PROGRAM REVIEW REPORT

of the

ENGINEERING TRANSFER PROGRAM

Cariboo College

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ENGINEERING TRANSFER PROGRAM

OFFICE OF INSTITUTIONAL RESEARCH & EVALUATION

January, 1991

THE PROGRAM EVALUATION COMMITTEE

(December 6-7, 1990)

COMMITTEE CHAIRPERSON	**Brian Elliott** Chairperson, Social & Environmental Studies
FACULTY REPRESENTATIVE	**Wayne Babinchuk** Instructor, Computing
EXTERNAL REPRESENTATIVE	**Michael Davies** Associate Dean, Applied Science University of British Columbia
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SUMMARY

The Engineering Transfer Program at Cariboo College is seen by faculty, students, and this review panel as working effectively. For the most part, students appear to be well prepared for the transition to the universities, and comments from former students reveal appreciation of the general quality of instruction and excellence of resources, especially in Computer Drafting, Physics, and Chemistry.

Engineering at the College, though, has to "piggy-back" on the general Science, Math, and Computing programs, and this has made it difficult for the program to achieve the degree of co-ordination that would encourage a truly distinct identity. That is a pity, for programs that lack clear identities tend to do poorly in the internal competition for funding and institutional support. With all the excitement of "degree completion" at the College, there is some danger that the virtues of this transfer program will be overlooked and that it may not receive the recognition and the resources that it deserves and needs.

The Evaluation Committee recommends increasing the first year Engineering intake to a size that can command Engineering sections in all courses, and providing a full second year in Electrical Engineering. At this point only about two-thirds of U.B.C.'s second year Electrical Engineering courses are available here. These expansions, along with some organizational changes to improve the integration and continuous monitoring of the program, will help to establish Engineering as a more distinctive element in the College. Funds to support this should be sought within the next few months.

Looking further ahead, a more substantial development of Engineering education should be contemplated. The world-wide demand for engineers is projected to grow considerably over the next decade or so, and with excellent programs like Electronics and Computer Aided Design and Drafting, the College is well placed to develop the co-ordinated growth of Engineering and these "specialities".

INTRODUCTION

The Engineering Transfer Program Review was initiated on July 13, 1990, with a formal request for program data from Colin James, Acting Dean, Sciences/Health Sciences. Initial discussions on questionnaire design and review procedures were held with Dr. James on July 20, and again with Dr. Tom Walton, Chairman, Sciences/Engineering, on August 31. Former Engineering students (1985-1989) were mailed surveys on September 5; the second mailing was done on October 3, with (thanks to the good graces of Barry Brooks, Program Manager, Engineering Co-Op and Undergraduate Office) particular emphasis on those students who have transferred to U.Vic., and a third mailing, concentrating on U.B.C. transferees, took place on October 29. Faculty were surveyed on October 1, and October 30, the questionnaire was distributed to the 1990 Engineering Transfer intake. The cut-off date for all responses was November 16. The Evaluation Committee met on December 6 & 7, 1990. It reviewed the results of the questionnaires and a variety of other data, and conducted interviews with a number of the faculty most closely involved in teaching Engineering students.

PROGRAM BACKGROUND

The Engineering Transfer Program has been offered since 1980. At that time a Bachelor of Applied Science (B.A.Sc.), at U.B.C., required five years, which consisted of one year of Science and four years of Applied Science. Cariboo College offered the year of Science and the first year of Applied Science. Students would then transfer directly to U.B.C. and enter second year Applied Science.

In 1985, U.B.C. reduced the length of the program to four years by eliminating the requirement of first year science. The five year route was retained for students transferring from the faculty of science.

In 1986, Cariboo College modified its program to offer the first year of U.B.C.'s four year program while still keeping the five year route open.

The Engineering Transfer Program articulates with all three provincial universities via meetings of the Engineering Related Education Co-ordinating Committee (ERECC). This committee meets approximately once a year and includes representatives from colleges with engineering transfer programs, the Association of Professional Engineers, and the Applied Science Technologists and Technicians of B.C.

ADMISSIONS DATA, COMPLETION AND ATTRITION

Admissions Requirements:

1. B.C. Grade 12 graduation or equivalent

2. Completion of Algebra, Chemistry and Physics at the Grade 12 level (completion of Geometry 12 is strongly recommended).

3. Applicants must attend a group Engineering Orientation Session before submitting an application.

Program Capacity/Program Demand over past six years:

Program Capacity: 24

Program Demand: Engineering enrolments over the last six years are as follows:

1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
18	21	23	29	20	22

Average annual enrolment over the six year period has been 22, giving a utilization rate of 92.36%.

Completion & Attrition Rates: Engineering Students at Cariboo College

Year	Enrolled	Passed	Failed	W	% Att.	% Com.
1985/86	18	11	5	2	39%	61%
1986/87	21	13	6	2	38%	62%
1987/88	23	22	1	0	4%	96%
1988/89	30	20	6	4	33%	67%
1989/90	20	16	2	2	20%	80%
TOTAL	**112**	**82**	**20**	**10**	**27%**	**73%**

DISCUSSION OF QUESTIONNAIRES

Faculty Survey:

All 13 faculty associated with the Engineering Transfer Program responded, for a return rate of 100%.

Current Student Survey:

Fifteen of the 22 students registered in the Engineering Transfer Program responded to the questionnaire for a response rate of 68%.

Former Student Survey:

Of the 95 former students surveyed, 40 responded for a return rate of 42%. Seven (17.5%) respondents were attending U.Vic., and 13 (32.5%) were at U.B.C. In other words, 50% of former student respondents were currently attending one of the two major engineering schools in B.C.

TABULAR SUMMARY OF QUESTIONNAIRE RESPONSES

The categories and quantities of responses are tabled below:

Recipient		# Sent	# Completed and Returned	% Return
Faculty		13	13	100%
Students:	Current	22	15	68%
	Former	95	40	42%
TOTAL		**130**	**68**	**52%**

Former Students
Returned by Post Office (all years): 16

Former Students Non-Respondents: 39

As At November 16, 1990

SUMMARY OF QUESTIONNAIRE DATA

A. FACULTY:

In general, the survey of the faculty conveys an impression of moderate satisfaction with the Engineering Transfer Program. Scores on the various items suggest that the following are matters where the faculty would like to see some improvements:

A1. Program Identity:

Since Engineering is not a self-contained program with its own courses, there has not been much incentive or opportunity for tailoring courses specifically for engineers. With some modest growth in the program and with some more deliberate co-ordination of the constituent courses, it should be possible to respond to the criticism implied in these questionnaire responses by establishing distinct sections.

