S.89-39

SIMON FRASER UNIVERSITY

MEMORANDUM

To: Senate

From: L. Salter
Chair, SCAP

Subject: Proposal for Certification of Non-Credit Programs
Reference: SCAP 89-24

Date: November 9, 1989

Action undertaken by the Senate Committee on Academic Planning/Senate Committee on Continuing Studies gives rise to the following motions:

Motion 1:

"That Senate approve and recommend approval to the Board of Governors as set forth in S.89-39 the proposal to establish recognized University Certification for Non-Credit Programs."

Motion 2:

"That Senate approve and recommend approval to the Board of Governors as set forth in S.89-39 the proposal for a Certificate Program in Telecommunications Engineering"

Proposal for Certification of Non-Credit Programs

Description:

The University offers, in addition to degree programs and certificate and diploma programs made up of degree related courses, specialized programs of non-degree courses in areas of professional practice. The Program in Telecommunications Engineering for the British Columbia Telephone Company, developed by the Faculty of Applied Sciences and Continuing Studies in conjunction with the University of California at Los Angeles, is a notable example. The educational needs of some groups, such as the B.C. Telephone engineers, cannot be met by traditional university offerings. Their area of interest is too specialized to be met by existing university programs and the traditional 13-week format is unsuitable for both the curriculum and the working lives of practicing professionals. In most cases, such individuals have advanced degrees and neither seek nor need credit toward a university degree. Nonetheless, participants in such programs would like some recognition of satisfactory completion of programs which are academically rigorous and taught at a university level.

There is a strong desire on the part of students enrolled in such programs, and associated business and professional organizations, that the University formally recognize satisfactory academic performance. To this end, it is recommended that the University Senate approve the granting of certificates to participants in approved programs of non-credit courses who demonstrate academic competence at a level comparable to that acceptable in courses which are part of degree programs.

Rationale:

The existence of specialized programs, such as the Program for Telecommunications Engineering, has benefits for organizations, including corporations and government agencies; for the professions; and for the University. The organizations and professions benefit from being able to obtain high quality professional development programs. The University and individual faculty members benefit from close contact with practicing professionals working, in many cases, on problems of theoretical, as well as practical, interest.

Both working professionals and their employers say that university recognition is important in gaining financial support and acceptance for such professional development programs. Official recognition of academic competence contributes also to a sense of commitment on the part of students and a feeling of accomplishment on completion. University certification seems appropriate in cases in which instruction and evaluation procedures and curriculum content are academically comparable to other university programs.

Many universities in Canada, including the Universities of British Columbia and Victoria and three Alberta universities, already offer Senate approved certificates for programs of non-credit courses.

1.

Criteria for the Establishment of Certificates for Successful Completion of Program of Non-degree Courses:

1. A program should be initiated only if the subject matter is such that the University appears to be the most appropriate body to offer the instruction.

2. A program must have a clearly defined educational objective and rationale. The rationale should include a statement of required University resources and community needs.

3. A program must be under the direct and ongoing supervision of an academic department of the University.

Proposed Guidelines for Certificate Programs of Non-degree Courses:

1. Each program would be the specific responsibility of a department, school, Faculty, or centre. The department would be responsible for ensuring the academic rigour of the curriculum and the quality of instruction. In cases of interdisciplinary programs, responsibility may be shared.

2. Programs being proposed as suitable for certificate granting status are to be submitted to the Senate Committee on Continuing Studies for consideration and, if accepted, forwarded by that Committee with its recommendations to SCAP and to Senate for approval. A description of the course/s which make up the program must be submitted, including information on: the content and duration of each course; the proposed instructors; and the means of evaluation.

3. Students would be expected to maintain satisfactory performance in each course to remain eligible for a certificate.

4. Programs would consist of courses which may vary in length and format from standard university credit courses but would include a minimum number of 120 contact hours in total (including lectures, labs, seminars, and tutorials).

