S.80-162

SIMON FRASER UNIVERSITY

MEMORANDUM

To: SENATE

From: SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Subject: FACULTY OF SCIENCE CURRICULUM AND PROGRAM CHANGES

Date: NOVEMBER 12, 1980

Action undertaken by the Senate Committee on Undergraduate Studies at its meeting of November 4, 1980 gives rise to the following motion:

MOTION "That Senate approve and recommend approval to the Board of Governors, as set forth in S.80-162, the following changes:

i) Physics changes:
   1. Physics Honors Program
   2. PHYS 483-3 - Topics in Mathematical Biophysics - prerequisite change

ii) Geography (B.Sc.) - changes in Major requirement

iii) Chemistry changes:
   1. New courses:
      CHEM 118-2 - General Chemistry Laboratory II
      (delete CHEM 117-2 - Quantitative Chemistry Laboratory)
      CHEM 218-3 - Introduction to Analytical Chemistry
   2. Addition of CHEM 118-2 to list of courses required as prerequisites for Major and Honors programs in Chemistry
   3. Chemistry course changes:
      a) CHEM 105-3 - General Chemistry II - prerequisite change
      b) CHEM 115-2 - Title change, description change
      c) CHEM 256-2 - Organic Chemistry Laboratory II - prerequisite change
      d) CHEM 416-3 - Modern Methods of Analytical Chemistry - prerequisite change
   4. Addition of CHEM 357-3 - Chemical and Instrumental Methods of Identification of Organic Compounds and CHEM 361-3 - Physical Chemistry II to courses required for the Major program in Chemistry
   5. Addition of CHEM 333-3 - Inorganic Chemistry of Biological Processes as a choice in Group II requirements for the Major program in Chemistry
   6. Addition of CHEM 465-3 - Electrochemistry as a choice in Group III requirements for the Major in Chemistry
   7. CHEM 362-3 - Physical Chemistry III - prerequisite change

iv) Chemical Physics changes to the Major program and to the Honors program relative to laboratory requirements

v) Biochemistry changes to the Major and to the Honors program relative to laboratory requirements

vi) Biological Science changes:
   a) Changes to the Major program requirements
   b) Changes to the Honors program requirements."

SIMON FRASER UNIVERSITY SCUS 80-80

MEMORANDUM

To	Mr. H.M. Evans Registrar	From	N. Heath Assistant to the Dean Faculty of Science
Subject	Curriculum and Program Changes for the Faculty of Science	Date	1980 10 21

The Faculty of Science passed the following motions at the meeting of 1980 10 20:

1. *The proposed changes in the Physics Honors Program and the prerequisites of PHYS 483-3, as described in F-80-15, be approved and forwarded to SCUS and Senate for consideration and approval.*

   The document, F-80-15, is attached.

2. *The proposed changes in the Geography B.Sc. Major Program, as described in F-80-16, be approved and forwarded to SCUS and Senate for consideration and approval.*

   The document, F-80-16, is attached.

3. *The proposed revisions to the Chemistry Major and Honors programs and to the Chemistry curriculum, including new courses CHEM 118-2 and CHEM 218-3, as described in F-80-18, be approved and forwarded to SCUS and Senate for consideration and approval.*

   The document, F-80-18, is attached.

4. *The proposed changes in the Major and Honors Programs in Chemical Physics, as described in F-80-19, be approved and forwarded to SCUS and Senate for consideration and approval.*

   The document, F-80-19, is attached.

5. *The proposed changes in the Major and Honors Programs in Biochemistry, as described in F-80-20, be approved and forwarded to SCUS and Senate for consideration and approval.*

   The document, F-80-20, is attached.

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6. *The proposed changes in the Major and Honors Programs in Biological Sciences, as described in F-80-21, be approved and forwarded to SCUS and Senate for consideration and approval.*

The document, F-80-21, is attached.