A2. The Development of Oral and Written Communication Skills:

The faculty plainly felt the need for improvements to that area, and the Subjective Comments sections of the student questionnaires certainly showed why. The move--under the pressure of student numbers--away from written assignments towards objective tests does nothing to encourage writing skills. It may be desirable and possible to re-introduce more "report" writing in Engineering courses.

A3. Responsiveness of Program to Trends in the Field:

Some faculty thought there was room for improvement here--though it is impossible to specify those trends that they really had in mind. The establishment of a co-ordinating committee for Engineering might help. It could, for instance, promote discussions of developments in engineering among faculty teaching in the program, encourage closer liaison with university colleagues, and routinely review program content in the light of developments in the engineering profession.

A4. Fostering Team Work and Social Skills:

The program does not provide much opportunity for this, though according to instructors who were interviewed by the committee, the students taking Engineering do tend to form their own group and work together to some extent. The course on Applied Science, with its field trips and visiting speakers, fosters some identification with the engineering profession and brings the students together as a distinct group. It may be desirable to move this course to the first semester and/or to extend it somewhat.

Faculty Interviews:

The Committee held informal interviews with six of the 13 faculty who teach the Engineering students. In these conversations, there was elaboration of points made to the "Subjective Comments" section of the questionnaire, and some additional issues were raised.

A5. Engineering: Servant of Too Many Masters:

Students do not complete an engineering education at the College. They enroll for one or two years and then transfer--mostly to U.B.C.--and in smaller numbers to U.Vic., S.F.U. and the University of Alberta. The content of courses here is tailored to fit existing courses at the universities. The problem is that those courses show substantial differences from one university to another, and this places impossible demands on the instructors at the College. Until there is some closer alignment of the various university courses, it may be best to select one or two institutions, orient Cariboo courses to them, and admit that we cannot prepare students for a wide range of senior institutions.

A6. Transfer to University of Victoria:

There were many complaints from faculty and students about the difficulty students face when they try to transfer to U.Vic. There is simply no routine acceptance of college transfer courses. This issue needs to be addressed urgently, but it will no doubt be best to organize some collective approach among colleges and universities offering Engineering courses, perhaps via the Engineering Related Education Co-ordinating Committee.

A7. Computing: The Problem of Disparities in Ability:

Faculty who teach Computing 113 complain (as do the students) that the class contains some who are relatively sophisticated and others who are novices in computing. The results are predictable: boredom for some; bafflement for others.

Two suggestions were made: the first, that students should have at least a "B" in Math 12 before taking the College course; the second, that a diagnostic test, such as the advanced placement exam, be administered at the start of the College year to those wishing to challenge Computing 113. Those who did well would be encouraged to take Computing 123, which could be scheduled parallel to Computing 113.

A8. Mathematics: Declining Abilities:

In Math, the problem is that too few students come to the College adequately prepared. The most effective way of building confidence and ability is seen, by one instructor, to lie in holding classes five days a week and working through math problems every day. This would require an additional hour in the already full weekly schedule for Engineers. As with Computing, it was suggested that there be established a prerequisite of a minimum of "B" in Math 12 prior to enrolment in Math 113 or 114.

B. **CURRENT STUDENTS:**

Scores on the questionnaire items suggest that students are, for the most part, pleased with the quality of their education in this program. The matters on which they express some concern are as follows:

B1. Program Information and Orientation:

There are indications that students would like more and better information than that contained in the Calendar and that, when they arrive on campus, they would appreciate a more substantial orientation to their program.

B2. Computing 113:

This seems to pose the greatest problem among the courses taken by these students. The main difficulty lies in the disparate abilities of the students in a single class. A proposal from the students is to split the class into two groups distinguished by ability levels.

B3. Math 113: Need For a Text:

For some students the lack of text in this course (and in 123 according to former students) is a problem. The External Representative on this committee expressed some surprise that no text is required.

B4. Equipment in Chemistry Laboratory:

The Subjective Comments section of the questionnaire contained some complaints that no cupboards were provided in the Chemistry Lab. Neither, it seems, are there stools.

C. **FORMER STUDENTS:**

There were many very positive comments contained in the questionnaires. Plainly, among those who responded, most looked back on their time in the College with affection and appreciation. There was high praise for many instructors and very favourable comparisons were made between the Drafting and Computer facilities here and those at U.B.C.

C1. Computing 113:

The scored items suggested that this course is recalled as less than satisfactory.

C2. English 110:

Some aspects of this course received less positive scores than those of most other courses. A reasonable inference might be that when Engineers seem to suggest that they would like more varied and practical exercises and materials in English, they are probably asking, "Why can't English be more like Science?" Overall, as an "outside" subject, English fares well on the evaluations. The special section and dedicated instruction are working well.

C3. Transfer to University of Victoria:

The Subjective Comments make very plain the frustration felt by students who discover that, as yet, there is no formal or routine acceptance of College courses for U.Vic.'s Engineering Program. It would be highly desirable to alter this situation.

C4. Grade Comparability--College to University:

Students observe that some grades given at the College appear to be more generous than those awarded at the universities. The students' observation reflects, no doubt, the fact that when they apply to U.B.C., their college grades are "discounted" and that on average they receive noticeably lower marks in their university courses. (See data on p. 13.)

TRANSFERRING FROM COLLEGE TO UNIVERSITY

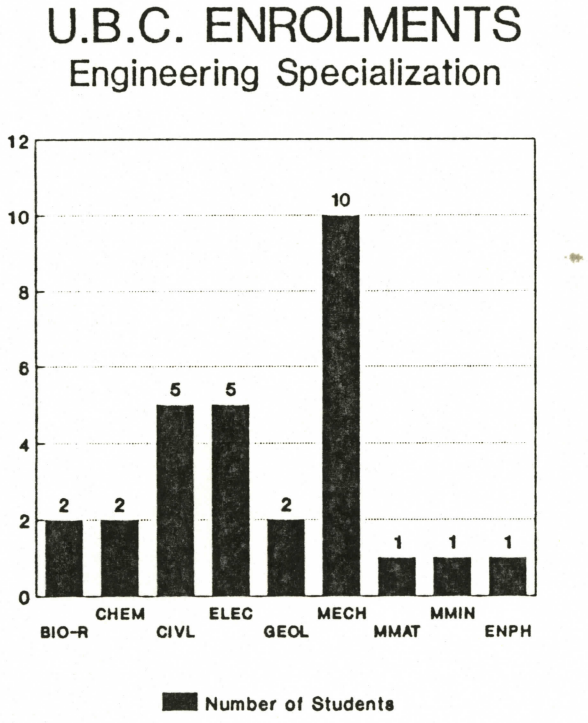
Successful Engineering Transfer students at Cariboo College have the option of transferring to most engineering schools in Canada. The largest number selects either U.B.C. or U.Vic., although some have gone to the Universities of Alberta, Calgary and even Lakehead.

