SIMON FRASER UNIVERSITY

S.79-10

MEMORANDUM

To: Senate	From: Senate Committee on Academic Planning
Subject: Graduate Programs in Computing Science	Date: December 20, 1978

At its meeting December 13, 1978, the Senate Committee on Academic Planning approved the following motion:

> "That the Masters and Doctoratal Programs be recommended to Senate for approval."

RATIONALE

The original proposal for graduate programs in Computing Science was developed during the 1976/77 academic year and submitted to the Senate Graduate Studies Committee in late summer, 1977. The Assessment Committee conducted an external review of that proposal during the spring of 1978.

Taking into consideration the concerns of the external examiners and following approval of the proposal by the Senate Graduate Studies Committee, the proposal was updated to reflect changes that had taken place in the Department in the fifteen months that had elapsed since the original document had been prepared. Dr. Clayman's memorandum (attached) indicates that both the Assessment Committee and the Senate Graduate Studies Committee are satisfied that the revisions to the original proposal made by the Department of Computing Science provide a more than adequate response to the concerns expressed by the external examiners.

There are a number of compelling reasons why Simon Fraser University should undertake to develop a distinct and new graduate program in Computing Science. In particular five aspects of computing at Simon Fraser appear relevant. First, the interdisciplinary nature of the undergraduate program is unique among computing science programs in North America. The application oriented bias reflected in the undergraduate program has a major place in the graduate proposal. This synthesis of two or more traditional approaches to problems melds well with our present faculty interests and abilities. The opportunity to continue at the graduate level the same successful approach toward other disciplines affected by computing is a major distinction of the proposed program.

Secondly, although there is considerable expertise in the Computing Science Department here at Simon Fraser to enhance the application oriented bias suggested above, there also exists considerable strength in traditional areas of computing, strengths without which the Department would not be able to consider its graduate offering. New faculty added to the program in the last several years were specifically selected for their strength in areas central to Computing Science. Two areas are particularly well represented by the present faculty and, together with an application oriented bias, form the core of the proposed graduate program. These areas are "Computer Design and Organization" and "Artificial Intelligence." In the area of Computer Design, fundamental theoretical computer design is represented by Harrop (switching theory, automata), systems design is represented by Edwards and Hobson (design of particular machines), and both areas are spanned by Dasgupta (hardware/software architecture microprogramming and language design). In the area of Artificial Intelligence, regarded by many as the primary application area within the central theme of computing, the program is represented by Cercone (natural language, understanding, heuristic programming), Havens (computer perception, heuristic programming), and Calvert (pattern recognition). With regard to the comparable program at the University of British Columbia, the advanced applications area and the computer design and organization area compliment their program by contrast while considerable rapport exists between the departments through personnel working in the area of Artificial Intelligence.

Third, Simon Fraser University offers a number of interdisciplinary programs in applied areas which will also contribute substantially to the graduate programs in Computing Science. Specifically, the University has one of the foremost cartography research efforts in the world (Peucker). The University also functions as a major centre in which large aggregates of data about health and the environment are analyzed and reviewed (Sterling and Weinkam). Simon Fraser is also well known for its contributions to radiation treatment planning and optimization of cancer therapy methods (Harrop, Sterling, and Weinkam). It offers an active program in the development of personal computers (Edwards and Hobson). There exists a strong tie to the humanities through dance choreography (Barrenholtz and Calvert). Advanced work using computers is done as well by members of the Simon Fraser University faculty , e.g. the distinguished work in computer produced music by Truax. The programs proposed for Simon Fraser University would also be complimentary to that of U.B.C. not only because of the opportunities for interdisciplinary outreach at S.F.U. but also because such areas as computer and systems design, in which we have strength, are only minimally represented at our sister institution.

Fourth, the form of the proposed program allows for a great degree of tutelege between supervisory committees and students. The emphasis is clearly on research with minimal (University minimum) course requirements (12 credit hours for the Masters). Since the supervisory committees are likely to be interdisciplinary as well, this tutelege appears warranted.

Fifth, despite the relative youth of the faculty in Computing Science and the short period of time during which a program in this field has existed at Simon Fraser University, the work of the faculty has become recognized in a number of ways (mainly through strong contract and grant support from government and industry agencies and through individual contracts). Present support includes not only the NSERC and Canada Council in Canada but also U.S. sources such as the U.S. National Institute of Occupational Health, The Council for Tobacco Research, the Office of Naval Research, and others. Presently, most members of the Department receive external grants and contracts while others have grants from the PGRC to do preliminary work which it is expected will result in additional support. The support the faculty received for its research not only substantiates the value of their work but has many implications for the Graduate Program including offering support for graduate students, underlining the need for graduate assistants so as to support research being done, and providing ample opportunities for employment for our graduate students once they have finished their course of studies at this University.

Discussions of the proposed program at the meetings of the Senate Committee on Academic Planning concentrated on three issues. The first related to the question of whether to introduce both the Masters and Ph.D. Programs at the same time or to delay the implementation of the Ph.D. Program contingent upon review of the success of the M.Sc. Program. Delayed implementation of the Ph.D. Program would make sense if it were true that the Masters Program could be mounted with fewer resources or a lesser commitment to faculty time than would be required for both the programs. However, this would not be the case. In particular:

(1) Both programs rely on the same set of graduate courses so there would be no difference in the faculty workload associated with teaching graduate courses.

(2) If the Ph.D. Program were delayed, the graduate student body would consist mostly of Masters students and a few doctoral students under special arrangements. If both programs were implemented concurrently, the graduate student body would be more evenly divided between Masters and Ph.D. students, but the total number of students would be about the same. Thus there would be little or no difference in the workload associated with graduate student supervision.

(3) The lack of a Ph.D. Program would adversely affect recruitment of new faculty and graduate students.

(4) The Department presently employs about eighteen teaching assistants, most of whom are undergraduates. Faculty members currently have research grant and contract funds sufficient to support about four to six research associates. By next year, faculty grant and contract support should reach a level where eight or nine research associates could be supported. Office and research space for this number of teaching assistants and research associates currently exists. Thus the Department presently support and house over twenty graduate students with no significant impact on physical resources, and this number can be expected to increase to thirty within one to two years as faculty grant and contract support increase. It is not intended that the graduate program increase beyond this number. Rather, it is the intention of the Department to concentrate on a modest number of high caliber graduate students.

A second question raised at the Senate Committee on Academic Planning concerned the ability of the faculty in the Department to mount a graduate program and supervise graduate students. The research and supervisory activities of those faculty members who were present prior to September, 1978 are summarized below:

3 Senior Faculty:	Over 200 publications 20 Ph.D.'s supervised Approximately 25 M.Sc.'s supervised
2 Associate Faculty:	Over 50 publications 4 Ph.D.'s supervised Approximately 10 M.Sc.'s supervised
6 Junior Faculty:	Over 60 publications 3 Ph.D.'s supervised 6 M.Sc.'s supervised

In addition, the Department has added two new faculty members in "Information Retrieval" and "Programming Languages" effective September, 1978 and is currently searching for three additional positions in "Theoretical Computing Science and Analysis of Algorithms," Interactive Graphics," and "Software Engineering" to be filled by September, 1979. One of these authorized positions serves as a replacement for a current lecturer positions.

Regarding the hiring of qualified faculty for such a program, it is true that there is intense competition. Despite this, the Department has successfully hired highly qualified faculty for all of the positions that have been authorized during the past four years. The Department now has hardware and graphics facilities that are among the finest in Canada, and expects to continue to attract excellent faculty. Clearly, a graduate program is a key issue in the minds of prospective faculty members.

SIMON FRASER UNIVERSITY

MEMORANDUM

To: SCAP

From: B.P. Clayman, Chairman
Assessment Committee

Subject: Computing Science

Date: 1978 12 20

The Assessment Committee has approved the proposed M.Sc. and Ph.D. programs in Computing Science. Its decision was based on careful evaluation of the submitted documentation, extensive discussions with the proposers, and external reviews of the proposal. Some modifications were made to the original proposal by the proposers in response to the criticisms raised by the external reviewers. These changes were considered by the committee to answer all the valid criticisms of the reviewers.

The Assessment Committee was fully satisfied as to the academic merit of and need for the revised program which it approved.

Bruce P. Clayman

BPC/dy

COMPUTING SCIENCE
GRADUATE STUDIES PROPOSAL

Graduate Studies Committee
Computing Science Department
21 September 1977
Update: 28 November 1977
Update: 5 December 1978

DEPARTMENT OF COMPUTING SCIENCE GRADUATE STUDIES PROPOSAL

TABLE OF CONTENTS

In accordance with the Senate document for "The Establishment of New Graduate Programs" as amended and approved by Senate July 10, 1972, this document contains a proposal from the Computing Science Department for a new graduate program.

(a) JUSTIFICATION FOR THE PROGRAM.

While computing science in many leading universities was established starting first with the graduate program, Simon Fraser University opted for the opposite approach. First a strong interdisciplinary Computing Science Program was established at the undergraduate level that satisfied the needs of the university. The graduate program was to develop as a continuation and a logical extension of a strong undergraduate department. These aims are embodied in Senate document S73-63. This undergraduate program has now been established. The program harmoniously integrates different streams giving the student a wide choice ranging from theory and concepts of computing science, to practical preparation as a computing professional. The success of the undergraduate program is partly reflected by its rapid growth. Fall semester enrolment was 1200 students, a 41% increase from Fall, 1977, and there is no sign that that rate of growth will depreciate.

Nevertheless, despite its undergraduate orientation, the design of the computing program and the composition of the new faculty has always reflected the original intention, to develop a full range of Graduate and Undergraduate offerings at the university. Computing Science at Simon Fraser University remains incomplete until the Graduate component has been added to it. Reasons for this further formal development within the Computing Science Department are many and varied. They include the following:

(1) Community need.

At both the undergraduate and the graduate level, Computing Science at Simon Fraser is attracting students. The undergraduate enrolment has steadily increased in less than five years from zero to more than 1200 students (Fall, 1978 figures) enrolled in Computing Science courses. In addition, a small but active graduate studies committee within the Computing Science Department consistently receives inquiries concerning graduate studies at our institution, even though we do not currently offer a graduate degree. So persistent are some students that we currently have two students working toward graduate degrees under Special Arrangements, one at the MSc level and one at the PhD level. In addition three other students are enrolled as Special Arrangements Qualifying students in Computing science. For further details see (m) below.

That computing personnel with advanced degrees are needed in the community is an understatement. It is not unusual to see approximately 20-40 positions for Ph.D. graduates listed in one issue of the Communications of the ACM, primarily for either academic or research positions. In addition, publications such as the University Affairs, the CAUT Bulletin, IEEE Spectrum and Computer journals regularly advertise additional posts calling for people with advanced computing degrees. In the past three years SFU has added five full time computing science faculty and two joint appointments with computing science; UBC has added three new faculty in the past year alone. The past Director of the Computing Science Department here at SFU has stated that he regularly receives inquiries from prospective employers for 2 to 3 graduate level educated computing scientists a month from all over North America (approximately 30 inquiries per year). In addition many industrial and government agencies are searching for and employing computing science graduates with advanced degrees. Advertisements in newspapers and trade journals (such as Datamation or Canadian Datasystems) easily verify this observation. At the most recent employment register held in February, 1978 in Detroit there were 3,000 job offerings and approximately 300 PhD candidates seeking them. A recent report on the production and employment of Ph.D.'s in computing science has been appended to the cover memo of this document. Note that this report only considers Ph.D.s and contains figures of employment of Ph.D.s by year and organisation type. Few fields offer the potential for sustained future growth that computing science offers both at the undergraduate and graduate levels.

(2) Departmental vitality.

The Computing Science Department is supported by a strong, research oriented faculty which despite its newness and relative youth has already established an impressive record of recognition for its work, objectively demonstrated by ample grant support and publications. Over three quarters of the faculty in Computing Science have attracted grant money. These grants come from a variety of sources, including NSERC, Canada Council, and the President's research grant, as well as various funding agencies in the United States. Without the presence of good graduate students it would be difficult to maintain this momentum of research.

(3) Natural extension to existing program.

