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SIMON FRASER UNIVERSITY

OFFICE OF THE VICE-PRESIDENT, ACADEMIC

MEMORANDUM

To: Senate

From: D. Gagan, Chair
Senate Committee on Academic Planning

Subject: External Review -
School of Engineering Science

Date: September 16, 1997

For Information

Attached are:

- the Report of the School of Engineering Science External Review Committee
- the Response prepared by the School of Engineering Science
- Five Year Plan for the School of Engineering Science

REPORT ON
SCHOOL OF ENGINEERING SCIENCE
AT
SIMON FRASER UNIVERSITY

Engineering Science Review Committee

Jon W. Mark, Chair	University of Waterloo
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Site Visit: October 25-27, 1995
Submitted: December 19, 1995

Executive Summary

The comments and recommendations contained in this report are based on the documentation provided prior to the site visit and the information gathered during the site visit. The structure of the report adheres to the SFU Senate Guidelines and Terms of Reference.

The Review Committee's impression is that, with an exceptionally high calibre crop of first year intakes, the School of Engineering Science is in an envious position to be an elite engineering science school. However, the Committee was surprised to find that the School's undergraduate program has been suffering from a high attrition rate and a long degree completion time. To enhance the reputation of its undergraduate degree program, the School must exert concerted efforts to improve its approximately 50% throughput rate to a vicinity of 90%, and to ensure a degree completion time of eight academic semesters, as advertised. The Review Committee feels that any effort towards improving the undergraduate program will also help strengthening the full-time Ph.D. and M.A.Sc. programs.

The mission to enhance the reputation of the School's undergraduate and graduate programs will require a significant restructuring of the undergraduate and graduate curriculums. With its present human resources, the School has the critical mass and the capacity to achieve this mission. A starting point would be the establishment of priorities and the formulation of administrative policies through wide consultation and effective communication. Effective communication and consultation processes have the effect of mitigating some of the contemporary unhappiness observed during the site visit.

The Internship program has been serving the mandatory co-operative engineering science program well. The operation of the Internship program should be maintained within the School through effective networking with the University Co-operative program.

As a whole, the School is weak in hardware and software computing in terms of faculty expertise and laboratory facilities. If infrastructure is available, priority should be in strengthening computing, both in terms of human resources and laboratory workstations. The School of Engineering Science should integrate its computing efforts with those of the School of Computing Science.

The recommendations of this report should be taken in a constructive vein aimed at making the School of Engineering Science a very significant contributor to manpower training and research not only in British Columbia but also in Canada. This is seen by the Review Committee as an achievable and realistic goal.

1 Introduction

The Engineering Science Review Committee was provided, in advance, with written documentation containing background information about the School, the School's mission statement, the undergraduate and graduate programs, the laboratory facilities, the administrative and professional staff, and the teaching and research activities of the individual faculty. This information together with the SFU Senate Guidelines facilitated the Review Committee to gather additional complementary information during the site visit to form the basis for the comments and recommendations contained in this report. A formal presentation by the Director of the School clearly delineating current status and future plans would have been of tremendous help to the Review Committee.

The School of Engineering Science administers both undergraduate and graduate programs. The undergraduate program is structured following the vision and model established at the time of its inception (1981). A major feature of the undergraduate program is that it has been attracting high quality students. At present the School has 22 professorial rank faculty plus two lecturers who oversee the communications skills aspect of the undergraduate program, and 9 laboratory professional staff who run the day-to-day operation of the laboratories and assist in the supervision of undergraduate theses. The current first year enrollment is approximately 70 students, with a planned maximum of 80. The School runs a regular (full-time) Ph.D. program, a regular (full-time) M.A.Sc. program and a (part-time) M.Eng. program. The current student populations are 22 Ph.D., 61 M.A.Sc. and 40 M.Eng.

2 Review Guidelines

Over the three day site visit period, the Review Committee interviewed the Director of the School, some of the faculty, either on an individual or group basis, the secretarial staff, the laboratory professional staff, and representatives of both undergraduate and graduate students. Based on the review of the documentation provided for the visit and the information gathered on site, the Committee makes the following observations, which reflect the SFU Senate guidelines.

a) Quality of the Program

The quality of the undergraduate program, as measured by the exceptionally high calibre of the students admitted to the program and the quality of the graduates from the program, is very high. However, from the statistics collected over the past 8 years, the attrition rate is in the vicinity of 50%. This high attrition rate indeed raises serious questions on the overall health and quality of the program in the long term. The School must direct considerable attention and effort to identify the causes and to take appropriate corrective measures to rectify the situation. The graduate program has

3 components: Ph.D., M.A.Sc. and M.Eng. The M.A.Sc. program, currently has 61 students, has been running for about 10 years. The Ph.D. program, with 22 students, needs nurturing attention. The M.Eng program has been experiencing a rather long completion time. As the other two programs have to cater for the M.Eng program in terms of course offering, the School should conduct a critical re-examination of the M.Eng program. In addition, the School should consider facilitating the creation of new graduate courses which mirror the interests of an increasingly research oriented faculty.

b) Quality of Faculty Research

The major strengths of the School are in the areas of signal processing and communications, microelectronics, micro-electro-mechanical systems, controls and robotics. The quality of the faculty research in these areas appears to be quite good. In the absence of an absolute yardstick, the size of NSERC research grants and the attainment of professional society fellowships are good measures of research excellence. The top NSERC research grants in the School is visibly low and there are no society fellows in the School.

c) Administration and Knowledge Dissemination

The Review Committee was unable to determine the extent of collegial participation in the administration of the School nor the style in which this participation takes place. The Committee had the feeling that the faculty tended to act more as individual entrepreneurs in their research specialty rather than as a member of a cohesive research team. The Review Committee hastens to add that this is not a unique characteristic of the School of Engineering Science at SFU.

d) Environment within the School

From the information collected, the Review Committee was unable to determine the short-term and long-term objectives of the School. It appears that the School is still guided by the original visionary model introduced at the time of inception. At its present size, the School is probably reaching maturity. Administrative policies should now be formalized and announced in a collegial way to create a harmonious environment.

3 Report on the School of Engineering Science

The Engineering Science Review Committee was instructed to examine and to provide comments and recommendations on a number of strategic areas pertaining to the mission and goal of the School. The following list the Review Committee's findings, comments and recommendations.