The decisions that students make about the university they wish to attend seem to vary a good deal from year to year and in a small program like this one there are some very noticeable group effects. In any given year the choice of a particular university by one or two students may precipitate a "snowball" effect, with half the class following their lead.

This helps to explain the patterns that emerge when we array the information on enrolment patterns in a university for a particular year. Take, for instance, the figures for Cariboo students at U.B.C. in session 1990/91. To the U.B.C. faculty, the striking feature of the bar chart is how few students transferred into Electrical Engineering, a speciality that normally attracts about as many candidates as Mechanical Engineering. The reason seems to be that last year a bloc of Cariboo students chose to go to U.Vic. to pursue this specialization.

An analysis of the specialities selected by ex-Cariboo College students currently registered for the 1990/91 Winter session at U.B.C. yields the following breakdown:

Specialization	# Enrolled
Bio-Resource	2
Chemical	2
Civil	5
Electrical	5
Engineering Physics	1
Geological	2
Mechanical	10
Metals & Materials	1
Mining & Mineral Process	1
TOTAL:	**29**



GRADES: INTERNAL AND EXTERNAL COMPARISON

The Committee discussed data and observations on college and university grades. Questions were raised whether instructors here are too lenient and whether there is a consistent pattern across all courses.

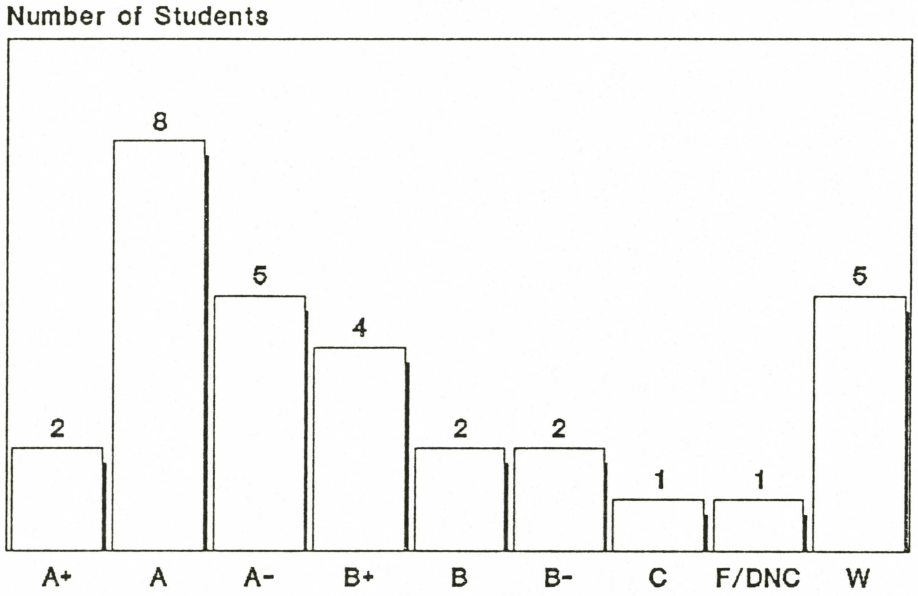
The histograms of grade distributions in Engineering Physics, Engineering Chemistry, and Math 113 certainly show an upward skew. In part this may reflect good teaching and class sizes that are much smaller that those at universities. It is possible that this more intimate and supportive educational environment turns more of the "geese" into "swans". But it is also likely that the high median marks in these courses are at least in part artifacts of assessment procedures where several mid-term tests and exercises yield higher average grades than end-of-course exams.

The grade distribution in English 111 produces a very different pattern. What it tells us is not that Engineers do badly in English courses but rather the norms of marking are very different. In Arts subjects grades in the 80's are given very sparingly. In Science-based subjects, far higher proportions of students score in the top two deciles. It is a universal phenomenon and therefore not one to excite great concern in this context.

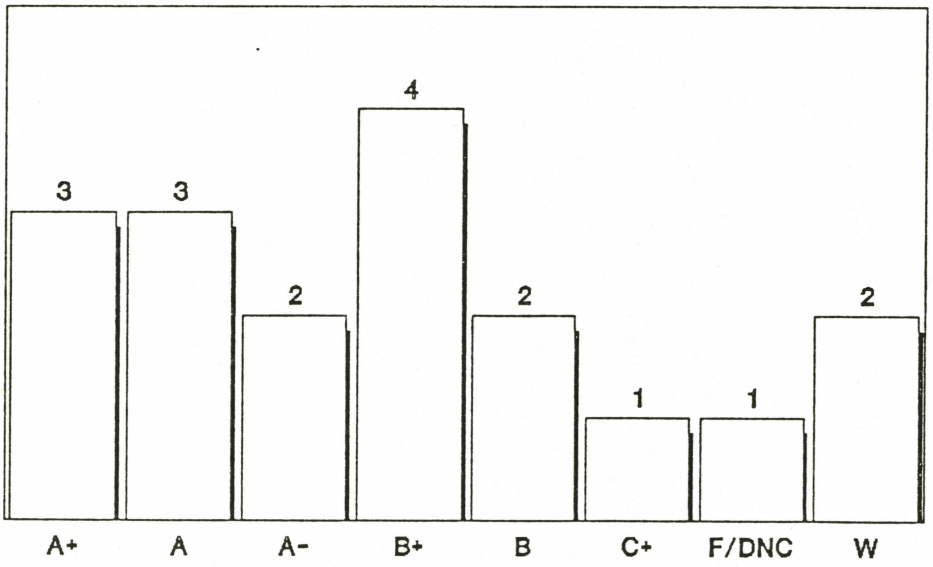
Which is not to say that grade distributions should not be monitored carefully. It might be advisable to consider whether the use of frequent tests throughout the semester and the relatively low weight placed on final exams are producing unintended consequences.

The grades of Cariboo students who transferred to U.B.C. (p. 13) show that our former students produce respectable performances, placing them, on average, in the middle or just below the middle of their classes. They also show, though, a differential between college and university grades: in all subjects the university grade is lower--by about 10%.