N. Heath

NH/mgj
Attachments

SIMON FRASER UNIVERSITY

F-80-15

MEMORANDUM

To: Dr. A. Sherwood, Chairman Faculty UGCC	From: A. S. Arrott, Chairman Physics Department
Subject: Changes in Calendar Entry	Date: 1980-05-05

The Physics UGCC at its last meeting proposed the following changes in the calendar entry regarding Phys. 483-3 (Topics in Mathematical Biophysics).

(1) That the prerequisite for Phys. 483-3 which presently reads as Phys. 344-3 (or Chem. 261-3) and Math. 310 be changed to Phys. 345-3 (or Chem. 362-3) and Phys. 385-3 (or Chem. 361-3).

(2) That the upper-division course requirements for Honors Physics be changed so as to read:

Phys. 325-3, 326-3, 344-3, 345-3, 355-3, 384-3, 385-3, 413-3, 415-3, 425-3
plus 3 of 432-4, 465-3, 483-3, 484-3, Nucl. Sci. 485-3 (or Nucl. Sci. 442-3).

Rationale

Enrollments in the Biophysics courses have been low and we have been under pressure to drop these course offerings. By encouraging our Honors students to take Phys. 483-3 we hope to encourage higher enrollments in this course and maintain the Biophysics program.

A. S. Arrott

ASA/ml

Added Note (1980-10-09):

The prerequisites for 483-3 have been changed for two reasons:

(1) The new prerequisites will allow the inclusion of additional topics in 483-3. They will also increase our flexibility in assigning people to teach the course.

(2) The new prerequisites are also more comparable to those for the other fourth year courses in the same group.

Leigh Hunt Palmer

F-80-16

SIMON FRASER UNIVERSITY

MEMORANDUM

To: N. Heath Assistant to the Dean of Science	From: Ida Curtis Departmental Assistant Department of Geography
Subject: GEOG. B.SC. REQUIREMENTS	Date: September 25, 1980

The Geography Department has substituted Geog. 251-3 (Methods in Spatial Analysis) for Geog. 407-3 (Quantitative Methods in Geography) in their B.A. Honors requirements.

The rational for this change is that this material should be covered early in a student's academic career, and Geog. 251 serves this purpose better than Geog. 407.

The Department wishes to make the same change for its Geography B.Sc. major requirements. Geog. 251 would be added to the requirements and Geog. 407 would be dropped.

If you have any questions, please give me a call.

IC/nb

Ida Curtis

SEP 26 1980

SIMON FRASER UNIVERSITY

F-80-18

MEMORANDUM

	Dr. B.P. Clayman Acting Dean of Science	From	A.G. Sherwood, Chairman Faculty of Science Undergraduate Curriculum Committee
Subject	CHEMISTRY PROGRAMME CHANGES	Date	1980 10 08

The Faculty of Science Undergraduate Curriculum Committee recommends the following changes to the Chemistry undergraduate programmes and recommends that the Calendar be changed accordingly:

1. That CHEM 117-2 (Quantitative Chemistry Laboratory) be deleted, that new courses CHEM 118-2 (General Chemistry Laboratory II) and CHEM 218-3 (Introduction to Analytical Chemistry) be added, and that CHEM 118-2 and CHEM 218-3 be added to the list of courses required as prerequisites in both the Major and Honours programs in Chemistry (documents appended).

These changes are designed to remedy problems in our undergraduate programmes, namely (1) we have been attempting to introduce the subject of analytical chemistry in the first year (CHEM 117-2) before the appropriate theoretical framework has been acquired by the students; (2) the second semester course CHEM 105-3 (General Chemistry II) has been without a suitable supporting laboratory course.

The effect of these changes will be to increase the number of required chemistry courses by 3 semester hours. The Biochemistry Committee has approved the inclusion of CHEM 118-2 and CHEM 218-3 as prerequisite courses in the Biochemistry programmes and the Department of Biological Sciences has approved the adoption of CHEM 118-2. This means that the Majors and Honours Chemistry, Biological Sciences and Biochemistry students will start with a common first year chemistry programme.

