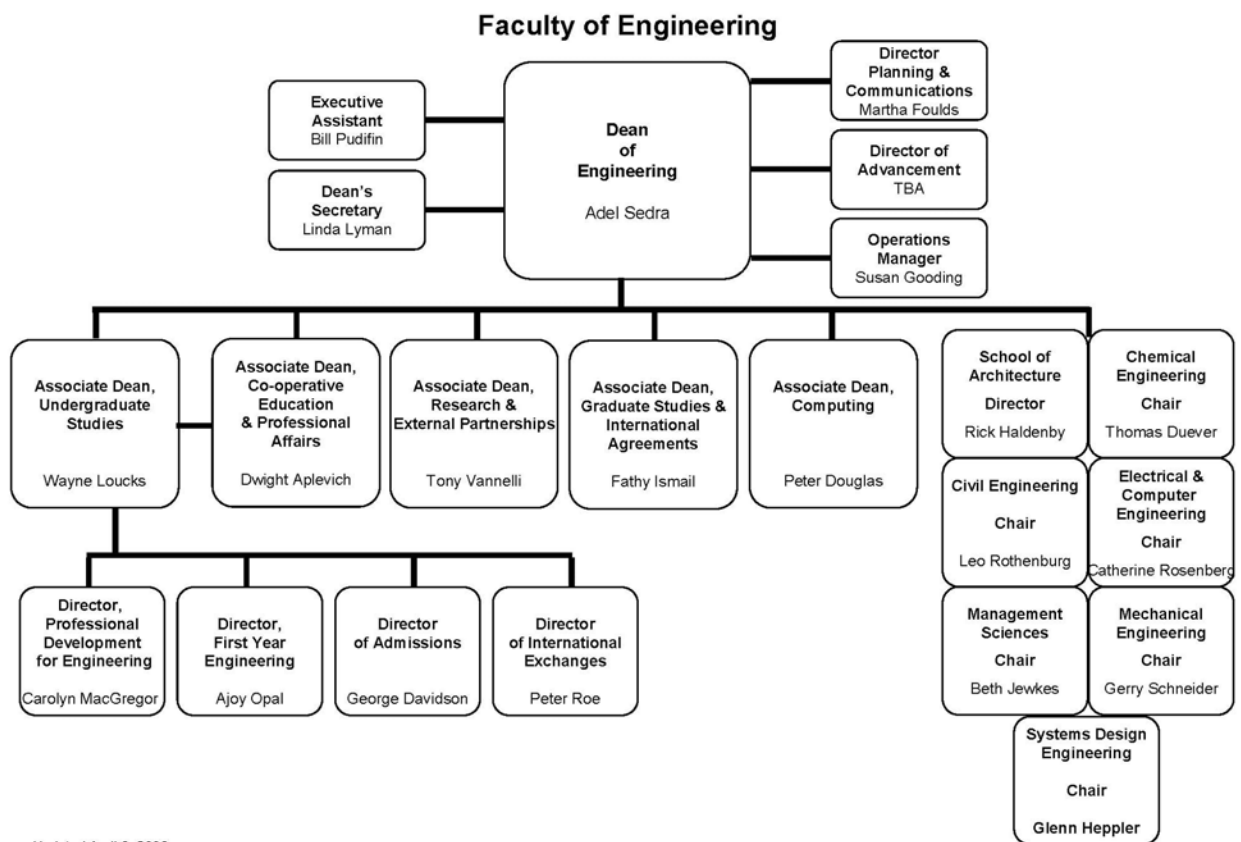
Waterloo Engineering faculty members work to generate new knowledge through research and to disseminate that knowledge through teaching. They have an impressive record of achievement that includes 14 Canada Research Chairs, 20 Premier's Research Excellence Awards, six Early Researcher Awards, six NSERC industrial 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. We recognize that our faculty are the key to our quality, and we are working to attract more of the best and brightest.

Much has changed since 1957, but our outward-looking philosophy of education has not. The Faculty of Engineering still works to integrate research with education, providing students hands-on experience with a solid academic foundation. The research done here benefits people today and shapes the future. We are proud of our reputation for leadership, innovation, and excellence, which has earned Waterloo Engineering recognition as a premier engineering school.

## Faculty of Engineering 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.

## Faculty of Engineering Organization Chart



Updated April 6, 2006

## **VI APPENDIX B: PLANNING MATERIALS**

### **Engineering Planning Committee Membership**

#### Chair

Adel Sedra, dean of engineering

#### Members

Wayne Loucks, associate dean engineering undergraduate studies

Dwight Aplevich, associate dean co-operative education and professional affairs -from March/06

Fathy Ismail, associate dean graduate studies and international agreements

Tony Vannelli, associate dean research and external partnerships

Hector Budman, associate dean engineering computing -to June 30/05

Peter Douglas, associate dean engineering computing -from July 1/05

Rick Haldenby, director, school of architecture

Tom Duever, chair, chemical engineering

Leo Rothenburg, chair, civil engineering

Catherine Rosenberg, chair, electrical and computer engineering

Beth Jewkes, chair, management sciences

Gerry Schneider, chair, mechanical engineering

Glenn Heppler, chair, systems design engineering

Bill Pudifin, executive assistant, engineering

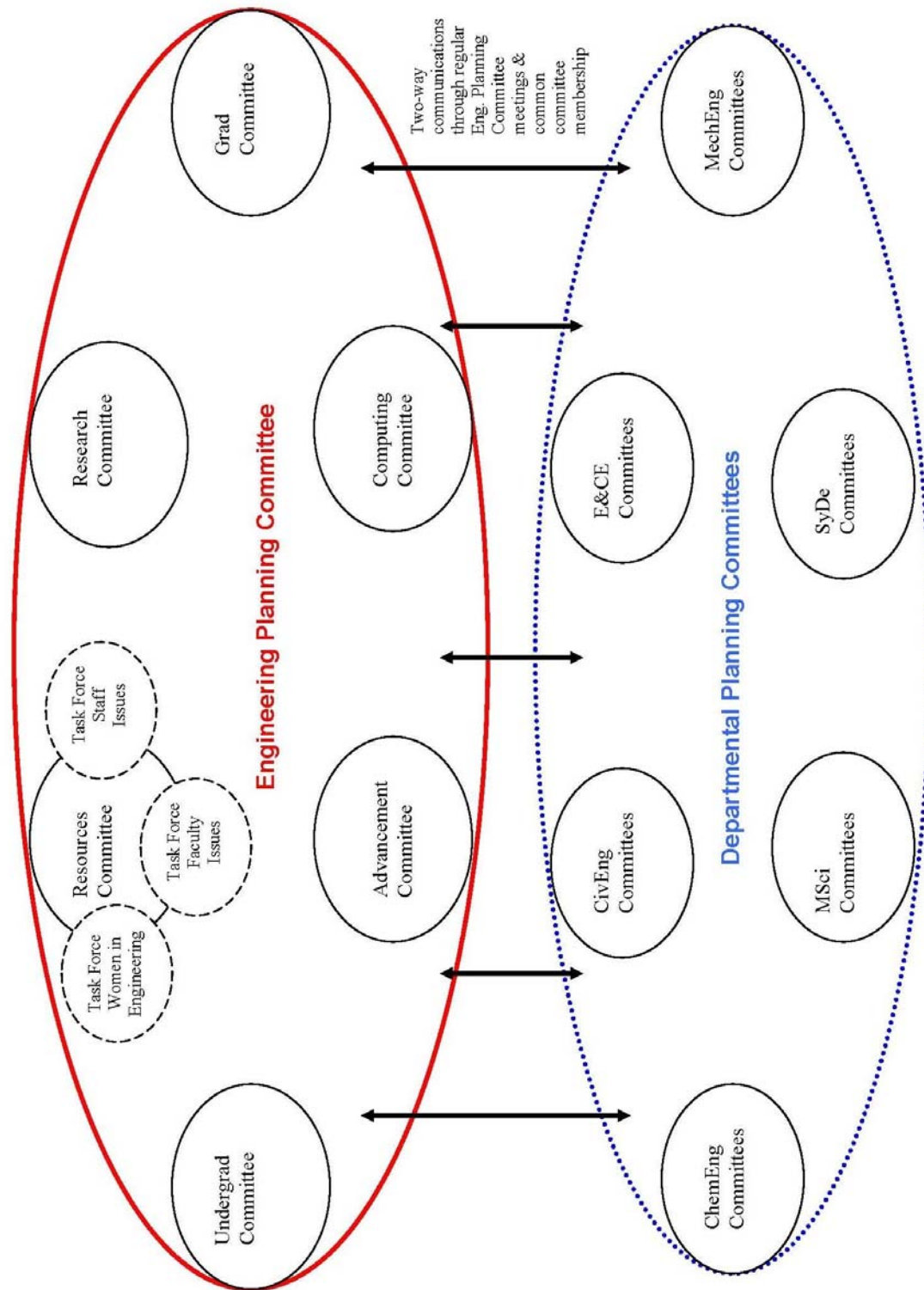
Tim Tribe, director of advancement, engineering

Martha Foulds, director of planning and communications, engineering

#### Secretary

Jane McGeoch, executive secretary, engineering

# Engineering Planning Committees: Structure and Integration



## **Engineering External Assessors, 2005/06**

### Engineering Computing: April 5-7, 2005

- ◇ Bill Burkhard, Director  
Electronic and Computer Services, College of Engineering, Penn State University
- ◇ Derek McCammond, Professor Emeritus  
University of Toronto

### Chemical Engineering: May 6-8, 2005

- ◇ John Grace, Professor  
Chemical and Biological Engineering, University of British Columbia
- ◇ Ronald Rousseau, Professor  
Chemical and Biomolecular Engineering, Georgia Institute of Technology
- ◇ Dale Seborg, Professor  
Chemical Engineering, University of California – Santa Barbara

### Electrical and Computer Engineering: June 8-10, 2005

- ◇ Tyseer Aboulnasr, Professor  
Information Technology and Engineering, University of Ottawa
- ◇ Pramod Khargonekar, Dean  
College of Engineering, University of Florida
- ◇ Safwat Zaky, Professor and Vice-Provost  
University of Toronto

### Systems Design Engineering: June 19-21, 2005

- ◇ Don Brown, Professor and Chairman  
Systems and Information Engineering, University of Virginia
- ◇ Yu-Ling Cheng, Professor and Chair  
Engineering Science, University of Toronto
- ◇ Clive Dym, Director  
Centre for Design Education, Harvey Mudd College

### Civil Engineering: June 20-22, 2005

- ◇ Eric Hall, Professor and Department Head  
Civil Engineering, University of British Columbia
- ◇ Chris Hendrickson, Professor and Department Head  
Civil and Environmental Engineering, Carnegie Mellon University
- ◇ Andrew Scanlon, Professor and Department Head  
Civil and Environmental Engineering, Penn State University

Mechanical Engineering: July 19-21, 2005

- ◇ George Dieter, Professor Emeritus  
Mechanical Engineering, University of Maryland
- ◇ Leroy “Skip” Fletcher, Deitz Professor and Regents Professor  
Mechanical Engineering, Texas A&M University
- ◇ Patrick Oosthuizen, Professor  
Mechanical and Materials Engineering, Queen’s University

Management Sciences: July 26-28, 2005

- ◇ Eldon Gunn, Professor  
Industrial Engineering, Dalhousie University
- ◇ Lawrence Seiford, Professor and Chair  
Industrial and Operations Engineering, University of Michigan

Faculty of Engineering: May 8-10, 2006

- ◇ Pradeep Khosla, Dean  
Carnegie Institute of Technology, Carnegie Mellon University
- ◇ Maria Klawe, Dean  
School of Engineering and Applied Science, Princeton University
- ◇ Gilles Patry, President and Vice-Chancellor  
University of Ottawa

## **VI APPENDIX C: SUPPORTING DOCUMENTS**

The following departmental documents are available for viewing in each department and in Engineering Computing. Interested parties may contact the appropriate departmental main office to make arrangements:

- ◇ Self study
- ◇ Draft plan

The following documents are available for viewing in the Dean's Office. Interested parties may contact Jane McGeoch (519-888-4567, ext. 7798) to make arrangements:

- ◇ Report of the task force on undergraduate admissions and first year engineering
- ◇ Engineering exchange office review report
- ◇ Graduate studies draft plan
- ◇ Research draft plan
- ◇ Advancement draft plan
- ◇ Engineering space plan

The following public documents are available on the planning web site at [www.engineering.uwaterloo.ca/Vision2010](http://www.engineering.uwaterloo.ca/Vision2010):

- ◇ Staff issues task force report and response from the dean
- ◇ Faculty issues task force report, supplemental report, and response from the dean
- ◇ Women in engineering task force report and response from the dean



## **VI APPENDIX D: BASELINE DATA**

### Faculty Data

Total Faculty, 2005: (a) by department & gender | (b) by department & rank  
New Faculty, 2003-2005: (a) by department & gender | (b) by department & PhD school  
New Faculty, 2005: (a) by department & gender | (b) by department & PhD school

### Staff Data

FTE Staff, 2005: (a) by department & gender | (b) by department & type  
FTE Staff (outside operating budget), 2005: (a) by department & type  
Faculty:Staff Ratios, 2005

### Undergraduate Student Data

Undergraduate Enrolment, 2005: (a) by program & gender | (b) by program & visa status  
Undergraduate Degrees Awarded, 2005: (a) by program & gender  
Undergraduate Students:Faculty Ratio, 2005  
Staff:Undergraduate Student Ratios, 2005  
Undergraduate Year One New Admissions Performance to Target, Fall 2005

### Graduate Student Data

Graduate Enrolment, 2005: (a) by department & gender | (b) by department & visa status |  
(c) by department & degree  
Graduate Degrees Awarded, 2005: (a) by department & gender | (b) by degree  
FTE Graduate Enrolment, 2005  
Graduate Students:Faculty Ratio, 2005  
Staff:Graduate Student Ratios, 2005