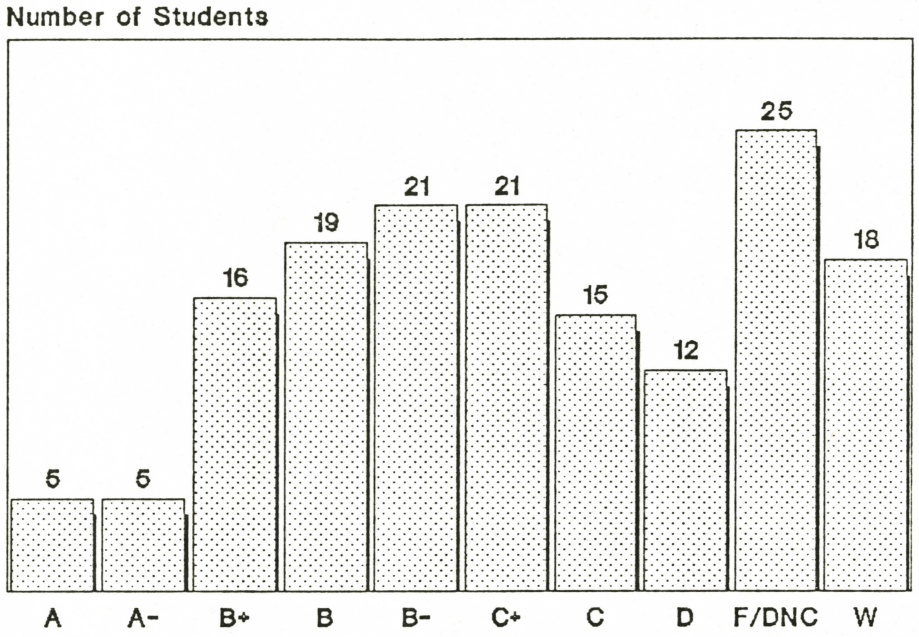
ENGINEERING COURSE GRADES DISTRIBUTION
ECHE111: Engineering Chemistry
(September 1986 to May 1990)



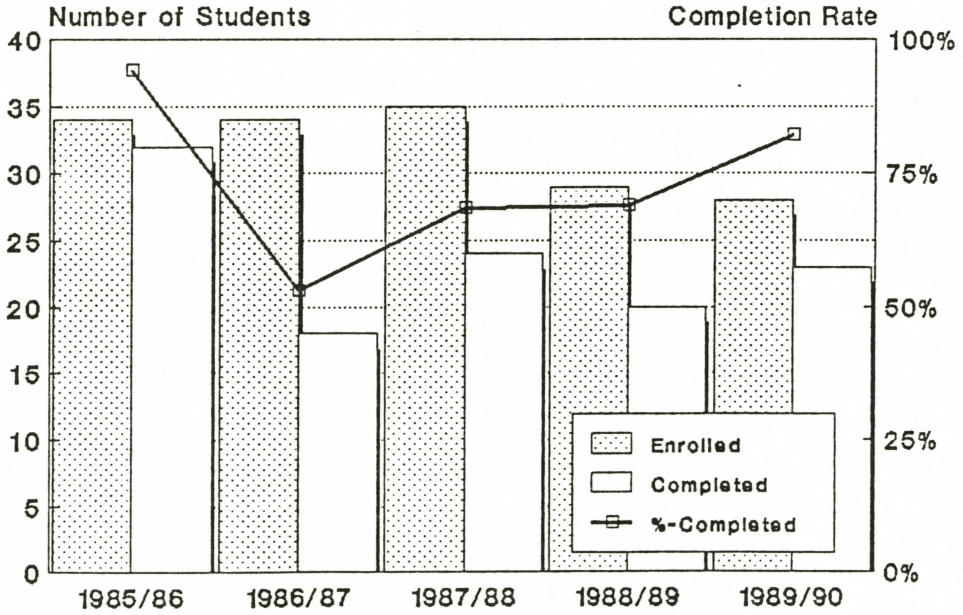
ENGINEERING COURSE GRADES DISTRIBUTION
EPHY115: Engineering Physics
(September 1986 to May 1990)



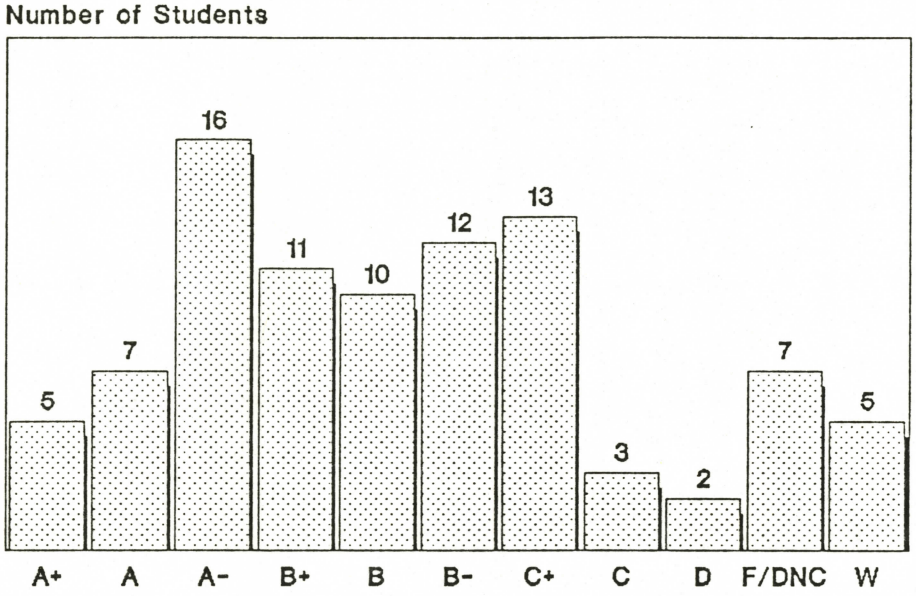
ENGINEERING COURSE GRADES DISTRIBUTION
ENGLISH 111 (Sept. 1985 -- May 1990)