The attractive interdisciplinary approach of our present program and the diverse interdisciplinary interests of our present faculty contribute heavily to the points mentioned above. Also, the proposal below should be viewed as an extension of what currently is happening under Special Arrangements.

In addition, Senate document S73-63, the computing science undergraduate proposal, was approved by Senate and contains the following observations regarding graduate studies in computing science:

(a) page 5, "While no graduate programme is presently proposed, programmes will be worked out for graduate students in the Arts and Sciences who want to acquire a Computing Science background";

(b) page 6, "The program for majors in Computing Science is organized so that students may take advantage of a number of options:

(1) they may continue graduate work leading to a higher degree in Computing Science

(2) they may continue graduate work leading to a higher degree (not in Computing Science) in an Applied or Theoretical Science or Art"

(c) page 31, "A number of courses in Computing Science will be taught [under Special Arrangements]".

(b) NEW POSITIONS AND JUSTIFICATION.

The proposed program, if approved and adopted, would require two and one half additional faculty positions for the Computing Science Department. While considerable expertise is available in the department to cover all of the areas mentioned in (e) below, the present teaching and research requirements of the Computing Science faculty precludes the possibility of a successful graduate program implementation without additional staffing.

Given the frequencies of offerings specified for the new courses we could comfortably teach 810, 820, 850, and 860 yearly and 863 semi-annually with 821, 830, 840, 861, 862, and seminar courses offered as scheduled with two and one half additional faculty members.

Note: Since the origin of this document in 1977, two faculty members have left the Department (Kirkpatrick and Granot) and two have joined (Havens and Luk). While we have considerably strengthened two of our areas described in the proposal, with the new faculty, one area has been weakened with the loss of the other faculty. Our faculty search committee has identified as the top recruitment priority a person with skills in the weakened area and we are actively conducting a search at this time for such a person. The position has been authorised through our dean.

(c) PERSONNEL

Curricula vitae of all persons wishing to be involved in the proposed program are attached (see Attachment 1). Listed below (in alphabetic order) are the names of these persons along with a statement of their current areas of interest and an indication of their involvement with the program (joint appointments are starred *).

Personnel	Interest
Jerry Barenholtz * Lecturer	Graphics, Programming Language Development
Margaret Benston * Ass't Professor	Scientific Applications, Instructional Aids
Thomas Calvert * Professor	Information Processing in Man & Machine, Biomedical Applications, Graphics
Nick Cercone Ass't Professor	Artificial Intelligence, Programming Languages, Computational Linguistics
Subrata Dasgupta Ass't Professor	Computer Architecture, Microprogramming, Artificial Intelligence
Ted Edwards Ass't Professor	APL Language and Extension, APL Implementation, Hardware Design, Graphics
Doreen Godwin Lecturer	Instructional Technology
Ronald Harrop * Professor	Switching Theory, Automata Theory, Logic
William Havens Ass't Professor	Artificial Intelligence, Programming Languages
Richard Hobson Ass't Professor	Microcomputer Architecture, Programming Environments, Educational Machines, Scientific Applications
Ross Jewell Assoc. Member	Computer Centre Management, Performance Evaluation
Wo-Shun Luk Ass't Professor	Information Storage and Retrieval, Data Base Systems
Thomas Peucker * Assoc. Professor	Graphics, Computer Mapping, Picture Processing Data Structures
Douglas Seeley Ass't Professor	Interactive Graphics, Computer Animation, Simulation and Modelling, Social Implications of Computing
Theodor Sterling Professor	Statistics and Data Processing Applications, Social Applications, Systems Design

James Weinkam
Assoc. Professor   Programming Languages, Biomedical Computing

The Computing Science graduate studies committee presently consists of Nick Cercone, Subrata Dasgupta, Tom Peucker, and Jay Weinkam.

(d) FIELD OF STUDY.

Listed below are six relevant areas within Computing Science from which comprehensive examination material will be drawn. The choice of areas was influenced by categories in use at other universities, by faculty interests and also by the desirability of identifying areas of comparable scope. A guiding principle was that each area should be one in which a "well educated computer scientist" ought to have some knowledge. The areas are listed with a brief operational description of their area's content.

(1) Theoretical Computing Science - Theoretical foundations and mathematical techniques which pervade all areas within Computing Science are accomodated in this area. Courses from this area should provide the student with an intellectual maturity to allow him to stay abreast of his own discipline.

(2) Artificial Intelligence - This area introduces students to those nonarithmetical applications of computing that attempt to achieve goals considered to require human mental capabilities (e.g. complex problem solving), model highly organised intellectual activity, and describe purposeful behaviour.

(3) Programming Languages, and
(4) Programming Systems - The subject matter of these two broad areas is concerned with the representations and transformations of information structures and with theoretical models for such representations and transformations.

(5) Computer Design and Organisation - Subject material in this area concentrates on systems having the ability to transform information. Such systems usually involve the interaction of hardware and software. With the advent of microprocessors, there appears to be no limit to the potential growth of design and application problems within the area.

(6) Advanced Applications - Diverse methodologies derived from broad applications of computing are concentrated in this area. They include graphics, cartography, medical applications, operations research, etc.

Area Course Content:

For the present, the course offerings will be restricted to the major courses in the six areas listed below (the ones with associated content descriptions), together with additional special topics courses and the directed reading courses.

(1) Theoretical Computing Science

CMPT 810-3 The Design and Analysis of Algorithms (3-0-0)

Analysis of computational problems and their algorithms on random access machines with various measures of complexity; survey of basic techniques for both design and analysis; applications to both algebraic and combinatorial problems including integer, matrix, and polynomial arithmetic, fast Fourier transforms, graph and set theoretic algorithms; NP-complete problems and other unifying concepts

CMPT 811-3 Effective and Efficient Computability (3-0-0)*

(2) Artificial Intelligence

CMPT 820-3 Heuristic Programming (3-0-0)

Heuristic problem solving; planning; concept formation; game playing and decision making; theorem proving and heuristic strategies; perception and vision; question-answering; comprehension of natural language.

CMPT 821-3 Pattern Recognition and Image Processing (3-0-0)

The representation of patterns and images; filtering and image enhancement; simple discrimination algorithms; statistical approaches; structural (linguistic) approaches; applications in medicine, earth resourse assessment, etc.

(3) Programming Languages

CMPT 830-3 Compiler Theory (3-0-0)

Grammars; top down and bottom up parsing of context-free languages, Earley's parser; precedence, LL(k), and LR(k) grammars; SLR(k), LALR(k), L(m)R(k) and LR(k) parsing techniques; transduction grammars; general compiler organisation, code generation and optimization; memory allocation for object programs; garbage collection; compile-time and run-time diagnostics.

CMPT 831-3 Language Design (3-0-0)*

(4) Programming Systems

CMPT 840-3 Advanced Topics in Simulation and Modelling (3-0-0)

Topics include the design of simulation languages, both process oriented and event-oriented; optimizing event scheduling; simulation data structures; the validation of simulations; queuing networks; simulation optimization; and the simulation of computer systems.

CMPT 841-3 Data Base Systems (3-0-0)*

CMPT 842-4 Operating Systems (3-0-0)*

(5) Computer Design and Organisation

CMPT 850-3 Computer Architecture (3-0-0)

Parallel processing: SIMD & MIMD systems, associative processors, pipelining, data flow architecture, Petri nets; microprogramming: control memory minimization, optimization and verification of microprograms, emulation; fault tolerant computing; performance analysis of computer architectures; computer design and description languages.

CMPT 851-3 Switching Theory and Logical Design (3-0-0)*

(6) Advanced Applications

CMPT 860-3 Algorithms of Optimization (3-0-0)

This course will cover a variety of optimization models, that naturally arise in the area of Management Science and Operations Research, which can be formulated as Mathematical Programming problems. Topics to be covered include: network flow algorithms; linear programming; dynamic programming; integer programming; transportation and assignment problems; non linear programming; and applications of game theory. Computational aspects of various algorithms will be discussed. There will be a strong emphasis on the formulation of problems and the design of algorithms for the various optimization problems.

CMPT 861-3 Biomedical Computing (3-0-0)

Computer and theoretical models of neural networks and physiological control systems (thermal, respiratory, cardiovascular). Selected topics from: simulation in physiology; computers in medical diagnosis; computers in intensive care monitoring; computers in rehabilitation and prosthetics; and medical records and data bases.

CMPT 862-3 Computer Mapping (3-0-0)

A study of the theoretic and algorithmic aspects which are involved in the automated production of maps. Three groups of topics will be discussed: basics - languages, data structures, and picture processing for computer mapping; computer cartography - the handling of points, lines, polygons, surfaces and considerations of their structures, displays, and generalisations; and geographic information systems - topographic, thematic, community, coverage, and cadastral systems, and digital terrain models.

CMPT 863-3 Principles of Computer-Aided Design (3-0-0)

Methodologies of interactive design, user-oriented systems, conversational dynamics, 3-D image representation and building, human factors of input/output devices and display systems, computer touring of 3-D models.

* These titles indicate possible courses which could be developed at some future date to provide additional depth within the six major areas. These courses (initially) will, depending on student demand and faculty availability, be offered under the special topics designation.

(e) RELATIONSHIP BETWEEN PERSONNEL AND CORE AREAS.

The table shown below illustrates both the care with which the proposed graduate studies program was designed and the delicate balance of the present faculty to fill areas necessary for successful implementation of the a program.

Area (1) Theoretical Computing Science
Barenholtz, Harrop

Area (2) Artificial Intelligence
Calvert, Cercone, Havens

Area (3) Programming Languages
Cercone, Edwards, Havens, Weinkam

Area (4) Programming Systems
Edwards, Hobson, Jewell, Peucker, Seeley

Area (5) Computer Design and Organisation
Dasgupta, Edwards, Hobson, Harrop, Havens

Area (6) Advanced Applications
Barenholtz, Benston, Calvert, Godwin, Luk, Peucker, Seeley, Sterling, Weinkam

(f) NEW DEGREE.

The Computing Science Program would offer courses leading to the M.Sc. and Ph.D. degrees.

The M.Sc. and the Ph.D. programs are envisioned to start simultaneously. The present faculty of Computing Science includes five joint appointments, four of whom have had considerable experience in graduate student supervision at the Ph.D. level (Benston, Calvert, Harrop, Peucker). The remaining full time faculty have for the most part participated in the supervision of graduate students, including the Ph.D. level (Cercone, Seeley, Sterling, Weinkam). Faculty within Computing Science (exclusive of joint appointments) have attracted more than $60,000 in grants (including NSERC) to carry out research projects. The joint appointments also hold research grants. This commitment to research sponsorship on the part of granting agencies shows faith on their part in the capabilities of faculty members to carry out high quality research.

(g) ACADEMIC REQUIREMENTS.

Academic requirements for the M.Sc. and Ph.D. degrees are given in section (q) - Graduate calendar entry.

We expect full-time graduate students to complete work leading to the M.Sc. degree in about 4-5 semesters time; the corresponding figure for students working toward the Ph.D. degree (with M.Sc. degrees or equivalent) is about 7-10 semesters.

(h) NEW COURSES.

The Computing Science Program proposes the following new graduate courses:

CMPT 810-3 The Design and Analysis of Algorithms (3-0-0)

CMPT 820-3 Heuristic Programming (3-0-0)

CMPT 821-3 Pattern Recognition and Image Processing (3-0-0)

CMPT 830-3 Compiler Theory (3-0-0)

CMPT 840-3 Advanced Topics in Simulation and Modelling (3-0-0)

CMPT 850-3 Computer Architecture (3-0-0)

CMPT 860-3 Algorithms of Optimization (3-0-0)

CMPT 861-3 Biomedical Computing (3-0-0)

CMPT 862-3 Computer Mapping (3-0-0)

CMPT 863-3 Principles of Computer-Aided Design (3-0-0)

CMPT 881-3 Special Topics

CMPT 882-3 Special Topics

CMPT 883-3 Special Topics

CMPT 891-3 Advanced Seminar I

CMPT 892-3 Advanced Seminar II

CMPT 893-3 Advanced Seminar III

CMPT 894-3 Directed Reading I

CMPT 895-5 Directed Reading II

CMPT 898 M.Sc. Thesis

CMPT 899 Ph.D. Thesis

See Attachment 2 for the individual new course proposals in the prescribed format.

