

SIMON FRASER UNIVERSITY

MEMORANDUM

S.74-88

To SENATE

From SENATE COMMITTEE ON UNDERGRADUATE
STUDIES

Subject REVISED PROGRAM IN BIO-CHEMISTRY

Date JUNE 18, 1974

MOTION 1: "That Senate approve, as set forth in S.74-88,
the proposed Calendar entry covering the core
program requirements for bio-chemistry majors,
and descriptions of courses."

MOTION 2: "That Senate approve, as set forth in S.74-88,
new course proposals for:

BICH 301-3 - The Structure and Reactivity of Biomolecules
BICH 302-2 - Metabolism
BICH 311-2 - Analytical Biochemistry Laboratory
BICH 312-2 - Metabolism Laboratory
BICH 403-3 - Physical Biochemistry
BICH 411-2 - Enzymology Laboratory
BICH 413-2 - Physical Biochemistry Laboratory
BICH 420-3 - Selected Topics in Contemporary Biochemistry
BICH 490-3 - Directed Study in Advanced Topics of Biochemistry
BICH 491-5 - Undergraduate Research."

MOTION 3: "That Senate approve, as set forth in S.74-88,
that the following courses be discontinued
over time:

CHEM 421-3 - Descriptive Bio-Chemistry
CHEM 422-3 - Physical Bio-Chemistry
CHEM 426-2 - Bio-Chemistry Laboratory I
CHEM 427-2 - Bio-Chemistry Laboratory II."

MOTION 4: "That Senate waive the normal two semester time
lag requirement in order that BICH 301-3, 311-2,
490-3, and 491-5 may be first offered in the
Fall semester 1974, and that BICH 302-3, 312-2,

403-3 and 420-3 may be first offered in the
Spring semester 1975."

SIMON FRASER UNIVERSITY

S.74-88

MEMORANDUM

To..... SENATE

From..... SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Subject..... REVISED PROGRAM IN BIO-CHEMISTRY

Date..... June 18, 1974

At its meeting of 11th June, 1974, the Senate Committee on Undergraduate Studies considered the revised Bio-Chemistry program and recommends approval to Senate.

This recommendation includes:

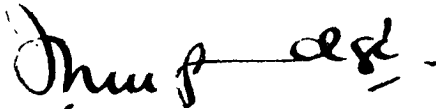
1. the proposed Calendar entry covering the core program, requirements for bio-chemistry majors, requirements for bio-chemistry honors and descriptions of courses;
2. new courses - BICH 301-3 - The Structure and Reactivity of Biomolecules
BICH 302-2 - Metabolism
BICH 311-2 - Analytical Biochemistry Laboratory
BICH 312-2 - Metabolism Laboratory
BICH 403-3 - Physical Biochemistry
BICH 411-2 - Enzymology Laboratory
BICH 413-2 - Physical Biochemistry Laboratory
BICH 420-3 - Selected Topics in Contemporary Biochemistry
BICH 490-3 - Directed Study in Advanced Topics of Biochemistry
BICH 491-5 - Undergraduate Research; and
3. the discontinuing of the following courses:
CHEM 421-3 - Descriptive Bio-Chemistry
CHEM 422-3 - Physical Bio-Chemistry
CHEM 426-2 - Bio-Chemistry Laboratory I
CHEM 427-2 - Bio-Chemistry Laboratory II

The Committee further recommends that, if the revisions to the Bio-Chemistry program are approved, the normal two semester time-lag requirement be waived in order that BICH 301-3, 311-2, 490-3, and 491-5 may be first offered in the Fall semester 1974 and that BICH 302-3, 312-2, 403-3 and 420-3 may be first offered in the Spring semester, 1975.