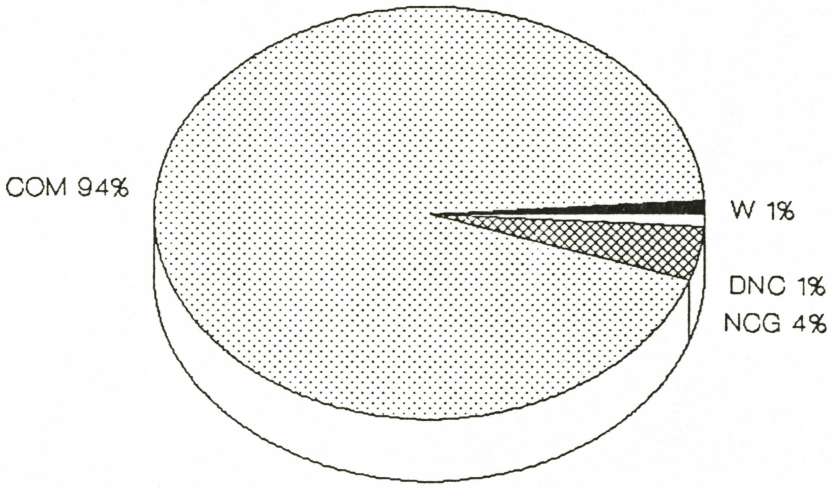
SELECTED ENGINEERING COURSE PERFORMANCE
ENGLISH 111 (Sept. 1985 - May 1990)
Enrolment/Completion Comparison



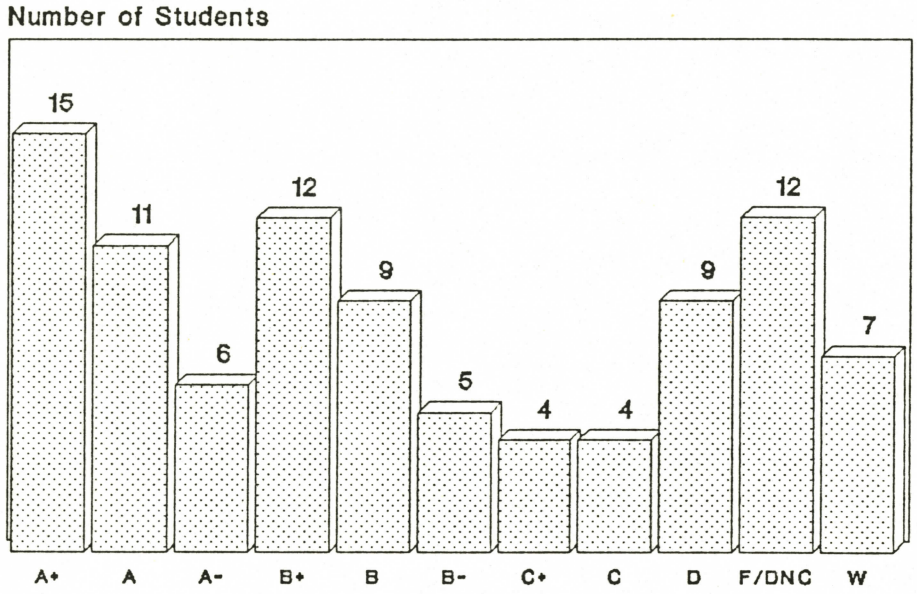
ENGINEERING COURSE GRADES DISTRIBUTION
DRAF152: Engineering Graphics
(September 1985 to May 1990)



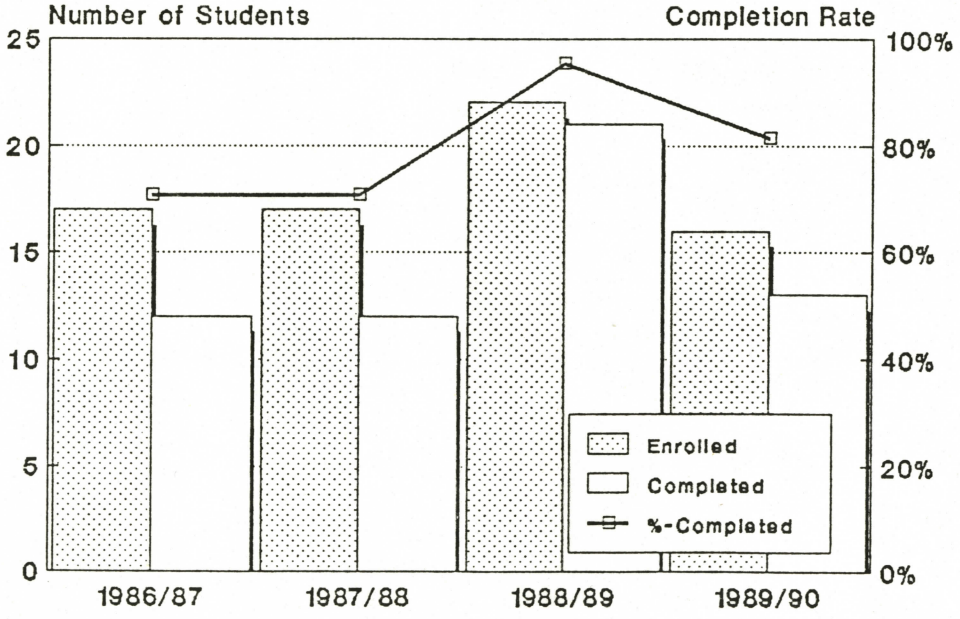
ENGINEERING COURSE GRADES DISTRIBUTION
APSC120: Introduction to Engineering
(September 1985 to May 1990)



ENGINEERING COURSE GRADES DISTRIBUTION
MATH113: Engn. Differential Calculus
(September 1986 to May 1990)



SELECTED ENGINEERING COURSE PERFORMANCE
MATH123 (Sept. 1986 - May 1990)
Enrolment/Completion Comparison



CARIBOO ENGINEERING STUDENTS AT U.B.C:

COMPARISON OF GRADES ON ADMISSION WITH AVERAGE ANNUAL PERFORMANCE AT U.B.C. AND AVERAGE PERCENTILE RANK 1990/91

MEAN ADM GPA	AVERAGE ANNUAL PERFORMANCE	AVERAGE PERCENTILE RANK	AVERAGE RANK IN AVERAGE CLASS SIZE
77.80 (29 students)	**66.66 (41 student yrs)**	**46 p% (based on 26 student years in which students carried full loads)**	**23/43**
High 86 Low 69	High 85.49 Low 51.15	12 of 29 students have carried < 80% course load for a year; 3 for two years or more	
BY SPECIALIZATION:			
CIVIL 73.48 (5)	62.43 (7)	44 p% (4 student yrs)	24/44
MECH 72.72 (11)	67.54 (19)	46 p% (14 " ")	30/57
CHM 78.00 (2)	66.08 (1)	--	--
MMAT 77.00 (1)	63.03 (2)	46 p% (2 " ")	8/16
BIOE 77.50 (2)	67.76 (5)	35 p% (3 " ")	5/8
ELEC 76.75 (4)	73.33 (2)	97 p% (1 " ")	1/39
ELCP 84.00 (1)	70.88 (1)	--	--
MMPE 78.00 (1)	61.99 (2)	18 p% (1 " ")	9/11
GEO 75.00 (1)	68.36 (1)	--	--
ENPH 73.00 (1)	72.29 (1)	68 p% (1 " ")	10/31