### Research

Total Sponsored Research Funds, 2004/05  
Total Contracts Awarded, 2004/05  
Total Grants Awarded, 2004/05  
Total NSERC Grants Awarded, 2004/05  
Total Tri-Council Grants Awarded, 2004/05  
Total Sponsored Research Funds:Faculty Ratio, 2004/05  
Total Sponsored Research Funds:Operating Budget Ratio, 2004/05

### Advancement

Alumni with Valid Addresses, 2005  
Alumni Donating to the University of Waterloo, 2005  
Alumni Attending Class Reunions, 2005  
Engineering Endowments, 2004/05  
Total Donations, 2004/05  
Engineering Annual Giving Statistics, 2004/05  
Architecture Annual Giving Statistics, 2004/05

### Women in Engineering

Women in Engineering, 2005: (a) women in engineering disciplines | (b) women in architecture

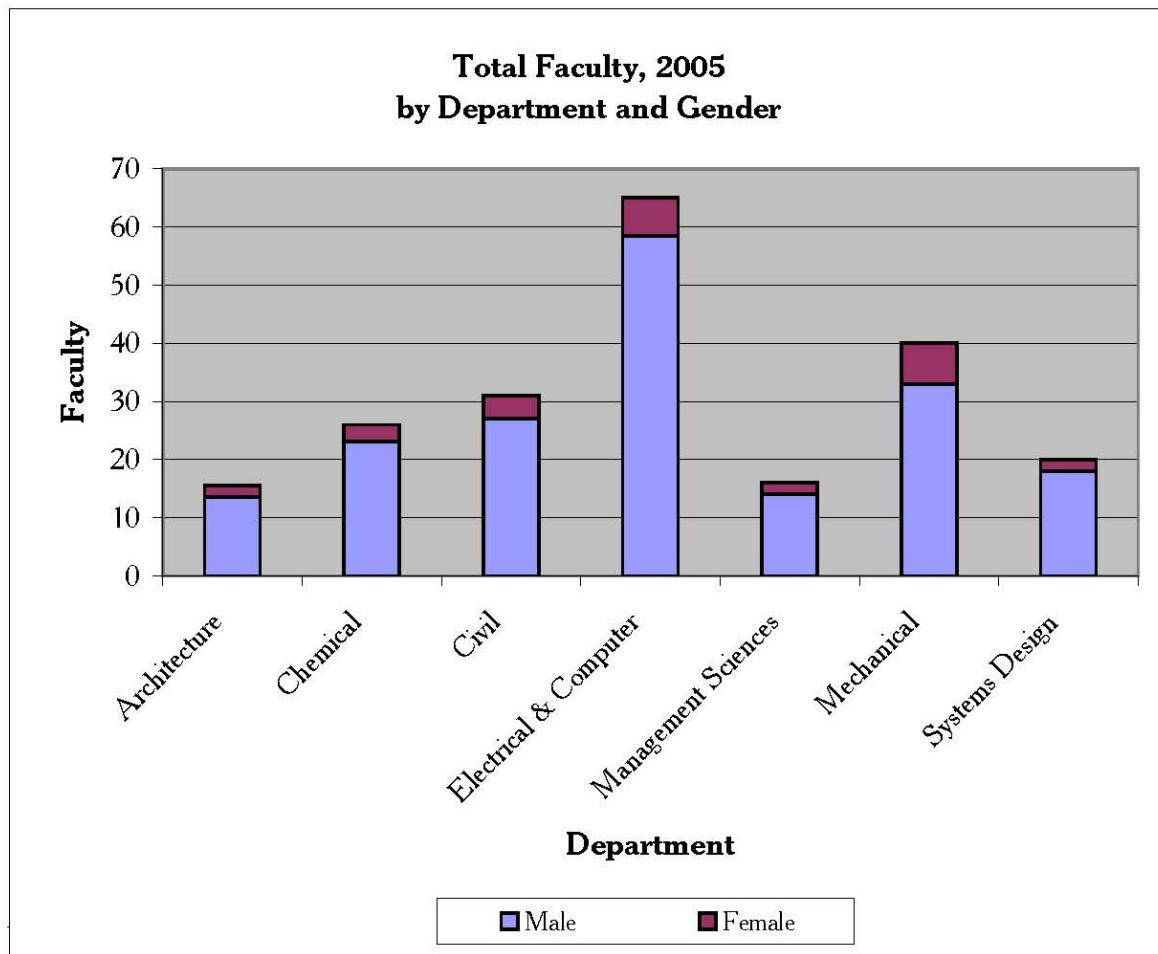
## Total Faculty, 2005

October 1, 2005 count date; excludes research professors and visitors

(A) by department and gender

Program	Male	Female	Total	% Women
Architecture	13.5	2	15.5	12.9%
Chemical	23	3	26	11.5%
Civil	27	4	31	12.9%
Electrical & Computer	58.5	6.5	65	10.0%
Management Sciences	14	2	16	12.5%
Mechanical	33	7	40	17.5%
Systems Design	18	2	20	10.0%
Support Unit Offices	2	0	2	0.0%
<b>TOTAL</b>	<b>189</b>	<b>26.5</b>	<b>215.5</b>	<b>12.3%</b>

**NOTE:** 1. Systems Design includes 2 Centre for Society, Technology, and Values faculty



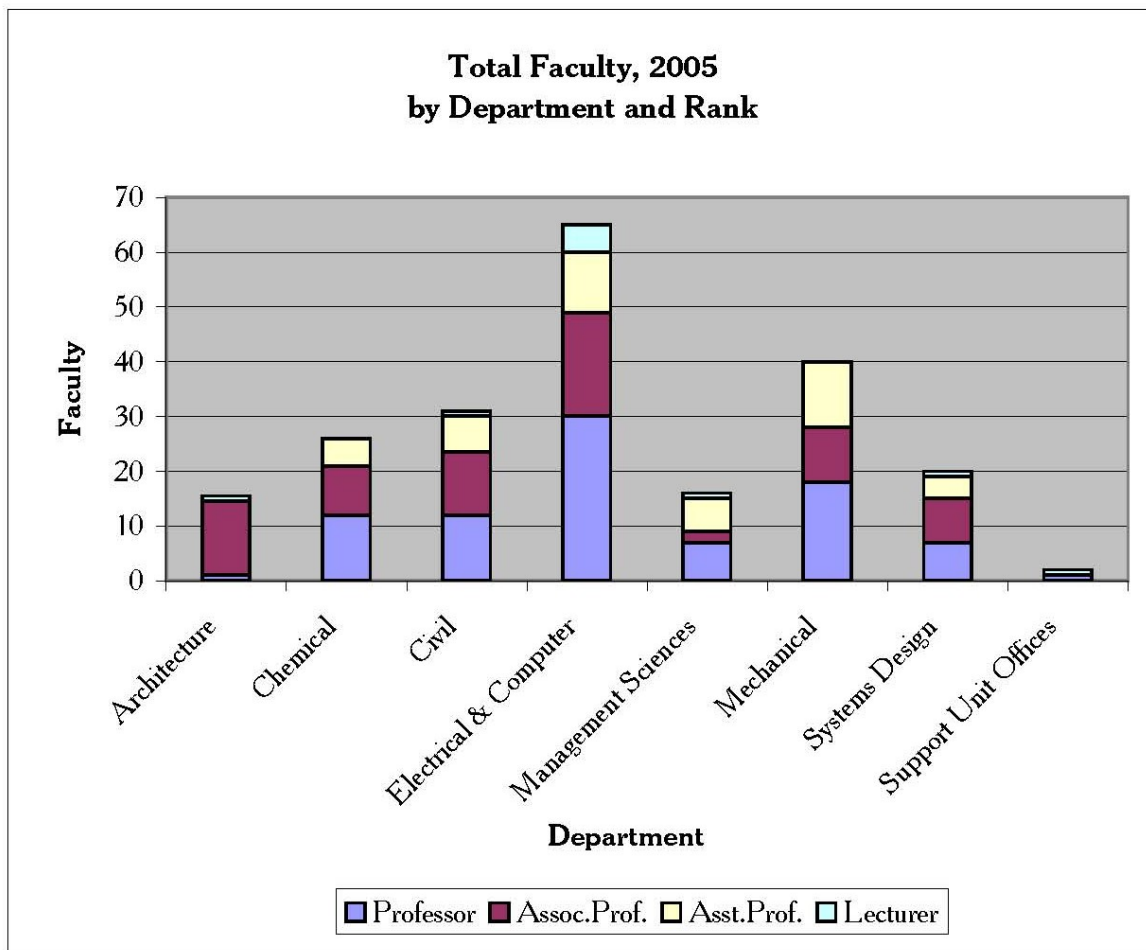
## Total Faculty, 2005

October 1, 2005 count date; excludes research professors and visitors

(B) by department and rank

Program	Professor	Assoc.Prof.	Asst.Prof.	Lecturer	Total
Architecture	1	13.5	0	1	15.5
Chemical	12	9	5	0	26
Civil	12	11.5	6.5	1	31
Electrical & Computer	30	19	11	5	65
Management Sciences	7	2	6	1	16
Mechanical	18	10	12	0	40
Systems Design	7	8	4	1	20
Support Unit Offices	1	0	0	1	2
<b>TOTAL</b>	<b>88</b>	<b>73</b>	<b>44.5</b>	<b>10</b>	<b>215.5</b>

**NOTE:** 1. Systems Design includes 2 Centre for Society, Technology, and Values faculty



## New Faculty, 2003-2005

Tenured and tenure-stream faculty hired during calendar years 2003, 2004, 2005

(A) by department and gender

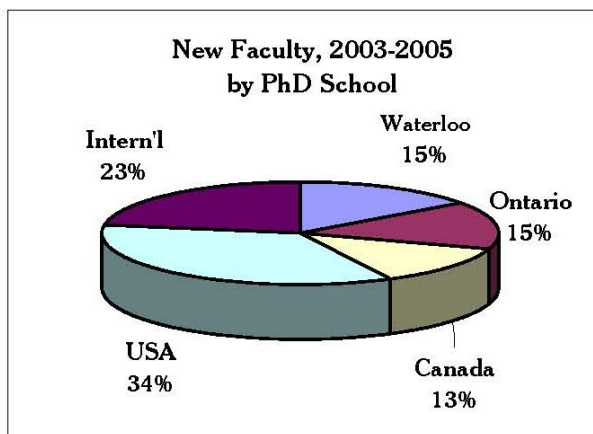
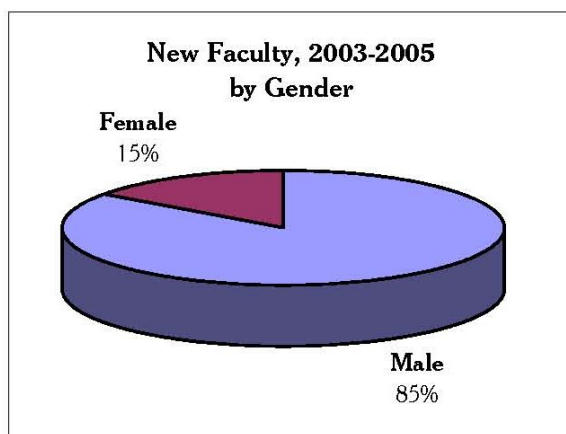
Program	Male	Female	Total	% Women
Architecture	0	0	0	0.0%
Chemical	4	0	4	0.0%
Civil	7	0	7	0.0%
Electrical & Computer	9	1	10	10.0%
Management Sciences	4	0	4	0.0%
Mechanical	7	5	12	41.7%
Systems Design	3	0	3	0.0%
<b>TOTAL</b>	<b>34</b>	<b>6</b>	<b>40</b>	<b>15.0%</b>

## New Faculty, 2003-2005

Tenured and tenure-stream faculty hired during calendar years 2003, 2004, 2005

(B) by department and PhD School

Program	Waterloo	Ontario <sup>1</sup>	Canada <sup>2</sup>	USA	Intern'l	Total
Architecture	0	0	0	0	0	0
Chemical	0	0	0	4	0	4
Civil	2	0	1	4	0	7
Electrical & Computer	1	2	0	2	5	10
Management Sciences	2	0	0	2	0	4
Mechanical	1	2	3	2	4	12
Systems Design	0	2	1	0	0	3
<b>TOTAL</b>	<b>6</b>	<b>6</b>	<b>5</b>	<b>14</b>	<b>9</b>	<b>40</b>



**NOTES:** 1. Ontario excludes University of Waterloo  
2. Canada excludes Ontario

## New Faculty, 2005

Tenured and tenure-stream faculty hired during calendar year 2005

(A) by department and gender

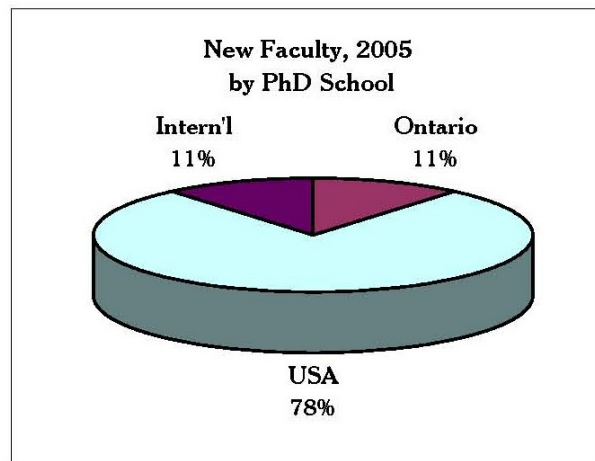
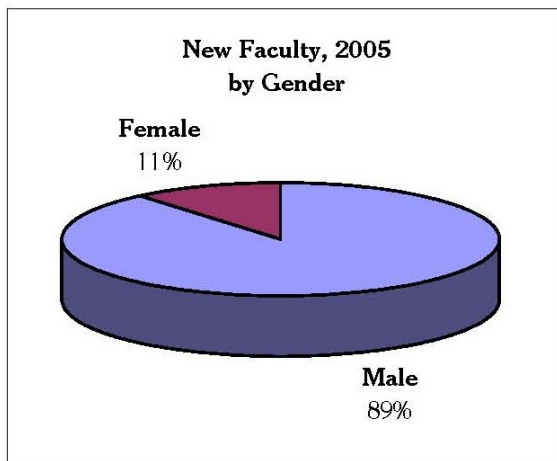
Program	Male	Female	Total	% Women
Architecture	0	0	0	0.0%
Chemical	1	0	1	0.0%
Civil	3	0	3	0.0%
Electrical & Computer	3	0	3	0.0%
Management Sciences	1	0	1	0.0%
Mechanical	0	1	1	100.0%
Systems Design	0	0	0	0.0%
<b>TOTAL</b>	<b>8</b>	<b>1</b>	<b>9</b>	<b>11.1%</b>