(i) LABORATORY FACILITIES.

The Computing Science Program at Simon Fraser University has computing equipment available for research and instruction including a microprogrammable Varian V75 (running VORTEX) with 64K of core memory and assorted peripheral equipment. The peripheral equipment includes: (1) 20 megabyte disk capacity (2 fixed, 2 removable platters); (2) 45 IPS 800/1600 BPI dual density tape drive; (3) dual port digital cassette; (4) Centronics 102 character printer; (5) TTY, CRT, Data Media terminals; and (6) a data link to the Computing Centre's 370/155 and 370/148 mainframes. The department is also equiped with an Evans and Sutherland Picture System I, a DEC PDP 11/34 (running RT11 or UNIX) with 80K of semiconductor memory and standard PDP 11/34 features, and a microprocessor laboratory. This microprocessor laboratory contains twelve Intel 8080A based mini-micro designers, evaluation kits including MC6800, RCA COSMAC, AMD2900, TMS 9900, PACE, and Fairchild F8, a 16 channel logic analyzer, 2 oscilloscopes, a universal EPROM programmer, 21 powered breadboards, and 15 logic probes. Available for research use is a hardware development computer based on the Intel 8085 with 64K bytes of RAM, dual floppy disks, an Intecolour CRT, UCSD PASCAL, and an assembler. This system is interfaced to the Varian, the Computing Centre's mainframes, the EPROM programmer, and has several spare ports for expansion. Also available for research use is a Hewlett Packard 2116 system operated by the Psychology Department and a DEC GT40 graphics computer operated by the Kinesiology Department.

In addition to the computing facilities housed within the Computing Science Program, the university computing centre currently offers three major computing systems to tend to the needs of the university community. An IBM 370/155 computer with 3 megabytes of main memory running under OS/MVT (with WYLBUR) with extensive peripheral devices is the main system available. A newer acquisition is the IBM 370/148 system with 2 megabytes of main memory; it operates under the Michigan Terminal System [MTS], a highly flexible interactive timesharing system, which greatly enhances service to the user community.

(j) SOURCES OF SUPPORT FOR GRADUATE STUDENTS.

The Computing Science Program has available a number of teaching assistantships for the support of graduate students. This number (approximately 50 over 3 yearly semesters for 1977-1978) varies depending on enrolment. In addition, a number of faculty are able to support graduate students through their NSERC, SFU and other research grants.

(k) LIBRARY RESOURCES AND FUTURE NEEDS.

The library reserves have been researched by Mr. Maurice Deutsch to ascertain whether their facilities could support such a program. His report and a subsequent update search made of the library resources reveal that they are generally satisfactory and the results of his search are appended as Attachment #3.

(l) ESTIMATED ENROLMENT.

The Computing Science Program anticipates accepting no more than six graduate students in the first year of the program and will accept no more than ten additional students in each of the following two years. At the present time the Computing Science program could probably accomodate 20-25 graduate students (excluding faculty requirements).

(m) SPACE REQUIREMENTS.

Space requirements will largely be for graduate students acting as

TAs and/or as research assistants. Offices are presently available for those graduate students who act as TAs though this number is expected to increase as our enrolment increases. Some of the research space required will be provided through the use of the hardware laboratories or spaces presently occupied by computing science equipment (e.g., the minicomputer or graphics equipment rooms). Some additional office space will be needed for those graduate students who are supported as teaching/research assistants in response to our increased enrolment. As most graduate students probably will be appointed as TAs, two or three small inset office rooms should satisfy the additional space required by teaching/research requirements. In addition, one large room for equipment expansion and laboratory facilities for research testing should provide ample space beyond what is presently occupied by Computing Science.

(n) GRADUATE CALENDAR ENTRY.

DEPARTMENT OF COMPUTING SCIENCE

Location: Room 7322 - Classroom Complex
Telephone: 291-4277

CHAIRMAN:

James J. Weinkam	B.S.(Xavier),M.S.(Chicago),D.Sc.(Wash.), Associate Professor (Programming Languages, Biomedical Computing)
Jerry Barenholtz	B.S.(Michigan), Lecturer, (Graphics, Programming Language Development)
Margaret L. Benston	B.A.(Williamette),Ph.D.(Wash.), Assistant Professor of Computing Science and Assistant Professor of Chemistry (Scientific Applications, Instructional Aids)
Thomas W. Calvert	B.Sc.(Lond.),M.S.(Wayne),Ph.D.(Carnegie Tech.), Professor of Computing Science and Professor of Kinesiology (Information Processing in Man & Machine, Biomedical Applications, Graphics)

Nick J. Cercone	B.S.(Steub.),M.S.(Ohio St.),Ph.D.(Alberta), Assistant Professor (Artificial Intelligence, Programming Languages, Computational Linguistics)
Subrata Dasgupta	B.E.(Calc.),M.Sc.,Ph.D.(Alberta), Assistant Professor (Computer Architecture, Microprogramming, Artificial Intelligence)
E. M. (Ted) Edwards	B.Sc.,M.Sc.(UBC) Assistant Professor (APL Language and Extension, APL Implementation, Hardware Design, Graphics)
Doreen Godwin	B.Comm.(Carleton), Lecturer (Instructional Technology)
William Havens	B.S.,M.S.(Virginia Tech),Ph.D.(UBC), Assistant Professor (Artificial Intelligence, Programming Languages)
Ronald Harrop	B.A.,M.A.,Ph.D.(Cambridge), Professor of Computing Science and Professor of Mathematics (Switching Theory, Automata Theory, Logic)
Richard F. Hobson	B.Sc.(Br. Col.),Ph.D.(Waterloo), Assistant Professor (Microcomputer Architecture, Programming Environments, Educational Machines, Scientific Applications)
T. Ross Jewell	B.Sc.(Br. Col.),M.S.(California), Associate Member (Computer Centre Management, Performance Evaluation)
Wo-Shun Luk	B.A.(Lond.),M.Math(Waterloo),Ph.D.(Alberta), Assistant Professor (Information Storage and Retrieval, Data Base Systems)
Thomas K. Peucker	Dr.phil.(Heidelberg), Associate Professor of Computing Science and Associate Professor of Geography (Graphics, Computer Mapping, Picture Processing Data Structures)

Douglas A. R. Seeley B.A.Sc.,M.A.Sc.,Ph.D.(Toronto),
Assistant Professor
(Interactive Graphics, Computer Animation, Simulation and Modelling, Social Implications of Computing)

Theodor D. Sterling A.B.,M.A.(Chicago),Ph.D.(Tulane),
Professor
(Statistics and Data Processing Applications, Social Applications, Systems Design)

Departmental Assistant: Mrs. Elma Krbavac
Location: Room 7321 - Classroom Complex
Telephone: 291-4675

DEGREES OFFERED

The Computing Science Program offers programs leading to the M.Sc. and Ph.D. degrees in Computing Science. The Computing Science Program provides students at the graduate level with graduate studies in the following specific areas: (i) Theoretical Computing Science; (ii) Artificial Intelligence; (iii) Programming Languages; (iv) Programming Systems; (v) Computer Design and Organisation; and (vi) Advanced Applications.

M.Sc. PROGRAM

ADMISSION

To qualify for admission to the M.Sc. program a student must, in addition to the general University regulations, have at least either (i) a Bachelor's degree (or equivalent) in Computing Science; or (ii) a Bachelor's degree in another discipline and a strong academic background in, or experience in, Computing Science.

DEGREE REQUIREMENTS

(i) Course Work

The minimum course requirement for the Master's degree consists of 12 semester hours of graduate-level course credit at least 9 of which must be in Computing Science. Additional undergraduate courses may be required to correct deficiences in the student's background. In addition, students will be required to present a seminar in the department seminar series. Note that students specialising in advanced applications may be required to take appropriate courses in other disciplines.

(ii) Research

{a} The student will be required to present a thesis proposal to the department at a seminar, for approval by his supervisory committee.

{b} The student will be required to submit and defend a satisfactory thesis. An examining committee will consist of at least three faculty members, one from a department other than Computing Science.

(iii) Research Seminar

The M.Sc. candidate will be required to present a seminar lecture based on his research. This seminar will normally be presented a few weeks before the candidate's thesis oral examination.

Ph.D. PROGRAM

ADMISSION

For admission requirements, refer to the general regulations section.

DEGREE REQUIREMENTS

(i) Course Work

The student may be required to complete a number of graduate-level reading and seminar courses. In addition, he will be required to present a seminar in the department seminar series. Note that students specialising in advanced applications may be required to take appropriate courses in other disciplines.

(ii) Qualifying Examination

By the end of the third semester of Ph.D. work, the student will be required to take a set of written comprehensive qualifying examinations to demonstrate breadth in Computing Science. Each student would be required to obtain at least a low pass in each of the five areas identified (excluding Advanced Applications) with a high pass in two areas. A student who passes this examination but whose results indicate deficiencies in certain areas, may be required to take additional courses. A student who fails will, depending on performance, be required to withdraw from the Ph.D program or allowed to take the examination a second time. A student who fails twice will be required to withdraw from the Ph.D. program.

(iii) Research

(a) The major portion of the Ph.D. program will be spent in doing original research.

(b) The student's research shall be under the direction of a supervisory committee of not fewer than three faculty members.

(c) The student is formally admitted as a Ph. D. candidate contingent on passing an oral candidacy examination in subjects relevant to his general field of research. At the candidacy examination, the student must demonstrate to the satisfaction of the examining committee that he possesses (a) an adequate knowledge of his discipline and of the subject matter relevant to his proposed research and (b) the ability to pursue and complete original research at an advanced level. The examination shall be under the direction of the supervisory committee to which two other faculty members have been added. The candidacy examination is normally taken around six months after the student passes written comprehensive qualifying examinations.

(d) A thesis embodying the results of this research must be presented and defended in an oral examination at the conclusion of the degree program. An examining committee will consist of the supervisory committee and at least two other examiners. One member of the examining committee shall be from a department or discipline other than that in which the candidate is working, and one member shall be an external examiner who is a recognised authority in the special field of research.

(iv) Research Seminar

The Ph.D. candidate will be required to present a seminar lecture based on his research. This seminar will normally be presented a few weeks before the candidate's thesis oral examination.

For further information and regulations for both the M.Sc. and Ph.D. degrees, refer to the General Regulations section of the Graduate Studies Calendar.

DESCRIPTION OF COMPUTING SCIENCE GRADUATE COURSES

CMPT 810-3 The Design and Analysis of Algorithms

Analysis of computational problems and their algorithms on random access machines; survey of basic techniques with applications to algebraic, numeric and combinatorial problems; NP-complete problems and other unifying concepts.

CMPT 820-3 Heuristic Programming

Heuristic problem solving; planning; concept formation; game playing and decision making; theorem proving and heuristic strategies; perception and vision; question-answering; comprehension of natural language.

CMPT 821-3 Pattern Recognition and Image Processing

The representation of patterns and images; filtering and image enhancement; simple discrimination algorithms; statistical and structural approaches; applications in medicine, earth resourses, etc.

CMPT 830-3 Compiler Theory

Precedence, LL(k), LR(k) grammars; SLR(k), LALR(k), L(m)R(k) and LR(k) parsing techniques; transduction grammars; general compiler organisation, code generation and optimization; memory allocation for object programs; garbage collection.

CMPT 840-3 Advanced Topics in Simulation and Modelling

Topics include the design of simulation languages, both process oriented and event-oriented; optimizing event scheduling; simulation data structures; the validation of simulations; queuing networks; simulation optimization; and the simulation of computer systems.

CMPT 850-3 Computer Architecture

Parallel processing: SIMD & MIMD systems, associative processors, pipelining, data flow architecture, Petri nets; microprogramming: control memory minimization, optimization and verification of microprograms, emulation; fault tolerant computing; performance analysis of computer architectures; computer design and description languages.

CMPT 860-3 Algorithms of Optimization

This course will cover a variety of optimization models, that naturally arise in the area of Management Science and Operations Research, which can be formulated as Mathematical Programming problems.

