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www.sfu.ca/vpacademic**MEMORANDUM**

ATTENTION Senate
DATE June 19, 2013
FROM Jon Driver, Vice-President, Academic and Provost, and Chair, SCUP
PAGES 1/1
RE: Faculty of Science: Full Program Proposal for a Joint Major in Chemistry and Molecular Biology and Biochemistry in the Departments of Chemistry and Molecular Biology and Biochemistry (SCUP 13-29)

At its June 19, 2013 meeting, SCUP reviewed and approved the Full Program Proposal for a Joint Major in Chemistry and Molecular Biology and Biochemistry in the departments of Chemistry and Molecular Biology and Biochemistry within the Faculty of Science, effective Spring 2014.

Motion:

That Senate approve and recommend to the Board of Governors the Full Program Proposal for a Joint Major in Chemistry and Molecular Biology and Biochemistry in the departments of Chemistry and Molecular Biology and Biochemistry within the Faculty of Science, effective Spring 2014.

c: D. Leznoff
I. Northwood

A handwritten signature in blue ink, appearing to be "Jon Driver".

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MEMORANDUM

ATTENTION	Senate Committee on University Priorities	DATE	June 7, 2013
FROM	Gordon Myers, Chair Senate Committee on Undergraduate Studies	PAGES	1/1
RE:	Faculty of Science (SCUS 13-25a) <i>Gordon Myers</i>		

Action undertaken by the Senate Committee on Undergraduate Studies at its meeting of June 6, 2013, gives rise to the following recommendations:

Motion

That SCUP approve and recommend to Senate the Full Program Proposal for the Joint Major in Chemistry and Molecular Biology and Biochemistry in the departments of Chemistry and Molecular Biology and Biochemistry within the Faculty of Science.

The relevant documentation for review by SCUP is attached.

PROPOSAL

Joint Major in Chemistry, Molecular Biology and Biochemistry

Simon Fraser University

Executive Summary

A Joint Major in Chemistry, Molecular Biology and Biochemistry has been developed and is proposed jointly by the two Departments in the Faculty of Science.

The intent of this proposal is to bring together the expertise from these three areas and to foster interdisciplinary training of highly motivated students in all three subjects, something not currently available in a comprehensive manner to SFU students. Given the substantial importance of biotechnology, pharmaceutical and health sectors to the economy of B.C., this Joint Major program will be attractive to students since it will prepare them to participate at the leading edge of these sectors; it will also form an excellent foundation for entry to professional health-related degrees and training. No analogous program is currently offered at other B.C. universities.

Based upon existing courses, this program can be mounted immediately with no requirement for new resources.

Background

Simon Fraser University has committed to expand its programming in new and emerging areas. The Joint Major in Chemistry, Molecular Biology and Biochemistry is one such area, and will provide advanced interdisciplinary training in the fields of chemical, biotechnology, pharmaceutical and health sectors, all areas of importance to B.C. and Canadian society. The subject areas have always been strongly complementary and this Joint Major will capitalize on strengths in both departments to educate students to answer biological questions using the tools of physical science, and will provide a credential that accurately reflects their broad experience and training at the interface of these disciplines.

Credential to be awarded:

Joint Major, Chemistry, Molecular Biology and Biochemistry, B.Sc.

Location:

SFU, Burnaby Campus

Faculty/Department/School offering the new program:

Chemistry Department and Molecular Biology and Biochemistry Department,
Faculty of Science

Anticipated program start date:

Summer 2014

Description of proposed program:**a) Aims, goals, and/or objectives**

The intent of this proposal is to bring together the expertise from Chemistry, Molecular Biology and Biochemistry to capitalize on strengths in both departments to foster interdisciplinary training of highly motivated students in all three disciplines, something not currently available in a comprehensive manner to SFU students. This program can be run with no requirements for new resources.

b) Anticipated contribution to mandate and strategic plan of the institution

The concept of the program is that it meets the needs of highly motivated students interested in immersion in Chemistry, Molecular Biology and Biochemistry. Graduates of the program will be trained to supply the needs of an increasingly important strategic sector at the intersection of physical and life sciences, thereby relating to the increased development of interdisciplinary/cross-disciplinary experience and training. According to the BC Labour Market Outlook 2010-2020,¹ "the occupation group expected to experience the strongest growth in demand in the province is Health Occupations", followed closely by "Natural and Applied Sciences and Related Occupations". This Program will help to fill this key skills need in B.C.

More generally, research in this area seeks answers to biological questions using the tools of physical science and has the potential to transform many areas of human endeavour. A NRC (US) report² indicates that "further research at this intersection not only will advance our understanding of the fundamental questions of science, but will also significantly impact public health, technology and stewardship of the environment for the benefit of society." Such conclusions are relevant not just for the US but for Canada as well, and this Joint Major will prepare SFU students to participate at the leading edge of this sector.

¹ BC Labour Market Outlook 2010-2020, Government of B.C.