June 15, 1989
Prepared by Mark Selman, Director, Extension Credit at Harbour Centre

M E M O R A N D U M

SIMON FRASER UNIVERSITY

FACULTY OF APPLIED SCIENCES

DATE: November 15, 1989

TO: Dr. Walter Wattamaniuk
Secretary, Senate Committee on Academic Planning

FROM: Dr. Donald A. George
Dean, Faculty of Applied Sciences

RE: Certificate Program in Telecommunications Engineering

I am writing to confirm that we are seeking approval of this program as a Certificate Program in Telecommunications Engineering. Much of the documentation on the program is associated with the B.C. Telephone Company which has funded program development and its delivery to 120 of their engineers, but we look forward to offering the program to a much wider group. It is in this generic context that we are presenting the proposal to Senate.

Dr. Donald A. George

DAG/lc

cc: J.L. Hoegg
J.R. Landsburg

3.

SIMON FRASER UNIVERSITY

FACULTY OF APPLIED SCIENCES AND CONTINUING STUDIES

Program in Telecommunications Engineering

Simon Fraser University, in association with the University of California, Los Angeles, is developing and presenting a major program in telecommunications engineering to a select group of professional engineers. The Program will be administered as part of Continuing Studies' applied sciences program area, in association with the School of Engineering Science. Its purpose is to ensure that this group has up-to-date knowledge of the newest developments in telecommunications.

The Program comprises eight one-week courses on basic communication systems, digital concepts, voice networks, computer technology, data networks, fibre optics and video networks, telecommunication standards and ISDN. Each course lasts five days, Monday to Friday, with typically three days of lecture and two days of other activities such as laboratory work, group projects and field trips.

Evaluation plays a critical role in the Program. A reading assignment preceding each course is the basis of a student pre-test, assignments are graded and a final test measures the students' overall understanding. Ongoing throughout are evaluations of the course content and presentations, coupled with course revisions.

This exciting university/industry venture is another example of the ties being developed between Engineering Science and the advanced technology industry as part of SFU's strong commitment to the renewal of individuals and organizations through mid-career education. In its first offering, the Program is being given to engineer employees of the B.C. Telephone Company which has contracted with SFU for both development and delivery.

Applied Sciences Program
Continuing Studies
Simon Fraser University

B.C. TELEPHONE COMPANY
PROGRAM IN TELECOMMUNICATIONS ENGINEERING

COURSE OUTLINES:

Course 1 Basic Communications Systems (SFU)

Dates Offered: May 29 - June 2

Contact Hours: 40

Outline and Objectives: It is the purpose of this course to serve as an introduction to the program as a whole, to review a number of topics basic to telecommunications engineering. As a result, students will enter subsequent courses not from a "cold start" but with a benefit of a good review of the basics. Topics include fundamental electrical and electronic concepts, electromagnetics, elements of communication systems and telecommunication networks, digital concepts and data communications, and the basics of computer programming.

Course 2 Digital Concepts (SFU)

Dates Offered: July 31 - August 4

Contact Hours: 40

Outline and Objectives: Carrying on from Course 1, the Digital Concepts course aims to ensure that the program participants become familiar with the basics of digital signalling in the telecommunications industry. Beginning with the digitalization process, the course emphasizes signal encoding and decoding, modulation, system performance, Shannon theory, forward error correction, and switching.

Course 3 Voice Networks

Dates Offered: October 16 - 20

Contact Hours: 40

Outline and Objectives: The existing voice network is studied in some detail which includes switching apparatus, traffic routing, transmission technology, network architecture and system administration. New applications and services will be described with emphasis on the user perspective.

Course 4 Computer Technology (SFU)

Dates Offered: January 22 - 26

Contact Hours: 40

Outline and Objectives: This course will provide an overall view of computer systems and their primary elements such as the central processing unit, permanent and temporary storage and input/output devices. The general characteristics of operating systems software, languages, computer systems and application packages will be discussed. Current trends in computing will provide an insight into anticipated future developments in both hardware and software.

Course 5 Data Networks (SFU)

Dates Offered: May 7 - 11

Contact Hours: 40

Outline and Objectives: Building on the digital signal concepts presented earlier, this course will focus on data communications. Topics will include data modems, network configurations and virtual circuits, protocols, telco data services and system performance.