The Chemical Physics Committee has approved the adoption of CHEM 218-3 but not CHEM 118-2. They request that CHEM 118-2 not be made a firm prerequisite for CHEM 218-3. Students in the Chemical Physics programmes would take CHEM 105-3 without the support CHEM 118-2 lab. The Kinesiology Department is not inclined to adopt CHEM 118-2 as a programme requirement either.

Associated with the adoption of these changes would be the following:

CHEM 105 Prerequisite Statement: delete mention of CHEM 117-2 and, instead, "CHEM 118-2 is normally taken concurrently by students intending to major in Chemistry, Biological Sciences or Biochemistry".

CHEM 115-2 Course Title: change to "General Chemistry Laboratory I".

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CHEM 115-2 Course Description: since the subject of chemical equilibrium is treated in CHEM 105-3, the subject should be treated in CHEM 118-2 instead of CHEM 115-2. The course description for CHEM 115-2 should thus be "Experiments in the preparation, separation, and analysis of chemical compounds and the measurement of their chemical and physical properties".

CHEM 256-2 (Organic Chemistry Laboratory I) Prerequisite Statement: change to "CHEM 115-2. CHEM 118-2 is recommended and CHEM 251-3 should be taken concurrently."

CHEM 416-3 (Modern Methods of Analytical Chemistry) Prerequisite Statement: change to "CHEM 218-3 or permission of the department". CHEM 416-3 is an advanced instrumental analysis course and requires the lower level analytical course as a prerequisite.

2. That CHEM 357-3 (Chemical and Instrumental Methods of Identification of Organic Compounds) and CHEM 361-3 (Physical Chemistry II) be included in the list of those courses required for the Major program in Chemistry (80-81 Calendar p. 425).

CHEM 357-3 is a course in instrumental methods in organic chemical analysis including U.V., I.R., NMR and mass spectrometry. CHEM 361-3 is an introduction to quantum chemistry. It is considered inappropriate that chemistry students should graduate without significant experience in both these areas.

This change would not increase the number of courses required for the degree. It would merely limit the amount of choice allowed to complete the upper division subject area requirement of 28 semester hours.

3. That CHEM 333-3 (Inorganic Chemistry of Biological Processes) be included as a choice for the fulfillment of the Group II (Upper Division Inorganic Chemistry) requirement for the Major program in Chemistry.
(80-81 Calendar p. 426).

This course is a suitable alternative to CHEM 332-3, The Chemistry of the Transition Elements, for the fulfillment of the requirement.

...3/

4. That CHEM 465-3 (Electrochemistry) be included as a choice for the fulfillment of the Group III (Upper Division Physical Chemistry) requirement for the Majors degree in Chemistry.
(80-81 Calendar p. 426).

This course is considered to be a suitable alternative to the other courses offered in this group.

5. That PHYS 385-3 (Quantum Physics) be accepted as a suitable alternative to CHEM 361-3 as prerequisiteto CHEM 362-3 (Physical Chemistry II).
(80-81 Calendar p. 431 , and amendment approved by Senate on 80 04 14.)

Both PHYS 385-3 and CHEM 361-3 are introductions to quantum mechanics and are regarded as suitable alternatives as prerequisites to provide this type of background.

A.G. Sherwood

AGS/mgj
Attachments

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

Calendar Information

Department: Chemistry

Abbreviation Code: CHEM **Course Number:** 118 **Credit Hours:** 2 **Vector:** 0-0-4

Title of Course: GENERAL CHEMISTRY LABORATORY II

Calendar Description of Course:

Experiments in chemical equilibrium, acids and bases, qualitative analysis, electrochemistry and chemical kinetics.

Nature of Course Laboratory

Prerequisites (or special instructions):

CHEM 104 and CHEM 115; CHEM 105 should be taken concurrently.
Students with credit for CHEM 117-2 may not receive credit for CHEM 118-2.

