

S.96-61

*As amended by
Senate 4/11/96*

SIMON FRASER UNIVERSITY

OFFICE OF THE VICE-PRESIDENT, ACADEMIC

MEMORANDUM

To: Senate

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

Subject: Proposed Honors Program
in Physics and Physiology

Date: October 17, 1996

Action undertaken at the meeting of the Senate Committee on Academic Planning on October 9, 1996 gives rise to the following motion:

Motion:

"That Senate approve, as set forth in S.96 - 61 , the proposed Honors Program in Physics and Physiology."

Simon Fraser University Honors Program in Physics and Physiology Full Program Proposal

Executive Summary

1. Institutional and Program Identification

**Honors Program in Physics and Physiology
Simon Fraser University**

2. Program Description

This challenging program is intended for the student who enjoys physics, but intends to pursue a career in the Life Sciences. The program is designed to provide a strong background in Physics with enough emphasis in ~~Biology~~, Physiology and Biomechanics for a graduate of the program to work in the biotechnology industry, or to attend a professional program, such as Medicine.

3. Admission and Transfer

The normal admission, transfer and articulation arrangements will apply to this program, although it may be necessary to limit enrollment if the program is oversubscribed.

4. Learning Methodologies

The program will utilize standard university learning methodologies: lectures, seminars and tutorials, laboratories, and computer aided instruction. The program will have a Co-operative Education option.

5. Program Resources

No new program resources are required.

6. Program Consultations and Evaluations

The program has developed out of consultation between the Department of Physics and the School of Kinesiology. Once established, the quality of the program will be evaluated through the normal program review process.

Simon Fraser University Honors Program in Physics and Physiology Full Program Proposal

B. Institutional and Program Identification

1. Institution which will award the degree? Which other institutions, if any, will contribute to this instructional program, and precisely what will each contribute?

This program will be offered by Simon Fraser University. No other institution is required to contribute, but some colleges may want to offer courses at the first and second year level to allow students to transfer to SFU for upper division credit and degree completion.

2. School which will be offering the degree:

School of Kinesiology and Department of Physics
Simon Fraser University
Burnaby, British Columbia
V5A 1S6

Contact people:

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3. Program title and the name of the credential to be awarded to graduates:

Honors B.Sc. degree in Physics and Physiology

4. In what way does this degree program contribute to the mandate and strategic plan of this institution?

The program makes use of the strength of the two departments involved to allow students to obtain an interdisciplinary degree. It is consistent with the aims of the University to utilize its resources to the fullest to supply a full range of quality educational opportunities to its students.

5. Intended schedule for implementation of the degree program:

The program will be implemented as soon as it is approved. September, 1997

C. Program Description

1. Economic/industrial/social/cultural goals this program is intended to serve and how do these relate to identified market niches or societal needs?

This program is designed to provide a strong background in Physics with enough emphasis in ~~Biology~~, Physiology and Biomechanics for a graduate of the program to work in the biotechnology industry, to pursue graduate studies in Medical Physics, Physiology, Kinesiology, or Biophysics, or to attend professional programs such as Medicine or Veterinary Medicine.

2. Anticipated employment destinations for graduates? What potential does this program provide for research and development or job creation?

Given the strong and diverse background of the graduates of this program, there should be a large number of possible employment destinations ranging from the traditional niches occupied by physicists to careers in medicine or medical research. Graduates from this program will have the potential to be high demand in the biotechnology industry, and they will be in an ideal position to contribute to research and development in this field.

3. Intended learning outcomes of this program? (skills, knowledge, attitudes or other attributes). In what way do these outcomes warrant a program of degree status?

Interdisciplinary learning at the honors level will provide students with a substantial breadth and depth of the subject areas.

4. Expected normal time required for program completion (in years or semesters):

The honors program is composed of 132 credit hours. Courses will be offered in sequence also allowing them to graduate in 8 semesters (12 semesters for those students selecting the Co-op Education option).

5. Specifically, what are the courses, or other curriculum requirements of the program? By what means are these integrated so as to contribute to the intended goals of the program? Which of these courses already exist at the institution? Which are new?