The Committee was informed that arrangements were being made within the Faculty of Science for the change over from the old to the revised program and that, while it was the wish of the Faculty to effect this change as quickly as possible, it may be necessary to phase out gradually the four Chemistry courses which are to be discontinued so that those students who have declared for an honors or major program in Bio-Chemistry could be accommodated under existing arrangements. The Committee also examined the

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question of relationship of the proposed program to that of the Department of Kinesiology. It was informed that two Faculty from the Kinesiology Department had been members of the Bio-Chemistry Committee and that extensive consultation had taken place between the Committee and that Department in determining the question of overlap between the proposed Bio-Chemistry courses and those of the Kinesiology Department.

A handwritten signature in cursive script, appearing to read "I. Mugridge", with a horizontal line extending from the end of the signature.

I. Mugridge

:ams

att.

SIMON FRASER UNIVERSITY

SCUS 74-22

MEMORANDUM

As approved by SCUS
June 11, 1974

To.....Senate Committee on
.....Undergraduate Studies
Subject.....REVISED BIOCHEMISTRY PROGRAM

From.....S. Aronoff *S. Aronoff*
.....Dean of Science
Date.....May 27, 1974

Attached is the revised Biochemistry Program as approved by the Faculty of Science at its meeting of May 16, 1974. Part I contains the revised Biochemistry Curriculum, complete with proposed calendar entry, new course proposal forms, and accompanying course outlines as required. Part II outlines the proposed changeover procedures and frequency of the offering of the new courses. Part III contains details of the administrative structure of the Biochemistry Curriculum Committee, which is directly responsible for the development and implementation of the Biochemistry Program.

I should like to emphasize that this is a *revised*, and *not a new Program*. (It should therefore *not* go to the Academic Planning Committee.) The revision has consisted of an extensive reshuffling of subject matter within the Chemistry courses so that they may be presented in a manner consistent with the progress in Biochemistry over the last decade. A further evaluation and reconsideration of Bio-Science 401 and 402 will occur during the coming year.

It is recommended that the Faculty of Science be granted a special dispensation in order that the new program be implemented in the Fall Semester, 74-3.

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P A R T I

REVISED BIOCHEMISTRY CURRICULUM

BIOCHEMISTRY CURRICULUM

Calendar Entry

A Major and Honors degree program in Biochemistry is offered by the Faculty of Science. Entry into these programs requires the permission of the Biochemistry Committee of the Faculty of Science.

All students taking Biochemistry must complete the "Core Program" as specified below, together with elective courses chosen in consultation with the Biochemistry faculty.

<u>CORE PROGRAM</u>	(78 semester hours)
Biochemistry	301-3, 302-3, 311-2, 312-2, 403-3, 411-2, and 413-2.
Bio-Science	20 hours, to include 202-3, 302-3, 401-3, and 402-3. 101-4 and 102-4 are strongly recommended.
Chemistry	104-3, 105-3, 115-2, 117-2, 233-2, 251-3, 252-3, 256-2, 261-3, and 356-2.
Mathematics	151-3, 152-3, and 253-4.
Physics	101-3 and 102-3. Students who intend to enter graduate studies in biochemistry are advised to take 201-2, 202-2, 203-2, 204-2, and 205-2 instead.

BIOCHEMISTRY MAJORS (120 semester hours)

In addition to the "Core Program", students majoring in Biochemistry must complete an additional 42 semester hours of electives, at least 6 of which must be outside the Faculty of Science, and at least 16 of which should be upper division (i.e. 300 and 400 level) courses.

Although many variations are possible, a student entering with Chemistry 12, and Physics 11 (or equivalents) might take the following typical program.

Levels 1 and 2 Bio-Science 101-4 and 102-4
Chemistry 104-3, 105-3, 115-2, and 117-2
Mathematics 151-3 and 152-3
6 hours of electives
Total 30 hours.

Levels 3 and 4 Bio-Science 202-3
Chemistry 251-3, 252-3, 256-2, and 356-2
Mathematics 253-4
Physics 101-3 and 102-3
7 hours of electives
Total 30 hours.