² "Research at the Intersection of the Physical and Life Sciences", National Research Council (US) Committee on Research at the Intersection of the Physical and Life Sciences, Washington (DC): National Academies Press (US); 2010.

c) Target audience

The proposed curriculum will graduate Science majors with backgrounds in Chemistry, Molecular Biology and Biochemistry. By combining these areas of expertise these students will fill an emerging niche that is often occupied by people with post-graduate degrees in a specialized discipline. Students interested in working primarily in the areas of biotechnology and pharmaceuticals either as laboratory workers or as management liaisons, or in government (e.g. Health, Agriculture) would gain a significant competitive advantage with this unique degree. Training in the critical area of genetic engineering would also be enhanced with this proposed program.

In addition, graduates of this program will be well prepared for advanced degrees in these areas.

d) Content and summary of requirements for graduation

Content Lower Division (LD) Requirements

Lower Division Requirements: 65 - 66 Units

Breakdown: 31 CHEM, 6 MBB and 28 – 29 other. Note that the “other” includes 11 units of BISC courses. MBB does not offer 100 level courses.

Upper Division (UD) Requirements

Chemistry UD Requirements: 16 -19 required units. MBB UD Requirements: 16 - 19 required units, 35 minimum units required across Chemistry and MBB courses (the three unit difference depends on whether students take CHEM 360 or MBB 323):

In addition to the above, students complete:

upper division courses from any faculty to total a minimum of 44 upper division units

electives at any division from any faculty to provide 120 units as required for the degree

University Breadth Requirement:

The B-Sci requirement is included in the required coursework, as per the WQB policy regarding Joint Majors. The 12 B-SocSci and B-Hum units will be required to complete the total breadth requirements and fulfilled with elective courses.

University Writing Intensive Requirement:

Both the lower and upper-division requirements will be included in the required coursework.

Co-Operative Education

Optional. Administered through the Science co-op coordinators

e) Delivery Methods

Since the program is based upon existing courses, the standard delivery methods already in place on campus - Lecture/Lab/Tutorial - will be used.

f) Linkages between learning outcomes and curriculum design

The learning outcomes are to train students for proficiency in the areas of Chemistry, Molecular Biology and Biochemistry for placement in the rapidly expanding biotechnology and pharmaceutical industries, and/or related government agencies.

g) Distinctive characteristics

The partnership of Chemistry and Molecular Biology and Biochemistry (MBB) in a Joint Major degree is an obvious expression of the linkages between the three disciplines and will help bring students (and faculty) in the two Departments closer together. The proposed new Joint Major will benefit students (and faculty) who have otherwise been pursuing their interests through major/minor combinations. These interests are better accommodated by this focused program which delivers the content centered at the interface of these three areas.

h) Anticipated completion time

Four years.

i) Enrolment plan for the length of the program

This program will be attractive to high-school students who have a strong interest in both chemistry and the life sciences. Admitted Science students can declare this Joint Major degree at any time. Other students, including transfer students, should consult with Chemistry and/or MBB advisors prior to officially pursuing this program.

The Chemistry department will have primary administrative oversight of the program.

We have informally surveyed current SFU Science students regarding their potential interest in this Joint Major program. From this exercise, it is clear that there is significant interest on both sides for such a program. We estimate the initial enrolment to be about 10-20 students but there is a large potential to increase once it has become established.

The surveyed interest of existing students indicates that this Joint Program will be a specific program offering that can target a new student audience resulting in increased enrolment into SFU programs.

j) Policies on student evaluation (degree requirements)

As per general regulations of the University and the Faculty of Science.

k) Policies on faculty appointment (minimum qualifications)

All continuing faculty have a Ph.D. or equivalent.

l) Policies on program assessment

All academic units at SFU are subject to external review every seven years.

m) Level of support and recognition from other post-secondary institutions (including plans for admission and transfer within BC) and relevant regulatory or professional bodies

As per SFU's transfer credit procedures, students may transfer from BC colleges or universities to enroll into this program.

n) Evidence of student interest and labour market demand

We have informally surveyed current SFU Science students regarding their potential interest in this Joint Major program. From this exercise, it is clear that there is significant interest for such a program. Incorporating the principles of the physical sciences to understand the operation of living systems is one of the next frontiers in Science, particularly with applications to society. The earlier referenced 2010 NRC report urges academic institutions to accelerate this cross-disciplinary education. There should be an enormous demand in many areas such as pharmaceutical development, other aspects of medicinal chemistry, environmental technology and genetic engineering for a graduate with a degree combining the physical and life sciences, as outlined in general in the aforementioned BC Labour Market Outlook 2010-2020 report.

o) Summary of resources (faculty members, space, and equipment) required and available to implement the program

No additional resources are required. The program can be accommodated with present courses and faculty.

p) Brief description of any program and associated resources that will be reduced or eliminated when the new program is introduced

None.

q) List of faculty members teaching/supervising, what percentage of their teaching will be devoted to the program, and their areas of specialization

All faculty in both departments will contribute to this program as part of their normal teaching load. All courses required for this Joint Major are already offered on a regular basis by the two Departments.

r) For a program where the intention is to charge a premium fee, a budget developed in collaboration with the dean of the faculty.