CMPT 861-3 Biomedical Computing

Computer and theoretical mcdels of neural networks and physiolcgical control systems (thermal, respiratcry, cardiovascular). Simulation in physiology; computers in medical diagonsis; intensive care monitoring; rehabilitaticn and prosthetics; and medical records and data bases.

CMPT 862-3 Computer Mapping

A study of the theoretic and algorithmic aspects which are involved in the automated production of maps. Three topics will be discussed: basics; computer cartography; and geographic information systems.

CMPT 863-3 Principles of Computer-Aided Design

Methodologies of interactive design, user-oriented systems, conversational dynamics, 3-D image representation and building, human factors of input/output devices and display systems, computer touring of 3-D models.

CMPT 891-3 Advanced Seminar I

CMPT 892-3 Advanced Seminar II

CMPT 893-3 Advanced Seminar III

CMPT 894-3 Directed Reading I

CMPT 895-5 Directed Reading II

CMPT 898 M.Sc. Thesis

CMPT 899 Ph.D. Thesis

SPECIAL TOPICS COURSES

In any semester only a very limited number of Special Topics courses will be offered subject to student demand and faculty availability. Details of any Special Topics course will be posted one semester prior to its being offered.

CMPT 881-3 Special Topics

CMPT 882-3 Special Topics

CMPT 883-3 Special Topics

ATTACHMENT #1

NEW COURSE PROPOSAL FORMS

FOR THE

COMPUTING SCIENCE GRADUATE PROGRAMS

Note: The Graduate Studies Committee approved these new course proposal forms as part of the proposed graduate programs in the Department of Computing Science.

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 810

Title: The Design and Analysis of Algorithms

Description: Analysis of computational problems and their algorithms on random access machines; survey of basic techniques with applications to algebraic, numeric and combinatorial problems; NP-complete problems and other unifying concepts.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Fall, first year of the program

How often will course be offered: once yearly.

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: David Kirkpatrick

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
c) Library resources (see Attachment No. 3)

Approved:	Departmental Graduate Studies Committee: yes	Date: 29/4/77
	Faculty Graduate Studies Committee: yes	Date: 19/5/77
	Faculty:	Date:
	Senate Graduate Studies Committee:	Date:
	Senate	Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 820

Title: Heuristic Programming

Description: Heuristic problem solving; planning; concept formation; game playing and decision making; theorem proving and heuristic strategies; perception and vision; question-answering; comprehension of natural language.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Fall, first year of the program

How often will course be offered: once yearly.

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Nick Cercone

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
c) Library resources (see Attachment No. 3)

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SFU: New Graduate Course Proposal Form (cont)

CMPT 820-3 (3-0-0) Heuristic Programming

OUTLINE

Topic	No. of Weeks
I. Meanings, Goals, and Methods of Artificial Intelligence.	1/2
II. LISP review, LISP programming and techniques.	1 1/2
III. State Space Representations and Search Methods.	1/2
IV. Game Playing.	1 1/2
V. Pattern Recognition, Classification for Computer Vision and Perception.	1 1/2
VI. Theorem Proving using the Resolution Principle.	1
VII. Question-Answering Systems.	1
VIII. Natural Language Representation and Understanding.	2 1/2
IX. Planning.	2
X. Miscellaneous.	1

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 820. An important aspect of Computing Science occurs because of the use of algorithms in problem solving. This aspect naturally gives rise to subfields such as natural and artificial language translation, artificial intelligence, and numerous applications of computers for which artificial intelligence techniques and methodologies are appropriate. Since heuristic programming is the methodology with the largest number of practitioners within artificial intelligence, it was chosen as the topic of CMPT 820.

LIBRARY REFERENCE MATERIALS

Proceedings

IJCAI, Walker, D., and Norton, L. (eds), (1969). Proceedings of the International Joint Conference on Artificial Intelligence, Washington, D.C., MITRE Corp.

IJCAI2, British Computer Society, (1971). Proceedings of the Second International Joint Conference on Artificial Intelligence, London, British Computer Society.

IJCAI3, Stanford University, (1973). Proceeding of the Third International Joint Conference on Artificial Intelligence, Stanford, California, Stanford University.

LIBRARY REFERENCE MATERIALS

Books

Aho, CURRENTS IN THE THEORY OF COMPUTING, Prentice - Hall, 1973.

Aho, Hopcroft, and Ullman, THE DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS, Addison-Wesley, 1974.

Borodin and Munio, THE COMPUTATIONAL COMPLEXITY OF ALGEBRAIC AND NUMERIC PROBLEMS, American Elsevier, 1975.

Deo, GRAPH THEORY WITH APPLICATIONS TO ENGINEERING AND COMPUTER SCIENCE, 1974.

Even, ALGORITHM COMBINATIONS, 1973.

Goodman and Hedetniem, INTRODUCTION TO THE DESIGN AND ANALYSIS OF ALGORITHMS, McGraw-Hill, 1977.

Harary, GRAPH THEORY, Addison-Wesley, 1969.

Knuth, THE ART OF COMPUTER PROGRAMMING, volumes 1-3, Addison-Wesley, 1968, 1969, 1973.

Knuth, THE ART OF COMPUTER PROGRAMMING, volume 4, (Combinatoral Algorithms), Addison-Wesley (to appear).

Lui, C.L., INTRODUCTION TO COMBINATORIAL MATHEMATICS, McGraw-Hill, 1968.

Miller and Thatcher, COMPLEXITY OF COMPUTER COMPUTATIONS, Plenum Press, 1972.

Nizenhuie and Wolfe, COMBINATORIAL ALGORITHMS, Academic Press, 1975.

Rheingold, Nieregelt and Deo, COMBINATORIAL COMPUTING, Prentice Hall (to appear).

Rustin, COMPUTATIONAL COMPLEXITY, Algorthmics Press, 1971.

Rustin, COMPUTATIONAL ALGORITHMS, Algorthmics Press, 1972.

Traub, COMPLEXITY OF SEQUENTIAL AND PARALLEL NUMERICAL ALGORITHMS, Academic Press, 1973.

Traub, ALGORITHMS AND COMPLEXITY, Academic Press, 1976.

Whitehead, COMBINATORIAL ALGORITHMS, Courant Institute Lecture Notes, 1973.

Proceedings (Annual)

ACM Symposia on Theory of Computing, Association for Computing Machinery

Symposium on Foundations of Computer Science, IEEE or IEEE Computer Society

CMPT 810-3 (3-0-0) The Design and Analysis of Algorithms

OUTLINE

1. Introduction
   analysis of algorithms - basic assumptions and limitations,
   points of contact with the traditional theory of computation
   automata theory and computational complexity

2. Basic Design and Analysis Techniques
   review of design considerations
   recursion - divide and conquer
   analysis of techniques
   asymptotic analysis
   upper and lower bounds on complexity

3. Complexity Hierarchy
   linear or near linear time algorithms
   polynomial time algorithms
   polynomial complete problems
   intractable problems

4. Set and Graph Theoretic Algorithms
   basic algorithms
   sorting and selection algorithms
   find union problems
   graph isomorphism and related problems
   plenarty algorithms

5. Algebraic Algorithms
   lower bound techniques
   matrix multiplication and related problems
   polynomial arithmetic
   FFT and related problems

6. Selected Topics (as time permits)
   complexity of parallel processes
   complexity of numerical computations
   study of heuristic and approximation algorithms

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 810. One of the most important aspects of Computing Science is the study of the characterization and limitations of algorithms and computation. This part of Computing Science contains theories of computability and computational complexity. CMPT 810 is concerned especially with the latter and is concerned with the description of algorithms, as well as their effeciency and correctness.

IJCAI4, AI Lab, MIT, (1975). Proceedings of the Fourth International Joint Conference on Artificial Intelligence, Tiblisi, USSR.

IJCAI5, MIT, (1977). Proceedings of the Fifth International Joint Conference on Artificial Intelligence, M I T, Cambridge, Massachusetts.

Books

Arbib, M. (1964). BRAINS, MACHINES, AND MATHEMATICS, McGraw Hill, New York.

Arnheim, R. (1971). VISUAL THINKING, Univ. of California Press, Berkeley, California.

Dreyfus, H. (1972). WHAT COMPUTERS CAN'T DO: A CRITIQUE OF ARTIFICIAL REASON, Harper and Row, New York.

Duda, R. and Hart, P. (1973). PATTERN CLASSIFICATION AND SCENE ANALYSIS, Wiley, New York.

Fogel, L., Owens, A., and Walsh, M. (1966). ARTIFICIAL INTELLIGENCE THROUGH SIMULATED EVOLUTION, Wiley, New York.

Feigenbaum, E., and Feldman, J. (eds), (1963). COMPUTERS AND THOUGHT, McGraw Hill, New York.

MACHINE INTELLIGENCE SERIES 1-8, American Elsevier, New York.

Jackson, P. (1974). INTRODUCTION TO ARTIFICIAL INTELLIGENCE, Petrocelli, New York.

Hunt, E. (1975). ARTIFICIAL INTELLIGENCE, Academic Press, New York.

Minsky, M. (ed). (1968). SEMANTIC INFORMATION PROCESSING, MIT Press, Cambridge, Massachusetts.

Nilsson, N. (1971). PROBLEM SOLVING METHODS IN ARTIFICIAL INTELLIGENCE, McGraw Hill, New York.

Schank, R. and Colby, K. (1973). CONCEPTUAL INFORMATION PROCESSING, Freeman, San Francisco.

Simon, H. (1969). THE SCIENCES OF THE ARTIFICIAL, MIT Press, Cambridge, Massachusetts.

Slagle, J. (1971). ARTIFICIAL INTELLIGENCE: THE HEURISTIC PROGRAMMING APPROACH, McGraw Hill, New York.

Winston, P. (1977). ARTIFICIAL INTELLIGENCE, Addison-Wesley, New York.

Journals

Artificial Intelligence
American Journal of Computational Linguistics
Pattern Recognition

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 821

Title: Pattern Recognition and Image Processing

Description: The representation of patterns and images; filtering and image enhancement; simple discrimination algorithms; statistical and structural approaches; applications in medicine, earth resources, etc.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Spring, first year of the program

How often will course be offered: once yearly (if required).

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Tom Calvert

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended:
a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
c) Library resources (see Attachment No. 3)

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

CMPT 821-3 (3-0-0) Pattern Recognition and IMage Processing

OUTLINE

I.	The representation of patterns and images.	2 weeks
II.	Filtering and image enhancement.	2 weeks
III.	Simple discrimination algorithms.	2 weeks
IV.	Statistical approaches.	3 weeks
V.	Applications in medicine, earth resource assessment, etc.	3 weeks

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 821. Humans and other animals survive in their complex and changing environment by using sophisticated sensory systems to detect, classify, and interpret patterns of input stimulation. For over two decades workers in artificial intelligence have been trying to approximate mechanically the performance of that ultimate in biological pattern recognizers, human vision. Despite this tremendous research investment computers still cannot "see" even a fraction as well as people. This course is important in order to get an idea of what has been done and how much remains to be accomplished.

LIBRARY REFERENCE MATERIALS

Books

Young, T., and Calvert, T., (1974). CLASSIFICATION, ESTIMATION, AND PATTERN RECOGNITION, American Elsevier.

Patrick, E., (1972). FUNDAMENTALS OF PATTERN RECOGNITION, Prentice Hall.

Papoulis, A., (1968). SYSTEMS AND TRANSFORMS WITH APPLICATIONS IN OPTICS, McGraw-Hill.

Sebestgen, G., (1962). DECISION MAKING PROCESSES IN PATTERN RECOGNITION, Macmillian.

Journals

Pattern Recognition

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE   Course Number: CMPT 830

Title: Compiler Theory

Description: Precedence, LL(k), LR(k) grammars; SLR(k), LALR(k), L(m)R(k) and LR(k) parsing techniques; transduction grammars; general compiler organisation, code generation and optimization; memory allocation for object programs; garbage collection.

Credit Hours: 3   Vector: (3-0-0)   Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Spring, second year of the program

How often will course be offered: once yearly (if required).