AVERAGE MEAN ADM GPA	AVERAGE ANNUAL PERFORMANCE	AVERAGE OVERALL PERCENTILE	AVERAGE OVERALL RANK
77.80 (29 students)	**66.66% (41 student yrs)**	**46 p% (26 student yrs)**	**23/43**

CARIBOO COLLEGE TRANSFEREES' ACADEMIC PERFORMANCE IN U.VIC. FACULTY OF ENGINEERING IN RELATION TO THAT OF ALL B.C. COLLEGE TRANSFEREES

	Year	# Admitted	# Reg.	U.Vic. GPA Over 3.0	U.Vic. GPA Under 3.0	Withdrawals
All B.C. Colleges:						
1985/86	2	8	8	6	1	1
Cariboo College:						
1985/86	2	1	1	1	0	0
***All B.C. Colleges:**						
1986/87	--	--	--	--	--	--
***Cariboo Colleges:**						
1986/87	--	--	--	--	--	--
***All B.C. Colleges:**						
1987/88	--	--	--	--	--	--
***Cariboo Colleges:**						
1987/88	--	--	--	--	--	--
All B.C. Colleges:						
1988/89	2	30	28	21	2	5
Cariboo College:						
1988/89	2	5	5	4	0	1
All B.C. Colleges:						
1989/90	2	28	21	16	4	1
Cariboo College:						
1989/90	2	11	8	7	1	0

* Data for 1986/87 and 1987/88 were not supplied by U.Vic.

EMPLOYMENT PROSPECTS

In its review, the Committee considered employment prospects for students who have passed through this program. Hard evidence about the careers followed by Cariboo's Engineers is difficult to obtain. As yet relatively few of them have completed their education, the fact that they leave college to complete their studies as several different universities makes tracking them a hard task.

However, while we can say little about the career paths of our own graduates, it is possible to assemble information from the engineering profession and the likely development of opportunities in its various branches. It is useful to begin by listing the main specialities as detailed in Job Futures British Columbia: An Occupational Outlook to 1995 (1989).

Types of Employment:

Aerospace Engineers: Aerospace engineers research, design, produce and test aircraft, missiles and spacecraft, and specialize in structural design, navigational control, guidance systems, instrumentation, flight analysis or stress analysis and testing.

Chemical Engineers: Chemical engineers work in many phases of the production of chemicals and chemical products. Specialties include petrochemical, pulp and paper, explosive, polymer, environmental and plastics engineering.

Civil Engineers: Civil engineers design, plan and supervise the construction of tunnels, highways, airports, bridges, buildings, and environmental, irrigation, drainage, water, and sewage systems.

Electrical Engineers: Electrical engineers design, construct and maintain electrical and electronic equipment in areas such as telecommunications, control systems, computers, automated systems, robotics, avionics, software design and consumer goods.

Industrial Engineers: Industrial engineers are concerned with the safe, efficient and economical integration of personnel, plant, machinery, equipment and materials. They review, analyze and improve systems to improve operations.

Mechanical Engineers: Mechanical engineers design, develop and maintain power producing machines such as internal combustion engines, jet engines, and rockets. Specializations include automotive engineering, plant and machine design, heating systems design, refrigeration, thermodynamics and hydraulics.

Metallurgical Engineers: Metallurgical engineers remove metals such as iron, copper, nickel and aluminum from ore and then refine and alloy them to obtain metals which are tailored to meet specific requirements such as heat-resistance, lightness, or malleability. Specialization in this field includes extractive and process metallurgy, and material and smelting engineering.

Mining Engineers: Design engineers, exploration engineers, production engineers, mineral engineers and safety engineers all fall into the mining category. They survey mineral deposits and ore bodies to determine commercial viability, decide on mining methods, plan and design mining facilities, oversee the construction of mine shafts and choose extraction processes.

Petroleum Engineers: Petroleum engineers locate reservoirs of oil and gas and determine the quantity and quality of the reserves and economical recovery strategies. Speciality areas include drilling, oil production and pipeline engineering.

Engineers: A Global Shortage:

Canada is not alone in experiencing, at the start of the '90's, an economic downturn and a serious loss of jobs--particularly in manufacturing. Inevitably, this will lead to some loss of employment in engineering but, as in the recession eight years ago, it will be the less skilled jobs that will be hardest hit. For qualified engineers the prospects over the next decade appear quite good. To begin with, the Canadian Engineering Manpower Board predicts a shortage of 30,000 engineers in Canada by the year 2000, as demand increases by 48%. Moreover, as the IEEE journal Spectrum reports in its December, 1990 issue, there is expected to be a considerable shortfall between the demand for engineers and the supply from the universities and colleges. In the United States, the National Science Foundation's Division of Policy Research and Analysis estimated that between 1989 and 2006 there would be a shortage of some 675,000 graduates in natural science and engineering. In Britain, the Institute for Manpower Studies anticipates a 25% increase in the demand for scientists and professional engineers in the next five years while the number of graduates produced will actually decline. The story is similar in France, Germany, and many other countries, including those that are rapidly emerging as substantial manufacturing centres in the newly industrialized sectors of the world.

The IEEE Spectrum report, "90's Employment: Some Bad News, Some Good", urges budding engineers to think about theirs as a truly international profession. Opportunities are global. For Canadian graduates from engineering programs, movement into the much larger market in the USA is being eased with the introduction of a new scheme for U.S. accreditation of their qualifications.

A much more detailed analysis of the employment prospects for engineers in B.C. is provided by **Jobs Futures British Columbia: An Occupational Outlook to 1995 (1989).** Of the nine engineering specialities identified, the three largest--civil, electrical, and mechanical--are all expected to generate substantial numbers of new jobs.