## New Faculty, 2005

Tenured and tenure-stream faculty hired during calendar year 2005

(B) by department and PhD School

Program	Waterloo	Ontario <sup>1</sup>	Canada <sup>2</sup>	USA	Intern'l	Total
Architecture	0	0	0	0	0	0
Chemical	0	0	0	1	0	1
Civil	0	0	0	3	0	3
Electrical & Computer	0	1	0	1	1	3
Management Sciences	0	0	0	1	0	1
Mechanical	0	0	0	1	0	1
Systems Design	0	0	0	0	0	0
<b>TOTAL</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>7</b>	<b>1</b>	<b>9</b>



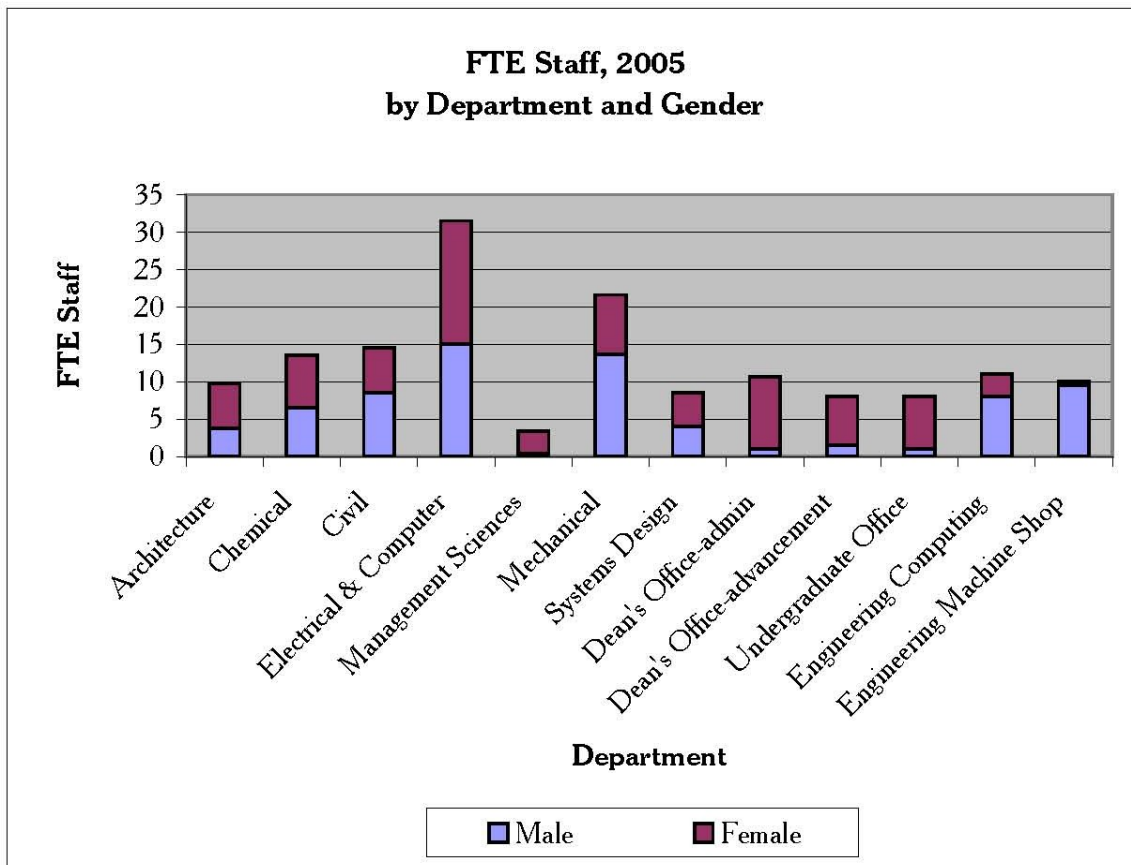
**NOTES:** 1. Ontario excludes University of Waterloo  
2. Canada excludes Ontario

## FTE Staff, 2005

October 1, 2005 count date of full-time equivalent positions paid from the operating budget

(A) by department and gender

Program	Male	Female	Total	% Women
Architecture	3.7	6	9.7	61.9%
Chemical	6.5	7	13.5	51.9%
Civil	8.5	6	14.5	41.4%
Electrical & Computer	15	16.5	31.5	52.4%
Management Sciences	0.4	3	3.4	88.2%
Mechanical	13.6	8	21.6	37.0%
Systems Design	4	4.5	8.5	52.9%
Dean's Office-admin	1	9.7	10.7	90.7%
Dean's Office-advancement	1.5	6.5	8.0	81.3%
Undergraduate Office	1	7	8.0	87.5%
Engineering Computing	8	3	11.0	27.3%
Engineering Machine Shop	9.5	0.5	10.0	5.0%
<b>TOTAL</b>	<b>72.7</b>	<b>77.7</b>	<b>150.4</b>	<b>51.7%</b>

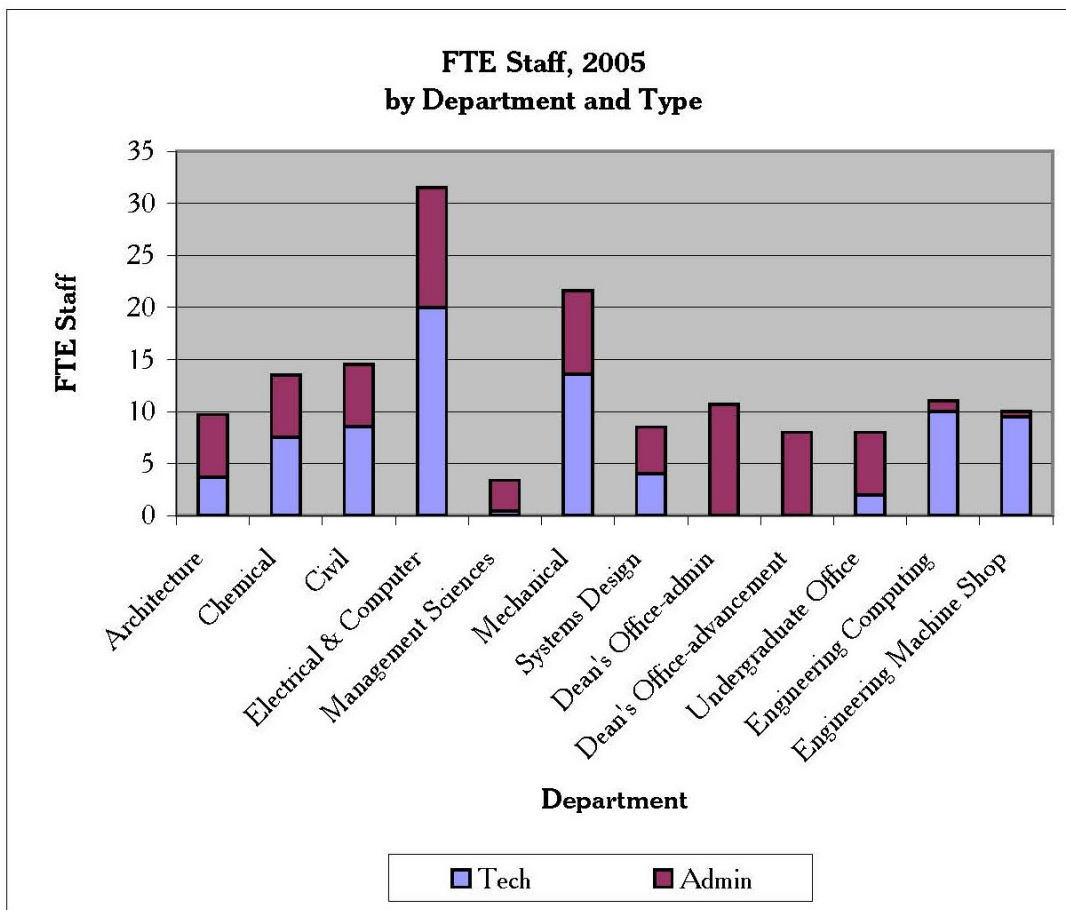


## FTE Staff, 2005

October 1, 2005 count date of full-time equivalent positions paid from the operating budget

(B) by department and type

Program	Tech	Admin	Total
Architecture	3.7	6	9.7
Chemical	7.5	6	13.5
Civil	8.5	6	14.5
Electrical & Computer	20	11.5	31.5
Management Sciences	0.4	3	3.4
Mechanical	13.6	8	21.6
Systems Design	4	4.5	8.5
Dean's Office-admin	0	10.7	10.7
Dean's Office-advancement	0	8	8
Undergraduate Office	2	6	8
Engineering Computing	10	1	11
Engineering Machine Shop	9.5	0.5	10
<b>TOTAL</b>	<b>79.2</b>	<b>71.2</b>	<b>150.4</b>

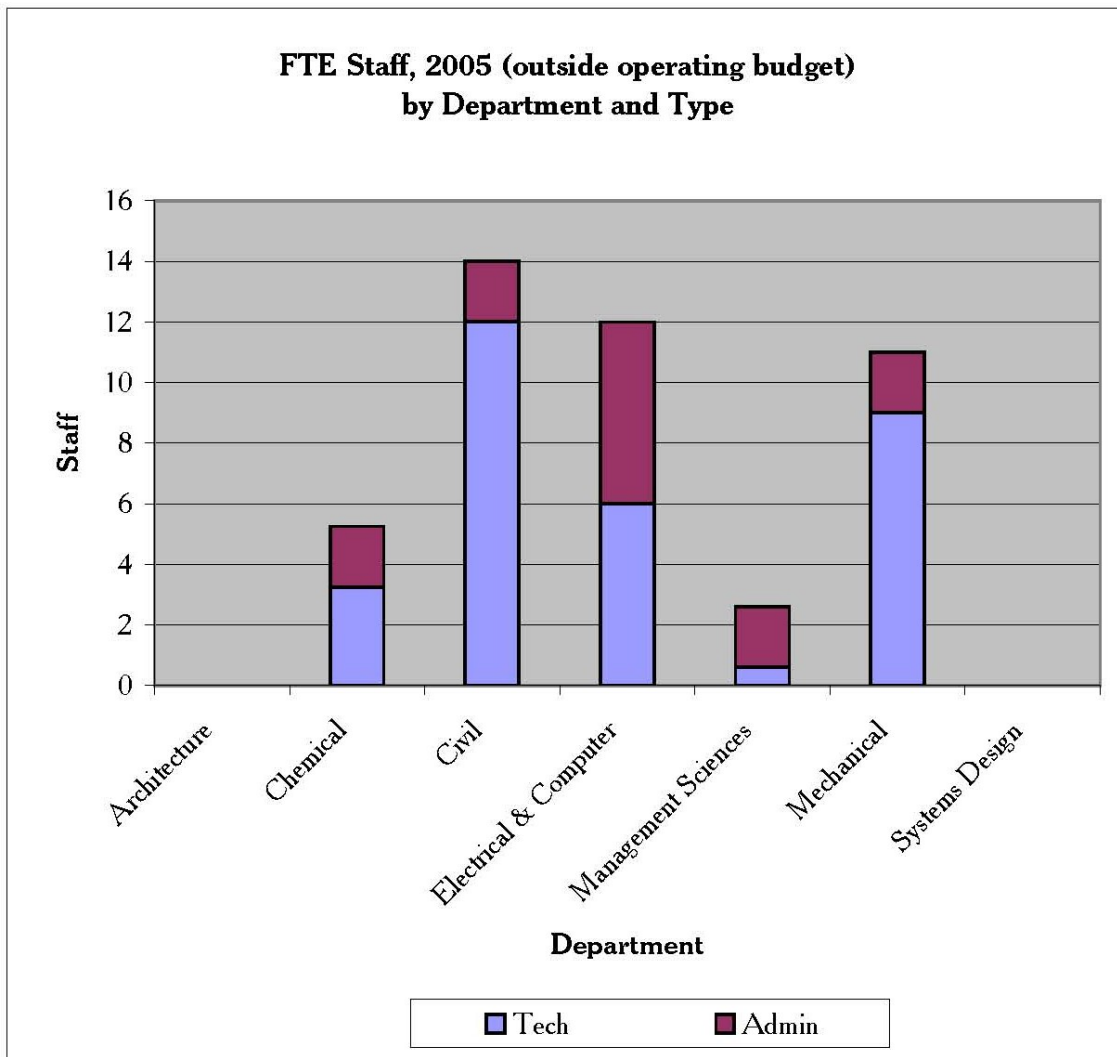


## FTE Staff (outside operating budget), 2005

October 1, 2005 count date of full-time equivalent positions paid outside operating budget

(A) by department and type

Program	Tech	Admin	Total
Architecture	0	0	0
Chemical	3.25	2	5.25
Civil	12	2	14
Electrical & Computer	6	6	12
Management Sciences	0.6	2	2.6
Mechanical	9	2	11
Systems Design	0	0	0
<b>TOTAL</b>	<b>30.85</b>	<b>14</b>	<b>44.85</b>





## Faculty:Staff Ratios, 2005

FTE staff paid from operating budget to tenured and tenure-stream faculty; as of October 1, 2005