This is not a premium fee program.

s) Related programs at SFU and other British Columbia post-secondary institutions

There is no analogous program at SFU. The closest related program would be a Double Major in CHEM/MBB or a Major/Minor combination. The Double Major requires substantially more credits and the Major/Minor has quite a different

balance. This proposed Joint Major focuses on the key courses that a student anticipating entering the labour force after graduation would need to be "fluent" in the areas of Chemistry, Biochemistry and Molecular Biology.

At UBC, there is no analogous program. As at SFU, UBC has separate "Chemistry" and "Biochemistry and Molecular Biology" Departments, however the focus of the latter is very biochemical. The closest that could be achieved would be the Double Major or Combined Honours degrees in either Chemistry/Biology or Chemistry/Biochemistry. These programs have much higher credit requirements and, critically, extremely low flexibility. Degrees in Biochemistry from UBC are much more "biochemistry"-focused than the more interdisciplinary offering of this proposed Joint Major, which includes a substantial Molecular Biology component.

At Univ. Victoria, there are separate "Chemistry" and "Biochemistry and Microbiology" Depts. Combined Majors in "Chemistry/Biochemistry" and "Chemistry/Microbiology" both have a much larger focus on microbiology than this proposed Joint Major, and nearly no flexibility and thus are not comparable degree programs.

Name, title, phone number and e-mail address of the institutional contact person in case more information is required.

Daniel Leznoff, Professor and Chair of Undergraduate Studies Committee, Department of Chemistry, 778-782-4887, dleznoff@sfu.ca. Ingrid Northwood, Senior Lecturer and Chair, Undergraduate Curriculum Committee, Department of Molecular Biology and Biochemistry, 778-782-3536, inorthwo@sfu.ca.

Proposed Calendar Description - Faculty of Science

The following text is proposed to be placed in the Faculty of Science section, linked to both the Dept. of Chemistry and the Dept. of Molecular Biology and Biochemistry:

This Bachelor of Science (B.Sc.) major program is offered jointly by the Department of Chemistry and Department of Molecular Biology and Biochemistry. Entry requires permission of both Departments.

Lower Division Requirements

Students complete 65-66 units, including all of

- CHEM 121-4 General Chemistry and Laboratory I
- CHEM 122-2 General Chemistry II
- CHEM 126-2 General Chemistry Laboratory II
- CHEM 215-4 Introduction to Analytical Chemistry
- CHEM 230-3 Inorganic Chemistry

- CHEM 236W -3 Inorganic Chemistry Laboratory
- CHEM 260-4 Atoms, Molecules, Spectroscopy
- CHEM 281-4 Organic Chemistry I
- CHEM 283-3 Organic Chemistry IIb
- CHEM 286-2 Organic Chemistry Laboratory II
- MATH 152-3 Calculus II
- BISC 101-4 Introduction to Biology
- BISC 102-4 Introduction to Biology
- BISC 202-3 Genetics
- MBB 222-3 Molecular Biology and Biochemistry
- MBB 231-3 Cellular Biology and Biochemistry

and one of

- MATH 150-4 Calculus I with Review
- MATH 151-3 Calculus I

and one of

- STAT 201-3 Statistics for the Life Sciences
- STAT 270-3 Introduction to Probability and Statistics

and all of

- PHYS 120-3 Mechanics and Modern Physics
- PHYS 121-3 Optics, Electricity and Magnetism
- PHYS 131-2 Physics Laboratory I

or all of

- PHYS 125-3 Mechanics and Special Relativity
- PHYS 126-3 Electricity, Magnetism and Light
- PHYS 131-2 Physics Laboratory I

or all of

- PHYS 101-3 Physics for the Life Sciences I
- PHYS 102-3 Physics for the Life Sciences II
- PHYS 131-2 Physics Laboratory I

or both of

- PHYS 140-4 Studio Physics – Mechanics and Modern Physics
- PHYS 141-4 Studio Physics – Optics, Electricity and Magnetism

Upper Division Requirements

Students complete all of the following (at least 35 units)

- CHEM 316-4 Introductory Instrumental Analysis
- CHEM 332-3 The Chemistry of Transition Metals
- CHEM 380-4 Chemical and Instrumental Methods of Identification of Organic Compounds
- MBB 309W-4 Biochemistry Laboratory
- MBB 321-3 Intermediary Metabolism
- MBB 331- 3 Molecular Biology

and one of

- CHEM 360-3 Thermodynamics and Chemical Kinetics
- MBB 323-3 Introduction to Physical Biochemistry

and a minimum of six units of 400 level MBB courses, and a minimum of two upper division chemistry courses, including at least 3 units (excluding CHEM 481) at the 400-level.

Electives

In addition to the above, students complete

- courses chosen to fulfill the WQB requirements
- upper division courses from any to total a minimum of 44 upper division units
- electives at any division from any faculty to provide 120 units as required for the degree.