How frequently will the course be offered? Every semester

Semester in which the course will first be offered? 81-3

Which of your present faculty would be available to make the proposed offering possible? Mrs. E. Palmer and all other faculty.

Objectives of the Course

To provide experience in the areas of chemistry introduced in CHEM 105-3.

Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty	none
Staff	none
Library	none
Audio Visual	none
Space	none
Equipment	none

Approval

Date: 25 Sept 80 Oct. 21/80 NOV 4 '80

C.H.J. Jones — Department Chairman

B.P. Clayman — Dean

L.D. Williams — Chairman, SCUS

SCUS 73-34b:- (When completing this form, for instructions see Memorandum SCUS 73-34a. Attach course outline).

CHEMISTRY 118

Week	Topics in 105	Experiment	Purpose
1	Equilibrium	$I_2 \rightarrow I^- + I_3^-$	-Exercise in use of concentration concept -experimental treatment of equilibrium
2	Acids and Bases	Weak acids, weak bases -calculation of Ka of weak acid by measurements of pH of solution of known concentration. -weak bases, salts	-introduction to weak acids and bases and equilibrium -use of pH meter
3	"	Titrations -color of indicators at various pH values -titration of unknown weak acid with OH^-.	-exercise in use of burette -exercise in quantitative analysis
4	"	Buffers -preparation of buffer of specific pH. -properties of buffers. -titration curve for polyprotic acid	-exercise in buffer calculations, -exercise in use of pH meter and burette

Week	Topics in 105	Experiment	Purpose
5, 6, & 7	**Thermodynamics**	Qualitative Analysis -explore the qualitative analysis scheme and apply it to analyze unknowns	-solubility properties of inorganic acids -exercise in qualitative analysis
8	**Electrochemistry**	Electrolysis -qualitative experiments -determination of equivalent weight of a metal	-exercise in electrical measurements
9	"	Galvanic cells -measurement of E 's using pH meter as VTVM -nernst equation -Ksp for AgCl -K_{stab} for $Cu(NH_3)_4^{++}$	
10	**Kinetics**	Kinetics H_2O_2 decomposition, I^- catalyzed reaction followed by measuring O_2	-exercise in kinetic measurements and manipulation of gases
11, 12, 13	**Properties of the elements**	Projects involving the application of techniques learned in Chem 115 and 118	

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

Department: Chemistry

1. **Calendar Information**

Abbreviation Code: CHEM **Course Number:** 218 **Credit Hours:** 3 **Vector:** 2-0-4

Title of Course: Introduction to Analytical Chemistry

Calendar Description of Course:

An introduction to analytical chemistry. Gravimetric, acid-base, complexometric and redox methods of chemical analysis. Basic instrumental techniques.

Nature of Course Lecture/Laboratory

Prerequisites (or special instructions):

CHEM 105-3, CHEM 115-2. CHEM 118-2 is strongly recommended.
Students with credit for CHEM 117-2 may not receive credit for CHEM 218-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: None

2. **Scheduling**

How frequently will the course be offered? Three times annually.

Semester in which the course will first be offered? 81-3

Which of your present faculty would be available to make the proposed offering possible? Mr. J. Simms, Drs. R.K. Pomeroy, L.K. Peterson, I.D. Gay, etc.

3. **Objectives of the Course**

The course will provide an introduction to both theoretical and experimental aspects of analytical chemistry.

4. **Budgetary and Space Requirements** (for information only)

What additional resources will be required in the following areas:

Faculty	One laboratory instructor
Staff	One technician
Library	Nil
Audio Visual	Nil
Space	A relocation of space will be required and the refitting of C8024 as a full teaching laboratory
Equipment	Nil

5. **Approval**

Date: 25 Sept 80 Oct. 21/80 NOV 4

Department Chairman — Dean — Chairman, SCUS

SCUS 73-34b:- (When completing this form, for instructions see Memorandum SCUS 73-34a. Attach course outline).

