

# SIMON FRASER UNIVERSITY

## MEMORANDUM

**To:** Senate

**From:** Senate Committee on  
Undergraduate Studies

**Subject:** Department of Biological  
Sciences - Curriculum Changes

**Date:** October 15, 1986

---

Action undertaken by the Senate Committee on Undergraduate Studies at its meeting of October 15, 1986 gives rise to the following motion:

### **MOTION:**

"That Senate approve and recommend approval to the Board of Governors, as set forth in S.86-72, the proposed

New courses - BISC 416-3 Fish Biology  
                  BISC 423-4 Biotechnology - Industrial  
  Applications  
                  BISC 431-4 Molecular Biotechnology

Deletion of - BISC 421-3 Biotechnology"

Subject to the approval by Senate and the Board of Governors the Senate Committee on Undergraduate Studies approved waiver of the normal two-semester time lag requirement to permit first offering of BISC 416 and BISC 431 in Spring 87-1.

SIMON FRASER UNIVERSITY  
MEMORANDUM

SCUS 86-24

To: R. Heath,  
Secretary to Senate

From: P. Dobud  
Administrative Assistant  
to the Dean of Science

Subject: Calendar Changes,  
Biological Sciences Program

Date: October 2, 1986

This is to inform you that the Faculty of Science, in its meeting held on Monday September 29, 1986 has approved the following motions with regards to calendar changes for the Biological Sciences Program. I would appreciate it very much if you would place these items in the agenda of the next SCUS meeting for consideration and approval.

- a) New course proposals: BISC 416-3, BISC 423-4 & BISC 431-4.  
(PAPER: FSC 86-2)

*To approve the following new course proposals:*

**BISC 416-3 Fish Biology . (3-0-4)**

*An i ntroduction to the biology of fishes with an emphasis on classification , evolution, anatomy, physiology , and ecology.*

**Prerequisites:** BISC 316, or permission of the Department.

**BISC 423-4 Biotechnology - Industrial Applications . (2-0-6)**

*The use and manipulations of microbial cultures for production and extraction of industrially important compounds will be studied.*

**Prerequisites:** BISC 303, BISC 321 recommended.

**BISC 431-4 Molecular Biotechnology . (3-0-6)**

*Laboratory with accompanying lectures to give practical experience in the application of recombinant DNA technology to basic and applied research.*

**Prerequisites:** BISC 321, or permission of instructor. Recommended BISC 401 and / or BISC 402 concurrently".

- b) Deletion of a course.

*"To delete BISC 421-3 Biotechnology from the Calendar offering of the Department of Biological Sciences."*

Thank you.

cc: Dr. L.M. Srivastava, Chairman Department of Biological Sciences.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Biological Sciences

Abbreviation Code: BISC Course Number: 416 Credit Hours: 3 Vector: 3-0-4

Title of Course: Fish Biology

Calendar Description of Course:

An introduction to the biology of fishes with an emphasis on classification, evolution, anatomy, physiology, and ecology.

Nature of Course Lecture and Laboratory.

Prerequisites (or special instructions):

BISC 316, or permission of the Department.

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? Biennially

Semester in which the course will first be offered? 87-1

Which of your present faculty would be available to make the proposed offering possible?

B.A. McKeown

3. Objectives of the Course

To develop an appreciation of the diversity of fishes with respect to structure, function and ecology through lectures.

Laboratory sessions will be designed to exhibit various species in association with different habitats as well as identification and classification methods. Labs will also introduce students to fish anatomy, behaviour and physiology.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual

Space

Equipment

5. Approval

Date: 8/10/86

4/October/1986

Calvin McKeown  
Department Chairman

Dean

Chairman, SCUS

## MEMORANDUM

FSC 86-2

To... Faculty of Science Undergraduate.....

From L. M. Srivastava, Chairman.....

.....Curriculum Committee.....

Dept. of Biological Sciences.....

Subject.....CALENDAR CHANGES.....

Date November 25, 1985.....