1. **The Undergraduate Program**

The undergraduate program is structured as a four academic year (eight academic semester) co-operative program. It is a credit-based system and the four academic year B.A.Sc. degree program has a formal requirement of 160 credit hours (CH), which include a thesis requirement of 12 CH. The first two academic years constitute the common core. The last two academic years of the program are structured as four options: Electronics Engineering, Computer Engineering, Engineering Physics (Electronics), and Systems. Starting in the third academic year, students elect one of the four options. In addition, students in each of the four options may elect to pursue a "biomedical engineering stream". Even though there is faculty strength in communications and signal processing, there is no explicitly defined option in this area. The Review Committee was informed that the communications and signal processing disciplines are implicitly encapsulated in the electronics engineering option. In fact most of the upper year students are in the electronics engineering or systems option; fewer are in the engineering physics or the computer engineering option. There appear to be sufficient technical electives in each of the options but a reorganization of the options may consider dropping the *Electronics* designation from the Engineering Physics (Electronics) option. A salient feature of the program, perhaps few other engineering departments/schools would have, is the explicit communications skills course in each of the eight academic semesters.

With a formal requirement of 160 CH, the B.A.Sc. engineering science degree program indeed has breadth. The program has a nominal 20 CH per semester. It is not reasonable to expect that many of the students would take 20 CH per semester. The credit-based system allows a student to take fewer than 20 CH per semester. During the visit, it appears that, on average, a student takes 15 to 16 CH per semester, and takes 10 to 11 academic semesters to complete the four academic year (eight academic semester) program. Moreover, the undergraduate engineering science program has an alarming attrition rate. A typical view of the undergraduate enrollment in the first through the sixth year of the program looks like this: 65, 52, 38, 37, 37, 18. This trend indicates that none of the students complete the four year program in four academic years, some 19 students complete their degree in the fifth year, with the remaining 18 going into the sixth year. The sad reality is that of some 65 or so students admitted to the program, only 37 will graduate with the others either dropped out of SFU entirely or transferred to another program at SFU. The School has not conducted an investigation of the attrition; such an undertaking is clearly and urgently needed.

As a comparison, other comparable B.A.Sc programs in Canada and the USA require from 120 to 128 CH for completion of a four academic year program. In B.A.Sc. programs in Canada that are not credit-based, the requirement is a mandatory five-course per semester package, which is estimated to be equivalent to 128 CH. In the School of Engineering Science, the laboratory courses are strictly open with no scheduled component; it is thus difficult to obtain a good estimate of the effort required. Nevertheless, the high attrition rate and long completion times are contentious issues that the School should address. Perhaps a good starting point for the School is to take a critical look at the four academic year degree requirement to arrive at a more reasonable undergraduate curriculum. With a full-time faculty of 24 and a full-time laboratory professional staff of 9, a B.A.Sc. degree production of only 37 or so students per year is extremely low. With an exceptionally qualified crop of intakes, the School should be more conscientious of the attrition and make every effort to improve its throughput rate to, say 90%, with a completion time of eight academic terms.

On the positive side, the overall program appears to be quite solid. However, the requirement of six courses in mathematics in the first two years is a rather large number, although it was established during the site visit that the coverage in the six courses of mathematics is equivalent to four in comparable B.A.Sc programs in Canada and the USA. This may also be a place for the School to consider reducing the 160 CH requirement. In its current form, the computer engineering option is rather weak, both in terms of hardware and software computer engineering courses. A major strength, and a competitive advantage to the SFU engineering science program, is the communications skills courses. The two lecturers in this program appear overburdened with students and their major service to the School does not appear to be uniformly appreciated by all of the engineering faculty and administration.

2. **The Internship Program**

The internship program is being managed by a staff of two full-time and one half-time person, all of whom report to the Director of the School. The internship program appears very solid and is one of the major features of the SFU engineering science co-operative program. There appears to be about 150 companies of varying sizes, which are required by the SFU engineering science co-operative program. The Review Committee did sense a certain amount of friction between the Engineering Science Internship program and the University Co-operative program. Undoubtedly, there is some overlap between the functions of these two offices and some students in different programs, particularly in Engineering Science, Computing Science, and Physics, may compete for the same job. This suggests that these two offices should have a better understanding of each other's operation through better and more effective communication and information exchange. Maintaining a close relationship with industry appears to be the fabric of the engineering science co-operative program. This suggests to the Review Committee that the School of Engineering Science should retain the administration of the Internship program, but closely network it with the University

Co-operative program.

3. **The Graduate Program**

The graduate program has three components: Ph.D., M.A.Sc., and M.Eng. Having been established only in 1990, the Ph.D. program is relative new and is still in the transient phase. With a current student population of 22, this program deserves time to nurture. The M.A.Sc. and M.Eng. programs have been in operation for almost ten years and should have attained the steady state condition. With a current student population of 61, the M.A.Sc. program has almost attained the steady state status. In any engineering department, an average of four to five graduate students per faculty is a good level. With a faculty of 22, the School should aim for a complement of about 100 graduate students (Ph.D. + M.A.Sc.). The M.Eng. program was designed to provide continuing education and upgrading to professionals in industry. However, this program has been suffering a very high dropout rate and a very long completion time. If the M.Eng. program is to remain viable, the School must find ways to reduce the dropout rate and the length of completion time.

The graduate programs have the following requirements: six courses plus a thesis for the Ph.D. degree, four courses plus a thesis for the M.A.Sc. degree, and six courses plus and engineering project for the M.Eng. degree. As in comparable engineering schools, all courses are one semester with 3 lecture hours per week. There are problems with the course requirement and the course offering. A Ph.D. student who has completed his/her M.A.Sc. degree at the School would have a very difficult time to find six additional appropriate courses for the Ph.D. program. Also, the Ph.D., M.A.Sc. and M.Eng. students all take the same courses that are offered twice a week in the evenings. Offering courses in the evenings is designed to cater for the part-time M.Eng. students. Nevertheless, commuting to the SFU campus twice a week for each course may not be that attractive to professionally employed students, and may be a factor associated with the high dropout rate and the long completion time. Also, having all three groups of students taking the same course in the same class may compromise both breadth and depth. Interviews with some of the graduate students suggests that the course selection with the appropriate contents is rather limited. It appears that, because all three groups of students with differing backgrounds are taking the same course simultaneously, there is a tendency for the lecturer to spend more time covering background material at the expense of new material. Interviews with a few graduate students suggests that some of the introductory graduate courses cover material which they have already taken at the undergraduate level at other Canadian universities.

Recently, the School replaced the written Ph.D. comprehensive examination with two courses to increase the Ph.D. course requirement from four to six. Interviews with the faculty suggests that this move was designed to avoid making graduate students devote time and effort studying for the comprehensive examination which may have little or no usefulness in their Ph.D. work. While this may be a valid consideration, the lack of good courses at the Ph.D. level creates a different problem. Interviews with both faculty and graduate students suggests that many of the graduate courses have small class size, say 2 to 4 students. Also, since all courses are offered twice weekly in fixed time slots in the evenings, most of the courses are being offered simultaneously in the same semester. This further limits the freedom to select courses in a given semester.