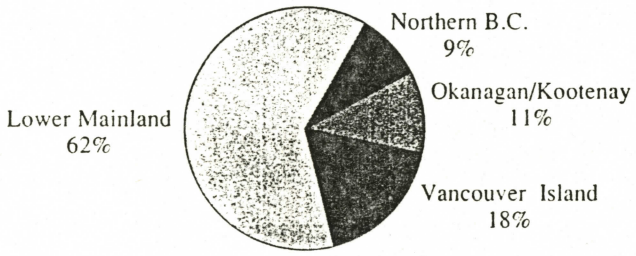
Civil Engineers: In B.C., civil engineers are concentrated in engineering firms (42%), government (20%), and construction firms (11%). Civil engineering is the largest branch of the profession, with a low unemployment rate (although it suffered during the mid 80's recession). Employment growth to 1995 is projected to create 1,230 openings, 630 being new jobs and 600 due to attrition.

B.C. employment trends and projections:

1981	1987	1995
4,510	4,040	4,670

Annual growth 1987 - 1995: 1.8%

Employment by Region



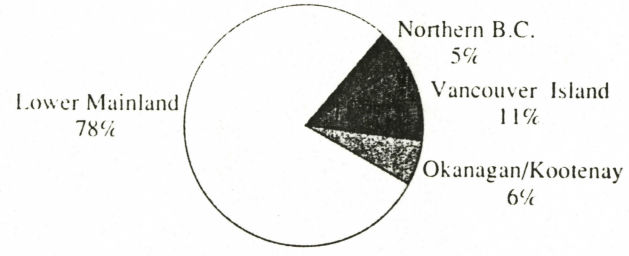
Electrical Engineers: The B.C. economy is expected to generate about 580 new jobs through to 1995, and a further 430 openings from departing personnel for a total of 1,010 openings. Employment is made up of business services (24%), telephone and telecommunications (20%), electric power industry (16%) and electrical and electronic manufacturing (12%). The majority of electrical engineers (70%) work in Ontario and Quebec and the rest evenly distributed throughout the remaining provinces.

B.C. employment trends and projections:

1981	1987	1995
2,880	3,310	3,890

Annual growth 1987 - 1995: 2.0%

Employment by Region



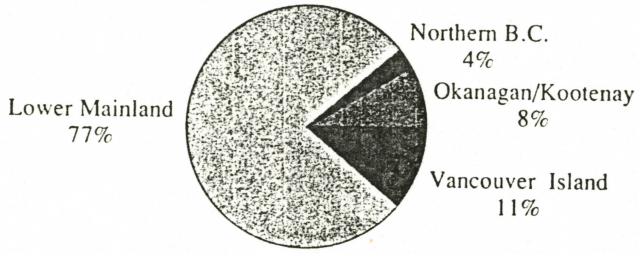
Mechanical Engineers: The B.C. economy will create 320 new mechanical engineering jobs to 1995 with another 320 due to attrition.

B.C. employment trends and projections:

1981	1987	1995
1,950	2,000	2,320

Annual growth 1987 - 1995: 1.9%

Employment by Region



Specialities that have smaller numbers also look forward to growing demand for their services and some, like mining and petroleum engineering, expect to see substantial proportional growth in the B.C. Southern Interior.

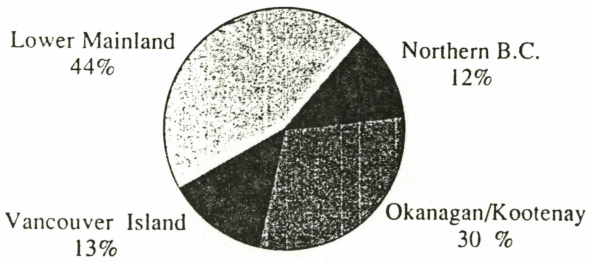
Mining Engineers: Employment prospects to 1995 are provincially good with about 160 replacement jobs and 130 new positions expected for a total of 290 openings by 1995. Twenty percent of Canadian mining engineers, or about 635, work in B.C., mostly in the mining industry (65%), and engineering and scientific services (28%).

B.C. employment trends and projections:

1981	1987	1995
710	640	770

Annual growth 1987 - 1995: 2.4%

Employment by Region



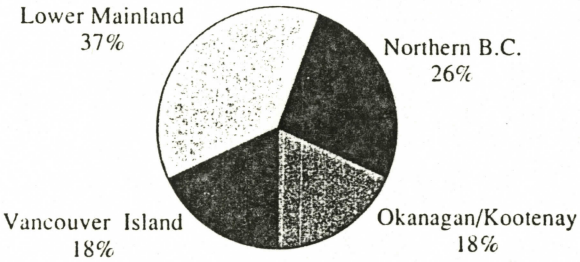
Petroleum Engineers: The recession of the mid 80's, combined with low oil prices, reduced job prospects in this sector, but slightly higher than average growth is expected to 1995. This will continue to be a very small occupation in B.C. and one of the smallest engineering specializations.

B.C. employment trends and projections:

1981	1987	1995
150	120	140

Annual growth 1987 - 1995: 2.3%

Employment by Region



STRENGTHS OF THE PROGRAM

The following strengths may be identified in the Engineering Transfer Program:

1. Perhaps the greatest strength is the **general quality of instruction.** Certainly, that is widely applauded by former students, and our own discussions with a number of the faculty who teach the engineers left us with a powerful impression of how much they care and think about the instruction they provide for these students.

2. A second feature, which again draws much favourable comment, is **the standard of computer drafting facilities** at the College. These, by all accounts, are superior to those available at any of the provincial universities.

3. **Small class sizes** at the College are also greatly valued by students and faculty.

4. Mention should be made of the **excellent manner in which the curriculum and assignments of English sections with substantial Engineering enrolments have been adjusted to the needs of these students.**

5. Taken together, these three elements do much to account for the fact that over the last nine years engineering students transferring from the College to U.B.C. and other universities **have succeeded as well as those undergraduates who entered university directly from school.**

6. A final "bonus" is that for the student, the first year or two of an Engineering Program taken at the College is **much cheaper than a comparable period at one of the B.C. universities.**

AREAS WHICH CAN BE IMPROVED: RECOMMENDATIONS FOR THE 90'S

1. PROGRAM CO-ORDINATION AND IDENTITY:

From a very early stage in our consideration of this program, it seemed to us that Engineering at the College lacked a clear and distinct identity. There are several reasons for this, but by far the most important is the fact that the Engineering curriculum is constructed almost entirely from components of the regular science and computing programs. We believe that this lack of distinctiveness has real disadvantages for the program and its students. We therefore offer a series of simple recommendations:

R1 (i) **That the Vice-President, Instruction, in consultation with the Chair of Science/Engineering and the Associate Dean of Science/Health Sciences, set up a Co-ordinating Committee for the Engineering Program.**

This committee should have representatives from the disciplines that contribute to the program, and its purpose should be to co-ordinate the various courses for engineers, to look for ways of tailoring course materials for engineers, to encourage discussion of developments within engineering, and stimulate the constant adaptation of the program to reflect important trends.