PROPOSED CURRICULUM FOR CHEM 218

LECTURES AND LAB EXPERIMENTS

		# Lectures	Expt. #	Experiment
1.	The Nature of Analytical Chem.	1	I	Use of SFU computer
2.	Treatment of Analytical Data: - basic statistical concepts - propagation of errors - confidence limits - graphs	3		
3.	Review of Basic Chemical Concepts - mole concept and stoichiometry - concentration of solutions - volumetric calculations	3	II	Basic techniques in volumetric analysis - tools of the trade
4.	Gravimetric methods - gravimetric calculations - nucleation and crystal growth - purity, co-precipitation - homogeneous precipitation	4	III	Determination of Nickel as $Ni(DMG)_2$
5.	Chemical Equilibrium and Acid-Base Theory - acid dissociation - hydrolysis - conjugate acid-base pairs - pH - buffers - titration curve - theory of indicators	5	IV V	Determination of Carbonate in soda ash Ion exchange - total salt in a mixture
6.	Complexometric Titrations - metal ion complexes - formation constants - influence of pH - EDTA titration curves - end-point detection - conditions for specific analysis by EDTA	3	VI	Determination of calcium with EDTA
7.	Redox Methods - electrochemical cells - the Nernst equation - redox titrations - reference and indicator electrodes - the pH meter	4	VII VIII IX X	Determination of Fe in an ore by Dichromate oxidation (2 weeks) Iodometric determination of copper in brass Potentiometric titration of an acid mixture

	# Lectures	Expt. #	Experiment
6. Absorption Spectrophotometry - Beer's law - parts of a spectrophotometer - non-linearity in calibration curves	3	VI	Determination of trace iron as bi-pyridine complex

SIMON FRASER UNIVERSITY

MEMORANDUM

To A. G. Sherwood
Dept of Chem

From E. Weinstein
Library

Subject New Courses

Date 14 Oct 80

This is to confirm that library resources are adequate to support proposed new courses CHEM 118-2 and CHEM 218-3.

SIMON FRASER UNIVERSITY

MEMORANDUM

To Nick Heath
Assistant to the Dean of Science

From Colin Jones
Chairman, Chemistry Department

Subject New Course Proposals
CHEM 118 and 218

Date October 14, 1980

When the above new courses were discussed by Chemistry an assumption was made that there would be no need to request new equipment to mount these courses but rather that existing equipment would be used.

Since Chemistry approved these new courses, Bioscience has approved requiring CHEM 118, along with CHEM 115, as a first year laboratory course for Bioscience majors and honours students. Biochemistry has also approved both CHEM 118 and 218 as required courses in the Biochemistry majors and honours programmes. These approvals will lead to a significant increase in our laboratory course enrolments. While we have sufficient laboratory space to accommodate this increase, we do not have a sufficient supply of some critical items of equipment, such as analytical balances and volumetric glassware.

I would now like to request that the new course proposal for CHEM 118 carry a request for additional equipment in the sum of $20,000 to cover the purchase of eight (8) new analytical balances and the required volumetric glassware.

C.H.W. Jones

cc: A.G. Sherwood

mc

SIMON FRASER UNIVERSITY

F-80-19

MEMORANDUM

To: Dr. C. Jones, Chairman
Department of Chemistry
C. Irwin, Chairman
Department of Physics

From: E. M. Voigt, Chairman
Chemical Physics Committee

Subject:

Date: 1980-10-03

The Chemical Physics Committee met on September 30, 1980 to discuss Majors and Honors Chemical Physics Program changes necessitated by the Chemistry Department endorsing on September 25, 1980 a crucial course change in their Majors and Honors Programs on the 100 and 200 levels, viz.:

previous: Chem. 117-2 (Quantitative Chem. Lab.) to be dropped and changed to

now: Chem. 118-2 (General Chem. Lab. II)

AND

Chem. 218-3 (Introduction to Analytical Chemistry)

This adds 3 required course credits to the Chem. Majors and Honors programs.