The Review Committee feels that, if the School of Engineering Science is serious about establishing a good reputation for its Ph.D. and M.A.Sc. programs, it must put these two programs as a high priority even if it means compromising the M.Eng. program. With a current student population of 40, and in view of the high dropout rate and long completion time, the School should choose between making the M.Eng. a viable program, separate from the full-time graduate programs, or to wind down the M.Eng. program. If the School continues to operate its graduate programs in their current form, it is the Review Committee's opinion that the School's full-time graduate programs will continue to suffer both quality and poor perception. With regard to the qualifying examination and course requirement issues, the Review Committee feels that it is appropriate to institute a comprehensive examination based on background knowledge on and related to the candidate's research area. This comprehensive examination may either be in a written or oral form. In this way, the course requirements can revert back to four.

4. **Graduate Student Support**

Although the School has a limited teaching assistantship budget ($50,000 per annum), interviews with graduate students suggests that many of them obtained teaching assistantships with other SFU departments, notably the School of Computing Science. It appears that there is no fixed level of graduate student support, and many students do rely heavily on teaching assistantship. Many faculty feel that they are not in a position to support graduate students while they are mainly taking courses. Interviews with some graduate students suggests that they would rather be self-supported than taking financial support from their supervisors whose research funds have strings attached, e.g., under contract to do mission-oriented work for industry. The Review Committee feels that it does not have a clear picture of graduate student support in the School, as different students seem to be receiving varying amounts. The Review Committee feels that the Graduate Studies Office of the School should have more discretionary power in initiating and administering policies (or guidelines) in terms of course structuring and financial support.

5. **Degree Completion Times**

As has already been noted, the progress rate and degree completion times for undergraduate students are very significant issues that require immediate attention. One effective way to address these issues is to redesign the undergraduate curriculum to be more in-keeping with a four academic year (eight academic semester) program so that students can actually complete the program in eight academic semesters. With the flexibility inherent in a credit-based system, even with a redesign of the undergraduate curriculum, the School needs to be more vigilant on degree completion times.

There is insufficient statistics to substantiate comments with regard to the Ph.D. program. Except for the problems associated with course offering noted earlier, the M.A.Sc. program seems to be running well, both in terms of progress rate and degree completion times. As noted earlier, the M.Eng. program suffers both from a slow progress rate and long degree completion times. The School needs to make a conscientious decision to either make the M.Eng. program worthwhile or to contemplate its demise.

6. **Environment within the School**

From the information contained in the documentation and the rapid pace of the three day site visit, it is difficult for the Review Committee to comment upon the extent to which the environment within the School is conducive to attainment of its objectives. From the Review Committee's perspective, the objectives and vision for the School are not well articulated, nor is there any commonly accepted set of objectives for the degree programs. An educated observation is that a major objective of the faculty is to achieve individual research success in their areas of specialization. While this is laudable, for this to be successful, they have to operate from a base that is enriched with a highly qualified undergraduate and graduate program. The School needs to clearly enunciate its mission and objectives and to establish priorities.

7. **The Faculty Complement**

A complement of 22 professorial rank faculty plus two lecturers is a good size for a program that has a first enrollment of about 70 (and aimed at a maximum of 80) students. However, in relation to the degree production rates at the graduate and undergraduate levels, the size of the present faculty is large. A faculty workload of two assigned courses plus unassigned tasks per year can easily be the lowest within SFU or elsewhere in Canada and other parts of the world. As noted earlier, with its present size, the School should be able to comfortably handle a first year enrollment of 80 and maintain a throughput rate of 90% or better. This may mean an increased workload for the faculty. The Review Committee was informed that the unassigned workload component, in the form of personal interaction with advanced undergraduate and graduate students, is relatively heavy. Although this may well be the case, it is difficult to quantify. The Review Committee has the uneasy feeling that the overall operation, encompassing both assigned and unassigned workloads, is neither efficient nor effective. The present workload situation does not appear to be a healthy one, in the long term, even for the faculty who benefit from it. An increased workload to 3 courses per year per faculty member would also go a long way towards addressing the issue of availability of graduate courses. The School should collectively address this issue.

8. **Research and Teaching Contributions**

   The faculty appear adequately involved in individual research efforts. There is some, but perhaps not extensive, group and collaborative research efforts within the School. Some of the faculty do have good interaction with industry.

   As the Review Committee had no opportunity to either observe classroom performance or access such information, it cannot offer any tangible comments on classroom teaching. However, with the small class size at both the undergraduate and graduate levels, classroom teaching must be quite pleasant.

9. **External Research Support**

   The level of external support is good, but not outstanding. The average NSERC research grant appears to be at or below the national level. Many faculty express strong interests in interaction with industry, and some do have ongoing industrial interaction.

10. **Interaction and Integration with other Units**

    There appears to be interaction with the School of Computing Science, Departments of Physics and Mathematics, and the Institute for System Science. Much of the interaction appears to be at the research level, as opposed to teaching. The School of Engineering Science is weak in hardware and software computing. Every effort should be made to integrate the efforts of computing science and engineering science to enhance efficiency and effectiveness at the teaching as well as the research level.

11. **Administration of the School**

    The Director of the School, assisted by an Associate Director and a Departmental Assistant, has the overall administrative responsibility, including setting guidelines and priorities. The Director appears adequately supported by an administrative staff, which include a departmental assistant, a Director's secretary, a graduate secretary, an undergraduate secretary, a receptionist and a laboratory resource control person. The School has structured appropriate committees to oversee its day to day operation. Of particular relevance are the Undergraduate Curriculum Committee and the Graduate Program Committee, as these committees have the overall responsibility to develop and to monitor the respective curriculum. With a membership of 15, the Undergraduate Curriculum Committee is too large to be effective. As noted earlier, the high attrition rate and the long completion times of the undergraduate degree program need urgent attention. The Review Committee feels that the School needs a smaller and more effective Undergraduate Curriculum Committee to adequately address revamping the curriculum.

There appears to be a modest amount of contemporary unhappiness on the part of the laboratory professional staff, the internship staff and the communications program staff. This would appear to be caused by a perceived lack of consultation prior to the recent imposition of a hierarchical reporting structure. Perhaps this situation can be rectified through better communication and consultation processes.

12. **Resources and Facilities**

The library resources appear quite adequate. Several graduate students expressed unhappiness with both the number and quality of available computer workstations, and the office space that is available to them. Overall, computer workstation upgrading is needed for both undergraduate and graduate programs.

4 Conclusions

The School of Engineering Science has the critical mass and the capacity to handle approximately 300 undergraduate and 100 graduate students. By setting priorities and taking effective measures to position its undergraduate and graduate curriculums, the School has potential to attain a good reputation in both undergraduate and graduate programs. The key elements are improvement of the undergraduate throughput rate, reduction of the B.A.Sc. degree completion times, and better nurturing of the full-time Ph.D. and M.A.Sc. programs.