Course 6 Fibre Optic Transmission and Video Networks (UCLA)

Course Dates: August 13 - 17

Contact Hours: 40

Outline and Objectives: Fiber Optics is the most recent transmission medium to come into use in the telephone industry. This course will present the fundamentals of fibre optic transmission, system characteristics and performance interfaces, basic electro-optic technology applications and future trends. In the same course will be a distinct but related topic: video networks. Beginning with the basic structure of video signals, material will be presented to define the nature of video networks, services provided, network functions and performance, and current developments such as digital TV and high-resolution TV.

Course 7 Standards and Common Channel Signalling (UCLA)

Dates Offered: December 3 - 7

Contact Hours: 40

Outline and Objectives: This too is a two-topic course. Part of the week will be devoted to standards: the need, standardization processes and agencies, and the principal telco standards. The remainder will deal with common channel signalling (CCS) including network architecture, operation and performance. Particular emphasis will be given to CCS No. 7, its applications, current status and future developments.

Course 8 Integrated Systems Digital Networks (ISDN) (UCLA)

Dates Offered: March 18 - 22

Contact Hours: 40

Outline and Objectives: Building on Course 7, this course will deal with both Narrowband and Wideband ISDN. The ISDN concept will be given particular emphasis along with customer services, network aspects, and trends. In Wideband ISDN, transport and switching technologies will be discussed as well as future prospects. This course, which completes the program, will put particular emphasis on the telecommunication networks and services of the future.

INSTRUCTORS:

Vijay K. Bhargava, Professor, Department of Electrical and Computer Engineering, University of Victoria
Vladimir Cuperman, Professor, School of Engineering Science, Simon Fraser University
John Dickinson, Director, School of Kinesiology, Simon Fraser University
John Dickson, Director School of Kinesiology, Simon Fraser University
John C. Dill, Professor, School of Engineering Science, Simon Fraser University
Anthony H. Dixon, Assistant to the Director, School of Computing Science, Simon Fraser University
Paul Franklin, Lecturer, School of Computing Science, Simon Fraser University
Donald A. George, Director, School of Engineering Science and Dean of the Faculty of Applied Sciences, Simon Fraser University
David J. Gregson, Engineering Manager, Sierra-Misco Environment Limited
Gary W. Hall, Research Scientist, Centre for Systems Science, Simon Fraser University
James M. MacFie, Manager, Network Systems Engineering Department, MPR Limited
Margaret F. Hope, Communications Instructor, Lions Gate Communications Inc.
Wo-Shun Luk, Professor, School of Computing Science, Simon Fraser University
Patrick Ogmundson, Member of Technical Staff, Voice and Data Products, MPR Limited
Robert G. Pettigrew, Graduate Student, School of Engineering Science, Simon Fraser University
Andrew I. Spolsky, Program Manager, Radio and Satellite Network Planning, MPR Limited
Shawn Stapleton, Assistant Professor, School of Engineering Science, Simon Fraser University
Norman P. Steinberg, Director of Special Projects, ESE Inc., Simon Fraser University
Lloyd Watts, Graduate Student, School of Engineering Science, Simon Fraser University
Leslie Webster, System Design Engineer, MPR Limited
David J. Gregson, Engineering Manager, Sierra-Misco Environment Limited

PROGRAM EVALUATION

William Glackman, PhD, R. Psych., Director, Criminology Research Centre, Simon Fraser University

STUDENT EVALUATION

Students receive grades on their work in the Program, whether undertaken as an individual or as a team member. Usually team members receive the same grade on group work, however, the individual continues to be responsible for his or her participation. The grading scheme at Simon Fraser University is used. Sample exams and grade histograms are attached.

The British Columbia Telephone Company
Certificate Program in Telecommunications Engineering

Course 1, Basic Communication Systems
CLASS A

Pretest, Monday, 10:30 to 12 noon Closed Book

Schedule:		
	10:30 to 10:40	Instructions and preparation
	10:40 to 11:10	Individual answer period
	11:10 to 11:20	Team organization
	11:20 to 12:00	Team answers **all** parts of **all** questions

Each of these questions has equal value and will be marked A, B, C, D or F.