At our meeting we addressed ourselves in great detail to the numerous options in which the Chem. Phys. Majors and Honors Programs (both of which have a common level 1 and 2 required base course set which includes Chem. 117-2) can and prefer to adapt to the above Chemistry offering changes on those levels.

We came to the unanimous decision that our Honors and Majors Chemical Physics Programs change their present set of stipulated Chemistry Lab. requirements (on levels 1 and 2)

from present: 115-2, 117-2, 256-2 (416-3)

to future: 115-2, 218-3, 256-2 (416-3)

with waiver by the Chemistry Department of Chem. 118-2 as prerequisite to Chem. 218-3 for Chemical Physics students.

I hereby ask that the Chemistry Department permit the Chem. Phys. Majors and Honors students to follow this lower level Chemistry Lab. course set. We realize fully that Chem. Phys. students will have as tough a jump to make from 115-2 to 218-3 (if not tougher than before from 115-2 - 117-2 because of the additional credit unit) and we also wish to state that the request for a waiver of Chem. 118-2 as prerequisite to Chem. 218-3 for Chem. Phys. students does NOT imply that the members of the Chem. Phys. committee do not recognize the importance of the new course Chem. 118-2 to the Majors

and Honors Chemistry Programs.

We are also asking that the Physics Department approve one additional required credit unit on levels 1 and 2 for the Chem. Physics Programs (Chem. 117-2, now Chem. 218-3).

Attend to this matter as soon as possible, please; the Faculty of Science UGCC will discuss the Chemistry course changes this coming Tuesday.

Yours,

EMV/hr
cc: Members, Chem. Phys. Committee

SIMON FRASER UNIVERSITY

F-80-20

MEMORANDUM

To	Faculty of Science	From	N. Heath Assistant to the Dean of Science
Subject	CHANGES IN BIOCHEMISTRY MAJORS AND HONORS PROGRAMS	Date	1980 10 08

On the recommendation of the Biochemistry Curriculum Committee, the Faculty of Science Undergraduate Curriculum Committee approved the following change at its meeting of 1980 10 07.

The new laboratory courses CHEM 218-3 and CHEM 118-2 will be required courses in the "Core Program", replacing CHEM 117-2.

The following changes in the Calendar will result (see pp. 399 and 400, 1980-81 Calendar):

MAJOR PROGRAM: -the core program consists of 82 semester hours.
-an additional 38 semester hours of electives are required for the degree to include at least 6 semester hours outside the Faculty of Science, and at least 9 semester hours of upper division credit (excluding EDUC 401, 402, 405).

HONORS PROGRAM:

The Calendar statement should read:

"In addition to the 'Core Program', students taking Honors in Biochemistry must complete a further 50 semester hours, to include: MATH 251-3; either a) BICH 491-5, Undergraduate Research, plus at least 8 semester hours of upper division credit in a coherent area of specialization approved by the Biochemistry Curriculum Committee or, b) BICH 493-15, Individual Study Semester (Option B); 6 semester hours in courses outside the Faculty of Science (excluding EDUC 401, 402, 405); sufficient upper division courses to bring the total upper division credit to at least 60 semester hours and sufficient credit at any division to bring the total credit for the degree to 132 semester hours (excluding EDUC 401, 402, 405)."

NH/mgj

N. Heath

SIMON FRASER UNIVERSITY

F-80-21

MEMORANDUM

To	A.G. Sherwood, Chairman Faculty of Science Undergraduate Curriculum Committee	From	C.L. Kemp, Chairman DUCC Department of Biological Sciences
Subject	BISC Program Change	Date	1980 10 09

The basic degree requirements in Biological Sciences at SFU have not changed significantly for 15 years. The marked increase in information and interest in Biology, notably in Molecular Biology and Ecology, have resulted in the development of guided streams or areas of specialization in many North American universities. In order to remain current, and to ensure that graduates from BISC at SFU remain adequately prepared in either a general or a more specialized stream, the changes outlined are proposed. These replace the regulations and requirements shown on pp. 408-410 and p. 412 of the 1980-81 Calendar.