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Jay Weinkam

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
c) Library resources (see Attachment No. 3)

Approved: Departmental Graduate Studies Committee: yes   Date: 29/4/77

Faculty Graduate Studies Committee: yes   Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

CMPT 830-3 (3-0-0) Compiler Theory

OUTLINE

	Topic	No. of Weeks
I	Elements of Language Theory - Representation of Languages - Regular Sets - Context Free Languages - Pushdown Automata	1 1/2
II	Theory of Translation - Syntax-Directed Translation - Lexical Analysis - Parsing	1 1/2
III	Single-Pass No. Backtrack Parsing Methods - LL(k) grammars - Deterministic Bottom-up Parsing - Precedence Grammars - Other shift-reduce algorithms	2 1/2
IV	General Parsing Methods - Backtrack Parsing - Tabular Parsing Methods	1
V	Bookkeeping - Symbol Tables - Hash tables and hashing functions - Property Grammars	1
VI	Run Time Storage Organization - Storage for elementary data types, arrays, strings, structures - Actual/formal parameter correspondence - Storage administration for block-structured languages - Dynamic storage allocation	1
VII	Translation and Code Generation - The Role of Translation in Compiling - Syntax-directed Translations - Generalized Translation schemes	2
VIII	Code-Optimization - Staight Line Code - Arithmetic Expressions - Programs with loops - Data Flow Analysis	2 1/2

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 830. An important aspect of computing science is the study of the representations of algorithms and their data. This accounts for the large amount of research that has been done in the areas of problem-oriented language design, programming language specification and translation techniques, etc. Compiler design lies at the heart of this important subfield of computing science and CMPT 830 is designed to teach the current thinking and methodologies researchers employ when they design and implement compilers.

LIBRARY REFERENCE MATERIALS

Books

1. A.V. Aho & J.D. Ullmann, THE THEORY OF PARSING, TRANSLATION AND COMPILING, VOL 1: PARSING, Prentice-Hall, N.J. 1972.

2. A.V. Aho & J.D. Ullman, THE THEORY OF PARSING, TRANSLATION AND COMPILING, VOL 2: COMPILING, Prentice-Hall, N.J. 1972.

3. D.G. Gries, COMPILER CONSTRUCTION FOR DIGITAL COMPUTERS, John Wiley, N.Y., 1971.

4. P.M. Lewis II, D.J. Rosenkrantz, R.E. Stearns, COMPILER DESIGN THEORY, Addison-Wesley, 1976.

5. W. Wulf, R.K. Johnsson, C.B. Weinstrock, S.O. Hobbs, C.M. Geschke, THE DESIGN OF AN OPTIMIZING COMPILER, Elsevier, N.Y., 1975.

6. McKeeman, W., Horning, J., and Wortman, D., A COMPILER GENERATOR, Prentice Hall, 1970.

7. Hopgood, F., COMPILING TECHNIQUES, American Elsevier, 1969.

8. Rustin, R., DESIGN AND OPTIMIZATION OF COMPILERS, Prentice Hall, 1972.

9. Randall, B., and Russell, L., ALGOL 60 IMPLEMENTATION, Academic Press, 1969.

10. Griswold, R., THE MACRO IMPLEMENTATION OF SNOBOL 4, W. H. Freeman, 1972.

Journals

SIGPLAN (Association for Computing Machinery Special Interest Group)

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE   Course Number: CMPT 840

Title: Advanced Topics in Simulation and Modelling

Description: Topics include the design of simulation languages, both process oriented and event-oriented; optimizing event scheduling; simulation data structures; the validation of simulations; queuing networks; simulation optimization; and the simulation of computer systems.

Credit Hours: 3   Vector: (3-0-0)   Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Fall, second year of the program

How often will course be offered: once yearly (if required).

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Doug Seeley

What are the budgetary implications of mounting the course:
- a) 1/4 faculty person per offering
- b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended:
- a) Outline of the Course
- b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
- c) Library resources (see Attachment No. 3)

Approved:	Departmental Graduate Studies Committee: yes	Date: 29/4/77
	Faculty Graduate Studies Committee: yes	Date: 19/5/77
	Faculty:	Date:
	Senate Graduate Studies Committee:	Date:
	Senate:	Date:

CMPT 840-3 (3-0-0) Advanced Topics in Simulation and Modelling

OUTLINE

1. Simulation Language Design
   - the control structure of GPSS
   - the control structure of SIMSCRIPT II.5
   - the control structure of SIMULA
   - event scheduling algorithms
   - data structures for simulation
   - the parallel processing paradigm
   - conditional events

2. Simulation Experiments
   - regression
   - analysis of variance
   - design of simulation experiments
   - search methods in optimization
   - conjugate gradient methods

3. Simulation Validation
   - input - output analysis
   - time series analysis
   - statistical tests
   - internal validity
   - sub-model validity
   - open problems

4. Continuous Systems Simulation
   - timing mechanisms
   - numerical computation
   - modelling concepts
   - CSMP
   - DYNAMO
   - hybrid simulation
   - accuracy considerations
   - computer - aided modelling

5. Systems Dynamics Modelling
   - elements of control and feedback
   - entropy and variety
   - systems organization
   - industrial dynamics
   - resource models
   - law of requisite variety
   - CYBERSTRIDE
   - modelling issues in the Club of Rome studies

6. Simulation of Computer Systems
   - system measurement
   - measurement distortion
   - disk systems
   - time-sharing systems
   - virtual memory systems
   - distributed processing and networks
   - real - time control

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 850

Title: Computer Architecture

Description: Parallel processing: SIMD & MIMD systems, associative processors, pipelining, data flow architecture, Petri nets; microprogramming: control memory minimization, optimization and verification of microprograms, emulation; fault tolerant computing; performance analysis of computer architectures; computer design and description languages.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Fall, first year of the program

How often will course be offered: once yearly.

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Subrata Dasgupta

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
c) Library resources (see Attachment No. 3)

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 840. The current CMPT 305 is only too brief an exposure to this widely applied computing tool. This course provides a natural extension into more difficult areas of discrete simulation and discusses the methodology of continuous systems simulation which 305 has no time to develop.

LIBRARY REFERENCE MATERIALS

Books

Maisel, H. and Grugoli, G., SIMULATION OF DISCRETE STOCHASTIC SYSTEMS, S. R. A., 1972.

Emshoff, T.R., and Sisson, R.L., DESIGN AND USE OF COMPUTER SIMULATION MODELS, Macmillan, 1972.

Forrester, T.W., INDUSTRIAL DYNAMICS, M. I. T. Press, 1961.

Forrester, T.W., PRINCIPLES OF SYSTEMS, Wright-Allen, 1968.

Oed-Smith, R.T. and Stephenson, J., COMPUTER SIMULATION OF CONTINUOUS SYSTEMS, Cambridge University Press, 1975.

Mesarovic, M., and Pestel, E., MANKIND AT THE TURNING POINT, Signet, 1976.

Ashby, R., DESIGN FOR A BRAIN. Chapman and Hall, 1960.

Beer, S., PLATFORM FOR CHANGE, Wiley, 1975.

Everling, W., EXERCISE IN COMPUTER SYSTEMS ANALYSIS, Springer-Verlag, 1972.

Dugh, A., DYNAMO USERS MANUAL, M. I. T. Press, 1963.

Dahl, O., and Nygaard, "SIMULA - An Algol-based Simulation Language", Communications of the ACM, September, 1966.

Kiviat, P.J., et al., 'The SIMSCRIPT II PROGRAMMING LANGUAGE, Prentice-Hall, 1968.

CMPT 850-3 (3-0-0) Computer Architecture

OUTLINE

TOPICS		No. of Weeks
I	Taxonomy of Computer Structures	1/2
II	Array Machine Organization and Programming - Principles and applications of array processing - Architecture of the ILLIAC IV - Data and Program Organizations	1 1/2
III	Associative Processing - Associative Memories - Fully Parallel & Bit Serial Associative Processors	1
IV	Multiprocessor Organizations - Processor and Memory Interconnection Structures - C.mmp system - Performance analysis of multiprocessors	1
V	Pipeline Processing - Overlap designs - Principles of Pipeline design - Pipeline processing of arithmetic operations - Vector Processing - MU5 and the TI ASC	2
VI	Principles of data-flow architecture	1/2
VII	Principles of Emulation - The design of DEL and HLL Machines - Firmware/Hardware Implementation of Operating System Functions	2
VIII	Design of Control Store Organizations - ROM and WCS Microword Structures - Control Store Word Minimization Techniques - Microprogram Optimization	1
IX	Design and verification of Microprograms - High Level Microprogramming Languages - Formal Techniques for Software and Firmware Verification	1 1/2

X Protection in Computer Systems 1
- Hardware/Firmware Implementation of Capabilities

XI Principles of Fault Tolerant Computing 1

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 850. With the advent of inexpensive microprocessors a few years ago, the traditional design of computing systems has undergone a tremendous development. Inovative design techniques are being introduced as well as new applications. CMPT 850 is designed to present material that will augment a student's background in computer architecture and enable him to try inovative designs and computer organisations of his own. This fundamental course for computing scientists and computer engineers is the study of the organisation and interconnection of components of computer systems.

LIBRARY REFERENCE MATERIALS

Books

C.G. Bell & A. Newell, COMPUTER STRUCTURES: READINGS AND EXAMPLES, McGraw-Hill, N.Y., 1971.

H.S. Stone (Editor), AN INTRODUCTION TO COMPUTER ARCHITECTURE, Science Research Associates, Chicago, 1975.

C.C. Foster, CONTENT-ADDRESSABLE PARALLEL PROCESSORS, Van Nostrand Reinhold Co., N.Y., 1976.

C.C. Foster, COMPUTER ARCHITECTURE. (2nd Edition), Van Nostrand Reinhold Co., N.Y., 1976.

E. I. Organick, COMPUTER SYSTEM ORGANIZATION: THE B5700/B6700 SERIES, Academic Press, N.Y. 1973.

P. H. Enslow (Ed), MULTIPROCESSORS AND PARALLEL PROCESSING, John Wiley & Sons, N.Y., 1974.

Y. Chu (Ed), HIGH LEVEL LANGUAGE COMPUTER ARCHITECTURE, Academic Press, N.Y., 1975.

A.K. Agrawala & T.G. Rauscher, FOUNDATIONS OF MICROPROGRAMMING, Academic Press, N.Y., 1976.

R. Hartenstein & R. Zaks, (Ed.), MICROARCHITECTURE OF COMPUTER SYSTEMS, North-Holland, Amsterdam, 1975.

A. B. Salsbury, MICROPROGRAMMABLE COMPUTER ARCHITECTURES, Elsevier-North-Holland, N.Y., 1976.

Conference Proceedings and Journals

Proc. First Annual Symposium on Computer Architecture (ACM/IEEE),1973
Proc. Second Annual Symposium on Computer Architecture (ACM/IEEE),1975
Proc. Third Annual Symposium on Computer Architecture (ACM/IEEE), 1976
Proc. Fourth Annual Symposium on Computer Architecture (ACM/IEEE), 1977
IEEE Transactions on Computers
ACM Computing Surveys
Communications of the ACM

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 860

Title: Algorithms of Optimization

Description: This course will cover a variety of optimization models, that naturally arise in the area of Management Science and Operations Research, which can be formulated as Mathematical Programming problems.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Spring, first year of the program

How often will course be offered: once yearly.

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Daniel Granot

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
c) Library resources (see Attachment No. 3)

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SFU: New Graduate Course Proposal Form (cont)

CMPT 860-3 (3-0-0) Algorithms of Optimization

OUTLINE

I. Network Flow Algorithms

II. Linear Programming

III. Dynamic Programming

IV. Integer Programming

V. Transportation and Assignment Problems

VI. Non-linear Programming

VII. Applications of Game Theory

VIII. Computational Aspects of Various Algorithms

IX. Design of Algorithms for Various Optimization Problems

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 860. The scientific approach to decision making that involves the operations of organizational systems is an important application area for computing science. CMPT 860 is designed to make the tools available to researchers who do research concerned with the automatic analysis and interpretation of the conduct and operations or activities within and organization. An additional consideration is finding the best of optimal solution to a particular problem.