The School was apparently founded by a person with much vision. The School should develop long range planning to better articulate its future mission and to evolve a visionary model that would better reflect the reality of today, as opposed to holding onto that of the past.

5 Summary of Recommendations

- With 22 professorial rank faculty, 2 lecturers, 9 laboratory professional staff, 6 administrative support staff and 3 Internship staff, the School of Engineering Science has the critical mass and the capacity to effectively handle approximately 300 undergraduate and 100 graduate students. The basis for these numbers includes a first year enrollment of 80 with a throughput rate of 90%, and an average of 4+ graduate students per faculty. The School should structure a model with these numbers as parameters.

- The Review Committee was surprised to learn that, with statistics compiled over an 8-year period, the throughput rate is only approximately 50%. Moreover, the undergraduate program was structured (and advertised) as a 4-academic-year (8-academic-semesters) program, those completed took at least 10 academic semesters. The Committee attributes this to two causes: (i) the overall program requirement of 160 credit hours is heavy and (ii) the credit system, which offers flexibility to the students, is not being tightly controlled. The School should devise measures to improve the throughput rate to the vicinity of 90% and to ensure a degree completion time of eight academic semesters.

- The Ph.D. program, which started in 1990, is still embryonic. The M.A.Sc. program appears to be running well. However, for the M.Eng. program, the degree completion time is far too long and the dropout rate is too high. It is recommended that the School considers the separation of the part-time M.Eng. program from the full-time Ph.D. and M.A.Sc. programs in terms of course offering, and to consolidate efforts on the health of the full-time graduate programs.

- The Internship program in the School of Engineering Science appears to be the fabric of the mandatory co-operative undergraduate engineering science program. It appears that the Internship has been serving the School well, and its operation should be maintained. Nevertheless, the Internship program and the University Co-operative program should have better communication and consultation to avoid potential conflicts.

- There appears to be a modest amount of contemporary unhappiness on the part of the laboratory professional staff, the internship staff and the communications program staff. It appears that this is caused by a perceived lack of consultation prior to the implementation of administrative changes. The School should be sensitive to this and to ensure a harmonious working environment through better consultation and communication processes. Whatever is the cause, it is critically important that the School focuses on harmonizing the work environment.

April 26, 1996

A Response To Our External Review

The School of Engineering Science

1 Summary

The External Review Report (ER) on our School was received by Engineering Science in January of this year. Although the report contains valid criticisms of our School, it is nonetheless flawed by errors in fact and by faulty interpretations. It is also of deep concern that the report neglects to mention any of the major achievements in our School (which are very significant given our youth). Indeed, we feel that the review team's intent was to provide a critique, rather than a balanced evaluation. Nonetheless, we see the external review as an opportunity to initiate a planning process that will guide the development of the school.

We began planning in February and will have developed a long term vision for the School by the end of August. As a result of this process, specific one and five-year plans will be prepared in order to coordinate the various initiatives going on within the School (such as our curriculum revision); they will address the problems raised in the ER.

The purpose of this document is as follows:

- To recognize and address the most important criticisms raised by the external review.
- To correct the most serious factual errors made by the the review committee.
- To give our own interpretations of issues and facts to provide a counterpoint to those of the review committee.

2 Valid Criticisms

The ER makes a number of valid criticisms of our school, many of which we have been examining (and re-examining) for a several years. On some matters, such as the major curriculum revision, a long process is unavoidable since the issues involved have deep implications; however, on other points, we have tended to substitute discussion for action. In this sense, the galvanizing action of the ER can be seen as a catalyst for action.

2.1 Problems

The following section lists the main problems brought out by the external review and indicates how these are being dealt with.

2.1.1 Enrollment and Class Size

The School agrees with the ER that we can increase our first year admissions to some degree. In fact, we decided in an April retreat to increase the size of our 96-3 first-year class to the recommended number of 80: we also committed ourselves to double our FTE output in 5 years. This FTE goal is feasible, since our curriculum revision project (passed by the ENSC UCC in March 1996) will reduce our attrition and will bring more courses into Engineering Science. Longer term goals and FTE targets will come out of our planning process

In regards to class size, a study of the size of our lower and upper division classes indicates that there is some capacity in the upper years of our program; however, this is not a problem that is unique to Engineering as is indicated below in Tables 1 and 2. The problem is expected to be reduced as first year enrollments increase and our attrition rates become healthier.

Table 1: Percent Distribution of Undergraduate Course Sections (lower division).

	Percentage of Students Enrolled							
	class-size range							
Unit	1–5	6–10	11–15	16–25	26–50	51–100	101–200	201+
Eng. Science	-	-	-	16.7	83.3	-	-	-
Applied Sciences	-	-	-	11.6	30.2	37.2	18.6	2.3
Across SFU	0.5	2.5	9.5	22.9	23.1	16.7	18.2	6.7

Table 2: Percent Distribution of Undergraduate Course Sections (upper division).

	Percentage of Students Enrolled							
	class-size range							
Unit	1–5	6–10	11–15	16–25	26–50	51–100	101–200	201+
Eng. Science	-	14.3	28.6	14.3	42.9	-	-	-
Applied Sciences	3.1	12.3	6.2	23.1	44.6	10.8	-	-
Across SFU	4.0	8.1	13.1	32.7	28.3	11.2	2.3	0.4

2.1.2 Attrition Rate

The ER is strongly critical of our attrition rate and indicates that a rate of 10% should be achievable at SFU due to the high quality of our incoming class. New data regarding our actual attrition rate (computed by looking at BC Grade-12 entrants who spent at least two weeks in Engineering) was obtained from Analytical Studies and is summarized in Tables 3[1] and 4 below; the data in Table 3 indicates the cohort size at the end of each academic year (year zero is the freshman class size). Transfer students (of which there were 10 in 1995) follow a different profile and are difficult to track as a group; as a result, they are not included in these tables.

Table 3: Enrollment by Year Cohort (BC Grade-12 Admissions)

	enrol. at the end of the academic yr.					
admit yr.	yr. 0	yr. 1	yr. 2	yr. 3	yr. 4	yr. 5
1989	38	36	31	28	27	26
1990	43	42	30	27	25	23
1991	51	37	34	25	24	
1992	44	37	29	27		
1993	49	40	33			
1994	54	43				
1994	65					

Table 4: Attrition by Year Cohort (BC Grade-12 Admissions)

	cumulative attrition (percent)				
admit yr.	yr. 1	yr. 2	yr. 3	yr. 4	yr. 5
1989	5	18	26	29	32
1990	2	30	37	42	47
1991	27	33	51	53	
1992	16	34	39		
1993	18	33			
1994	20				

As can be seen, our final attrition rate is in the order of 40–50%. Although we agree that this rate is somewhat high (despite the fact that 50% was the anticipated rate when our program was created), a number of students leave due to our requirement that they maintain a 3.00 GPA. It is not clear that we want to relax our academic standards in order to push more students through. On the other hand, we do lose a number of students by a failure to convey the appeal of Engineering early in the program; this issue is being addressed in our curriculum revision project . In addition, we recently started a "Faculty Advising" program, where each student meets with a faculty member every semester to discuss their program. It is hoped that these measures will significantly increase our retention of students and a 70% target is expected to be achievable.