Question 1: Briefly define **five** of the following terms:

a) semiconducting material
b) ROM
c) pulse amplitude modulation
d) geo synchronous satellite
e) by-pass technologies
f) multiplexing
g) deciBel
h) coaxial cable
i) teleconference
j) radio spectrum

Question 2: Briefly compare **three** of the following pairs:

a) dumb and intelligent terminals
b) ring and tree networks
c) terrestrial microwave and satellite communications
d) voice and data communications
e) narrowband and broadband communications
f) radio dispatch and cellular systems

Question 3: The assigned pre-reading from Course Readings, Volume 1, presented an overall view of telecommunications for homes and businesses which is more all-encompassing than basic telephone service. Describe **one** of:

a) the basic types of communication functions discussed,
b) the role of corporate network management,
or
c) possible changes to communication services in the home.

The British Columbia Telephone Company
Certificate Program in Telecommunications Engineering

Course 1, Basic Communication Systems
CLASS A

Sample Final Examination

Time: Two hours Open Book

A hint for out-of-practice exam writers: limit yourself to a maximum of 20 minutes per question, and then use the remaining time for reviewing or to go back to any questions which you did not complete to your satisfaction.

Questions:

(1) What changes would be needed in the processing of the single link point-to-point data system described in the notes if the data transmission speed is 2400 bits per second instead of 1200?

(2) A common problem in programming is the correct termination of an iterative process to input a sequence of values. Two approaches are:

1. Input a count of the number of data values to be input, and then use that count to control the number of iterations of the loop;

2. Include a special value called a "sentinel" at the end of the data values. At the beginning of each iteration a value is read and tested to determine whether it is equal to the sentinel value. If so, the loop is terminated.

a. Draw flowchart segments to illustrate the steps required to input a sequence of numeric values and output each value as it is read, using each of the two approaches described.

b. Write BASIC program segments (not complete programs) which implement each of the approaches described using only the **WHILE** statement for iteration.

c. An additional iterative statement type provided in BASIC is the **FOR...NEXT** statement. This syntax permits the definition of a loop whose body is to be performed a specified number of times. For example, the following syntax illustrates how to define a loop that is executed N times:

```
1200 for I - 1 TO N
1210 (...first statement of loop...)
1220 (...second statement of loop...)
...
1290 (...last statement of loop...)
1300 NEXT I
```

Write BASIC program segments to implement each of the two approaches above for reading a sequence of at most 1000 numbers using only the **FOR...NEXT** statement for iteration.

...../2

10.

d. From your answers to questions b and c, which syntax for iteration would be preferred in each approach? Justify your choices.

(3) Draw a basic block diagram for a digital communications link from the information sink to the information source, given that the signal being communicated is analog voice. Briefly explain the function of each step in the process.

(4). Describe Maxwell's four equations.

(5) The following technical description has some flaws. List all the technical mistakes - each correct answer gives you one point toward the final grade, each wrong answer will decrease the final grade by 0.5 point.

"An advanced technique for narrow-band digital voice"

"According to the proposed procedure, the speech signal is first sampled at a rate of 2 KHz and quantized using an 8 bit linear A/D converter. This results in a digital stream of 16 Kbit/s, which is applied to the input of a 16-ary QAM modulator. The QAM modulator will have a symbol of 4 ksymbol/s. Hence, the minimum channel bandwidth for this digital voice system is 2 KHz. The system robustness may be improved by adding one parity bit to each 8 bits of data. This increases the required bandwidth by only 12.5%, while correcting any single error in the sequence of 8 bits".

11.

The British Columbia Telephone Company
Certificate Program in Telecommunications Engineering

Course 1, Basic Communication Systems
CLASS A

Final Examination
May 2, 1989

Time: Two Hours — Open Book

ALL QUESTIONS HAVE EQUAL VALUE

IF YOU ARE UNCERTAIN ABOUT ANY ASPECT OF A PROBLEM, MAKE YOUR OWN INTERPRETATION, STATE THIS CLEARLY, AND PROCEED WITH YOUR ANSWER.

A hint for out-of-practice exam writers: read over the exam and start with the question which you think you can best handle.