(ii) **That there be a clearly identified Co-ordinator of the Engineering Program who would be able to devote time and energy to its promotion and improvement.**

(iii) **That in the Calendar and elsewhere, there be clear statements about the prerequisites for Engineering courses.**

Over the years, the requirements of the university programs have changed and the present College Calendar entry could be more specific. The Chair or Co-ordinator should be responsible for monitoring the external "constraints" and making periodical alterations to College stipulations.

(iv) **That the Engineering Co-ordinator organize the production of a brochure describing and promoting the College Engineering Program.**

This would provide better information for students wishing to enroll and could be used by counsellors and others on their excursions to schools and other colleges.

(v) **That the Engineering Co-ordinator explore the possibility of moving the Applied Science course APSC 120 into the first semester and/or extending the course to run for both semesters.**

This course provides the best opportunity to bring the engineers together and to encourage team work and a strong sense of identity with the program. It might allow a more extensive orientation process than is currently provided.

(vi) **That the Dean and Associate Dean, Sciences/Health Sciences, increase the first-year Engineering intake from 24 to 36 to enable distinct Engineering sections, and seek to offer a full second-year transfer program in Electrical Engineering.**

2. CURRICULUM-RELATED MATTERS:

Our discussions with faculty led to some suggestions for minor pedagogical changes:

R2 (i) **That Computing Science faculty organize some testing of Engineering students enrolled in Computing 113 in the first few days of the Fall Semester.**

Those students likely to be bored by this course should be required by the Co-ordinator of Engineering to take Computing 123.

(ii) **That the Computer Science Department schedule Computing 123 parallel to Computing 113 so that those engineers who could benefit from the more advanced course can do so.**

(iii) **That the Mathematics Department schedule MATH 113 five hours per week.**

This extends the time allotted to this subject, but it will allow the instructor to see whether (as with other classes he runs this way) it produces a noticeable improvement in students' performance.

(iv) **That the Mathematics Department give serious thought to the provision of texts as complements to the existing materials used in teaching MATH 113.**

However good the material provided, it is quite appropriate that students should feel the need for some source to which they can routinely turn.

3. TRANSFERABILITY:

The difficulty and confusion surrounding transfer to the U.Vic. program came up many times. Accordingly, we recommend:

R3 (i) **That the Engineering Co-ordinator, the Associate Dean, Science/ Engineering, and the Vice-President, Instruction, seek to improve transferability of College science courses to the U.Vic. Engineering Program.**

This is a matter of real urgency. It may require some co-ordination of effort with colleagues at other colleges and B.C. universities, perhaps through the mechanism of ERECC.

4. BUDGET-RELATED MATTERS:

Since Engineering "piggy-backs" on other courses, the real costs of running the program are hidden. Because it is not a discrete entity, Engineering has no identifiable budget of its own. We do not think that is appropriate, and recommend:

R4 (i) **That the Vice-President, Instruction, together with the Dean of Science, find ways to**

a) **identify the true costs of the Engineering Transfer Program, and**
b) **furnish the Engineering Co-ordinator with a modest budget to promote and co-ordinate the program.**

(ii) **That the Engineering Co-ordinator and the Vice-President, Instruction, seek funds for the expansion of the College Engineering Program from the MAETT.**

This should be part of a collaborative effort linking college and university Engineering Directors and Deans and the Professional Associations. There are special, separate funds which may be tapped if a co-ordinated plan of engineering education for the Province can be agreed on. It is possible that any such plan will allow the development of two full years of course work at the colleges. **This will underwrite what we see as the most important immediate development at Cariboo College.**

5. FUTURE DEVELOPMENTS:

But there are long-run considerations. We recommend:

R5 (i) **That the Engineering Co-ordinator establish a small group, including membership from engineering educational groups elsewhere, to examine the longer term development of Engineering education at the College.**

Expansion of Engineering, as of most science-based education, is expensive. Laboratories and equipment often require major expenditures. At this College, particular attention should be given to the possibility of developing two specialities--Mechanical and Electronic Engineering--in conjunction with existing programs in CADD and Electronics. The concept of developing a degree in Applied Science has already been mooted by representatives of the Divisions of Sciences/Health Sciences and Applied Industrial Technology, and work is afoot to restructure the CADD Program so as to allow for more specialization in civil and mechanical drafting.

When the College acquires its independent degree-granting status, it could be in a position to offer new and exciting programs in two of those areas of the profession that are most likely to grow and offer good career opportunities.

COLLEGE-WIDE RECOMMENDATION

The External Representative found the wide variation in faculty curriculum vitae and course outline format irritating, and suggested that the College adopt standard formats which all faculty should be encouraged to follow. The Committee endorses this suggestion, and recommends:

That the College, as far as possible, adopt uniform formats for course outlines and develop a standard curriculum vitae format for all faculty.

APPENDIX A

METHODOLOGY

Data were gathered in the following ways:

1) Standard questionnaires were administered to former ENGN students, faculty, and current students. All data were processed with an SPSSX software program to determine mean, median, and standard deviation responses. Verbal comments for each group were recorded separately and anonymously.

2) "Descriptive Data" on the Engineering Transfer Program's history, description, objectives, budget, etc., were solicited from Tom Walton, Chairman, Sciences & Engineering, via the standard "Data Required From Dean/Chairperson/Program Co-ordinator" form, along with course outlines.

3) Statistical data on annual headcounts, attrition rates, completion rates, and grade distribution were provided by the Office of Institutional Research.

4) Several discussions were conducted with Colin James, Associate Dean, Sciences/Health Sciences, and Tom Walton, Chairman, Sciences & Engineering, on the program review process and questionnaire design.

5) The Program Evaluation Committee interviewed the following faculty associated with the program:

    Roelph Brouwer, Instructor, Computing
    Roland Cobb, Instructor, Physics
    John Crawford, Instructor, Mathematics
    Dennis Oldridge, Instructor, Engineering Graphics
    Ginny Ratsoy, Instructor, English
    Joe Spuller, Instructor, Physics.

PROGRAM REVIEW REPORT ON THE