Levels 5 and 6 Biochemistry 301-3, 302-3, 311-2, and 312-2
Bio-Science 302-3
Chemistry 233-2 and 261-3
12 hours of electives
Total 30 hours.

Levels 7 and 8 Biochemistry 403-3, 411-2, and 413-2
Bio-Science 401-3 and 402-3
17 hours of electives
Total 30 hours.

Students entering without the equivalent of Chemistry 12 may not enter Chemistry 104-3, but may begin with Chemistry 101-3 and 106-2 and then follow a program similar to the above. Students with Biology 11 may omit Bio-Science 101-4 and students with Biology 12 may omit both Bio-Science 101-4 and 102-4 and substitute the equivalent number of Bio-Science electives if they wish.

BIOCHEMISTRY HONORS (132 semester hours)

In addition to the "Core Program" students taking honors in Biochemistry must complete an additional 54 semester hours as follows: Biochemistry Research (Biochemistry 491-5) and 49 semester hours of electives. At least 6 hours of electives must

be outside the Faculty of Science and at least 27 should be upper division (i.e. 300 and 400 level) courses of which at least 15 complement a coherent area of specialization approved by the Biochemistry Committee.

KINESIOLOGY ELECTIVES

The student's attention is drawn to the following biochemistry-related courses offered by the Department of Kinesiology in the Faculty of Interdisciplinary Studies. Any of these courses may be included in the 42 semester hours (or 49 for honors students) of electives:

Kinesiology 100-3, 200-3, 326-3, 330-3, 336-3, 402-4, 404-5,
405-3, 407-3.

DESCRIPTION OF COURSES

It is intended that Biochemistry Majors or Honors students will take the Biochemistry courses in the order presented under the Recommended Program above, and with the prescribed prerequisites. However, students in other majors and honors programs may be admitted into any of these courses at the discretion of the Biochemistry Committee.

Note: Students with credit for CHEM 421-3 and CHEM 422-3 cannot take BICH 301-3 and BICH 302-3 for further credit. Those with credit for CHEM 426-2 and CHEM 427-2 cannot take BICH 311-2 and BICH 312-2 for further credit. Those with other combinations in these courses may seek advice from the Biochemistry Committee.

BICH 301-3 - The Structure and Reactivity of Biomolecules (3-1-0)

The structure and analysis of amino acids, peptides, carbohydrates, lipids, nucleotides, and nucleic acids; coenzyme activation; reactivity of biomolecules and mechanisms of biochemical reactions.

Prerequisite: Chemistry 252-3. Biochemistry 311-2 will ordinarily be taken concurrently, but may be taken subsequent to BICH 301-3.

BICH 302-3 - Metabolism (3-1-0)

The major pathways of primary metabolism; bioenergetics; compartmentalization of cellular metabolic functions; elementary control mechanisms.

Prerequisite: Biochemistry 301-3. Biochemistry 312-2 will ordinarily be taken concurrently, but may be taken subsequent to BICH 302-3.

BICH 311-2 - Analytical Biochemistry Laboratory (0-0-4)

The biochemical analysis of amino acids, peptides, carbohydrates, lipids, nucleotides, and nucleic acids.

Prerequisite: Chemistry 256-2. Biochemistry 301-3 will ordinarily be taken concurrently, but may precede BICH 311-2.

BICH 312-2 - Metabolism Laboratory (0-0-4)

Experiments demonstrating the major energy yielding processes of metabolism and selected biosyntheses.

Prerequisite: Chemistry 256-2. Biochemistry 302-3 will ordinarily be taken concurrently, but may precede BICH 312-2.

BICH 403-3 - Physical Biochemistry (3-1-0)

The physical properties of biopolymers and their use in molecular weight and structure determinations; modern methods of purification of proteins and nucleic acids; properties of membranes and methods of membrane analysis and study.

Prerequisites: Physics 102-3 (or Physics 202-2 and 204-2), Math 253-4 and Biochemistry 301-3. Biochemistry 413-2 will ordinarily be taken concurrently, but may be taken subsequent to BICH 403-3.