1) Describe the concept of moding in a fibre optic cable.

2) (a) In asynchronous transmission at 1200 bits per second, how badly out-of-sync does the clock of the UART in the remote station have to be in order to cause the station to miss one bit (out of 8 bits)?

(b) Assume that a message for synchronous transmission consists of 1000 bytes of data (1 byte = 8 bits), 3 bytes for SYN header and trailer and 32 bytes for CRC. Show that synchronous transmission is more "efficient" than asynchronous transmission, based on a definition of efficiency supplied by you.

3) The following technical description has some flaws. List all the technical mistakes - each correct answer gives you one point toward the final grade, each wrong answer will decrease the final grade by 0.5 point.

"An advanced technique for narrow-band digital voice"

"According to the proposed procedure, the speech signal is first sampled at a rate of 2 KHz and quantized using an 8 bit linear A/D converter. This results in a digital stream of 16 Kbit/s, which is applied to the input of a 16-ary QAM modulator. The QAM modulator will have a symbol rate of 4 ksymbol/s. Hence, the minimum channel bandwidth for this digital voice system is 2 KHz. The system robustness may be improved by adding one parity bit to each 8 bits of data. This increases the required bandwidth by only 12.5%, while correcting any single error in the sequence of 8 bits".

4) Chapter 12 of Digital Network Notes described two evolutionary patterns for network growth, the overlay approach and the island approach. In the Notes, the two techniques were described as they applied to the evolution of the Telecom Canada network from analog to digital. Now imagine that BC Tel has announced a long-term goal of providing switched broadband (i.e. video) services to each business and household. Describe how the overlay and island strategies would apply in the case of evolution from today's network to the broadband goal. Compare and contrast their possible advantages and disadvantages.

...../2

12.

5) The **IF** statement examined in the workshop is an example of what is referred to as a "two-way branch". Sometimes a situation will arise where it is more convenient to select from more than two alternatives. Many programming languages provide the syntax to define a "multi-way branch". The selection of alternatives is then based on the value of an expression. In BASIC, this capability is provided by the **ON...GOTO** statement. The following example illustrates its use. Assume **X** has an integer value. The expression **X \ 5** specifies the quotient obtained when **X** is divided by **5** (ie. **2 \ 5 = 0, 11 \ 5 = 2, 20 \ 5 = 4,** etc.):

```
1200 ON X \ 5 GOTO 1300, 2200
1210     (...next statement...)
```

The value of the expression **X \ 5** is used to determine where control is transferred, as follows:

- If **X \ 5** < 0 or **X \ 5** > = 256, an error occurs; program halts.
- If **X \ 5** = O, control transfers to the statement after the **ON...GOTO** (1210)
- If **X \ 5** = 1, control transfers to the FIRST statement number (1300).
- If **X \ 5** = 2, control transfers to the SECOND statement number (2200).
- If 2 < **X \ 5** < 256, control transfers to the statement following the **ON...GOTO** (1210).

Up to 256 statement numbers can be specified in a single **ON...GOTO.** In the example only two were given.

a. Show how the example of the **ON...GOTO** given above can be drawn as a flowchart segment, using two-way decision boxes. This "proves" that multi-way branches are accommodated by the Bohm-Jacopini programming constructs.

b. Write a short BASIC program using **ON...GOTO** to calculate and print the Federal and Provincial Income Tax using the following table, given the net income as input:

TAXABLE INCOME	FEDERAL TAX
$27,500 or less	17%
$27,500 to $55,000	$4,675 + 26% on remainder
$55,000 or more	$11,825 + 29% on remainder