2.1.3 Graduate Program Curriculum

We agree with the ER that the Graduate Program, and especially the M.Eng. program, needs a careful review.

[1] Students who have graduated have not been removed from the enrollment numbers.

2.1.4 Long Completion Time

The ER points out that our undergraduate program has a relatively long completion time, with the average student taking approximately 5.5 years to finish. The main cause of this problem is the fact that we have a flexible program and that we allow students to deviate from the "plan" laid out in the calendar. Indeed, many students take substantially fewer credits than the recommended number. However, this problem is also a virtue in some sense, since flexibility is seen as a real plus of our program by our students. We are addressing the completion time issue on two fronts:

- Our revised curriculum will be structured so that it is easier to follow the recommended schedule.
- We will enforce our minimum load per semester rule much more strictly in the future.

2.2 Action Items

The School is undertaking a number of initiatives to address weaknesses identified in the Report; these are summarized below.

- Undertake a process to articulate a vision and set of plans of the School's development over the next five years. This process will be completed by the end of August.
- Complete the curriculum redesign project in 96-2. This process will be linked with our vision and should address the "attrition" and "long completion time" issues.
- Initiate a reassessment of the goals and design of graduate program, including the issue of financial support.
- Form a committee to analyze the workload of ENSC faculty.
- Study the School's FTE output in terms of external pressures and the long term vision for the School.

3 Errors and Misinterpretations

The ER contains a number of errors and misinterpretations. Although these are probably due to the short amount of time available to the review committee (and perhaps poor explanations on our part), it is nonetheless important that they be corrected.

3.1 Errors in Fact

3.1.1 Investigation of the Attrition

On page 5, the Report states that "the School has not conducted an investigation of the attrition; such an undertaking is clearly and urgently needed". This is simply false. In the fall of 1993, the School performed a detailed analysis of the dropout rate and the long completion times. The process involved analysis of student records, extensive consultation with faculty and students, public meetings of the entire School (faculty, staff and students) and surveys of time taken by courses in relation to their credit hour designations. A memo reporting the findings was distributed to the entire School and used to initiate and guide the curriculum revision activity.

3.1.2 Long Completion Times

The Report is also critical of the long completion times for the B.A.Sc. degree. As just noted, the School analyzed the problem in late 1993. In early 1994, a curriculum revision project was launched to address it. The goal was a program that students could complete within the Canadian norm for co-op based engineering programs: 4–5 years with 8 academic semesters. The methods include restructuring to 18 credit hour semesters and strict containment of the time demands of engineering courses to an amount commensurate with their credit hour designations. Because of a simultaneous change of School Director and UCC Chair, the process was somewhat delayed; however, it was almost complete at the time of the review, and discussion and passage of the revised curriculum is scheduled for 96-2. The fact that the School was already addressing completion time in this way is critical information, and the team was told about it during their visit. Perhaps they misunderstood its significance, but it is unfortunate that their Report omits any reference to our curriculum revision project.

3.1.3 Number of Credit Hours

At the foot of page 5, the Report claims that our credit hour requirements are much greater than those of comparable Engineering programs in Canada and the USA; this is not true in our opinion. A simple comparison of calendars, using standard credit hour definitions (1 credit-hour/lecture hour/week, + 0.5 credits per tutorial or lab hour/week) has showed that our credit hour requirements are less than UBC's, a little more than UVic's and about the same as Waterloo's.

The Canadian Engineering Accreditation Board (CEAB) has recently defined the "accreditation unit (AU)" as a means of comparing the course loads at different institutions. According to the CEAB, the AUs earned by courses are equal to the number of contact hours per week (one for each lecture hour and a half for each lab hour) multiplied by the number of weeks in the semester. The CEAB mandates that an Engineering program must have a minimum of 1800 AUs. The number of 120 credit hours recommended in the ER for our program comes in at 1560 AUs, which is well below the minimum. Our current program has 2080 AUs.

The School believes that its revised curriculum proposal (at approximately 155 credit hours - or 2015 AUs) is quite feasible and that it is a substantial improvement on the status quo.

3.1.4 Financial Support in the Graduate Program

On page 8, the report states that "it appears that there is no fixed level of graduate student support, and many students do rely heavily on teaching assistantships." We do have guidelines for minimum levels of support. As for the reliance on teaching assistantships, we believe that the level of graduate student support from faculty members' research funds in Engineering Science is the highest of any department at Simon Fraser University. The team may have accepted chance comments from graduate students uncritically, and generalized from that point.

3.2 Misinterpretations

3.2.1 External Links

On page 10, concerning external research support, the Report states that "many faculty express strong interests in interaction with industry, and some do have ongoing industrial interaction"; this is a gross understatement. In fact, the majority of our tenure track faculty members have research contracts, do extensive consulting, foster SFU spin-off companies, have just returned from a sabbatical in industry or have just joined from industry. Our two communications skills Lecturers are also active professionally and are in continual demand for their services in off-campus workshops and short courses.

3.2.2 Objectives of the Program

On page 9, the Report states "... nor is there any commonly accepted set of objectives for the degree programs". Although this statement is partially true, the ER ignored the fact that we do have a high degree of consensus on the general type of education that we want to provide our undergraduates: we do not want to train student engineers in cookie-cutter fashion; we want them to be intellectually proficient and self-reliant; we want them to integrate high academic achievement with industrial experience and a smattering of entrepreneurship. These goals are elaborated in the same vein at every retreat. Most of the faculty believe that the sense of idealism and mission are far higher here than at any other engineering school in the country.

3.2.3 Faculty Workload

For years ENSC has stated that our workload is at least as heavy as that of faculty members in other departments, although details of the load mix may vary. We have presented the argument publicly on several occasions, but have felt that it met with misunderstanding on the part of other members of the university community. The crux of the issue is the "unassigned load" component of our teaching, which consists of the supervision on B.A.Sc. theses, a great deal of one-on-one student contact (which is required in a high calibre Engineering program like ours) as well as the teaching of Directed Studies and Selected Topics courses. The newly formed "ENSC Workload Committee" is developing quantitative measures of this unassigned component.

4 Outstanding Achievements

Our School has many outstanding achievements to its credit (especially considering its youth) and it is disappointing that these were overlooked in the ER. A partial list is presented below.