BICH 411-2 - Enzymology Laboratory (0-0-4)

Experiments on enzyme kinetics, enzyme activation, and inhibition.

Prerequisite: Biochemistry 311-2 or 312-2. Bio-Science 401-3 will ordinarily be taken concurrently, but may precede BICH 411-2.

BICH 413-2 - Physical Biochemistry Laboratory (0-0-4)

Enzyme isolation and purification; the measurement of physical properties of macromolecules; studies with bio-membranes.

Prerequisite: Biochemistry 411-2. Biochemistry 403-3 will ordinarily be taken concurrently, but may precede BICH 413-2.

BICH 420-3 - Selected Topics In Contemporary Biochemistry (3-1-0)

A course of selected topics of contemporary interest to biochemists, such as drug research, pollution, cancer research, genetic engineering, aging, memory research, etc.

Prerequisite: Permission of the Biochemistry Committee. Upper levels standing (at least 60 semester hours) in a Faculty of Science degree program will usually be required.

BICH 490-3 - Directed study In advanced Topics of Biochemistry

Directed reading in a topic chosen in consultation with a supervisor.

Prerequisite: Permission of the Biochemistry Committee. Upper levels standing (with at least 75 semester hours) in the Biochemistry Program will usually be required.

BICH 491-5 - Undergraduate Research

Laboratory research for preparation of a thesis for the honors degree in Biochemistry.

Prerequisite: Permission of the Biochemistry Committee.

SIMON FRASER UNIVERSITY

FACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 301 Title:
The Structure and Reactivity
of Biomolecules

Sub-title or Description:

The structure and analysis of amino acids, peptides, carbohydrates, lipids, nucleotides, nucleic acids; coenzyme activation; reactivity of biomolecules and mechanisms of biochemical reactions.

Credit Hours: 3

Vector Description: (30140)

Prerequisite(s): Chem. 252-3. Biochem. 311-2 will ordinarily be taken concurrently, but may be taken subsequent to BICH 301-3.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: 20

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Yearly, every Fall.

When course will first be offered: 74-3

III JUSTIFICATION

A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

It is an extension of Chem. 252 principles to biomolecules. By dropping Chem. 421, no course content overlap will exist in the Chemistry Department. In addition, no increased overlap will occur with courses in the Bio-Science Department.

B. What is the range of topics that may be dealt with in the course?
cf. course outline attached.

C. How does this course fit the goals of the program?

It is of fundamental importance to the Biochemistry Program.

D. How does this course affect degree requirements?

It is a core requirement of the Biochemistry Program.

- E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current descriptions on p. 245 and p. 260.

- F. What course, if any, is being dropped from the calendar if this course is approved?

Chem. 421-3.

- G. What is the nature of student demand for this course?

There are approximately 80 students currently registered in the Biochemistry Program. In addition, Chemistry, Bio-Science and Kinesiology majors may wish to take this course as an elective.

- H. Other reasons for introducing the course.

N/A

IV BUDGETARY AND SPACE FACTORS

- A. Which faculty will be available to teach this course?

Members of the Biochemistry Committee, and any others seconded by Departments of the Faculty of Science and approved by the Chairman of the Biochemistry Committee.

- B. What are the special space and/or equipment requirements for this course?

None

- C. Any other budgetary implications of mounting this course?

None

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:

J. Barlow

S. Smith

COURSE OUTLINE

BICH 301-3 The Structure and Reactivity of Biomolecules

<u>Lect. No.</u>	<u>Topics</u>
1	Introductory remarks
2	Acids and amino acids--pK's, titration and analysis
3	Peptide bond--synthesis of polypeptides
4	Proteins--classification and analysis
5	Proteins--forces determining the 4 levels of structure
6	Proteins and enzymes--3-D structure
7	Enzyme mechanisms--active site participation
8	Carbohydrates--naming and structure--hemiacetals and acetals
9	Mono- and disaccharides--carbohydrate tests and analysis
10	Oligo- and polysaccharides--structure and analysis
11	Simple lipids--fatty acids, fats and phospholipids
12	Complex lipids--sphingolipids, glycolipids and bacterial cell walls
13	Isoprenoids and steroids--classification and structure
14	Purines and pyrimidines--nucleotide formation (incl. NAD, FAD, etc.)
15	Structure of RNA (t-, m-, and r-RNA)--methods of analysis
16	Structure of DNA--base pairing and double helix--genetic code
17	Coenzymes--classification (group transfer, redox, etc.)
18	Hydration of double bonds and elimination mechanisms--isomerization (e.g. aconitase, tautomerization, epimerization)--enolase, fumarase, aspartase, threonine and cysteine formation
19	"High energy" and "low energy" compounds
20	Hydrolases and phosphatases--peptidases, amylases, lipases and nucleases--phosphorylase
21	Activation of carboxyl group--ester and amide formation

<u>Lect. No.</u>	<u>Topics</u>
22	Phosphate transfer reactions--examples in glycolysis, citric acid cycle and biosynthesis of carbohydrates, proteins, phospholipids, nucleic acids and generation of ATP
23	Generation of nucleophiles--activation by thiamine pyrophos., pyridoxal phos. and coenzyme A
24	Claissen-type reactions--citrate, fatty acid and mevalonate synthesis.
25	Aldol-type reactions--aldolase and transaldolase--Schiff's bases
26	Acyloin-type reactions--transketolase--decarboxylations with thiamine pyrophosphate (compare with β -ketoacid decarboxylation)
27	Pyridoxal phosphate/aminoacid reactions--transamination, etc.
28	One-carbon coenzymes--tetrahydrofolic acid, vitamin B ₁₂ , S-adenosylmethionine, biotin, carbamyl phosphate
29	Dehydrogenase coenzymes--NAD(P), flavins, lipoic acid, GSH
30	Redox reactions of alcohols/ketones and amines/imines couples
31	Redox reactions of aldehydes/acids--oxidative decarboxylation of α -ketoacids
32	Major energy yielding mechanisms in citric acid cycle and β -oxidation
33	Other redox coenzymes--hemoproteins, metallo-flavoproteins, non-heme iron and copper proteins
34	Hydroxylases and oxidases--function of biopterin and ascorbic acid
35	Electron transport chains--quinones, cytochromes, ferredoxin, cytochrome oxidase--examples of alternate inorganic acceptors

SIMON FRASER UNIVERSITY

FACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 302

Title: Metabolism

Sub-title or Description:

The major pathways of primary metabolism; bioenergetics; compartmentalization of cellular metabolic functions; elementary control mechanisms.

Credit Hours: 3

Vector Description: (3-1-0)

Pre-requisite(s): Biochemistry 301-3, Biochemistry 312-2 will ordinarily be taken concurrently, but may be taken subsequent to BICH 302-3.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: 20

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Yearly, every Spring.

When course will first be offered: 75-1

III JUSTIFICATION

A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

By dropping Chem 421 and 422, no course content overlap will exist in the Chemistry Department. Some 30-32% overlap of course content with Bisc 301 and to a lesser extent with Bisc 201 will exist in the Bio-Science Department. cf. paper B-73-6 appended.

B. What is the range of topics that may be dealt with in the course?
cf. course outline attached.

C. How does this course fit the goals of the program?
It is of fundamental importance to the Biochemistry Program.

D. How does this course affect degree requirements?
It is a core requirement of the Biochemistry Program.

E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current descriptions on p. 245 and p. 260.

F. What course, if any, is being dropped from the calendar if this course is approved?

Chem. 422

G. What is the nature of student demand for this course?

There are approximately 80 students currently registered in the Biochemistry Program. In addition, Chemistry, Bio-Science and Kinesiology majors may wish to take this course as an elective.