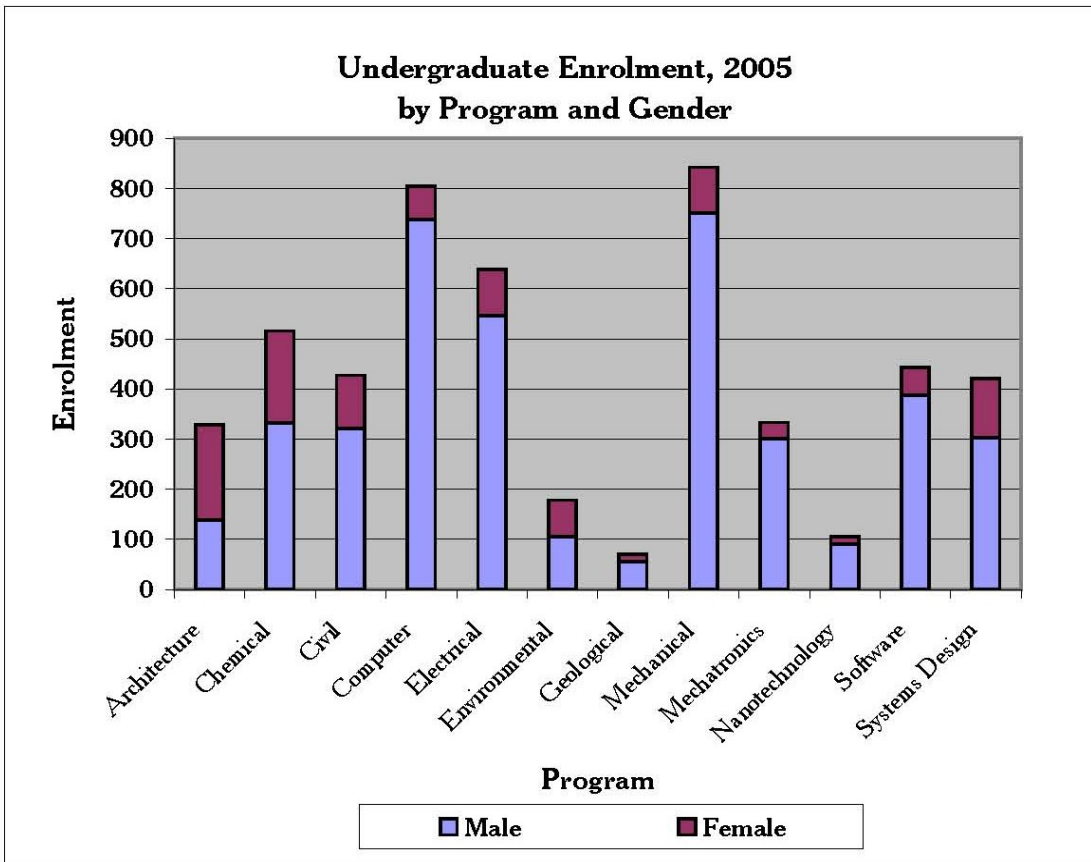
Degree Program	Admin Staff	Tech Staff	Total Staff	Total Faculty	Ratios		
					Faculty to Admin Staff	Faculty to Tech Staff	Faculty to Total Staff
Architecture	6	3.7	9.7	14.5	2.42	3.92	1.49
Chemical	6	7.5	13.5	26	4.33	3.47	1.93
Civil	6	8.5	14.5	30	5.00	3.53	2.07
Electrical & Computer	11.5	20	31.5	60	5.22	3.00	1.90
Management Sciences	3	0.4	3.4	15	5.00	37.50	4.41
Mechanical	8	13.6	21.6	40	5.00	2.94	1.85
Systems Design	4.5	4	8.5	19	4.22	4.75	2.24
Support Units	26.2	21.5	47.7	1	n/a	n/a	n/a
<b>TOTAL</b>	<b>71.2</b>	<b>79.2</b>	<b>150.4</b>	<b>205.5</b>	<b>2.89</b>	<b>2.59</b>	<b>1.37</b>

## Undergraduate Enrolment, 2005

November 1, 2005 count date, including students on official co-op work term

(A) by program and gender

Program	Male	Female	Total	% Women
Architecture	139	190	329	57.8%
Chemical	332	184	516	35.7%
Civil	321	106	427	24.8%
Computer	737	68	805	8.4%
Electrical	545	94	639	14.7%
Environmental	105	73	178	41.0%
Geological	55	15	70	21.4%
Mechanical	751	91	842	10.8%
Mechatronics	300	33	333	9.9%
Nanotechnology	91	15	106	14.2%
Software	388	55	443	12.4%
Systems Design	303	118	421	28.0%
<b>TOTAL</b>	<b>4067</b>	<b>1042</b>	<b>5109</b>	<b>20.4%</b>

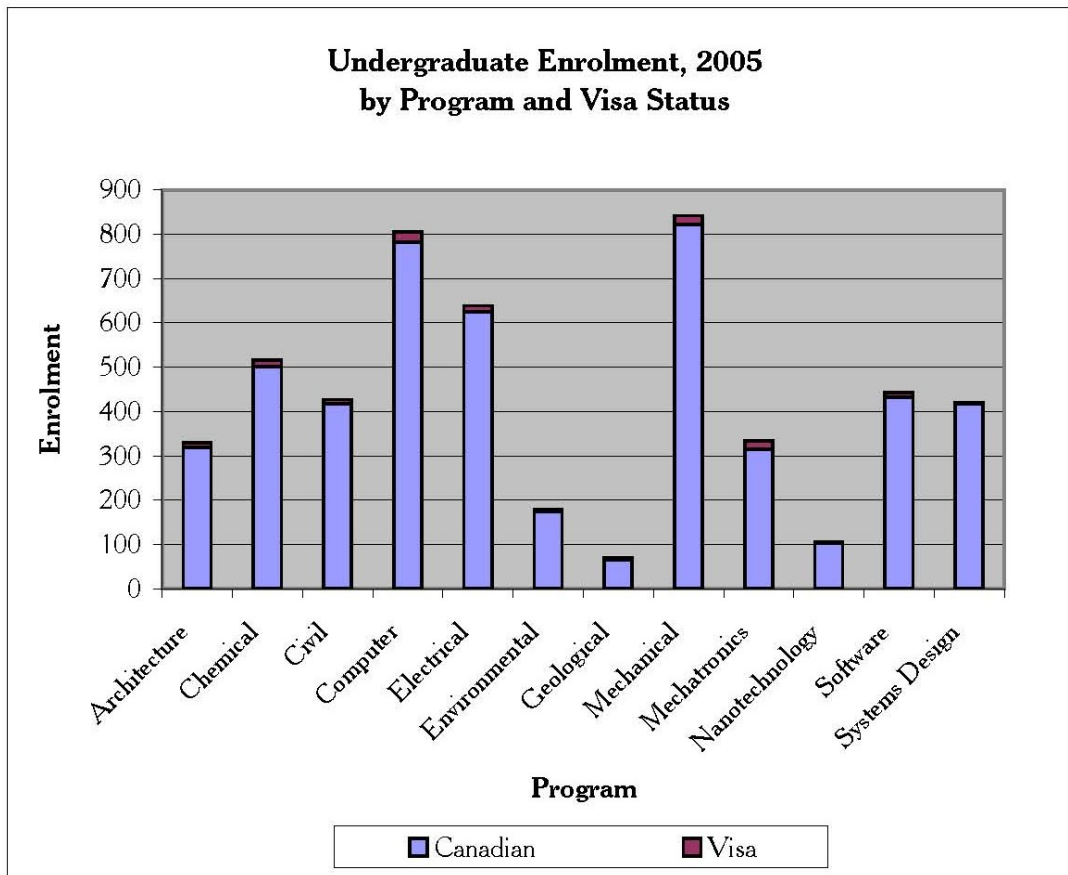


## Undergraduate Enrolment, 2005

November 1, 2005 count date, including students on official co-op work term

(B) by program and visa status

Program	Canadian	Visa	Total	% Visa
Architecture	319	10	329	3.0%
Chemical	501	15	516	2.9%
Civil	418	9	427	2.1%
Computer	782	23	805	2.9%
Electrical	625	14	639	2.2%
Environmental	175	3	178	1.7%
Geological	66	4	70	5.7%
Mechanical	822	20	842	2.4%
Mechatronics	315	18	333	5.4%
Nanotechnology	102	4	106	3.8%
Software	432	11	443	2.5%
Systems Design	417	4	421	1.0%
<b>TOTAL</b>	<b>4974</b>	<b>135</b>	<b>5109</b>	<b>2.6%</b>



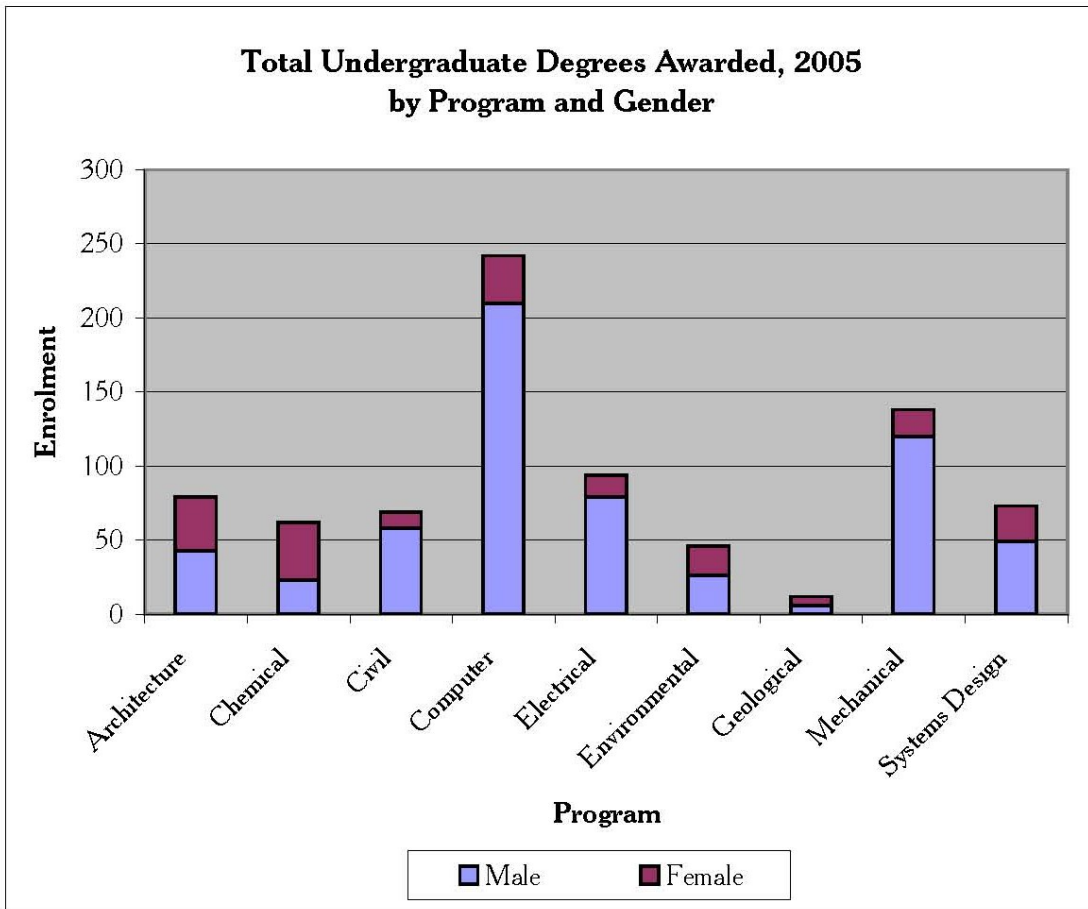
## Undergraduate Degrees Awarded, 2005

Degrees awarded at spring and fall convocation, 2005

Includes BAsc, BArch, and BAS degrees awarded

(A) by program and gender

Program	Male	Female	Total	% Women
Architecture	43	36	79	45.6%
Chemical	23	39	62	62.9%
Civil	58	11	69	15.9%
Computer	210	32	242	13.2%
Electrical	79	15	94	16.0%
Environmental	26	20	46	43.5%
Geological	6	6	12	50.0%
Mechanical	120	18	138	13.0%
Systems Design	49	24	73	32.9%
<b>TOTAL</b>	<b>614</b>	<b>201</b>	<b>815</b>	<b>24.7%</b>



## Undergraduate Students:Faculty Ratio, 2005

Annual Undergraduate FTE, 2004-2005, to Total Regular Faculty Members, 2005

Department	FTE Undergraduates	Total Regular Faculty	Student:Faculty Ratio
Architecture	289.5	15.5	18.7
Chemical	409.4	26	15.7
Civil	523.9	31	16.9
Electrical & Computer	1411.1	65	21.7
Management Sciences	0	16	n/a
Mechanical	758.66	40	19.0
Systems Design	370.72	18	20.6
Other Faculty Offices	0	2	n/a
<b>TOTAL</b>	<b>3763.3</b>	<b>213.5</b>	<b>17.6</b>

**NOTES:** Annual Undergraduate FTE =

(spring + fall + winter registrations, excluding students on co-op)/2

Students in joint programs are allocated to departments as follows:

Software = 1/2 to E&CE

Mechatronics = 3/5 to ME, 1/5 to SYDE, 1/5 to E&CE

*This FTE differs from FTE by program because 1/2 of Software is in Mathematics Faculty*

Total Regular faculty members =

October 1 count date, excluding visiting and research professors

*Systems Design faculty here excludes 2 Centre for Society, Technology, and Values faculty*

## Undergraduate Students:Staff Ratios, 2005

FTE staff paid from operating budget to 2004/2005 annual FTE undergraduate students

Degree Program	Admin Staff	Tech Staff	Total Staff	FTE Stdts	Ratios		
					Students to Admin Staff	Students to Tech Staff	Students to Total Staff
Architecture	6	3.7	9.7	289.5	48.25	78.24	29.85
Chemical	6	7.5	13.5	409.4	68.23	54.59	30.33
Civil	6	8.5	14.5	523.9	87.32	61.64	36.13
Electrical & Computer	11.5	20	31.5	1411.1	122.70	70.56	44.80
Management Sciences	3	0.4	3.4	0	n/a	n/a	n/a
Mechanical	8	13.6	21.6	758.66	94.83	55.78	35.12
Systems Design	4.5	4	8.5	370.72	82.38	92.68	43.61
Support Units	26.2	21.5	47.7	0	n/a	n/a	n/a
<b>TOTAL</b>	<b>71.2</b>	<b>79.2</b>	<b>150.4</b>	<b>3763.28</b>	<b>52.86</b>	<b>47.52</b>	<b>25.02</b>