4.1 Research

Information recently completed an analysis of the impact of research publications, as measured by the number of times a paper was cited. Among all Canadian engineering schools, Simon Fraser's received the highest ranking. In particular, this puts the quality of the School's research contributions ahead of those from Waterloo and Toronto, two schools represented on the team. SFU's Physics department enjoyed a similar distinction, and thought it sufficiently important to have a congratulatory article published in Simon Fraser News ("Physics department leads country in research impact", January 11, 1996). The review team was made aware of Engineering Science's leading ranking in citations during their visit, and one member of the team was a long-serving Chair of the SFU Physics department.

4.1.1 Participation in NCEs

Recently the TeleLearning NCE was created. This program is coordinated from SFU and one of the NCE leaders, Tom Calvert, has a 1/4 position in Engineering. Two of the projects also involve members of Engineering Science (Vlad Cuperman and Jacques Vaisey).

Engineering Science also participates in the IRIS (Intelligent Robotics) and CITR (Telecommunications) Centres through the projects of John Dill, Paul Ho and Shahram Payandeh.

4.1.2 Society Fellows

Bill Gruver and Vladimir Cuperman were recently named Fellows of the IEEE. It should be noted, however, that these elections took place after the visit of the Review Committee.

4.2 External Service/Technology Transfer

Jim Cavers was awarded the Science Council of B.C. Gold Medal in Engineering and Applied Science shortly before the team's visit, a fact that was in the documentation.

The V-chip, which has received intense media coverage recently, was developed by Tim Collings, an Engineering Science lab engineer.

4.3 Quality of the Students/Teaching

We would like to comment on an observation the team did not make. While acknowledging "the exceptionally qualified crop of intakes", they did not look beyond this point to the fact that our students win awards at provincial, national and international student competitions, both for presentations and for projects, in proportions far beyond their numbers. This suggests that our program really does "add value" and does it in a way geared to the intellectually able student.

Our School attracts many of the best students at SFU, which raises the level of all of the classes in which they participate. Even if these students leave Engineering, they usually transfer to another Dept. in the University rather than drop out completely.

The School of Engineering Science

A Five Year Plan for Engineering Science

September 6, 1996

Contents

Executive Summary

This document sets out the philosophy of the School of Engineering Science, and our vision for the School's development over the next five years. Key action items include:

- We will increase our first-year intake to 80 students, effective September 1996.
- We will implement extensive changes in the undergraduate curriculum to reduce attrition and completion times. The new curriculum has been designed and is awaiting confirmation at the faculty level.
- As a result of the first two items, the average number of FTE's and contact hours taught in the School are expected to increase by 100% over the next five years.
- The first priority in our capital budgets over the next five years will be to increase the number of computer workstations for the undergraduate and graduate programs.
- We will examine and restructure our part-time Masters program (the M.Eng.) to address the problems of long completion times and high attrition rates.

In the remainder of this document, the details of this vision are described at four successive levels of refinement, starting with our general philosophy and progressing to actions by identifiable individuals.

1 Operating Philosophy of the School of Engineering Science

Our responsibility is to create, disseminate and apply engineering knowledge through excellence in research and teaching. In both graduate and undergraduate teaching, we must continually strive to offer the best education possible, to develop engineers capable of making outstanding contributions to our society. Our vision of this education is based on a deep understanding of the natural sciences, but must also include practical experience, the ability to work productively as a member of a team, superior communication skills, and an appreciation for the economic and social contexts of our profession. These goals are realized through the formal curriculum, the co-op and communication programs, and, accompanying and underlying this, the continuing partnership of students, faculty and staff in the application of engineering to the betterment of the human condition.

We seek to foster a sense of community within our School, where relationships are built on mutual respect for our strengths and tolerance for our differences. Our School must be one where initiative and innovation are encouraged and all feel that their contributions are valued. In this light, everyone in the School should understand and take responsibility for his or her role in accomplishing the School's mission, and must know what measures to use to evaluate their success.

2 The Five-Year Vision

2.1 Introduction

The School of Engineering Science was established in 1983, and offers both undergraduate and graduate programs. The first students in our undergraduate program graduated in 1986, our first M.A.Sc. students in 1988, and our first Ph.D. student in 1993.

We are not a traditional engineering school, but focus on innovative and personal instruction, combined with a program emphasis on advanced technological areas such as microelectronics, telecommunications and signal processing, systems engineering, and computers. Our research programs aim at excellence in selected areas and our faculty members are encouraged to maintain strong links with industry. We are a comparatively small and personal program that prides itself on its quality, and we produce engineering graduates with an unusual ability for innovation.

Undergraduate Program

We have four major areas of concentration where faculty members' research strengths are tied to the undergraduate curriculum: electronics engineering; computer engineering; engineering physics, and systems. We also have a biomedical engineering stream, which allows a biomedical "flavour" to be added to one of the existing options: the idea being to prepare students either for graduate training in biomedical engineering or to work in the interdisciplinary field of engineering applied to the medical sciences.

Among the most distinctive features of our School are the communications program, the mandatory co-op program, and the undergraduate thesis. In a set of courses closely integrated with the rest of the curriculum, the students study communications topics such as written and oral presentation, reports and project documentation, computer-aided drafting, ethics and social implications of technology. Further, every Engineering Science student must spend at least three semesters on co-op workterms. The final industrial semester often involves a major project, which is subsequently written up to form the undergraduate thesis. An alternative thesis mechanism is for a student to work on a project related to a faculty member's research.

Graduate Program

Since accepting its first graduate student in 1986, the Engineering Science graduate program has grown to its current population of 83 full-time Master's and Doctoral students. While further growth is still possible, current enrollment represents an average of about four graduate students per faculty member, and may therefore be close to steady-state. We also have 40 students enrolled in the part-time M.Eng. program.

The School offers two Master's level degrees, the M.Eng. and M.A.Sc.; since 1990 we have also accepted Ph.D. students.

The M.Eng. program is designed for part-time study by practicing engineers, and involves 24 credit hours of course-work, at least 20 of which must be at graduate level. Graduate courses are normally offered in the evenings, making them accessible to people working full-time. In addition, the program requires completion of a project, normally performed in industry.

The M.A.Sc. program is designed for full-time students and involves a minimum of 12 semester-hours of course-work, plus a thesis based on an independent project with a significant research component. The thesis must be defended orally, in accordance with general University regulations. With approval from the Graduate Committee and the student's Supervisory Committee, the thesis may be carried out in industry.

The Ph.D. program is designed for full-time students and involves a minimum of 18 credit-hours of course work, at least 12 of which must be at graduate level. In addition, the program requires the student to define and undertake a program of original research, the results of which are reported in a thesis.

2.2 The Vision

Our vision for Engineering Science over the next five years is:

1. To improve the quality of our undergraduate program by implementing our redesigned curriculum, while retaining a solid grounding in the sciences and continuing to develop strong engineering skills in our students. This new curriculum is expected to reduce completion times and to help us in lowering our attrition to less than 30% without a change in our academic standards. (A recent external review suggested a target attrition rate of 10%. We believe this to be unrealistic; the attrition rate for SFU as a whole is 50%.)