H. Other reasons for introducing the course.

N/A

IV BUDGETARY AND SPACE FACTORS

A. Which faculty will be available to teach this course?

Members of the Biochemistry Committee, and any others seconded by Departments of the Faculty of Science and approved by the Chairman of the Biochemistry Committee.

B. What are the special space and/or equipment requirements for this course?

None

C. Any other budgetary implications of mounting this course?

None

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:



COURSE OUTLINE

BICH 302-3 Metabolism

<u>Lect. No.</u>	<u>Topics</u>
1	Introduction-- the use of ΔG° and ΔE° values
2	Review of cytology
3	Digestion of food by an animal--breakdown of large MW compounds and transport of small MW compounds to cells--the function of lysosomes in cells
4	Carbohydrate activation and interconversion--polysaccharide synthesis.
5	Glycolysis--substrate level phosphorylation--pacemaker enzyme
6	Reversal of glycolysis--glycogen formation and breakdown with phosphorylase--metabolic control of insulin and cyclic-AMP-lactic acid fermentation
7	Phosphogluconate pathway--NADPH generation
8	Other pathways of carbohydrate metabolism--examples of bacterial and yeast fermentation, Entner-Doudoroff pathway, ascorbic acid metabolism, etc.
9	Outer and inner membrane structure of mitochondria--ion transport
10	Citric Acid Cycle--reactions and bioenergetics
11	β -Oxidation of fatty acids--including odd number, unsaturated, and methyl-branched fatty acids
12	Catabolism of aliphatic amino acids--urea cycle
13	Tetrahydrofolic acid one-carbon pool and methionine formation--choline-ethanolamine cycle
14	"Mixed-function" oxygenase of the smooth endoplasmic reticulum--oxidation of amines and catabolism of aromatic amino acids and nucleotide bases
15	Location, compartmentalization, integration and control of mitochondrial and "microsomal" reactions--comparison of electron transport chains from both membranes
16	Work on the isolation of ETC complexes--bioenergetics of ETC
17	Oxidative phosphorylation mechanisms--chemiosmotic, mechanical and chemical coupling--work with uncouplers and other inhibitors
18	Glyoxylate and dicarboxylic acid cycle--peroxisomes of plants

<u>Lect. No.</u>	<u>Topics</u>
19	Thylakoid membrane structure of chloroplasts
20	Light reactions of photosynthesis--two photosystems
21	Dark reactions of photosynthesis--electron transport chain, photophosphorylation and photoreduction of NADP
22	Dark reactions of photosynthesis--carbon dioxide fixation and Calvin-Bassham Cycle
23	Biosynthesis of fatty acids--elongation in the mitochondria and introduction of unsaturation
24	Phospholipid, sphingolipid and other complex lipid synthesis
25	Mevalonate synthesis--ketone body formation
26	Isoprenoid and steroid synthesis
27	Nitrogen and sulfur cycles--nitrate and sulfate reduction--transamination with glutamate--synthesis of Glu, Asp and Ala--synthesis of Gln and Asn
28	Synthesis and control of triose family (Gly, Ser, and Cys) and glutamate family (Pro, Ornithine and Arg) of amino acids
29	Synthesis and control of aspartate and branched-chain family of amino acids (Lys, Met, Thr, Ile, Val, Leu and pantothenate)
30	Synthesis and control of shikimic acid family (Phe, Tyr and Typ) of amino acids
31	Synthesis and control of histidine and purine nucleotides
32	Synthesis and control of pyrimidine nucleotides--deoxyribonucleotide formation--overall regulation of nucleotide synthesis
33	Nucleic acid synthesis--replication and transcription in the nucleus--function of the nucleolus
34	Protein synthesis--translation at the ribosomes--the function of the rough endoplasmic reticulum and the golgi complex
35	Examples of other biosyntheses--heme and chlorophyll, vitamins, antibiotics, alkaloids, hormones, etc.