TABLE 1
LOWER LEVEL REQUIREMENTS

BICH 221-3	Cellular Biology and Biochemistry
BISC 101-4	General Biology
CHEM 102-3	General Chemistry I
CHEM 115-2	General Chemistry Laboratory I
CHEM 103-3	General Chemistry II
CHEM 150-3	Organic Chemistry I
CHEM 261-3	Physical Chemistry I
CMPT 101-4	Introduction to Programming (or 102-3 Fortran)
KIN 205-3	Introduction to Human Physiology
MATH 151-3	Calculus I (or MATH 154-3)
MATH 152-3	Calculus II (or MATH 155-3)
MATH 232-3	Elementary Linear Algebra
MATH 251-3	Calculus III
MATH 252-3	Vector Calculus
PHYS 120-3	Modern Physics and Mechanics (or PHYS 101-3)
PHYS 121-3	Optics, Electricity and Magnetism (or PHYS 102-2)
PHYS 131-2	General Physics Laboratory B (or PHYS 130-2)
PHYS 211-3	Intermediate Mechanics
PHYS 221-3	Intermediate Electricity and Magnetism
PHYS 234-3	Introductory Physics Laboratory B
2 Electives	Faculty of Arts

UPPER LEVEL REQUIREMENTS FOR HONORS DEGREE

Required courses	
KIN 301-3	Biomechanics Laboratory
KIN 305-3	Human Physiology I
KIN 306-3	Human Physiology II
KIN 407-3	Human Physiology Laboratory
MATH 310-3	Introduction to Ordinary Differential Equations
PHYS 324-3	Electromagnetics
PHYS 326-3	Electronics and Instrumentation
PHYS 331-3	Electronics Laboratory
PHYS 384-3	Methods of Theoretical Physics
PHYS 385-3	Quantum Physics

and three of:	
KIN 326-3	Functional Anatomy
KIN 412-3	Molecular and Cellular Cardiology
KIN 415-3	Neural Control of Movement
KIN 416-3	Control of Limb Mechanics
KIN 418-3	Electrophysiological Techniques Laboratory
KIN 426-3	Neuromuscular Anatomy
KIN 442-3	Biomedical Systems
KIN 485-3	Human Factors in the Underwater Environment
and three of	
NUSC 341-3	Introduction to Radiochemistry
PHYS 332-3	Intermediate Laboratory
PHYS 345-3	Statistical Physics
PHYS 355-3	Optics
PHYS 413-3	Advanced Mechanics
PHYS 415-3	Quantum Mechanics
PHYS 425-3	Electromagnetic Theory
PHYS 431-4	Advanced Physics Laboratory I
PHYS 455-4	Applied Optics
PHYS 484-3	Nonlinear Physics
PHYS 430-5	Digital Electronics and Interfacing

These courses are all existing approved courses. This program contains no new courses.

6. The structure and expected class sizes of courses in this program?

Lecture courses at the 100 and 200 level will be delivered in a lecture and tutorial format. Class sizes will range from 50-300 students at the 100-200 level. At the 300 and 400 level, enrollments are expected to be around 10-50 students, based on existing class sizes. Laboratory course enrollments will number approximately 10-300 students, depending on the course.

7. Specialities, majors, or minors to be offered?

An honors program in Physics and Physiology is to be offered.

8. What programs exist at other B.C. institutions which contain similar content or have similar objectives, and, if similar, what is the rationale for duplication?

There are no similar programs in Canada. There is a physiology and physics major program at McGill which has considerably less emphasis on physics.

9. **How does this program relate to other programs offered at this institution? (shared or related expertise, other resources, etc.)**

This honors program combines expertise found in the Faculties of Science and Applied Sciences and uses existing courses. In the School of Kinesiology, three of the faculty members have their first degrees in Physics and four in Engineering. Their teaching and research is strongly based on principles of physics. There are faculty members in physics who have a strong research interest in biophysical areas.

10. **What, if any, other programs will be reduced or eliminated in order to initiate the new program?**

No other program will be reduced or eliminated in order to initiate this program.

11. **What, if any, are the research expectations or implications of this program?**

The quality of this program would benefit from the nationally recognized research which is a hallmark of both the Department of Physics and the School of Kinesiology.

D. Admission and Transfer

1. **What are the admission requirements for direct entry students and transfer students?**

The normal admission requirements for the Faculty of Science and for the School of Kinesiology will apply.

2. **What institutional regulations which apply to this program (residency requirements, etc.)?**

SFU's general regulations allow students up to 60 semester hours of transfer credit to be awarded for acceptable, passed courses.

3. **Who are the intended students?**

The intended students are those with an interest and aptitude for Physics and an interest in the Life Sciences. Some students have already expressed an interest in this program.