LIBRARY REFERENCE MATERIALS

Books

Hillier, F., and Lieberman, G., (1967). INTRODUCTION TO OPERATIONS RESEARCH, Holden-Day, San Francisco, California.

Churchman, C., Ackoff, R., and Arnoff, E., (1957). INTRODUCTION TO OPERATIONS RESEARCH, John Wiley, New York.

Miller, D., and Starr, M., (1960). EXECUTIVE DECISIONS AND OPERATIONS RESEARCH, Prentice Hall, Englewood Cliffs, N. J.

Shuchman, A., (1963). SCIENTIFIC DECISION MAKING IN BUSINESS, Holt, Rinehart, and Winston, New York.

Feller, W., (1957). AN INTRODUCTION TO PROBABILITY THEORY AND ITS APPLICATIONS, John Wiley, New York.

Parzen, E., (1960). MODERN PROBABILITY THEORY AND ITS APPLICATIONS, John Wiley, New York.

Dantzig, G., (1963). LINEAR PROGRAMMING AND EXTENSIONS, Princeton University Press, N. J.

Hadley, G., (1962). LINEAR PROGRAMMING, Addison-Wesley, Reading, Massachusetts.

Dresher, M., (1961). GAMES OF STRATEGY: THEORY AND APPLICATIONS, Prentice Hall, Englewood Cliffs, N. J.

Luce, R., and Raiffa, H., (1957). GAMES AND DECISIONS, John Wiley, New York.

Vajda, S., (1960). AN INTRODUCTION TO LINEAR PROGRAMMING AND THE THEORY OF GAMES, Methuen, London.

Cox, D., and Smith, W., (1961). QUEUES, John Wiley, New York.

Journals

Operations Research

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 861

Title: Biomedical Computing

Description: Computer and theoretical models of neural networks and physiological control systems (thermal, respiratory, cardiovascular). Simulation in physiology; computers in medical diagonsis; intensive care monitoring; rehabilitation and prosthetics; and medical records and data bases.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Spring, second year of the program

How often will course be offered: as enrolment justifies.

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Ted Sterling

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
c) Library resources (see Attachment No. 3)

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SFU: New Graduate Course Proposal Form (cont)

CMPT 861-3 (3-0-0) Biomedical Computing

OUTLINE

I. Simulation in Physiology

II. Computers in Medical Diagnosis

III. Computers in Intensive Care Monitoring

IV. Computers in Rehabilitation and Prosthetics

V. Medical Records and Data Bases

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 861. The use of computers in medical research is a rapidly growing phenomena. Research money is becoming available to capable computer scientists who wish to persue this advanced application. In T. Calvert, J. Weinkam, and T. Sterling, Simon Fraser has more than ample expertise to nurture this application and make it one of the outstanding graduate level computing courses.

LIBRARY REFERENCE MATERIALS

Journals

Biomedical Engineering
Transactions of IEEE
Computers in Biology and Medicine
Biometrics
Computer Programs in Biomedicine
Radiology
British Journal of Radiology

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE   Course Number: CMPT 862

Title: Computer Mapping

Description: A study of the theoretic and algorithmic aspects which are involved in the automated production of maps. Three topics will be discussed: basics; computer cartography; and geographic information systems.

Credit Hours: 3   Vector: (3-0-0)   Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 6-10

When will course first be offered: Spring, first year of the program

How often will course be offered: as enrolment justifies.

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Tom Peucker

What are the budgetary implications of mounting the course:
- a) 1/4 faculty person per offering
- b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended:
- a) Outline of the Course
- b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
- c) Library resources (see Attachment No. 3)

Approved: Departmental Graduate Studies Committee: yes   Date: 29/4/77

Faculty Graduate Studies Committee: yes   Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

CMPT 862-3 (3-0-0) Computer Mapping

OUTLINE

I. Introduction
- -Overview
- -Computer Graphics
- -Surveying

II. Line Handling
- -Theory
- -Display
- -Generalisation

III. Polygons
- -Data Structures
- -Display

IV. Points
- -Symbolism
- -Generalisation

V. Surface Manipulation
- -Theory
- -Data Structures
- -Interpolation
- -Triangulation
- -Smoothing
- -Generalisation

VI. Surface Display
- -Contouring
- -Shading
- -Inclined and Shaded Contours
- -Profiles
- -Radar Maps

VII. Geographic Information Systems
- -Introduction
- -Overview and History
- -Data Structures

VIII. Topographic Information Systems
- -Hardware
- -The Map as Information Storage
- -Generalisation Examples

IX. Thematic Information Systems
- -Graphic Symbolism
- -Statistical Geography
- -Examples

X. Cadastral Systems
- -Topological Data Structures
- -Survey Adjustment

XI. Geocoding Systems
- -The Geographic Base File
- -The DIME file
- -GRDSR
- -Data Retrieval

XII. Resourse Systems
- -Polygon Overlays
- -The Grid Approach
- -Examples

XIII. Digital Terrain Models
- -Data Gathering
- -Interpolation
- -Contouring
- -Data Structures
- -Examples

XIV. Integrated GIS
- -Interfaces
- -Reference Systems
- -Planning

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 862. Many of the problems faced by geographers have no algorithmic solution. The techniques developed within artificial intelligence have, as yet, to prove of real value to computer cartographers. This application, important in its scope and in its implications, deserves our special attention since we have at Simon Fraser both the equipment (our new Graphics laboratory) and the personnel to make Simon Fraser the leading institution in this area. CMPT 862 will attempt to teach and motivate computing scientists interested in persuing the automated production of maps.

LIBRARY REFERENCE MATERIALS

Books

Davis, J., and McCullagh (eds), (1975). DISPLAY AND ANALYSIS OF SPATIAL DATA, John Wiley and Sons, London.

MacDougall, E., (1976). COMPUTER PROGRAMMING FOR SPATIAL PROBLEMS, London.

Mordbeck, S., and Rystedt, B., (1972). COMPUTER CARTOGRAPHY, Lund.

Peucker, T., (1972). "Computer Cartography", Resource Paper No. 17, AAG, Washington.

Tomlinson, R. (ed), (1970). ENVIRONMENT INFORMATION SYSTEMS, Ottawa.

Tomlinson, R. (ed), (1972). GEOGRAPHIC DATA HANDLING, 2 Volumes, Ottawa.

Tomlinson, R., Calkins, H., and Marble, D. (eds), (1976). COMPUTER HANDLING OF GEOGRAPHIC DATA, Paris.

Proceedings

Auto-Carlo II: Proceedings of the International Symposium on Computer Assisted Cartography, Washington, 1975.

Experimental Cartographic Unit: Royal College of Arts: Automatic Cartography and Planning, London, 1970.

Taylor, D. (ed), Proceedings of the Workshop on Current Issues in Geographic Data Processing, Ottawa, 1976.

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE   Course Number: CMPT 863

Title: Principles of Computer-Aided Design

Description: Methodologies of interactive design, user-oriented systems, conversational dynamics, 3-D image representation and building, human factors of input/output devices and display systems, computer touring of 3-D models.

Credit Hours: 3   Vector: (3-0-0)   Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 8-15

When will course first be offered: Fall, first year of the program

How often will course be offered: alternate years.

JUSTIFICATION:

See Justification with Outline of the course (appended).

RESOURCES:

Which faculty member will normally teach the course: Doug Seeley

What are the budgetary implications of mounting the course:
- a) 1/4 faculty person per offering
- b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Appended:
- a) Outline of the Course
- b) An indication of the competence of the Faculty member to give the course (see Curriculum vitae - Attachment No. 1)
- c) Library resources (see Attachment No. 3)

Approved:	Departmental Graduate Studies Committee: yes	Date: 29/4/77
	Faculty Graduate Studies Committee: yes	Date: 19/5/77
	Faculty:	Date:
	Senate Graduate Studies Committee:	Date:
	Senate:	Date:

CMPT 863-3 (3-0-0) Principles of Computer-Aided Design

OUTLINE

I. Interactive Design
- design process loops
- graphic feedback
- control functions
- input/output devices
- graphic representations
- menu tactics
- the screen as a working environment
- databases for "scratch-pads" (partially specified designs)

II. Conversational Dynamics
- conversational state
- goal-oriented design
- context guidance
- visual syntax
- archiving prototypes
- user control of system

III. User-Oriented Systems
- system extensibility
- action inference
- knowledge-based graphics
- idiosyncratic systems
- iconic systems
- LOGO
- SMALLTALK
- PYGMALION
- THE ARCHITECTURE MACHINE

IV. Human Factors of Display Systems
- visual perception channel
- extending channel capacity
- short-term memory characteristics
- attention and vigilance
- chunking, multi-dimensional displays
- response time requirements
- display tactics
- aids to learning

V. Human Factors of Input/Output Devices
- representations of data
- functional properties of devices
- analogue control
- the tactile channel
- sensory context guidance
- sensory feedback

VI. 3-D Image Building
- 3-D representations
- procedural data
- image sculpting
- image building primitives
- hidden-line removal
- hidden-surface removal
- types of display coherence

VII. Computer Touring
- simulated motion
- representation of micro-worlds
- frame-frame coherence
- real-time experiments
- polyhedral structures
- graphic working sets

JUSTIFICATION

In addition to the justification mentioned in the cover memorandum, the following rationale is appropriate for CMPT 863. With the recent acquisition of the Evans and Sutherland Picture Processing system and the active interests of Seeley, Calvert, and Barenholtz interactive graphics is becoming a strength in the Program. This course is a natural extension and advance on the related undergraduate courses and is eminently applicable in other departments such as Kinesology, Physics, Mathematics, and Chemistry.

LIBRARY REFERENCE MATERIALS

Martin, James, (1973). THE DESIGN OF MAN-COMPUTER DIALOGS, Prentice Hall, New York.

Kay, Alan, (1969). "The Reactive Engine", PhD Thesis, University of Utah, Salt Lake City, Utah.

Smith, D., (1975). "PYGMALION, A Creative Programming Environment", PhD Thesis, Stanford University, Stanford, California.

Winston, P., (1975). THE PSYCHOLOGY OF COMPUTER VISION, McGraw Hill, New York.

Keele, J., (1975). ATTENTION AND HUMAN PERFORMANCE, Goodyear.

Learning Research Group, (1975). "Personal Dynamic Media", Xerox PARC, Palo Alto, California.

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 881

Title: Special Topics

Description: To be posted one semester prior to being offered.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 3-10 When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Special topics courses should be offered for the following reasons: (i) Before a new course is added to the curriculum, special topics offers the test vechicle for testing and evaluating the course's potential for inclusion into the calendar as a permanent course; (ii) special topics courses enhance the existing program offerings; (iii) special topics provide the program with the opportunity to take advantage of visitors and new faculty with expertise in a particular area not normally covered in the present curriculum; and (iv) special topics allow latitude for course development.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE   Course Number: CMPT 882

Title: Special Topics

Description: To be posted one semester prior to being offered.

Credit Hours: 3   Vector: (3-0-0)   Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 3-10 When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Special topics courses should be offered for the following reasons: (i) Before a new course is added to the curriculum, special topics offers the test vechicle for testing and evaluating the course's potential for inclusion into the calendar as a permanent course; (ii) special topics courses enhance the existing program offerings; (iii) special topics provide the program with the opportunity to take advantage of visitors and new faculty with expertise in a particular area not normally covered in the present curriculum; and (iv) special topics allow latitude for course development.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
  a) 1/4 faculty person per offering
  b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes   Date: 29/4/77

Faculty Graduate Studies Committee: yes   Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE   Course Number: CMPT 883

Title: Special Topics

Description: To be posted one semester prior to being offered.