The following new courses were approved at a Department Meeting held on October 9, 1985 and now require your consideration and approval:

BISC 416-3 Fish Biology

BISC 423-4 Biotechnology - Industrial Applications

BISC 431-4 Molecular Biotechnology.

Note that the introduction of BISC 423-4 and BISC 431-4 will be coupled with the removal of BISC 421-3 from the Department offerings.

Course proposal forms and relevant documentation are attached.



Lalit M. Srivastava

LMS/ms

Encls.

cc C. L. Kemp

RECEIVED  
NOV 26 1985  
DEPT. OF SCIENCE  
OFFICE

### Rationale

The Biological Sciences Department historically has offered courses on various basic aspects of life sciences such as cell biology, genetics, developmental biology, ecology, physiology, marine biology, microbiology, evolution, parasitology, morphology, toxicology and pest management. The department has also emphasized experimental techniques used in the life sciences. In comparison to other universities, less emphasis has been devoted to plants and animals at the organismal level. More recently, the department has introduced courses on invertebrates, entomology, ornithology and mammology. Fish represent a major and diverse group of vertebrates and a number of faculty members in the department (Belton, Dill, Farrell, Geen, Gross, Law, McKeown, Oloffs, Smith and Webster) use or have used fish as experimental models in their research. Fish biology has been offered as a special topics course five times on a more or less biennial basis with good student enrolments. The department is moving towards an undergraduate stream in marine biology and with existing faculty and student interest in fish biology it is now proposed to offer this academic area as a regular component of the undergraduate curriculum.

Since fish biology has already been offered five times, it has been a course that has required teaching assignments previously. If this new course is offered on a biennial basis it would thus not require any more teaching commitment than has been provided for in the past. Thus, no other course(s) in the department should be required to be dropped. This course has been offered at the Bamfield Marine Station as well as at SFU. Museum specimens are already available at Bamfield and are starting here at SFU. Library facilities here at SFU as well as at Bamfield are already adequate for this course.

### Lectures

- A. Classification and evolution - an introduction to what fish are and where they live. The scope, aims and methods of classification. The vertebrate ancestry and major groups of extinct fishes and those represented as living forms.
- B. Form and function. Including,
  1. Integumentary system. Including scolation, scale derivatives, barbels, colouration, light organs and poison glands.
  2. Respiration and circulation - gill structure and function in major fish groups. Mechanisms of gas exchange and transport in blood. Air breathing in fishes.
  3. Swim bladders - development, structure and function. Removal and concentration of gas from blood and by the rete mirabile. Air bladders and sound production and reception.

4. Nervous system and senses - structure and function of the central and peripheral nervous systems. Fish senses including the lateral line system, electric organs, electromagnetic reception, equilibrium, hearing, sight, temperature reception and chemoreception.
  5. Chemical messengers. Typical vertebrate endocrine tissues and their hormonal elaborations. Specialized endocrine developments in fishes such as urophysis, corpuscles of Stannius and ultimobranchial glands.
  6. Reproduction. Gonadal structure and development. Viviparity in fishes.
- C. Ecology and behavior. Including predator-prey relationships, competition, ~~intraspecific interactions and adaptation to various~~ environments.
- D. Migration with emphasis on patterns, orientation, bioenergetics and physiology.

### Laboratory

#### Anatomy.

Dissection of 3-4 differing species that are available at the time and are of an adequate size (salmon, rockfish, dogfish, hagfish, flounder, ling cod).

#### Identification and classification.

In addition to museum specimens, students will make their own day and night collections by a variety of means (scuba, beach seine, hook and line, trawl). In order to relate various species with different habitats fish will be collected from estuaries, rocky intertidal, exposed beaches, mud flats, sea grass flats, kelp beds, near-shore rocky bottom, near-shore soft bottom, deeper sublittoral and mesopelagic areas as well as stream and lake habitats.

Field trips to natural spawning grounds (Carnation Creek, Sweltzer Creek), artificial spawning grounds and rearing facilities (Robertson Creek, Capilano Hatchery, Weaver Creek) and aquaculture operations (Pacific Biological Station, Tidal Rush Marine Farms).