B-73-6

SIMON FRASER UNIVERSITY

MEMORANDUM

To.....Biochemistry Committee

From.....J. Rahe, Chairman

.....Faculty of Science

.....Biochemistry Subcommittee

Subject.....

Date.....March 20, 1973

It has been said that the respective syllabi for BISC-301 (Biochemistry I) and proposed BICH-302 (Metabolism) suggest substantial overlap between the two courses. Discussions among the Faculty members who are teaching or are projected to teach these courses and with two students who have recently taken both BISC-301 and CHEM-421 (somewhat similar to proposed BICH-302) indicate that the overlap is more apparent than real. By analogy, the similarities and differences would appear to be somewhat like those embodied in treatments of principles of aerodynamics for aircraft pilots and those for aeronautical engineers.

This document attempts to analyze the course syllabi for BISC-301 and proposed BICH-302 and to quantitatively express the degree of overlap which actually exists. Procedure for analysis of subject material in the respective courses is as follows:

1. Major topic areas are identified ("macro-analysis").
2. In those major topic areas covered in both courses, specific subtopics are identified and quantitated on the basis of number of lecture hours allotted in each course ("micro-analysis").
3. In each analysis, the number of hours essentially duplicated in the respective courses is identified and expressed as a percentage of the total course lecture hours (35).

It is recognized that some topics may be covered but not identified. For example, integration, regulation, and control of metabolic processes may be discussed as an integral part of coverage of the processes themselves. In some cases it is logical to presume this; in other cases it is not. Where it appears that material not specifically identified in one course is in fact covered in a fashion which duplicates identified material in another course, this is considered in the analysis; otherwise, the syllabi are taken at face value.

The results of this analysis are somewhat surprising in that they indicate that the courses are not really similar, even on paper. Less than 30 to 32% of the subject material of each course would appear to be common to both courses, the remaining 68 to 70% being entirely different. Of the 30 to 32% common subject matter, it is probable that emphasis is distinct in the respective courses; however, no attempt has been made to evaluate this.

It is hoped that this analysis will clarify opinions as to the degree of duplication which exists and satisfy questions concerning overlap which may be encountered in obtaining course approval for proposed BICH-302.

MACRO-ANALYSIS

Subject	Total Hours		"Overlap" as % of Total Course Content	Lectures Where Covered	
	<u>BISC-301</u>	<u>BICH-302</u>		<u>BISC-301</u>	<u>BICH-302</u>
Proteins and Enzymes: Structure and Function	9	0	0	2- 9	
Carbohydrate Metabolism	10	6	≤ 13%	12-19, 22-23	4-8, 10
Lipid Metabolism	4	5+	5- 6%	24-27	11, 23-26, 18*
Protein and Amino Acid Metabolism	4	7	6- 7%	28-31	12, 13*, 14*, 27-30 31*, 34
Nucleotide Metabolism	0	2 1/2	0	-	31*, 32-33
Electron Transport and Oxidative Phosphorylation	2	4	5- 6%	20-21	9, 14-16, 17
Photosynthesis	0	3	0	-	20-22
Integration, Regulation, and Control	4	> 0	1- 2%	11, 32-34	5*, 6*
Cytology	0	4 3/4	0	-	2, 3*, 9*, 14*, 15*, 19*, 33*, 34
Miscellaneous	<u>2</u>	<u>2 3/4</u>	<u>0 (?)</u>	1, 35	1, 3*, 35
TOTALS	35	35	30-32%		

* Not major subject of lecture.