   We consider the following features to be vital to a quality program:

   a) a great deal of one-on-one student–teacher contact (this means that we need to limit both our undergraduate and graduate enrollment to a manageable number of students. The eighty that we will be admitting in 96-3 is the maximum that we can teach with our current resources);

   b) maintenance of a strong communications program;

   c) project-oriented labs (especially in the upper division);

   d) good and relevant co-op jobs;

   e) well-equipped teaching labs that operate primarily on the "open principle", that is, students have access to the lab 24 hours a day, seven days a week;

   f) a healthy student culture reflected in mutual support and communication across years;

   g) encouragement of initiative, creativity and social responsibility;

   h) involvement of the undergraduate students in research projects, leading to peer-level interactions with graduate students, staff and faculty;

2. To continue to develop our research programs and to strive for increased international recognition.
3. To continue to maintain strong links with industry and to develop opportunities for technology transfer.
4. To significantly improve the quality of our graduate program so that it is as innovative and exciting as our undergraduate school. Making this improvement recognizes the importance of the graduate students to our research programs and to the health of the school in general.

   Our M.Eng. program must be rationalized to eliminate the following problems:

   a) It seems that very few M.Eng. students finish their program. One hypothesis is that they are mainly interested in upgrading their skills in a selected area.
   b) Most of our current M.Eng. students are interested in very practical things that will be of direct use in their careers; this conflicts with the goals of our current M.A.Sc. courses.
   c) Many M.Eng. students require significant review of basic material in order to understand the topics covered in our M.A.Sc. courses; the need to cover this material compromises the level of the courses for M.A.Sc. students.
5. To seek ways in which we may cooperate with and serve other sectors of the university community, by developing joint programs and a minor in engineering.
6. To do all of the above in a co-operative manner that builds a sense of community within the school.

A vision is what we want to happen, while goals and actions are the means of making it happen; these are presented in the next two sections.

3 Goals

Undergraduate Program

1. To increase our average FTE by 100% by September 2001. This goal will be achieved via two sub-goals: an immediate increase in our intake to 80 students as of Fall 96, and a reduction in our attrition rate to 30% over the next five years (without a reduction in academic standards). Much of this reduction is expected to occur in the next two years as a result of our curriculum re-design. Exit interviews must be conducted with those leaving the program to determine where they've gone and why.

2. To deal with increased enrollment, we will consider the following measures:

   a) splitting the lab, though not the lecture, sections of large-enrollment classes and having reserved time blocks for particular labs, during which the appropriate faculty and lab staff will be available to answer questions;

   b) Arranging for "workshops" at designated hours, during which TA's will be available to answer questions on any one of a number of courses;

   c) arranging for on-line newsgroups associated with each course, so that frequently-asked questions need only be addressed once.

3. For undergraduates entering the program in 1996 and subsequently, our goal is that 90% of the graduating class will graduate in 10 academic semesters or fewer.

4. To have adequate computing resources available to our undergraduate students, it is estimated that we require 0.2 workstations per FTE student, these workstations should offer the current equivalent of Pentium performance. To reach and maintain this level, we require an adequate budget (currently estimated at $18k) to be spent on new workstations as our student population grows over the next five years. Lastly, we must keep our software licenses current; the cost is estimated to be $10k per year.

5. We will increase the entrepreneurial emphasis in our program through several mechanisms:

   a) We will seek to develop a new "stream" in the Management of Technological Innovation in collaboration with the School of Business Administration, drawing as far as possible on existing courses. Although this stream might take longer to complete, it will be attractive to those students who like the business route, want formal recognition of their emphasis, and who can benefit by taking a well-thought-out sequence of courses. We believe that for this to be successful, a faculty member from ENSC must be found to act as a "champion".

   b) We will offer more seminars from successful entrepreneurs.

   c) We will arrange for more tours of small companies.

   d) We will solicit help from the BC Advanced Systems Institute for student projects undertaken with small companies.

6. To rationalize the biomedical engineering stream by developing a clear list of prerequisites and a set of suitable projects. We should also investigate the possibility of a new course on biomedical instrumentation, targetted at Kinesiology students. Professor Andrew Rawicz has stepped forward to act as a champion for the biomedical stream.
7. To continue to investigate the possibility of a software engineering option, offered jointly with Computing Science.
8. To investigate the possibility of offering a minor in Computer Engineering (which would be attractive to Computing Science students).
9. All faculty will actively seek to involve undergraduate students in their research programs (even if simply as "sub-contractors" for their graduate students).
10. We will put more emphasis on high-school visits and do a better job of attracting those students who visit our school in order to maintain the quality of the applicant pool from which we recruit.
11. We must increase the number of undergraduate course offerings in the summer.
12. We all (students, staff and faculty) will treat each other as partners in the building of our programs and community.

Graduate Program

1. We should develop a source of funding to support graduate students for that portion of their time when they're still doing course-work. (TA-ships alone are not an adequate source of funds for this purpose.)
2. The School as a whole must develop a set of graduate courses adequate to support healthy M.A.Sc. and Ph.D. programs. The Academic Planning Committee believes that this can be done by:
   i) maintaining our current graduate courses, and perhaps increasing their rigour as we will no longer need to adjust them for M.Eng. students (see below);
   ii) adding one advanced graduate course per faculty member per biennium, to strengthen the Ph.D. program.
3. We need to ensure that adequate computing resources are available for our graduate students, which means that we should have in the order of 0.25 workstations per FTE graduate student (exclusive of the machines owned by individual research groups), these workstations should offer the current equivalent of Sparc 5 performance. We should also introduce a policy to control the use of workstations by visitors, perhaps by restricting them to the research machines of the research group with which they are associated.
4. To have a regular seminar series, featuring presentations by grad students, faculty and guest speakers, at least every two weeks.

5. To reduce costs and promote efficiency, we will have graduate students pay for their printing in the same way that our undergrads do now.
6. We must investigate the use alternative course delivery mechanisms such as the internet and video so that our offerings will be available to more students (especially those in the M.Eng. program). We also need to look more deeply into offering video conferencing courses together with other institutions.
7. We will modify our current M.Eng. program by offering certificates for "packages" of courses, short of the eight courses required for an M.Eng. degree.
8. We will remove the project requirement from the M.Eng. program, thus converting it to a "mainstream" Masters degree without a thesis (along the US model). This should allow students to enter this program without an industrial connection and to finish in 3 semesters. The program will be targetted to two groups: those students who want more education, but who aren't interested in research, and who want to finish their program in a timely manner; and those students wishing to do a Ph.D., who will get their research experience in the course of their Ph.D.. It is recommended that the course requirement for Ph.D. students graduating from this or other course-based Masters shall be dropped from 6 to 4.
9. We will investigate whether it will be possible to offer enough graduate courses in the summer so that students in the new M.Eng. program will have the option of completing in three semesters. We also hope to be able to offer more of our graduate courses during the day, which will make things more pleasant for our on-campus graduate students.
10. Some students coming into our graduate school (particularly M.Eng. students) either have an inadequate background, or have forgotten important material through lack of use. This problem needs to be dealt with, since it compromises many of our current courses. One possibility is to develop a set of "refresher" courses in the biggest problem areas (which could be offered in a distance mode). We should also consider placements exams for certain types of students so that they could be required to take "refresher courses" if needed.