Lab experiments in physiology and behavior in areas of faculty research - predator-prey interactions, cardiac physiology, endocrine regulation and fish toxicology.

### Text

Fishes: An Introduction to Ichthyology, P.B. Moyle and J.J. Cech, Jr., Prentice-Hall, Inc., 1982.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

AMMENDED: FACULTY OF SCIENCE

29/ Sept./86

Department: Biological Sciences

1. Calendar Information

Abbreviation Code: BISC Course Number: 423 Credit Hours: 4 Vector: 2-0-6

Title of Course: Biotechnology - Industrial Applications

Calendar Description of Course:

The use and manipulations of microbial ~~and tissue~~ <sup>XXXXXXXXXX</sup> cultures for production and extraction of ~~industrial~~ <sup>XXXXXXXXXX</sup> important compounds will be studied. industrially

Nature of Course Lecture and Laboratory. Two - three hour laboratories per week are required.

Prerequisites (or special instructions):

BISC 303, BISC 321 recommended.

What course (courses), if any, is being dropped from the calendar if this course is approved:  
BISC 421

2. Scheduling

How frequently will the course be offered? Once/year

Semester in which the course will first be offered? ~~86-1~~ 87-3

Which of your present faculty would be available to make the proposed offering possible? L.J. Albright

3. Objectives of the Course

Biotechnology is a rapidly expanding field in which industry is using bacteria, fungi, viruses and plant and animal tissue cultures to obtain useful materials. This course will show students how to select industrially important microbial, plant and animal cells, maintain them, modify them to enhance their product formation in bioreactors and to isolate the desired product.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty None

Staff None

Library Subscription to: Applied Microbiology and Biotechnology

Audio Visual None

Space None

Equipment \$1,000 for bioreactors, \$3,000 for a tissue culture incubator with ancillary glassware, \$4,000 for microlitre pipettes, microfuge, etc.

5. Approval

Date: 8/10/88 4/ October /1986  
[Signature] [Signature]  
Department Chairman Dean Chairman, SCUS

## LECTURE SCHEDULE

### Lecture

- 1 Introduction to Biotechnology
- 2 Culture collections
- 3 Bioreactors: Design and Operation
- 4 All Propagation: Viral, Bacterial, Fungal, Algal and Plant and Animal Cell Growth Patterns
- 5 Cell Propagation: Batch Cultures
- 6 Cell Propagation: Continuous Cultures
- 7 Cell Propagation: Continuous Cultures

---

- 8 Midterm Exam
- 9 Anaerobic Pathways Useful for Product Formation
- 10 Anaerobic Pathways Useful for Product Formation
- 11 Bioreactor Products Related to the TCA Cycle
- 12 Bioreactor Products Related to the TCA Cycle
- 13 Idiolite Production
- 14 Idiolite Production
- 15 Microbial Adherence
- 16 Production and Use of Immobilized Cells
- 17 Production and Use of Immobilized Enzymes
- 18 Midterm Exam
- 19 Automation and scale-up of Biological Process Engineering
- 20 Manipulation of yeast for Desired Product Formation
- 21 Brewing and Spirits Production in Theory and Practise
- 22 Microorganisms and the Oil Industry
- 23 Genetic manipulation of viruses and bacteria for commercial vaccine production
- 24 Applications of microbial biotechnology in agriculture and forestry
- 25 Use of microorganisms in mineral extractions