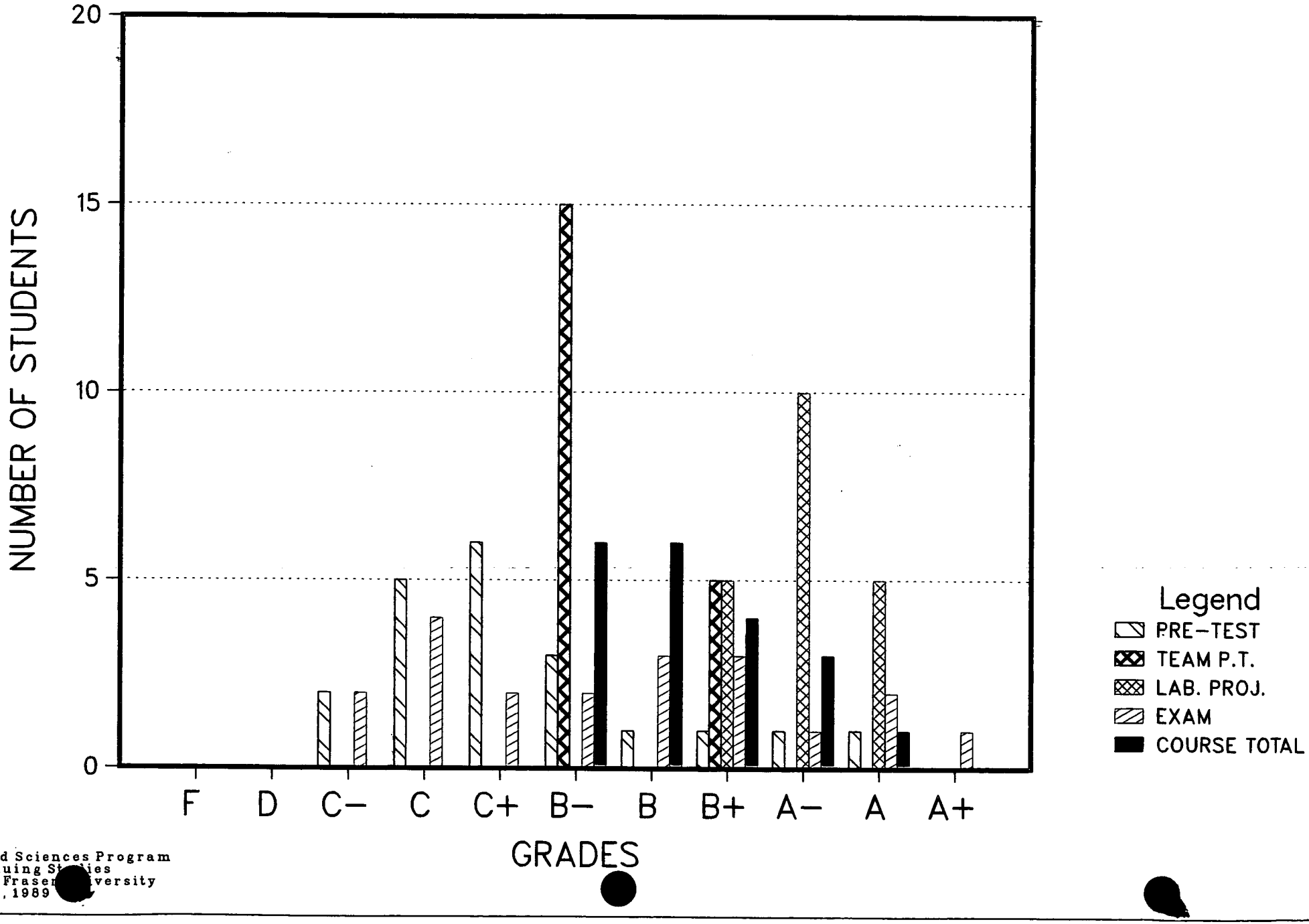
Total Tax = Federal Tax + Surtax + Provincial Tax
where
Surtax = 3% * Federal Tax
Provincial Tax = 51.5% * Federal Tax

c. Write a short BASIC program to perform the task described in (b) WITHOUT using the multi-way branch statement **ON...GOTO**.

d. Comment on which implementation (b or c) is preferable and justify your answer.