Credit Hours: 3   Vector: (3-0-0)   Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 3-10 When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Special topics courses should be offered for the following reasons: (i) Before a new course is added to the curriculum, special topics offers the test vechicle for testing and evaluating the course's potential for inclusion into the calendar as a permanent course; (ii) special topics courses enhance the existing program offerings; (iii) special topics provide the program with the opportunity to take advantage of visitors and new faculty with expertise in a particular area not normally covered in the present curriculum; and (iv) special topics allow latitude for course development.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes   Date: 29/4/77

Faculty Graduate Studies Committee: yes   Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 891

Title: Advanced Seminar I

Description: To be posted one semester prior to being offered.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 3-10 When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Advanced seminar courses should be offered for the following reasons: (i) advanced seminars enhance the existing program offerings; (ii) advanced seminars provide the program with the opportunity to advantageously utilise visitors and new faculty with expertise in a particular area not normally covered in the present curriculum and an area which is doubtful for permanent inclusion as part of the curriculum; and (iii) advanced seminars allow some latitude for course development.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 892

Title: Advanced Seminar II

Description: To be posted one semester prior to being offered.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 3-10 When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Advanced seminar courses should be offered for the following reasons: (i) advanced seminars enhance the existing program offerings; (ii) advanced seminars provide the program with the opportunity to advantageously utilise visitors and new faculty with expertise in a particular area not normally covered in the present curriculum and an area which is doubtful for permanent inclusion as part of the curriculum; and (iii) advanced seminars allow some latitude for course development.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 893

Title: Advanced Seminar III

Description: To be posted one semester prior to being offered.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 3-10 When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Advanced seminar courses should be offered for the following reasons: (i) advanced seminars enhance the existing program offerings; (ii) advanced seminars provide the program with the opportunity to advantageously utilise visitors and new faculty with expertise in a particular area not normally covered in the present curriculum and an area which is doubtful for permanent inclusion as part of the curriculum; and (iii) advanced seminars allow some latitude for course development.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
a) 1/4 faculty person per offering
b) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE   Course Number: CMPT 894

Title: Directed Reading I

Description: A reading course arranged between student and faculty.

Credit Hours: 3   Vector: (3-0-0)   Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 1   When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Subject to student demand and faculty availablily (visitors included) directed reading courses enhance a student's program.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
a) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes   Date: 29/4/77

Faculty Graduate Studies Committee: yes   Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 895

Title: Directed Reading II

Description: A reading course arranged between student and faculty.

Credit Hours: 3 Vector: (3-0-0) Prerequisite(s) if any: none

ENROLMENT AND SCHEDULING:

Estimated Enrolment: 1 When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Subject to student demand and faculty availablily (visitors included) directed reading courses enhance a student's program.

RESOURCES:

Which faculty member will normally teach the course: Faculty.

What are the budgetary implications of mounting the course:
a) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE Course Number: CMPT 898

Title: M. Sc. Thesis

Description: Thesis.

Credit Hours: 0 Vector: (~~0-0-0~~) Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 1 When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Required for Degree.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
a) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes Date: 29/4/77

Faculty Graduate Studies Committee: yes Date: 19/5/77

Faculty: Date:

Senate Graduate Studies Committee: Date:

Senate: Date:

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: COMPUTING SCIENCE | Course Number: CMPT 899

Title: Ph. D. Thesis

Description: Thesis.

Credit Hours: 0 | Vector: (~~0-0-0~~) | Prerequisite(s) if any: none

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ENROLMENT AND SCHEDULING:

Estimated Enrolment: 1 | When will course first be offered: as needed

How often will course be offered: as necessary.

JUSTIFICATION:

Required for Degree.

RESOURCES:

Which faculty member will normally teach the course: Faculty

What are the budgetary implications of mounting the course:
a) computing costs - see attachment #2 cover memo

Are there sufficient Library resources (append details): see Attachment Number 3.

Approved: Departmental Graduate Studies Committee: yes | Date: 29/4/77

Faculty Graduate Studies Committee: yes | Date: 19/5/77

Faculty: | Date:

Senate Graduate Studies Committee: | Date:

Senate: | Date:

ATTACHMENT #2

Analysis of the Computing Science Collections in Support of the Proposed Masters and Ph.D. Programs in Computing Science

Prepared by

Maurice Deutsch

Simon Fraser University Library

September 1977

This report describes the Library's monograph and journal collections in support of graduate studies in the Computing Science Department as set forth in the 'Computing Science Graduate Studies Proposal', by the Graduate Studies Committee, Computing Science Program, May 4, 1977.

It provides essentially a summary of current acquisition practices and an overall view of the Library's book and journal collections in computing science. It is to be regarded as a supplement to the 'Survey of the Literature Holdings of Simon Fraser University Lirary in Computing Science', written by Dan Bruce, Physical Sciences Librarian, January 1971 (copy enclosed with this report) which provides an analysis of the computing science collections.

The areas of study in the Proposal may be outlined as follows:

163 Theoretical Computing Science including analysis of computational problems and algorithm design.

2. Artificial Intelligence including heuristic problem solving, pattern recognition, image processing, game playing and decision making.

3. Programming Languages including compiler theory and language design.

4. Programming Systems including simulation, modelling, queuing, operating and database systems.

5. Computer Design and Organization including computer architecture, switching theory and logical design.

6. Advanced Applications, such as, optimization models, linear and nonlinear programming; biomedical computing, including theoretical models of neural networks and physiological control systems; computer mapping and computer cartography; and computer graphics.

7. Special Topics, such as, symbolic and algebraic manipulation; adaptive systems, biological mechanisms of information processing, feedback control; social implications of computer technology; creative programming environments which facilitate and enhance the design process in other areas.

Supporting current work in the Computing Science Department and work by many individuals who are involved with theoretical, applied, and methodological aspects of computers and computing in the sciences, humanities, and social sciences is a core book collection of more than 3,400 volumes. This book collection consists of dictionaries, encyclopedias, textbooks, dissertations, reviews, treatises, handbooks, manuals, guides, primers, proceedings of conferences, congresses, symposia, government publications, unpublished technical and research reports, and data compilations in such areas as computing science, programming and programming languages, debugging, compilers, systems analysis and design, computer modelling and simulation, operating systems, computers and minicomputers and their applications, networks, information science, data processing, and so forth.

Realizing the importance and immediate impact of computers and computer applications, the science librarians began, early in the history of SFU before the creation of the Computing Science Department, to build a strong core collection for undergraduates, graduates, and faculty in computing science, programming, and related areas. This collection also provided support to the handful of computing science and programming courses taught by the Mathematics Department.

The computing science collection as a whole is by no means easy to define because of the development of such profoundly diverse and specialized applications of computers in so many different areas. The rapid expansion of computer applications, the birth of new programming languages and the development of new progamming techniques is reflected in an expansive growth of both book and journal publications. We are currently attempting to collect materials which deal with computers and computer applications and which have some useful value to teaching and research at SFU.

Major acquisitions is taking place in the following areas:

Adaptive Control Systems
Algorithms
Artificial Intelligence
Automata
Automation
Biological Control Systems
Bionics
Boolean Algebra
Calculus of Operations
Compiling and Compilers
Computer Architecture
Computer Design
computer Graphics
Computer Industry
Computer Music
Computers including minicomputers, microcomputers, and microprocessors
Computers and Civilization
Computing Science
Control Theory
Critical Path Analysis
Cybernetics
Debugging
Decision Making - Mathematical Models
Digital Computer Simulation
Discrete Time Systems
Dynamic Programming
Electronic Data Processing
Experimental Design
Feedback Control
Flow Charts
Flowgraphs
Games of Strategy (Mathematics)
Human Engineering
Human Information Processing
Information Science
Information Storage and Retrieval Systems
Information Theory
Linear Algebra
Linear Proramming
Linguistics - Data Processing
Logical Design
Mathematical Models
Machine Theory
Machine Translating

Man-Machines Systems
Management Games
Management Information Systems
Mathematical Linguistic
Mathematical Optimization
Network Analysis (Planning)
Nonlinear Theories
Numerical Analysis
Neural Transmission
Nonlinear Proramming
Nonparametric Statistics
Operations Research
Optical Data Processing
Optical PatternRecognition
Pattern Perception
Problem Solving
Programming (Electronic Computers)
Programming Languages (Electronic Computers)
Progamming (Mathematics)
Queuing Theory
Sequential Analysis
Simulation
Statistical Decision
Switching Theory
System Analysis
Time Sharing

We are not purchasing detailed technical material in such areas as electronic and electrical engineering, hardware construction, materials technology, circuit construction and assembly and we are not collecting manuals associated with operating systems (for example the IBM series) which need frequent updating and should be kept at or as close as possible to the computer site.

The 1976 American Book Publishing Record (a listing of about 35,000 books which were published in the United States or distributed in the United States by agents of foreign publishers) was used as a yardstick to measure the degree of completeness of selection on the basis of what was available for the entire publishing year. The number of titles purchased in computing science for 1976 copyrighted books are as follows:

Computing science, programming, operating systems, etc.	136
Mathematical aspects	68
Technological aspects	57
Business aspects	53
Total	314

The purchase of 314 titles represents about 90% of the available titles (330) published for that year, the remainder representing highly technical works in electrical engineering and popular treatments of computers.

It can be seen from Fig. 1 that this core collection as a whole has increased by 32% between April 1974 through August 1977; this is an increase in 842 volumes. The specific section dealing with computing science, computers, operating systems, compilers, computer simulation, programming and programming languages has increased by 47% (386 volumes). In my view the book and monograph collection can now provide excellent support for the proposed graduate program in Computing Science.

A list of 119 journals, conference proceedings, annuals, and indexes and abstracts for which there are standing orders is included with this report.

Of 79 desirable periodicals (list is included with this report) submitted with the Proposal, 58 or 73% are held by the Library. Since the Library must cancel the equivalent dollar value of current journals to subscribe to new journals, 895 dollars must be found outside the Library's serials budget to purchase the 19 journals and 2 indexes recommended by the Computing Science Department. This practice of purchasing new journals in exchange for cancelling already existing subscriptions as a technique for weeding 'little used material' and attempting to 'contain' the journals budget not only hampers the development and growth of the journals collection, but fast reaches a point of diminishing returns after which nothing is cancelled and nothing is ordered.

I strongly suggest that, in view of current practice, the Computing Science Department in conjunction with the Science Librarians decide on any additional journal titles and that a request for funds to initiate subscriptions be included with the Proposal since no real future commitment for journal acquisitions can be made at this time. I am including with this report a list of additional recommended purchases consisting of 42 journals at about 1500 dollars, 10 annuals at about 250 dollars, and one index at 108 dollars, a total of about 1858 dollars worth of subscriptions. Many of these journals should be ordered to support current undergraduate teaching and research particularly in the applications areas. Three to five years of backfiles of two of the indexes, Computers and Control Abstracts, and Computer and Information Systems, should be purchased to support literature searching.

I also recommend the appointment of a Library Representative from the Computing Science Faculty to act as a liason between the Department and the Library during at least the initial stages of program development. This individual can provide a reliable, familiar channel through which requests for materials would be forwarded to the Library, and keep the Library informed of new course proposals, curriculum changes, and so forth.

Fig. 1. Core Computing Science Book Collection

Library of Congress Categories	-Number of Volumes-- Apr 74	Aug 77	Incr	%
Computers in the Business Environment #HF5548	258	322	64	25
Computers in Education and Teaching #LB1028	253	317	64	25
Systems Theory, Cybernetics, Pattern Recognition, Artificial Intelligence, Heuristic Programming, Machine Intelligence, Information Theory #Q295-Q375	174	222	48	28
Computing Science, Computers, Computer Simulation, Programming and Programming Languages, Compilers, Operating Systems, Algorithyms, Data Structures Microprogramming, Flowcharting, Debugging #QA75-QA76	821	1207	386	47
Combinatorics, Approximation, Relaxation Method, Linear and Nonlinear Programming, Numerical Analysis #QA164-QA165; QA218-QA225; #QA264-QA265; QA281-QA299	315	377	62	20
Automation Theory, Boolean Algebra, Automata, Game Theory, Decision Making #QA267-QA272	77	113	36	47
Systems Analysis, Control Systems, Optimization, Discrete Time Systems #QA402-QA402.5	166	220	54	33
Systems, Operations Research, Linear and Nonlinear Programming, Network Analysis Queuing, Decision Processes, Games and Strategy #T57	185	215	30	16
Computers - Hardware, Design, Networks #TK7885-TK7895	109	124	15	14
Library Automation #Z678	63	90	27	43
Information Science #Z699	173	229	56	32
TOTALS	2594	3436	842	32

Recommendations

Prices quoted for recommended serials were obtained from the 1975-1976, 16th edition of Ulrich's International Periodicals Directory and should be regarded as conservative in view of the current inflationary trends in publishing.