### NOTES:

Annual Undergraduate FTE =

(spring+fall+winter registrations, excluding students on co-op)/2

Students in joint programs are allocated to departments as follows:

Software = 1/2 to E&CE

Mechatronics = 3/5 to ME, 1/5 to SYDE, 1/5 to E&CE

*This FTE differs from FTE by program because 1/2 of Software is in Mathematics Faculty*

**Undergraduate Year One New Admissions  
Performance to Target, Fall 2005**

November 1, 2005 count date, including students on official co-op work term

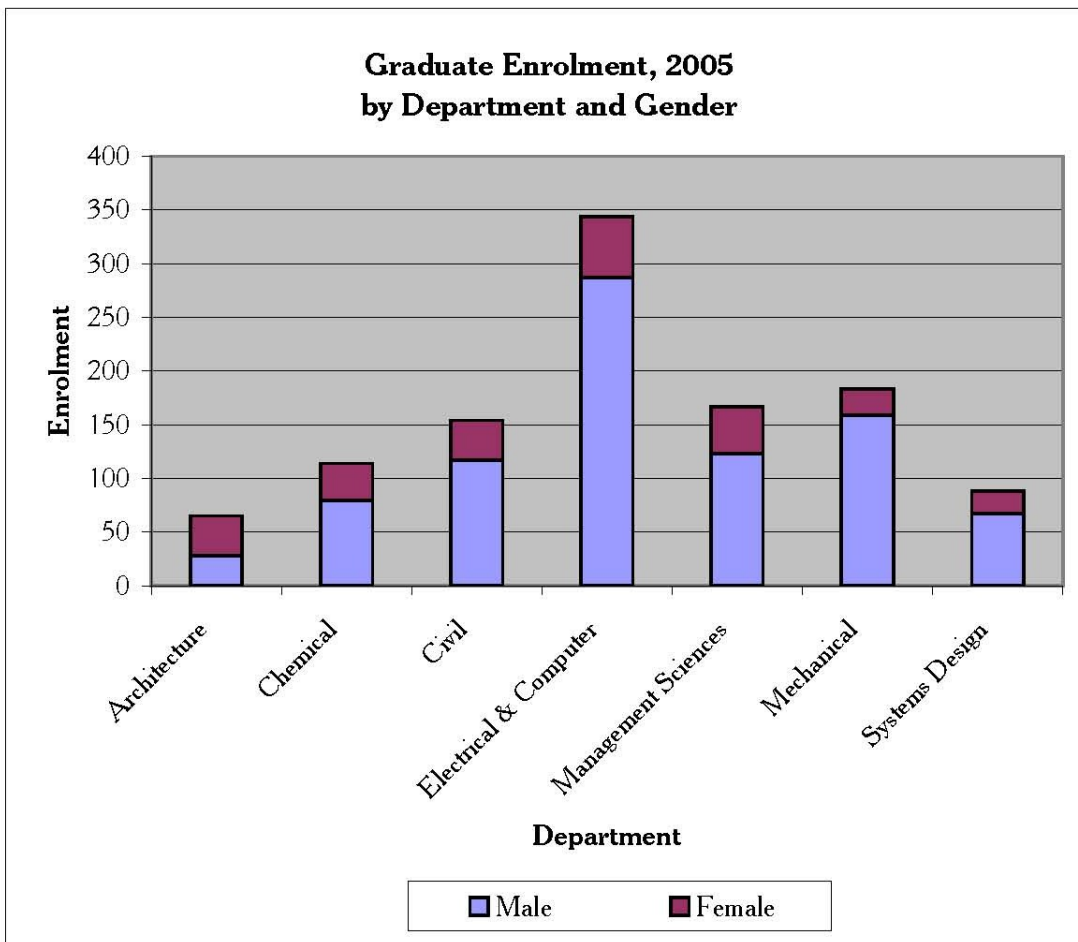
Degree Program	TARGET			ACTUAL			% OF TARGET	
	Canadian/PR	International	Total	Canadian/PR	International	Total	% of total	% of intern'l
Architecture	65	7	72	63	6	69	95.83%	85.7%
Chemical	115	10	125	120	7	127	101.60%	70.0%
Civil	95	5	100	90	5	95	95.00%	100.0%
Electrical & Computer	300	20	320	318	15	333	104.06%	75.0%
Environmental	35	3	38	39	1	40	105.26%	33.3%
Geological	15	2	17	17	3	20	117.65%	150.0%
Mechanical	180	10	190	179	10	189	99.47%	100.0%
Mechatronics	100	10	110	106	12	118	107.27%	120.0%
Nanotechnology	95	5	100	102	4	106	106.00%	80.0%
Software	100	5	105	106	4	110	104.76%	80.0%
Systems Design	90	0	90	85	2	87	96.67%	n/a
<b>TOTAL</b>	<b>1190</b>	<b>77</b>	<b>1267</b>	<b>1225</b>	<b>69</b>	<b>1294</b>	<b>102.13%</b>	<b>89.6%</b>

## Graduate Enrolment, 2005

November 1, 2005 count date, including full- and part-time students

(A) by department and gender

Program	Male	Female	Total	% Women
Architecture	28	37	65	56.9%
Chemical	79	35	114	30.7%
Civil	117	37	154	24.0%
Electrical & Computer	287	57	344	16.6%
Management Sciences	123	44	167	26.3%
Mechanical	159	24	183	13.1%
Systems Design	67	21	88	23.9%
<b>TOTAL</b>	<b>860</b>	<b>255</b>	<b>1115</b>	<b>22.9%</b>



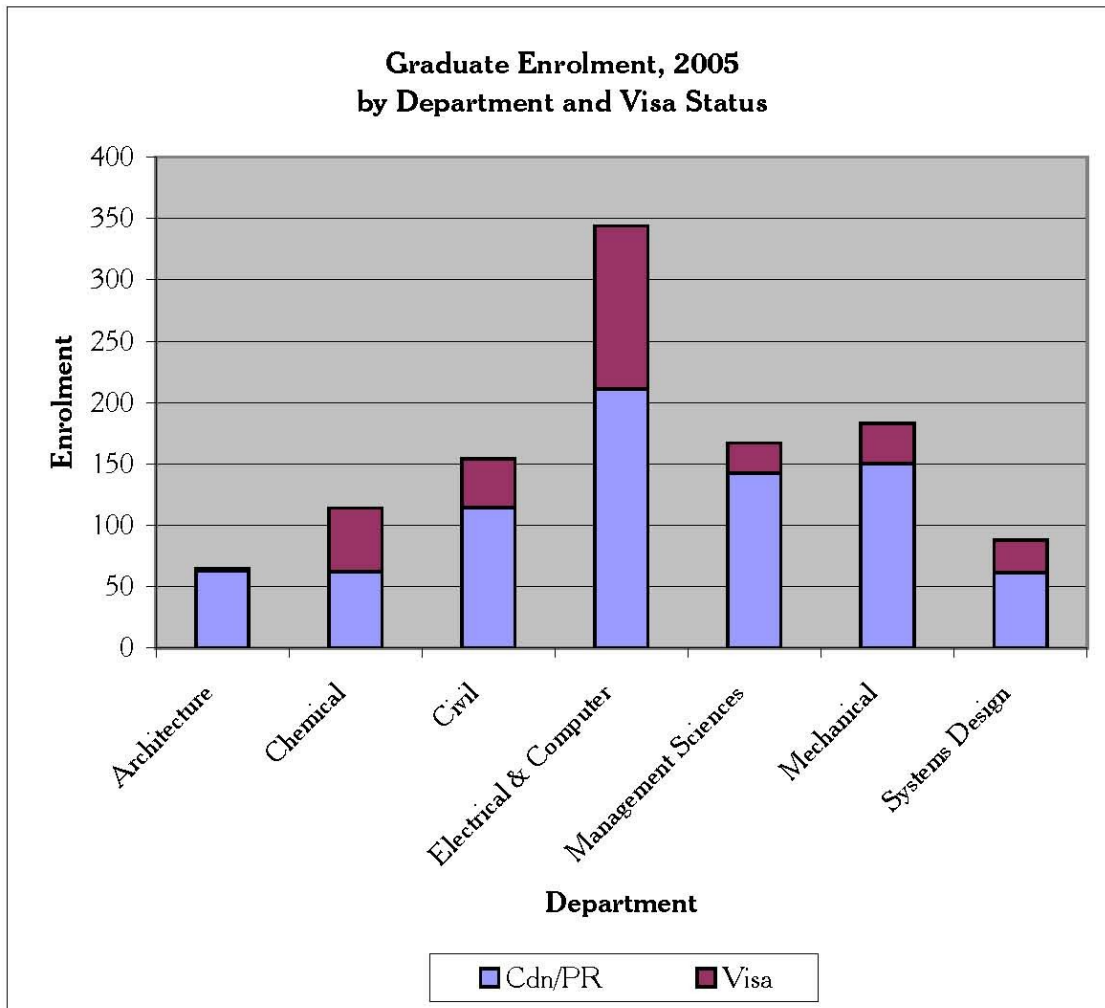


## Graduate Enrolment, 2005

November 1, 2005 count date, including full- and part-time students

(B) by department and visa status

Program	Cdn/PR	Visa	Total	% Visa
Architecture	63	2	65	3.1%
Chemical	62	52	114	45.6%
Civil	114	40	154	26.0%
Electrical & Computer	211	133	344	38.7%
Management Sciences	142	25	167	15.0%
Mechanical	150	33	183	18.0%
Systems Design	61	27	88	30.7%
<b>TOTAL</b>	<b>803</b>	<b>312</b>	<b>1115</b>	<b>28.0%</b>

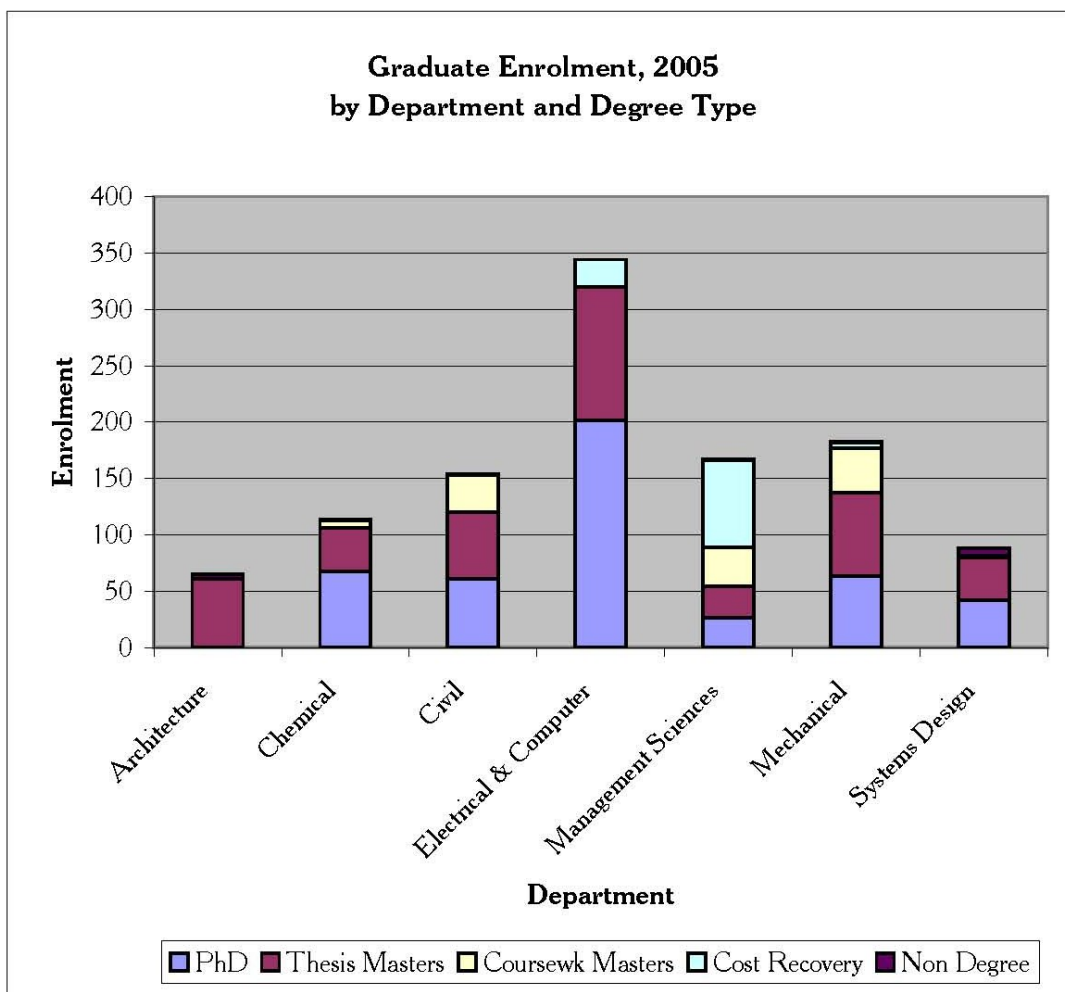


## Graduate Enrolment, 2005

November 1, 2005 count date, including full- and part-time students

(C) by department and degree

Program	PhD	Thesis Masters	Coursewk Masters	Cost Recovery	Non Degree
Architecture	0	61	0	0	4
Chemical	67	39	7	0	1
Civil	61	59	33	1	0
Electrical & Computer	201	119	0	24	0
Management Sciences	26	28	35	77	1
Mechanical	63	74	40	5	1
Systems Design	42	38	1	0	7
<b>TOTAL</b>	<b>460</b>	<b>418</b>	<b>116</b>	<b>107</b>	<b>14</b>