British Columbia Telephone Company
Certificate Program in Telecommunications Engineering

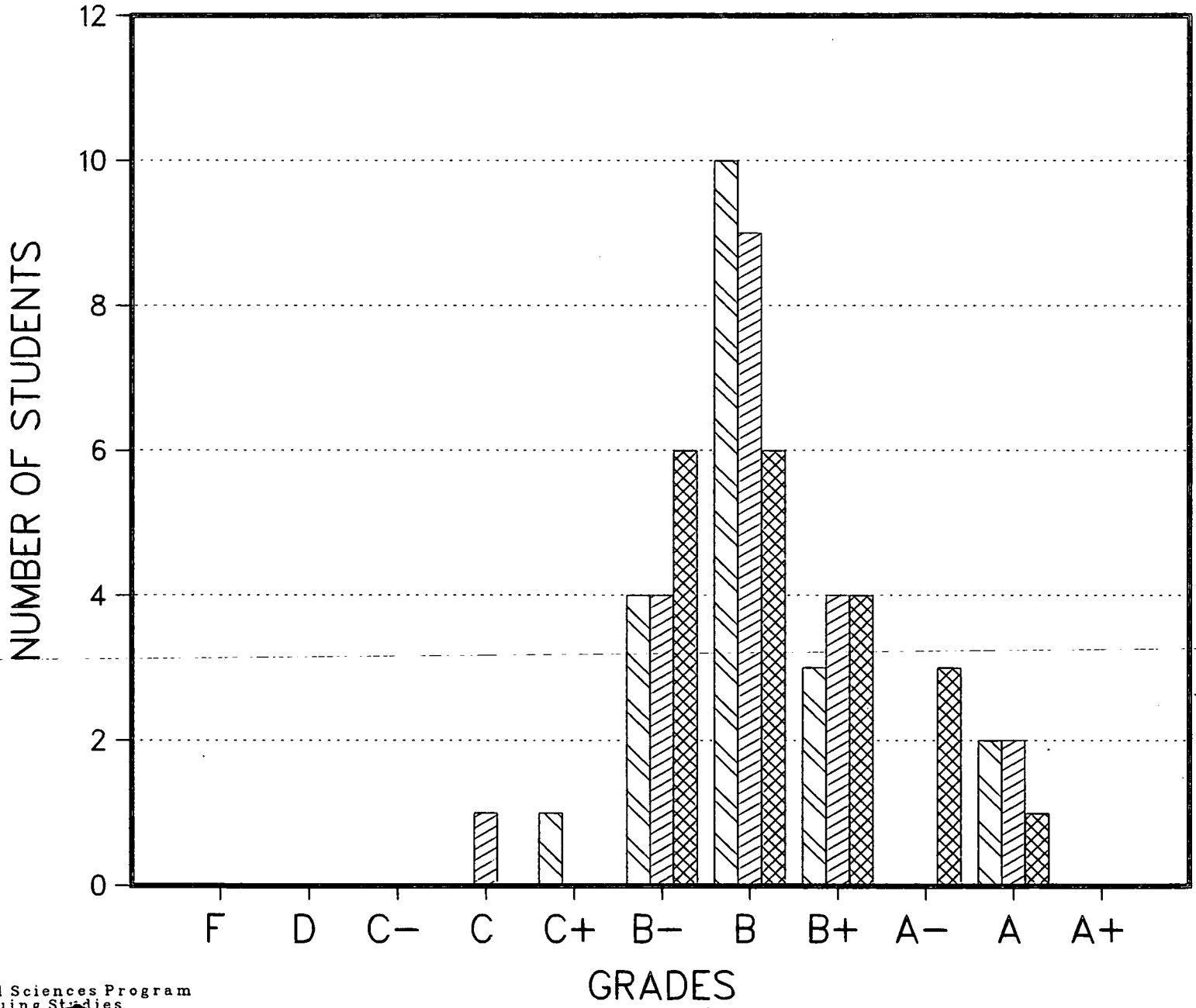
CLASS A, COURSE 2 RESULTS
DISTRIBUTION OF GRADES



Applied Sciences Program
Continuing Studies
Simon Fraser University
Aug.25, 1989

British Columbia Telephone Company
Certificate Program in Telecommunications Engineering

CLASS A, COURSE 2 AND PREVIOUS RESULTS
DISTRIBUTION OF GRADES



Applied Sciences Program
Continuing Studies
Simon Fraser University
Aug.25, 1989