## BIOTECHNOLOGY - INDUSTRIAL APPLICATIONS

- WEEK 1 Selection and Preservation of Industrial Cell Strains.  
Demonstration of Bioreactor Types.
- WEEK 2 Batch culture of Penicillium: Kinetics of Cell Growth and  
Penicillin Formation.
- WEEK 3 Batch Culture of Penicillin: Penicillin Purification and  
Bioassay.
- WEEK 4 Continuous Yeast Culture: Part I.
- WEEK 5 Continuous Yeast Culture: Part II.
- WEEK 6 Mechanisms of Bacterial Adherence: Reversible and  
Irreversible Attachment\*.
- WEEK 7 Production and bioassay of a Bio-insecticide.
- WEEK 8 Fusion as a Technique for Altering Industrially Important  
Yeasts\*.
- WEEK 9 Product Formation by a Hybridoma\*.
- WEEK 10 Klenow Fragment Preparation from Escherichia coli\*.
- WEEK 11 Scale-up Problems in Industrial Bioreactors\*.
- WEEK 12 Ethanol Production by Immobilized Yeast.
- WEEK 13 Glucose Isomerase: An Important Industrial Immobilized Enzyme.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Biology

Abbreviation Code: BISC Course Number: 431 Credit Hours: 4 Vector: 3-0-6

Title of Course: Molecular Biotechnology

Calendar Description of Course:

Laboratory with accompanying lectures to give practical experience in the application of recombinant DNA technology to basic and applied research.

Nature of Course

Prerequisites (or special instructions):

BISC 321, or permission of instructor. Recommend BISC 401 and/or BISC 402 concurrently.

What course (courses), if any, is being dropped from the calendar if this course is approved:

BISC 421

2. Scheduling

How frequently will the course be offered? once/year

Semester in which the course will first be offered? ~~XXXX~~ 87-1

Which of your present faculty would be available to make the proposed offering possible? Dr. B. Honda (Drs. Baillie, Smith also possible).

3. Objectives of the Course Biotechnology and recombinant DNA methodology are rapidly finding wide applications in various areas of biology (from taxonomy to evolutionary studies), as well as in applied fields. The purpose of this course, following the theoretical background of BISC 321, is to provide practical, hands-on laboratory experience with technical aspects of recombinant DNA technology. BISC 421 was split into two courses because: (i) the two areas covered are so different in requirements and scope, and (ii) to allow material in each area to be covered adequately in more depth.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library Ref. list attached with course outline.

Audio Visual

Space Lecture room (20-25), and lab space for two afternoons/week.

Equipment Most required equipment already available; some small items (pipetmen, power supplies) and disposables necessary.

5. Approval

Date:

85/10/08

4/October/1986

Salil Datta Pruthi  
Department Chairman

[Signature]  
Dean

[Signature]  
Chairman, SCUS

Lectures and laboratories covering the following topics:

Introduction: Overview of molecular biology  
Bacteria: growth and maintenance  
vector-host systems  
Manipulating DNA: restriction enzymes  
other enzymes used in molecular cloning  
gel electrophoresis  
hybridization, blots  
Plasmid vectors: properties, construction  
isolation from bacteria  
cloning protocols  
Phage vectors: properties, construction  
growth and maintenance  
cloning protocols, packaging  
Cloning strategies: making cDNA  
probes, selection, characterization of  
desired genes  
DNA sequencing: Maxam and Gilbert (chemical) sequencing  
Sanger (enzymatic) methods  
Expression of eukaryotic genes in bacteria: production of biologically  
important substances  
Eukaryotic vector systems: yeast  
mammalian cells  
transgenic organisms  
plant vectors and prospects  
Tissue culture technology, monoclonal antibodies

#### REFERENCE LIST

Maniatis, T. et al. Molecular Cloning (A Laboratory Manual), New York, Cold Spring Harbor Laboratory (1982). ISBN 0-87969-136-0  
Watson, J.D. et al. Recombinant DNA: A Short Course. W.H. Freeman, NY, (1983). ISBN 0-7167-1484-1  
Recombinant DNA Methodology, Dillon, Nasim and Nestmann eds, Wiley and Sons, Toronto, (1985). ISBN 0-471-89851-1  
Rodriguez and Tait, Recombinant DNA Techniques, An Introduction, Addison Wesley, Don Mills (1983).  
Genetic Engineering, R. Williamson ed., VOL 3, Academic Press (1982).

Also various scientific journals and reference texts presently held in the library.