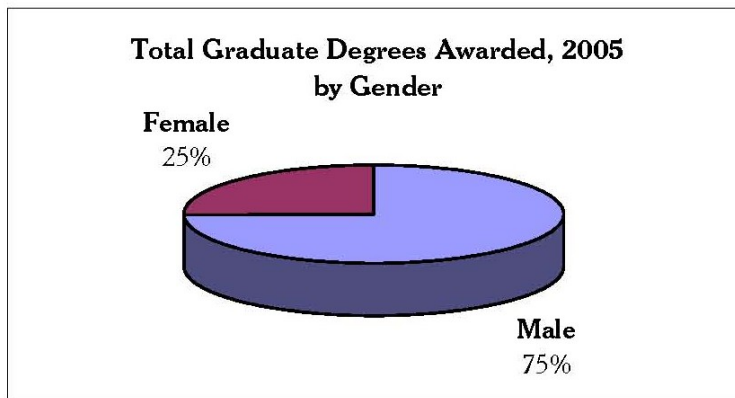
## Graduate Degrees Awarded, 2005

Degrees awarded at spring and fall convocation, 2005

Includes MASc, MArch, MMSc, MEng, and PhD degrees awarded

(A) by department and gender

Program	Male	Female	Total	% Women
Architecture	13	17	30	56.7%
Chemical	25	11	36	30.6%
Civil	31	7	38	18.4%
Electrical & Computer	53	7	60	11.7%
Management Sciences	27	10	37	27.0%
Mechanical	46	12	58	20.7%
Systems Design	22	9	31	29.0%
<b>TOTAL</b>	<b>217</b>	<b>73</b>	<b>290</b>	<b>25.2%</b>



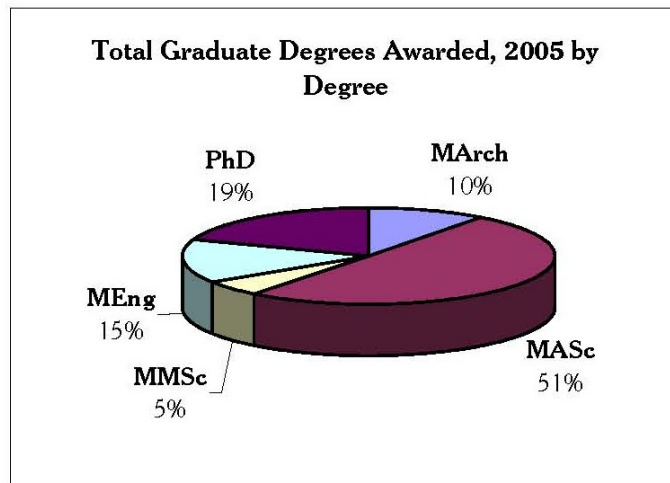
## Graduate Degrees Awarded, 2005

Degrees awarded at spring and fall convocation, 2005

Includes MASc, MArch, MMSc, MEng, and PhD degrees awarded

(B) by degree

Degree	Total
MArch	30
MASc	146
MMSc	15
MEng	43
PhD	56
<b>TOTAL</b>	<b>290</b>



## FTE Graduate Enrolment, 2005

November 1, 2005 FTE enrolment

Department	Degree Type	Canadian/PR	International	Total
Architecture <sup>1</sup>	PhD			0.0
	Masters - thesis	74.9	1.7	76.6
	Masters - coursework			0.0
	Full-cost recovery			0.0
	<b>TOTAL</b>	<b>74.9</b>	<b>1.7</b>	<b>76.6</b>
Chemical Engineering	PhD	25.2	39.0	64.2
	Masters - thesis	24.9	12.0	36.9
	Masters - coursework	6.3		6.3
	Full-cost recovery			0.0
	<b>TOTAL</b>	<b>56.4</b>	<b>51.0</b>	<b>107.4</b>
Civil Engineering	PhD	27.1	28.3	55.4
	Masters - thesis	45.5	10.0	55.5
	Masters - coursework	29.2	1.0	30.2
	Full-cost recovery	0.3		0.3
	<b>TOTAL</b>	<b>102.1</b>	<b>39.3</b>	<b>141.4</b>
Electrical & Computer Engineering	PhD	98.2	92.0	190.2
	Masters - thesis	61.9	40.3	102.2
	Masters - coursework			0.0
	Full-cost recovery	7.2		7.2
	<b>TOTAL</b>	<b>167.3</b>	<b>132.3</b>	<b>299.6</b>
Management Sciences	PhD	17.8	4.0	21.8
	Masters - thesis	16.1	7.0	23.1
	Masters - coursework	20.8	10.0	30.8
	Full-cost recovery	22.2	0.9	23.1
	<b>TOTAL</b>	<b>76.9</b>	<b>21.9</b>	<b>98.8</b>
Mechanical Engineering	PhD	35.1	23.0	58.1
	Masters - thesis	59.1	9.3	68.4
	Masters - coursework	28.0		28.0
	Full-cost recovery	1.5		1.5
	<b>TOTAL</b>	<b>123.7</b>	<b>32.3</b>	<b>156.0</b>
Systems Design Engineering	PhD	28.5	10.0	38.5
	Masters - thesis	23.8	10.0	33.8
	Masters - coursework		0.3	0.3
	Full-cost recovery			0.0
	<b>TOTAL</b>	<b>52.3</b>	<b>20.3</b>	<b>72.6</b>
<b>TOTAL</b>	PhD	231.9	196.3	428.2
	Masters - thesis	306.2	90.3	396.5
	Masters - coursework	84.3	11.3	95.6
	Full-cost recovery	31.2	0.9	32.1
	<b>TOTAL</b>	<b>653.6</b>	<b>298.8</b>	<b>952.4</b>

**NOTES:** Fall term FTE = November 1, 2005 enrolment: FT+(PT\*0.3)

<sup>1</sup> Architecture total is annualized FTE for 2004/2005, not fall term FTE

## Graduate Students:Faculty Ratio, 2005

November 1, 2005 FTE enrolment to tenured & tenure-stream faculty as of October 1, 2005

Department	Degree Type	FTE Students	Tenured & Tenure-Stream Faculty	Ratio
Architecture <sup>1</sup>	PhD	0.0	14.5	0.0
	Masters - thesis	76.6	14.5	5.3
	Masters - coursework	0.0	14.5	0.0
	All research students	76.6	14.5	5.3
	<b>All students</b>	<b>76.6</b>	<b>14.5</b>	<b>5.3</b>
Chemical Engineering	PhD	64.2	26.0	2.5
	Masters - thesis	36.9	26.0	1.4
	Masters - coursework	6.3	26.0	0.2
	All research students	101.1	26.0	3.9
	<b>All students</b>	<b>107.4</b>	<b>26.0</b>	<b>4.1</b>
Civil Engineering	PhD	55.4	30.0	1.8
	Masters - thesis	55.5	30.0	1.9
	Masters - coursework	30.2	30.0	1.0
	All research students	110.9	30.0	3.7
	<b>All students</b>	<b>141.4</b>	<b>30.0</b>	<b>4.7</b>
Electrical & Computer Engineering	PhD	190.2	60.0	3.2
	Masters - thesis	102.2	60.0	1.7
	Masters - coursework	0.0	60.0	0.0
	All research students	292.4	60.0	4.9
	<b>All students</b>	<b>299.6</b>	<b>60.0</b>	<b>5.0</b>
Management Sciences	PhD	21.8	15.0	1.5
	Masters - thesis	23.1	15.0	1.5
	Masters - coursework	30.8	15.0	2.1
	All research students	44.9	15.0	3.0
	<b>All students</b>	<b>98.8</b>	<b>15.0</b>	<b>6.6</b>
Mechanical Engineering	PhD	58.1	40.0	1.5
	Masters - thesis	68.4	40.0	1.7
	Masters - coursework	28.0	40.0	0.7
	All research students	126.5	40.0	3.2
	<b>All students</b>	<b>156.0</b>	<b>40.0</b>	<b>3.9</b>
Systems Design Engineering	PhD	38.5	19.0	2.0
	Masters - thesis	33.8	19.0	1.8
	Masters - coursework	0.3	19.0	0.0
	All research students	72.3	19.0	3.8
	<b>All students</b>	<b>72.6</b>	<b>19.0</b>	<b>3.8</b>
<b>TOTAL</b>	PhD	428.2	205.5	2.1
	Masters - thesis	396.5	205.5	1.9
	Masters - coursework	95.6	205.5	0.5
	All research students	824.7	205.5	4.0
	<b>All students</b>	<b>952.4</b>	<b>205.5</b>	<b>4.6</b>

**NOTES:**

Fall term FTE = November 1, 2005 enrolment: FT + (PT\*0.3)

"All students" includes students in cost recovery programs

<sup>1</sup> Architecture total is annualized FTE for 2004/2005, not fall term FTE

## Graduate Students:Staff Ratios, 2005

FTE staff paid from operating budget to Fall 2005 FTE graduate students

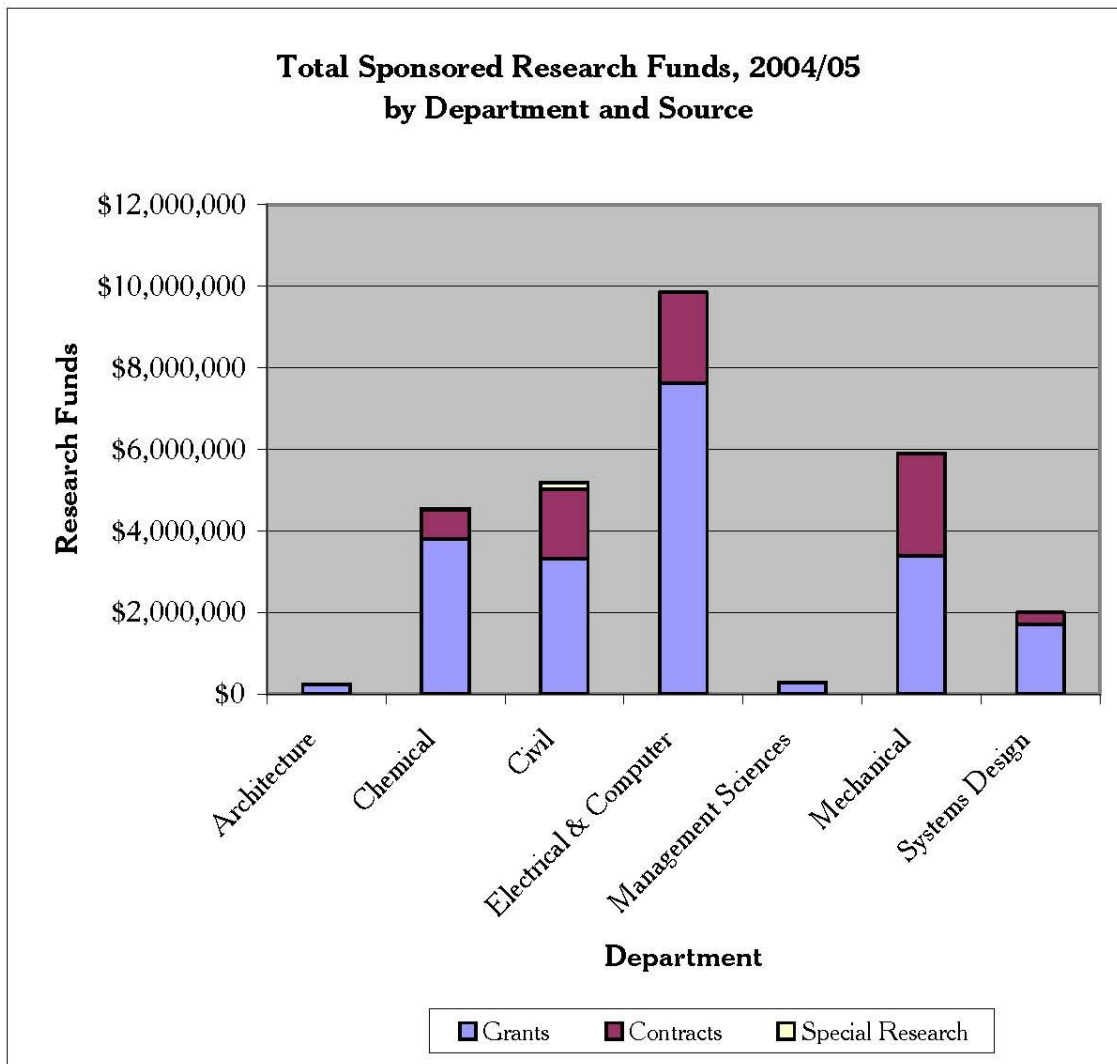
Degree Program	Admin Staff	Tech Staff	Total Staff	FTE Stdts	Ratios		
					Students to Admin Staff	Students to Tech Staff	Students to Total Staff
Architecture	6	3.7	9.7	76.6	12.77	20.70	7.90
Chemical	6	7.5	13.5	107.4	17.90	14.32	7.96
Civil	6	8.5	14.5	141.4	23.57	16.64	9.75
Electrical & Computer	11.5	20	31.5	299.6	26.05	14.98	9.51
Management Sciences	3	0.4	3.4	98.8	n/a	n/a	n/a
Mechanical	8	13.6	21.6	156	19.50	11.47	7.22
Systems Design	4.5	4	8.5	72.6	16.13	18.15	8.54
Support Units	26.2	21.5	47.7	0	n/a	n/a	n/a
<b>TOTAL</b>	<b>71.2</b>	<b>79.2</b>	<b>150.4</b>	<b>952.4</b>	<b>13.38</b>	<b>12.03</b>	<b>6.33</b>