Streams in Molecular and Cell Biology and Ecology are identified, as is an appropriate General stream. Students would normally be expected to complete the requirements of one of these streams, but deviations, approved in advance, would be possible.

The basic credit hour requirements underlying all streams are as follows:

BISC (Lower Division)	20 h	
Non-BISC Science (Lower Division)	30 h	
BISC (Upper Division)	40 h	(to be selected from General, Molecular & Cell, or Ecology streams (see below))
*Electives (Upper Division minimum = 4 h)	30 h	120 h

*Electives must include a minimum of 6 semester hours in subjects taken in Arts, Education (excluding EDUC 401, 402, 405) or Interdisciplinary Studies.

STREAMS FOR MAJORS

Lower Division Core: All students pursuing majors or honors programs in Biological Sciences are expected to complete the following courses or their equivalents within the first 60 hours (4 semesters) of their programs.

Courses in Biological Sciences	Semester Hours	
BISC 101-4 Introduction to Biology	4	
BISC 102-4 Introduction to Biology	4	
BISC 201-3 Cell Biology	3	
BISC 202-3 Genetics	3	
BISC 203-3 Developmental Biology	3	
BISC 204-3 Introduction to Ecology	3	20

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Courses in Faculty of Science (excluding Biological Sciences	Semester Hours	
CHEM 104-3 General Chemistry I	3	
CHEM 105-3 General Chemistry II	3	
CHEM 115-2 General Chemistry Laboratory I	2	
CHEM 118-2 General Chemistry Laboratory II	2	
CHEM 251-3 Organic Chemistry I	3	
CHEM 256-2 Organic Chemistry Laboratory I	2	
MATH 154-3 Calculus I for the Biological Sciences	3	
MATH 155-3 Calculus II for the Biological Sciences	3	
MATH 101-3 Introduction to Statistics	3	
PHYS 101-3 General Physics I	3	
PHYS 102-3 General Physics II	3	30
Lower Division Total		50

General Biology Stream -- Upper Division Requirements

Total of Lower Division Core (forward)		50
BISC 301-3 Biochemistry - Intermediary Metabolism	3	
BISC 302-3 Genetic Analysis OR BISC 405-3 Cell Physiology OR BISC 455-3 Endocrinology	3	
BISC 303-3 Microbiology	3	
BISC 304-3 Animal Ecology OR BISC 404-3 Plant Ecology	3	
BISC 305-3 Animal Physiology OR BISC 347-3 Physiology of Plant Nutrition and Metabolism	3	
BISC 306-3 Invertebrate Biology OR BISC 316-3 Vertebrate Biology	3	
BISC 317-3 Entomology OR BISC 415-3 Ornithology	3	
BISC 326-3 Biology of Non-Vascular Plants OR BISC 337-3 Comparative Morphology, Distribution and Evolution of Vascular Plants	3	
BISC 329-4 Introduction to Experimental Techniques	4	
BISC 400-3 Evolution	3	
BISC 429-3 Experimental Techniques I: Separation Methods OR BISC 439-3 Experimental Techniques II: Ecological Methods OR BISC 449-3 Experimental Techniques III: Histochemistry	3	34
Electives: BISC or related courses -- may be any of the Upper Division courses offered by the Department of Biological Sciences or courses chosen from among BICH 301, 302, 311, 312, KINES 326, 336, 405, 406, GEOG 315 and 415.		6
Upper Division Total		40

Electives

A minimum of 6 semester hours of electives in subjects taken in Arts, Education (excluding EDUC 401, 402, 405) or Interdisciplinary Studies.	6	

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A further 24 hours of electives in subjects offered by any department or program in the University (excluding EDUC 401, 402, 405) of which at least 4 semester hours must be in courses numbered 300 or above. English or a foreign language is recommended. MATH 302 is highly recommended.		24
Total Semester Hours of Electives		30
TOTAL Semester Hours		120