Recommendations by the Library - Journals

A C M SIGTOMS; transactions on mathematical software Association of Computing Machinery	$ 40.00
A S C FORUM American Society for Cybernetics	$ 18.00
AMERICAN JOURNAL OF COMPUTATIONAL LINGUISTICS Association for Computational Linguistics	$ 25.00
ASSOCIATION FOR LITERARY AND LINGUISTIC COMPUTING BULLETIN Association for Literary and Linguistic Computing	$ 10.00
AUTOMATIC CONTROL THEORY AND APPLICATIONS Acta Press	$ 27.00
COMPUTER AIDED DESIGN I P C Science and Technology Press	$ 52.00
COMPUTER APPLICATIONS NEWSLETTER Gordon and Breach	$ 45.00
COMPUTER DECISIONS; information systems, automated processing, problem solving Hayden Publishing	$ 24.00
COMPUTER DIGEST North American Publishing	$ 40.00
COMPUTER EDUCATION; a journal for teachers interested in computers and computing North Staffordshire Polytechnic	na
COMPUTER PROGRAMS IN SCIENCE AND TECHNOLOGY Science Associates International	$ 95.00

COMPUTERS AND CHEMISTRY Pergamon Press	$ 60.00
COMPUTERS AND DATABASES; an international journal Pergamon Press	$ 50.00
COMPUTERS AND EDUCATION; an international journal Pergamon Press	$ 50.00
COMPUTERS AND GEOSCIENCE; an international journal Pergamon Press	$ 60.00
COMPUTERS AND GRAPHICS Pergamon Press	$ 60.00
COMPUTERS AND HUMAN CONCERN Pergamon Press	$ 60.00
COMPUTERS AND MANAGEMENT; an international journal Pergamon Press	$ 60.00
COMPUTERS AND MATHEMATICS WITH APPLICATIONS Pergamon Press	$ 60.00
COMPUTERS AND MEDICINE American Medical Association	$ 5.00
COMPUTERS AND MEDIEVAL DATA PROCESSING Universite de Montreal	free
COMPUTERS AND OPERATIONS RESEARCH Pergamon Press	$ 50.00
COMPUTERS AND PHYSICS Pergamon Press	$ 60.00
COMPUTERS AND URBAN SOCIETY Pergamon Press	$ 60.00
COMPUTING NEWSLETTER FOR INSTRUCTORS OF DATA PROCESSING Center for Cybernetics Systems Synergism	$ 11.00
CONTROL AND CYBERNETICS Polska Akademia Nauk. Institute for Organization, Management and Control Science	Zl 50

DATA BASE Association for Computing Machinery	$ 3.50
DATA COMMUNICATIONS McGraw-Hill	$ 4.00
DATA PROCESSING FOR EDUCATION North American Publishing	$ 40.00
DATA PROCESSING MANAGEMENT ASSOCIATION MAGAZINE Data Processing Management Association of Toronto	na
DATABASE JOURNAL A. P. Publications Ltd.	$ 40.00
DIGITAL PROCESSES; an international journal on the theory and design of digital systems Delta Publishing	$ 50.00
E D P PERFORMANCE REVIEW; monthly report on computer performance improvement Applied Computer Research	$ 36.00
JOURNAL OF CLINICAL COMPUTING Journal of Clinical Computing Inc.	$ 16.00
MEDICAL AND BIOLOGICAL ENGINEERING AND COMPUTING: journal of the International Federation for Medical and Biological Engineering. Peregrinus	$ 80.00
OPERATING SYSTEMS REVIEW Association for Computing Machinery	$ 5.00
S I G C U E BULLETIN Association for Computing Machinery. Special Interest Group on Computer Uses in Education.	$ 6.00
STATISTICAL COMPUTATION AND SIMULATION Gordon and Breach	$ 75.00
THEORETICAL COMPUTER SCIENCE North Holland Publishing	$ 50.00
UNIVERSITY OF TORONTO. DEPARTMENT OF COMPUTER SCIENCE. TECHNICAL REPORTS. University of Toronto	free

WORD PROCESSING WORLD; the magazine of automated business communications — $ 4.00
Geyer-McAllister

WORDS — na
International Word Processing Association

*** Estimated total: 42 journals — $1431.50 ***

Recommendations by the Library - Annuals and Irregularly Issued Serials

AMERICAN SOCIETY FOR CYBERNETICS. PROCEEDINGS OF THE ANNUAL MEETING Spartan Books	varies
ANNUAL REVIEW IN AUTOMATIC PROGRAMMING Pergamon Press	varies
AUTOMATIC PROGRAMMING INFORMATION CENTER STUDIES IN DATA PROCESSING Academic Press	varies
CALIFORNIA. UNIVERSITY OF CALIFORNIA PUBLICATIONS IN AUTOMATIC COMPUTATION University of California Press	varies
COMPUTER APPLICATIONS IN THE NATURAL AND SOCIAL SCIENCES The University, Nottingham	varies
COMPUTER PROGRAM DIRECTORY Association of Computing Machinery	$ 25.00
H. ROWAN GAITHER LECTURES IN SYSTEMS SCIENCE University of California Press	varies
HARVARD UNIVERSITY. COMPUTATION LABORATORY. ANNALS Harvard University Press	varies
INTERNATIONAL TRACTS IN COMPUTER SCIENCE AND TECHNOLOGY AND THEIR APPLICATION Pergamon Press	varies
MACHINE INTELLIGENCE WORKSHOP American Elsevier	varies

*** Estimated total: 10 annuals — $250.00 ***

Recommendations by the Library - Indexes

COMPUTER AND CONTROL ABSTRACTS Institution of Electrical Engineers	$108.00
*** Estimated total: 1 index	$108.00 ***

Recommendations by the Computing Science Department - Journals

ALGORYTMY/ALGORITHMS Instytut Maszyn Matematycznych	na
AUTOMATIC CONTROL AND COMPUTER SCIENCES. English translation of: Avtomatika i Vychislitel'naya Tekhnika Allerton Press	$145.00
AUTOMATIC DOCUMENTATION AND MATHEMATICAL LINGUISTICS English translation of: Nauchno-Tekhnicheskaya Informatsiya Allerton Press	$145.00
CALCOLO Associazione Italiana per Il Calcolo Automatico-AICA	$ 12.00
CANADIAN CONTROLS AND INSTRUMENTATION Maclean-Hunter	$ 10.00
CANADIAN ELECTRONICS ENGINEERING Maclean-Hunter	$ 10.00
COMPUTER AIDED DESIGN I P C Science and Technology	$ 52.00
COMPUTERS AND STRUCTURES Pergamon Press	$100.00
COMPUTERWORLD; newsweekly for the computer community Computerworld Inc.	$ 12.00
CONTROL AND INSTRUMENTATION Morgan Grampian Ltd.	$ 40.00
ECONOMIC COMPUTATION AND ECONOMIC CYBERNETICS STUDIES AND RESEARCH The Center of Economic Computation and Economic Cybernetics, Bucharest, Romania	na

ELECTRONICS AND COMMUNICATIONS IN JAPAN; scripta electronica Japonica. English translaticn of: Institute of Electronics and Communication Engineers of Japan. Transactions. Scripta Publishing	\$ 8.00
ELEKTRONISCHE RECHENANLAGEN; Theorie, Technik und Anwendung der Computer R. Oldenbourg	DM 108
INFORMATION PROCESSING IN JAPAN Information Processing Society of japan	na
INTERNATIONAL ASSOCIATION FOR ANALOG COMPUTATION. PROCEEDINGS: MODELLING AND COMPUTER SIMULATION International Associatin for analog Computation	FR 800
INTERNATIONAL JOURNAL OF BIO-MEDICAL COMPUTING Appliea Science Publishers Ltd.	\$ 35.00
JOURNAL OF COMPUTER AND SYSTEM SCIENCES Academic Press	\$ 77.00
SOFTWARE: PRACTICE AND EXPERIENCE John Wiley	\$ 33.00
SOFTWAFE WORLD; an international journal of computer programs and packages A. P. Publications	\$ 35.00
*** Estimated total: 19 journals	\$714.00 ***

Recommendations by the Computing Science Department - Indexes and Abstracts
==

BEHAVIORAL SCIENCE University of Louisville	\$ 21.00
COMPUTER AND INFORMATION SYSTEMS; an abstract journal pertaining to the theory, design, fabrication and application of computer and information systems Cambridge Scientific Abstracts	\$160.00
*** Estimated total: 2 indexes	\$181.00 ***
*** GRAND TOTAL	\$2684.50 ***

SUPPLEMENT TO

Analysis of the Computing Science Collections in Support of the Proposed Masters and Ph.D. Programs in Computing Science

Prepared by

Maurice Deutsch

Simon Fraser University Library

September 1977

The intent of this report supplement is to update the estimated costs of journal recommendations.

Prices quoted were obtained from Ulrich's International Periodicals Directory, 17th edition, 1977-78. Prices in parenthesis represent the values supplied in the original report. All prices are in U.S. dollars.

Recommendations by the Computing Science Department, considered essential:

Journals	$1,397	($714)
Indexes & Abstracts	$ 385	($181)
Sub total 1	$1,782	($895)

Recommended by the Library, considered ideal but not essential:

Journals	$1,634	($1,431.50)
Annuals, etc.	$ 250	($250)
Indexes & Abstracts	$ 108	($108)
Sub total 2	$1,992	($1,789.50)
Sub total 3 (excluding Pergamon series of Computers and...)	$1,462	($1,389.50)

Grand total (sub total 1 + sub total 3)	$3,244	($2,284.50)

Overall increase in cost	$ 959.50
Percentage " " "	42%

Estimated exchange 12-20%

Backfiles for all the journals and indexes recommended by the Computing Science Department may be estimated at the rate of about $1800 per year.

Overall start-up cost:	$3,244
	$1,800
	$5,044

ATTACHMENT #3

TENTATIVE BUDGET PROPOSAL

In addition to the regular Computing Science Department budget, revenues are expected in the form of research grants which can be utilised by individual faculty members to support qualified graduate students.

Operating costs are not expected to increase significantly. The major expense (new faculty excluded), computer usage, finds the Computing Science Department favourably equiped. With the addition of laboratory facilities as of 1978, Computing Science can support many computing requirements from within the Department. The Planning Budget shown below offers recurring and non-recurring costs including the expected computer machine time increase due to the graduate program. A modest increase in office expenses is anticipated especially for the reproduction of documents, technical reports, and so forth.

SALARIES	YEAR1	YEAR2	YEAR3
Faculty	12000.00	52000.00	63500.00
T.A.'s	5000.00	14500.00	31800.00
Sect. & Clerical		13300.00	13300.00
SUBTOTAL - Direct Salaries	17000.00	79800.00	108600.00
Benefits - 13%	-	8500.00	10000.00
TOTAL SALARIES & BENEFITS	17000.00	88300.00	118600.00
OPERATING EXPENSES			
Office Expenses	1000.00	4700.00	5800.00
Faculty Travel	-	700.00	900.00
Computer Materials	4000.00	10000.00	18000.00
Library - Journals	900.00	900.00	900.00
TOTAL - DIRECT OPERATING	5900.00	16300.00	25600.00
TOTAL - SAL & OPERATING	22900.00	104600.00	144200.00
Service Dept Overhead 15%	3400.00	15700.00	21600.00
TOTAL RECURRING COSTS	26300.00	120300.00	165800.00
NON RECURRING COSTS			
Library books, mono, backfiles	2000.00	2100.00	-
Recruiting	-	3900.00	1000.00
Equipment	-	1000.00	-
Moving Allowance	-	4500.00	1100.00
Space Alterations	-	-	-
TOTAL NON RECURRING COSTS	2000.00	11500.00	2100.00
TOTAL ADDITIONAL COSTS	28300.00	131800.00	167900.00
LESS - STUDENT FEES	5000.00	10000.00	15000.00
NET ADDITIONAL COSTS	23300.00	121800.00	152900.00
Computer Machine Time	20000.00	50000.00	90000.00