**NOTES:** Fall term FTE = November 1, 2005 enrolment: FT + (PT\*0.3)

## Total Sponsored Research Funds, 2004/05

Fiscal year 2004/2005, by department and source

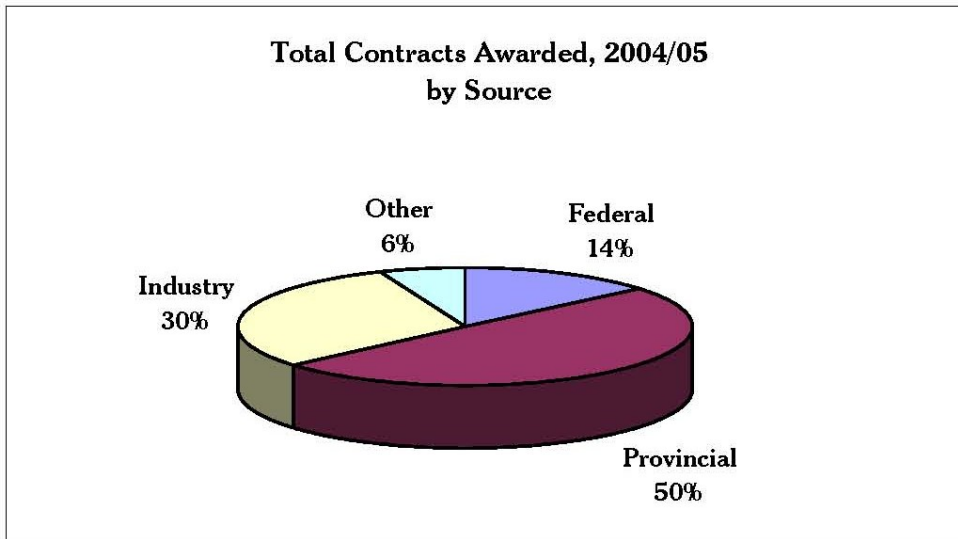
Program	Grants	Contracts	Special Research	Total
Architecture	\$228,000	\$0	\$7,000	\$235,000
Chemical	\$3,802,000	\$709,000	\$29,000	\$4,540,000
Civil	\$3,313,000	\$1,698,000	\$168,000	\$5,179,000
Electrical & Computer	\$7,625,000	\$2,220,000	\$4,000	\$9,849,000
Management Sciences	\$280,000	\$0	\$0	\$280,000
Mechanical	\$3,374,000	\$2,520,000	\$0	\$5,894,000
Systems Design	\$1,700,000	\$295,000	\$8,000	\$2,003,000
<b>TOTAL</b>	<b>\$20,322,000</b>	<b>\$7,442,000</b>	<b>\$216,000</b>	<b>\$27,980,000</b>



## Total Contracts Awarded, 2004/05

Fiscal year 2004/2005, by department and source

Program	Federal	Provincial	Industry	Other	Total
Architecture	\$0	\$0	\$0	\$0	\$0
Chemical	\$113,000	\$129,000	\$467,000	\$0	\$709,000
Civil	\$119,000	\$801,000	\$400,000	\$378,000	\$1,698,000
Electrical & Computer	\$0	\$1,302,000	\$844,000	\$74,000	\$2,220,000
Management Sciences	\$0	\$0	\$0	\$0	\$0
Mechanical	\$759,000	\$1,221,000	\$530,000	\$10,000	\$2,520,000
Systems Design	\$35,000	\$245,000	\$15,000	\$0	\$295,000
<b>TOTAL</b>	<b>\$1,026,000</b>	<b>\$3,698,000</b>	<b>\$2,256,000</b>	<b>\$462,000</b>	<b>\$7,442,000</b>

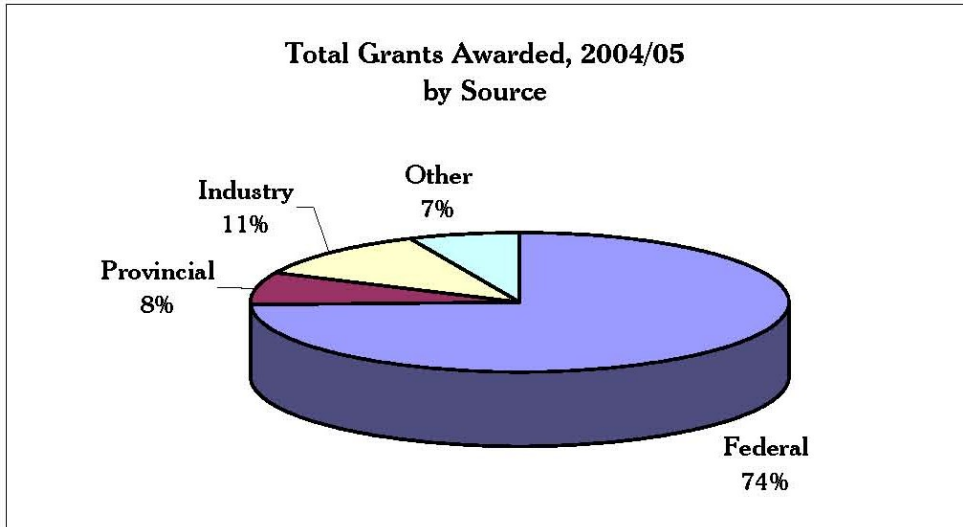




## Total Grants Awarded, 2004/05

Fiscal year 2004/2005, by department and source

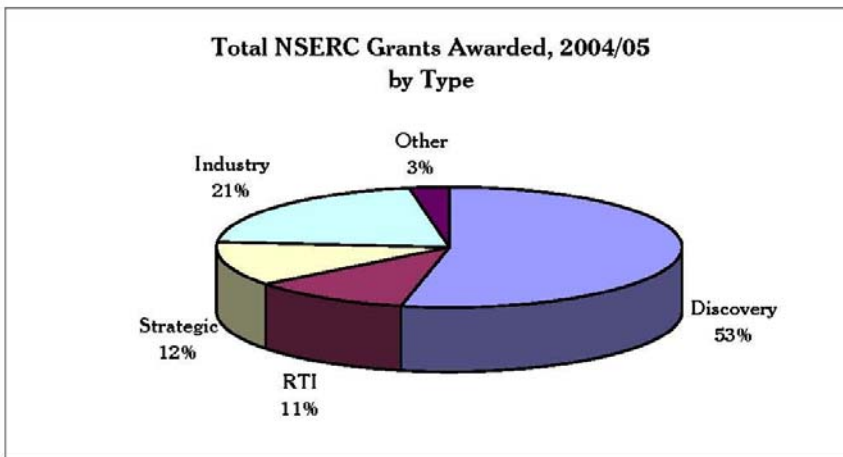
Program	Federal	Provincial	Industry	Other	Total
Architecture	\$189,000	\$0	\$9,000	\$30,000	\$228,000
Chemical	\$3,388,000	\$13,000	\$368,000	\$33,000	\$3,802,000
Civil	\$2,008,000	\$301,000	\$461,000	\$543,000	\$3,313,000
Electrical & Computer	\$5,115,000	\$1,192,000	\$1,054,000	\$264,000	\$7,625,000
Management Sciences	\$271,000	\$0	\$0	\$9,000	\$280,000
Mechanical	\$2,834,000	\$48,000	\$360,000	\$132,000	\$3,374,000
Systems Design	\$1,301,000	\$20,000	\$53,000	\$326,000	\$1,700,000
<b>TOTAL</b>	<b>\$15,106,000</b>	<b>\$1,574,000</b>	<b>\$2,305,000</b>	<b>\$1,337,000</b>	<b>\$20,322,000</b>



## Total NSERC Grants Awarded, 2004/05

Fiscal year 2004/2005, by department and type

Program	Discovery	RTI	Strategic	Industry	Other	Total
Architecture	\$0	\$0	\$0	\$0	\$0	\$0
Chemical	\$1,134,000	\$585,000	\$362,000	\$670,000	\$0	\$2,751,000
Civil	\$911,000	\$189,000	\$0	\$205,000	\$265,000	\$1,570,000
Electrical & Computer	\$1,840,000	\$238,000	\$671,000	\$1,008,000	\$0	\$3,757,000
Management Sciences	\$162,000	\$0	\$0	\$0	\$0	\$162,000
Mechanical	\$1,077,000	\$60,000	\$0	\$282,000	\$0	\$1,419,000
Systems Design	\$464,000	\$69,000	\$238,000	\$0	\$26,000	\$797,000
<b>TOTAL</b>	<b>\$5,588,000</b>	<b>\$1,141,000</b>	<b>\$1,271,000</b>	<b>\$2,165,000</b>	<b>\$291,000</b>	<b>\$10,456,000</b>



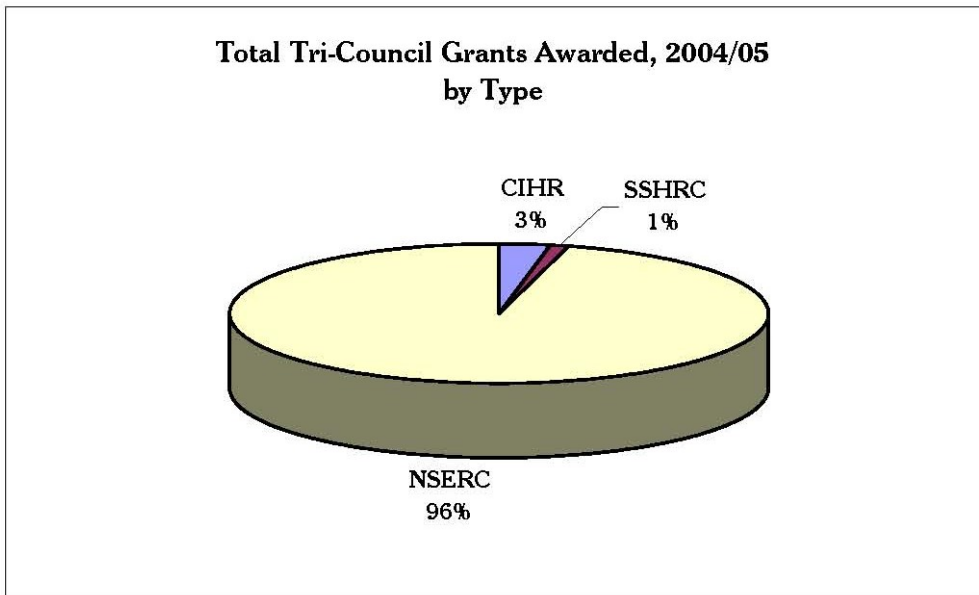
**NOTES:**

NSERC = National Sciences and Engineering Research Council of Canada  
RTI = Research tools and instrumentation

## Total Tri-Council Grants Awarded, 2004/05

Fiscal year 2004/2005, by funding agency (CIHR, SSHRC, NSERC)

Program	CIHR	SSHRC	NSERC	Total
<b>TOTAL</b>	\$342,000	\$109,000	\$10,456,000	\$10,907,000



**NOTES:**

CIHR = Canadian Institutes of Health Research

SSHRC = Social Sciences and Humanities Research Council of Canada

NSERC = National Sciences and Engineering Research Council of Canada

## Total Sponsored Research Funds: Faculty Ratio, 2004/05

Fiscal year 2004/2005 to tenured and tenure-stream faculty as of October 1, 2005

Department	Total Research Funding	Total Tenured & Tenure-Stream Faculty	Research Funding per Faculty
Architecture	\$235,000	14.5	\$16,207
Chemical	\$4,540,000	26	\$174,615
Civil	\$5,179,000	30	\$172,633
Electrical & Computer	\$9,849,000	60	\$164,150
Management Sciences	\$280,000	15	\$18,667
Mechanical	\$5,894,000	40	\$147,350
Systems Design	\$2,003,000	19	\$105,421
Other Faculty Offices	\$0	1	n/a
<b>TOTAL</b>	<b>\$27,980,000</b>	<b>205.5</b>	<b>\$136,156</b>

**NOTE:** "Other Faculty Offices" includes all areas outside of academic departments (e.g. Dean's Office, Undergraduate Office, Engineering Computing, Machine Shop, etc.)

## Total Sponsored Research Funds: Operating Budget Ratio, 2004/05

Fiscal year 2004/2005, by department

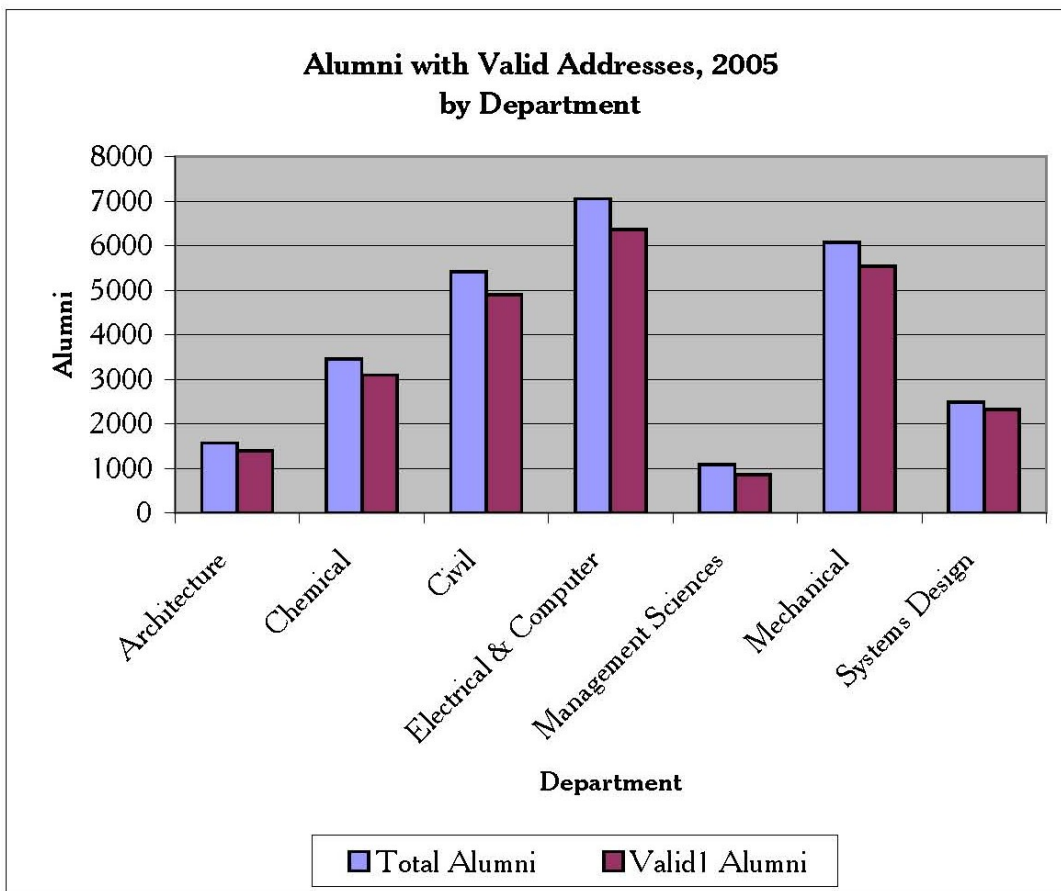
Department	Total Research Funding	Operating Budget	Research Funding to Operating Budget
Architecture	\$235,000	\$2,355,604	0.10
Chemical	\$4,540,000	\$4,844,152	0.94
Civil	\$5,179,000	\$4,982,137	1.04
Electrical & Computer	\$9,849,000	\$11,639,137	0.85
Management Sciences	\$280,000	\$2,182,091	0.13
Mechanical	\$5,894,000	\$7,804,260	0.76
Systems Design	\$2,003,000	\$3,564,772	0.56
Other Faculty Offices	\$0	\$7,435,000	n/a
<b>TOTAL</b>	<b>\$27,980,000</b>	<b>\$44,807,153</b>	<b>0.62</b>

**NOTE:** "Other Faculty Offices" includes all areas outside of academic departments (e.g. Dean's Office, Undergraduate Office, Engineering Computing, Machine Shop, etc.)