Cellular & Molecular Biology Stream

Lower Division Core (See above General Stream)		50
BISC 301-3 Biochemistry - Intermediary Metabolism	3	
BISC 302-3 Genetic Analysis	3	
BISC 303-3 Microbiology	3	
BISC 305-3 Animal Physiology	3	
BISC 306-3 Invertebrate Biology OR BISC 316-3 Vertebrate Biology	3	
BISC 326-3 Biology of Non-Vascular Plants OR BISC 337-3 Comparative Morphology, Distribution and Evolution of Vascular Plants	3	
BISC 329-4 Introduction to Experimental Techniques	4	
BISC 347-3 Physiology of Plant Nutrition and Metabolism	3	
BISC 401-3 Biochemistry - Regulatory Mechanisms	3	
BISC 402-3 Molecular Genetics	3	
BISC 405-3 Cell Phyisology	3	
BISC 429-3 Experimental Techniques I: Separation Methods	3	
BISC 455-3 Endocrinology OR BISC 481-3 Biophysics	3	
Upper Division Total		40
Electives: see General Stream		30
TOTAL Semester Hours		120

Ecology Stream

Lower Division Core (See above General Stream)		50
Upper Division Requirements		
BISC 301-3 Biochemistry - Intermediary Metabolism	3	
BISC 304-3 Animal Ecology	3	
BISC 305-3 Animal Phyisology OR BISC 347-3 Physiology of Plant Nutrition and Metabolism	3	
BISC 329-4 Introduction to Experimental Techniques	4	
BISC 400-3 Evolution	3	
BISC 404-3 Plant Ecology	3	

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BISC 407-3 Population Dynamics		3
BISC 422-3 Population Genetics		3
BISC 439-3 Experimental Techniques II: Ecological Methods		3
4 Courses Chosen from Among:		
BISC 303-3 Microbiology	)	
BISC 306-3 Invertebrate Biology	)	
BISC 316-3 Vertebrate Biology	)	
BISC 317-3 Insect Biology	)	12
BISC 326-3 Biology of Non-Vascular Plants	)	
BISC 337-3 Comparative Morphology, Distribution and Evolution of Vascular Plants	)	
Upper Division Total		40
Electives: See General Stream		30
TOTAL Semester Hours		120

Revisions to Honors Program

The change in the Honors program emphasizes a much stronger and more formal advising component. All Honors students will be required to have their programs of studies approved by the Department. In addition, an Honors thesis taken as the Individual Study Semester is a requirement.

The Honors Program is designed for biology students who wish to pursue an advanced degree in BISC. This Program requires a minimum of 60 semester hours of Upper Division BISC courses, or related subjects, which will be selected for each student in consultation with appropriate advisors, in relation to his/her career goals.

Departmental approval is required for entry into the Honors Program. All students applying for entry must have completed 30 semester hours at SFU in a Major Program in BISC. Applications received after more than 90 semester hours have been completed will not normally be considered.

Program For Honors

The B.Sc. Honors BISC degree requires:

(1) maintenance of a minimum 3.00 CGPA;
(2) completion of the same Lower Division course of studies as for the Major BISC Program;
(3) an additional 60 hours of Upper Division BISC or related subjects which will include BISC 490-5, 491-5 and 492-5 (Individual Study Semester) these latter to constitute the Honors Thesis, and;
(4) completion of appropriate electives to achieve a final total of at least 132 semester hours, including at least 6 semester hours from

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courses outside the Faculty of Science (excluding EDUC 401, 402, 405).

An additional change is to include the following general prerequisite statement between the entries for BISC 204-3 and BISC 300-3 (see p. 413 of the 1980-81 Calendar):

> "Entry into the following courses normally requires completion of the Lower Division Core Program in Biological Sciences."

This statement will permit many of the individual course prerequisite statements for upper division BISC courses to be eliminated, where the present prerequisites are contained within the lower division core program.

CLK/mgj

C.L. Kemp