General

1. We must exploit technological options for improving the efficiency and delivery of teaching. The basic idea here is to create/buy CD-ROMs or videos for instructing students on basic skills such as using instruments and software packages. In addition, we might be able to make our courses more efficient through appropriate uses of technology: for example, by putting many of our course materials on the Web. The Engineering Student Society (EUSS) is planning to provide coaching for first-years in the use of selected lab equipment.

2. The increase in enrollment and the anticipated increase in retention will increase the workload on the staff. To deal with this, we will:
   a) examine and balance the staff workload;
   b) obtain and maintain up-to-date office equipment;
   c) create and maintain a database;
   d) employ two permanent full-time co-op coordinators;
   e) ask faculty and staff to help in finding/providing relevant co-op jobs and theses;
   f) ask faculty and staff to help with high-school liaison work.
3. We should have a policy of meeting some of our hardware needs through student projects, if possible.
4. We must find ways of obtaining more space, with the goal of maintaining a certain minimum square footage per student. Four suggested methods for doing this are:
   a) the sharing of offices by staff members, removing intervening walls when necessary;
   b) putting up portables;
   c) pursuing a new Applied Sciences building;
   d) investigating vacant or under-used space on campus (for example, in the Shrum building).
5. We need to be more pro-active in recruiting the top high-school students into our program. This activity should involve more visits to high-schools and more compelling lab tours of our facility. The tours and demos should focus on student projects more than faculty members research: we should keep the best student projects in working order so that they can be demonstrated as needed.

4 Actions

In this section, we translate our goals into specific actions organized according to the committees responsible for implementing them.

The progress towards the goals (and vision) will be tracked by a new Oversight Committee. This committee shall consist of the Director, the undergraduate and graduate chairs, representatives from the undergraduate and graduate students, and representatives of the office and lab staff. The committee will meet at least once a year and should prepare an annual report to the School documenting our progress towards our goals and suggesting any necessary modifications to the plan. The report should be released in a time frame that corresponds with the School's annual retreat.

4.1 Committee Responsibilities

Capital Budget Committee

1. To set aside, as a first priority, adequate funds (current estimate: $10k) every year to maintain software licenses.
2. To set aside, as a second priority, adequate funds (current estimate: $18k) every year for computer acquisition and maintenance.

Computer Committee

1. To maintain 0.2 or more workstations per undergraduate FTE student, these workstations to provide the contemporary equivalent of Pentium performance.
2. To keep our necessary software licenses current.
3. To develop a policy whereby grad students pay for their printing, in the same way as undergrad students do now.
4. To develop a policy on the use of workstations by visitors.
5. In consultation with the Graduate Program Committee, develop a policy to ensure 0.25 publically available workstations, with Sparc 5 performance or better, per graduate student.

Coop Office

1. To arrange for additional tours of local companies for groups of students (in collaboration with the EUSS).

Graduate Committee

1. The Graduate committee will develop a certificate program to supplement the current M.Eng. program, offering suitable certificates for the completion certain packages of courses.
2. The project requirement shall be dropped from the M.Eng. degree.

3. The Graduate committee will attempt to develop a timetable of graduate course offerings, including the summer semester, to allow full-time M.Eng. students to complete eight suitable courses in one year.
4. The course requirement for Ph.D. students graduating from our course-based Masters program shall be reduced from 6 to 4. The Committee will decide on which other programs fit this same category on an on-going basis.
5. Establish and maintain a graduate seminar series.
6. By the end of 1997, examine the graduate courses offered by the research groups and determine whether they offer adequate coverage at the M.Eng., M.A.Sc. and Ph.D. levels.
7. By the end of 1997, investigate and report on the use of live video links from ENSC to selected remote sites. The potential of the internet as a course delivery mechanism should also be investigated.
8. Investigate the possibility of offering practically oriented M.Eng. courses through Continuing Studies.
9. In consultation with the Computer Committee, develop a policy to ensure the availability of 0.25 publically available workstations, with Sparc 5 performance or better, per graduate student.
10. The Graduate Committee will investigate ways to develop sources of funding for new graduate students that will support them while they are doing courses.
11. The Graduate Committee should look into the problem of many graduate students having poor English skills. Possible actions are to increase the TOEFL threshold for admission into our program, or to set up a separate TOEFL threshold for those students who will be acting as TAs.

High-School Liaison Committee

1. To become more actively involved in recruiting, both by organizing school visits and by using student projects in demos and tours.
2. To involve faculty and staff in high-school liaison work.
3. To investigate the possibility of a promotional video, perhaps based on the existing 10th anniversary video.

Workload Committee

1. To develop a formal workload policy, consistent with University policy and the goals proposed in this document.

Lab Committee

1. To plan for scheduled labs at which guaranteed help will be available from lab staff and faculty.

Policy Committee

1. In consultation with the Chair of the Lab Committee, to study and report on the work-load and workload balance for office and lab staff.

Research Group Representatives

1. Each research group will develop a policy for dealing with intended graduate students who lack background in the area, or whose skills have become rusty through lack of use.
2. Each research group will develop one or more Ph.D.-level courses in its research area.

Scholarship and Progress Review Committee

1. Monitor the attrition rate, conduct exit interviews, and prepare an annual report on the results.
2. Monitor the rate at which undergraduates pass through the program, with the goal that 90% of the graduating class should graduate in 10 academic semesters or fewer.

Space Committee

1. To find ways of obtaining more space.

Undergraduate Curriculum Committee

1. To develop 'workshops', as used by other departments, such as Mathematics, at which qualified grad students will be available to consult on all lower-division courses.
2. To arrange for on-line newsgroups associated with each undergraduate course.
3. To initiate discussions with the School of Business Administration on the development of a stream or program in the Management of Technological Innovation by the end of 1996.
4. To study the Biomedical Engineering stream and to present a plan for re-vitalising it by January 31, 1997.
5. To continue to study the possibility of a software engineering option, to be offered jointly with Computing Science.
6. To investigate the possibility of offering a minor in Computer Engineering.
7. To investigate the possibility of a new course on biomedical instrumentation targetted at Kinesiology students (together with Andrew Rawicz).
8. To coordinate more entrepreneurial speakers together with Susan Stevenson and Steve Whitmore.