## Alumni with Valid Addresses, 2005

Total and valid alumni as of December 31, 2005

Program	Total Alumni	Valid <sup>1</sup> Alumni	% Valid
Architecture	1567	1387	88.5%
Chemical	3455	3090	89.4%
Civil	5417	4899	90.4%
Electrical & Computer	7053	6357	90.1%
Management Sciences	1078	851	78.9%
Mechanical	6078	5542	91.2%
Systems Design	2487	2325	93.5%
<b>TOTAL</b>	<b>27135</b>	<b>24451</b>	<b>90.1%</b>

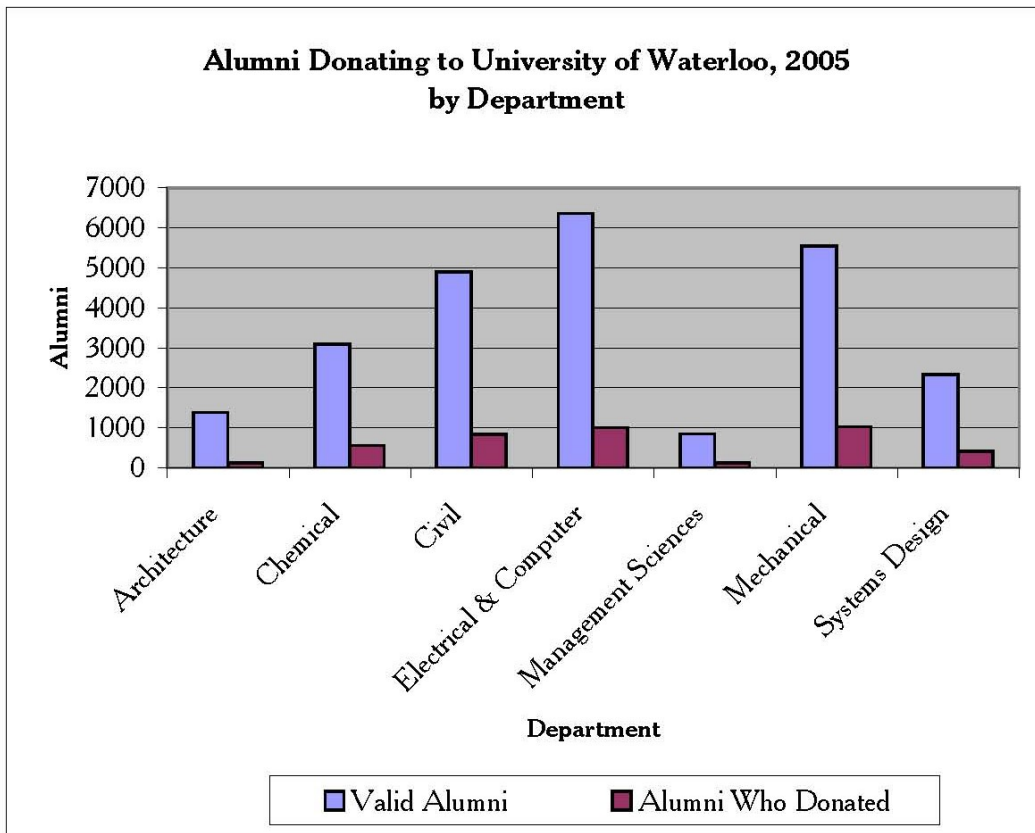


**NOTE:** 1. Valid alumni are those for whom Offices of Development & Alumni Affairs have at least one current method of contact

## Alumni Donating to University of Waterloo, 2005

Valid alumni and alumni who donated as of December 31, 2005

Program	Valid Alumni	Alumni Who Donated	% Donating
Architecture	1387	127	9.2%
Chemical	3090	555	18.0%
Civil	4899	831	17.0%
Electrical & Computer	6357	1002	15.8%
Management Sciences	851	127	14.9%
Mechanical	5542	1027	18.5%
Systems Design	2325	406	17.5%
<b>TOTAL</b>	<b>24451</b>	<b>4075</b>	<b>16.7%</b>



**NOTE:** 1. Valid alumni are those for whom Offices of Development & Alumni Affairs have at least one current method of contact

## Alumni Attending Class Reunions, 2005

Percent of those invited who registered for reunion, by department and class

### (A) June reunion

Program	Reunion Year				
	5	10	15	20	25
Chemical	5.80%	14.90%	16.70%	19.00%	19.40%
Civil	6.20%	3.60%	7.90%	24.00%	10.10%
Computer	6.30%	2.10%	2.10%	n/a	n/a
Electrical & Computer	0.00%	0.00%	0.00%	0.00%	0.00%
Electrical	2.00%	1.10%	1.10%	1.30%	13.80%
Management Sciences	0.00%	n/a	n/a	n/a	n/a
Mechanical	0.80%	14.00%	4.70%	5.40%	17.50%
Systems Design	5.40%	3.80%	28.10%	7.90%	29.70%
<b>TOTAL</b>	<b>4.00%</b>	<b>7.30%</b>	<b>8.60%</b>	<b>9.20%</b>	<b>15.50%</b>

### (B) September reunion

Program	Reunion Year		
	30	35	40
Chemical	6.60%	11.50%	0.00%
Civil	17.10%	7.10%	13.80%
Electrical & Computer	0.00%	0.00%	0.00%
Electrical	17.20%	8.50%	8.00%
Management Sciences	0.00%	0.00%	n/a
Mechanical	8.00%	10.60%	3.40%
Systems Design	7.50%	0.00%	n/a
<b>TOTAL</b>	<b>11.30%</b>	<b>8.80%</b>	<b>6.90%</b>

## Engineering Endowments, 2004/05

Total principal in Engineering endowment funds at fiscal year end (April, 2005)

Endowment	Principal
Eng Scholarship Fund	\$2,840,748
Eyton Chair	\$2,371,931
Heasley, Col H	\$1,881,564
Carl A Pollock Schp Fund	\$532,687
Waterloo Eng (SVC)	\$6,064,182
Equipment Fund	\$1,222,750
Nortel Networks	\$893,000
Chandrashekar Memorial	\$244,527
Iron Ring Fund	\$52,070
Madter Fund	\$715,199
O'Donovan Chair	\$2,647,639
Other <sup>1</sup>	\$3,014,812
<b>TOTAL</b>	<b>\$22,481,109</b>

**NOTE:** 1. Engineering award endowments held by the UW Student Awards and Financial Aid Office.



## Total Donations, 2004/05

<b>Department/Defined Area</b>	<b>Alumni Donations</b>	<b>Total Donations</b>
Architecture	\$555,537.50	\$912,056.60
Chemical Engineering <sup>1</sup>	\$4,370,409.22	\$6,421,262.40
Civil Engineering <sup>2</sup>	\$60,340.55	\$103,124.50
Electrical & Computer Engineering	\$563,356.00	\$583,764.78
Management Sciences	\$3,794.49	\$21,105.13
Mechanical Engineering <sup>3</sup>	\$66,492.66	\$254,196.55
Systems Design Engineering	\$31,082.42	\$36,093.72
Student Teams	\$175,402.50	\$68,091.21
Undergraduate Scholarships	\$192,443.16	\$434,436.98
Graduate Scholarships	\$74,073.80	\$41,831.50
Faculty of Engineering	\$623,531.96	\$440,211.20
<b>TOTAL</b>	<b>\$6,716,464.26</b>	<b>\$9,316,174.57</b>

Total Donations to the Faculty of Engineering <sup>4,5</sup>	\$10,663,474.00
Total Donations to the School of Architecture for 2004-05 <sup>5</sup>	\$1,285,112.00

### **NOTES:**

- 1 Includes funds received for Nanotechnology Engineering
- 2 Includes funds received for Environmental Engineering and Geological Engineering
- 3 Includes funds received for Mechatronics Engineering
- 4 Excludes Architecture
- 5 Includes donations that arise out of research partnerships

## Engineering Annual Giving Statistics, 2004/05

Amount Donated	Total # of Eng. Alumni Donors	% of Total Eng. Alumni Donors	Total Donations (\$) Received from Eng. Alumni (for any designation)**	% of Total Donations Received	Number of Eng. Alumni Donors who contributed to their Faculty	Donations (\$) From Eng. Alumni to Their Own Faculty	Total (\$) from All UW Alumni to Eng. Designations
\$1 - \$99	1,298	33.76%	\$59,820.10	3.62%	1,254	\$57,623.20	\$60,028.30
\$100 - \$249	1,683	43.77%	\$228,113.72	13.81%	1,594	\$215,530.30	\$221,912.83
\$250 - \$499	625	16.25%	\$181,531.24	10.99%	578	\$166,713.20	\$169,207.21
\$500 - \$999	129	3.36%	\$76,243.44	4.62%	112	\$65,725.62	\$67,525.62
\$1000 - \$4,999	92	2.39%	\$118,382.54	7.17%	65	\$75,027.23	\$91,139.73
\$5,000 +	18	0.47%	\$987,288.13	59.79%	11	\$309,138.20	\$5,140,138.20
<b>TOTAL</b>	<b>3,845</b>	<b>100.00%</b>	<b>\$1,651,379.17</b>	<b>100.00%</b>	<b>3,614</b>	<b>\$889,757.75</b>	<b>\$5,749,951.89</b>

**NOTES:**

These figures include all gifts received from Alumni through Annual Fund and Major Prospects Solicitation

The Total number of Engineering Alumni was 24,451 of which:

- 17,272 have a valid contact information
- 335 are deceased
- 33 are College Exclusives
- 1,406 are College Duals
- 830 are on the Do not Solicit List

Based on the number of Engineering Alumni with valid contact information, the overall participation rate was 22.7%.

Excluding Engineering Alumni on the do not call list, the participation rate was 23.9%.

54% of the total donations received from Engineering Alumni were designated to their own Faculty.\*

\* Excluding gifts over \$5,000, 87.4% of the total donations received from Engineering Alumni was designated to their own Faculty.

94% of Engineering Alumni donors designated their support to their own Faculty.

The average gift was \$429.49 (to any designation), and \$246.20 (to their own Faculty).

\*\*Excluding gifts over \$5,000, the average gift was \$173.53 (to any designation) and \$161.15 (to their own Faculty).

## Architecture Annual Giving Statistics, 2004/05

Amount Donated	Total # of Arch. Alumni Donors	% of Total Arch. Alumni Donors	Total Donations (\$) Received from Arch. Alumni (for any designation)**	% of Total Donations Received	Number of Arch. Alumni Donors who contributed to their Faculty	Donations (\$) From Arch. Alumni to Their Own Faculty
\$1 - \$99	52	33.77%	\$2,203.00	6.00%	51	\$2,020.00
\$100 - \$249	65	42.21%	\$10,145.00	27.62%	61	\$9,585.86
\$250 - \$499	20	12.99%	\$5,744.83	15.64%	19	\$5,363.08
\$500 - \$999	8	5.19%	\$4,260.00	11.60%	7	\$3,760.00
\$1000 - \$4,999	9	5.84%	\$14,374.33	39.14%	9	\$14,259.82
\$5,000 +	0	0.00%	\$0.00	0.00%	0	\$0.00
<b>TOTAL</b>	<b>154</b>	<b>100.00%</b>	<b>\$36,727.16</b>	<b>100.00%</b>	<b>147</b>	<b>\$34,988.76</b>

**NOTES:**

These figures include all gifts received from Alumni through Annual Fund and Major Prospects Solicitation

The Total number of Architecture Alumni was 1,040 of which:

- 729 have a valid contact information
- 10 are deceased
- 79 are College Duals
- 50 are on the Do not Solicit List

Based on the number of Architecture Alumni with valid contact information, the overall participation rate was 21.4%.

Excluding Architecture Alumni on the do not call list, the participation rate was 23.0%.

95% of the total donations received from Architecture Alumni were designated to their own Program.\*

\* Excluding gifts over \$5,000, 95.3% of the total donations received from Architecture Alumni was designated to their own Program.

95% of Architecture Alumni donors designated their support to their own Program.

The average gift was \$238.49 (to any designation), and \$238.02 (to their own Program).

\*\*Excluding gifts over \$5,000, the average gift was \$238.49 (to any designation) and \$238.02 (to their own Program).

## Women in Engineering, 2005

### (A) women in engineering disciplines

	% Women
First-Year Undergraduate Class	15.0%
All Undergraduate Students	18.0%
Undergraduate Degrees Awarded	22.4%
All Graduate Students	21.0%
Master's Degrees Awarded	22.4%
PhD Degrees Awarded	17.9%
Professors	11.3%

### (B) women in architecture

	% Women
First-Year Undergraduate Class	55.0%
All Undergraduate Students	58.0%
Undergraduate Degrees Awarded	45.6%
All Graduate Students	57.0%
Master's Degrees Awarded	56.6%
Professors	13.0%

#### **NOTES:**

Undergraduate and graduate students per November 1, 2005 count date

Undergraduate students include students on official co-op work term

Graduate students include full- and part-time students

Faculty counts per October 1, 2005 count date

Faculty includes all regular faculty members; excludes research and visiting professors