What is the evidence that these students are not presently served reasonably within existing B.C. offerings?

The program does not exist in British Columbia

4. **What initiatives, if any, address low participation groups (e.g. aboriginal students)?**

The University welcomes applications from all eligible applicants, whether Canadian or International students. The First Nations Program Coordinator is available to assist and advise First Nations students.

5. **What enrolments are anticipated? How many of these are expected to represent a new client group (to be additional {new} enrolments) for this institution?**

The departments estimate that steady-state enrollment would be in the region of 10 students per year once the program has become fully established. Some of these might be new students to SFU attracted to this particular program.

6. **What articulation arrangements with other programs and institutions now exist and are planned?**

Articulation arrangements will be made for this program in a similar manner to the other articulation arrangements which exist for other SFU programs.

7. **What provision is made to enable students to receive credit for relevant learning previously achieved outside the B.C. public post-secondary system?**

The University routinely assesses relevant learning from other jurisdictions and admits students from other Canadian provinces (secondary schools, CEGEP, institutes of technology, universities, and degree holders), as well as students from other countries. In addition, students may obtain credit through course challenge procedures.

E. Learning Methodologies

1. **What learning environment and methodologies will be developed so as to achieve the intended outcome of the program?**

In the delivery of this program we will use advanced technology in support of a variety of classroom, laboratory, and computer-assisted learning techniques.

2. **What use will be made of:**

- **experimental learning (cooperative education, clinical, etc.)?**

A Co-operation Education option is available in this program.

- **distance education**

No distance education is planned at present. The high percentage of lab and mathematical courses make it impractical currently.

- **independent study, Computer Assisted Instruction, etc.?**

Independent study: Physics offers a 5 credit honors thesis project in which students may perform a research project under the guidance of a faculty member.

Computer assisted instruction: Faculty in Physics and Kinesiology routinely interact with their students through the use of email via the internet, to which all students have access. This greatly expands the accessibility of the instructors by allowing individual question and answer sessions. Instructors of lower division courses are increasingly making their lecture notes available on the world wide web. Physics has recently implemented a computer assisted assignment grading system (CAPA) for students to submit their homework electronically for the lower levels courses.

F. Faculty

1. How many faculty and other staff are required, and with what qualification?

The existing faculty and technical staff complement will teach the courses in this program.

2. Will there be any differentiation of faculty roles? (instruction, curriculum, research, innovation, etc.)

Tenure-track and tenured faculty engage in three areas of professional responsibilities: teaching, research (including scholarship) and service/governance. Over the course of their careers, faculty members are expected to be active and effective in all three areas, and to make particularly significant contributions in both teaching and research.

What are the percentages of time spent on teaching, research, and/or other roles?

Although this is not formally set out in policy, the generally understood breakdown in time between these areas of responsibilities is: teaching 40%; research and scholarship 40%, service/governance 20%.

G. Program Resources

1. What resources will be required to assure a program of acceptable quality?

No new resources are required.

H. Program Consultations and Evaluation

1. What consultations have occurred with professional associations, employers, educational institutions? Please attach any written endorsements or comments. Who else was involved, and how, in the collection and evaluation of information leading to the development and submission of this proposal?

The program was developed within the Department of Physics and School of Kinesiology.

2. What suggestions would your institution make to assist the DPRC in evaluating this proposal? (names of appropriate program experts, sources of supplementary data or information, etc.)

Dr. Gerhard Stroink, Professor of Physics, Dalhousie University
Dr. Jerry Loeb, Biomedical Engineering Unit, Physiology, Queen's University

3. After the program is implemented, what procedures are planned for ensuring adequate depth and breadth of ongoing review and evaluation?

Simon Fraser University has a cyclical procedure for reviewing programs and departments. This program would be evaluated as part of this normal process.

4. **What provision is made for ongoing membership on advisory committees to this program, or what other means are provided for maintaining extra-institutional perspectives?**

An advisory committee is not being considered at the present time.

What is the nature of the ongoing involvement of professional or other certifying or accrediting organizations?

No professional accreditation is sought for this program.

I. Other

1. **What additional information is relevant to an explanation of the need for, and the educational merits of, this program proposal? (special features, equity considerations, etc.)**

Many of the special features of the program have been outlined earlier. It is expected that the proposed program will introduce more gender balance into physics, which traditionally has a high percentage of male students. At the same time, the physiology program is expected to benefit from the presence of a group of students with strong mathematics and physics backgrounds.