MICRO-ANALYSIS

Subject	<u>BISC-301</u>		<u>BICH-302</u>		<u>Overlap</u>	
	Hours	Lecture #	Hours	Lecture #	Hours	% of Total Course
Proteins and Enzymes: Structure and Function	9	2-9	0	-	0	0
Carbohydrate Metabolism						
Glycolysis	3	12-15	2	5-6	≤ 2	
TCA-cycle	4	16-19	1	10	≤ 1	
Pentose-phosphate pathway	2	22-23	1	7	≤ 1	
Other metabolic pathways	< 1	-	1	8	~ 0	
Interconversions, biosynthesis	1	12-15	1	4	~ 1/2	
	10		6		4 1/2	< 13%
Lipid Metabolism						
Structure, function, comparative energetics	1	24	0	-	0	
β-oxidation	1	25	1	11	1	
Biosynthesis	1	26	4	23-26	1	
Integration; physiological considerations	1	27	?	18?	~ 0	
	4		5+		2+	5-6%
Protein and Amino Acid Metabolism						
Nutritional considerations	1/2	28	0	-	0	
Amino acid biosynthesis; transamination	1	29	~ 1/2	27	1/2	
anabolic pathways	1/2	19, 28-30	4	13, 28-31	1/2	
Amino acid catabolism	1	30	1	12, 14	1/2-1	

Nitrogen and sulfur cycles;
nitrogen excretion

Protein synthesis

1	31	1/2	27	1/2
0	-	1	34	0
4		7		2-2 1/2
				0

Nucleotide Metabolism

0	-	2 1/2	31-33	0
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Electron Transport and Oxidative Phosphorylation

Mitochondrial ET

1	20	1	9, 15	< 1
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Microsomal ET

1	21	1	14, 15	< 1
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Experimental analysis of ETC

0	-	1	16	0
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Mechanisms of phosphorylation

0	-	1	17	0
2		4		< 2
				5- 6%

Photosynthesis

0	-	3	20-22	0
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Integration, Regulation and Control

4	11, 32-34	> 0	5, 6	?
				1- 2%

Cytology

0	-	4 3/4	2, 3, 9 14, 15, 19 33, 34	0
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Miscellaneous

2	1, 35	2 3/4	1, 3, 35	0 (?)
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TOTALS

35		35		10 1/2-11 = 30-32%
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BIOCHEMISTRY I COURSE OUTLINE*CALENDAR DESCRIPTION:*

A brief introduction to the structure and function of protein and enzyme molecules; elementary enzyme kinetics; intermediary metabolism with emphasis on the three energy-transducing systems in animals and plants; microsomal electron transport and its biological implications.

LECTURE # PART I - LECTURE TOPICS FOR BIOSCIENCE 301 - BIOCHEMISTRY I

- 1 *Introduction:* Physical and chemical laws of life processes; inanimate vs. living matter. Molecular logic of the living state.
- 2- 5 *Structure and Function of Protein Molecules:* Primary, secondary, tertiary, quaternary conformation, and forces accounting for the structures. α -helix: structure and function of myoglobin and haemoglobin. Variation of amino acid sequences among homologous functional proteins (myoglobins, cytochromes c) and evolution. Abnormal a.a. variations in haemoglobin (Sickle Cell Anaemia, Methaemoglobinemia). Structural proteins: keratin (α -helix), silk (β -sheet), collagen (triple helix). Proteins and nutrition. Denaturation.
- 6-10 *Enzymes:* Reaction rates and energy of activation; specificity, active site, allosteric sites and allosteric effectors, substrate-, product-, feedback inhibition and activation, and their role in metabolic control; classification and nomenclature (old and new); cofactors, prosthetic groups, co-enzymes, activators; enzyme assaying and purification (Enzyme Unit, E. Concentration, Specific Activity, Molecular and Catalytic Centre Activity, "Balance Sheet"; Initial Velocity; Substrate Conc.; M.-M.-derivation and special cases ($V = 1/2V_m$; $(S) \ll K_m$); Lineweaver-Burk); inhibition (competitive, non-competitive); other factors (temperature, pH, etc.).

PART II - LECTURE TOPICS FOR INTERMEDIARY METABOLISM

- 11 *Introduction:* Metabolism; logical sequence (in time and space) of reactions leading to growth and self-replication $\rightarrow$ LIFE, and its control. Central metabolic pathways, their evolution and interrelations; energy-yielding vs. energy requiring reactions; "high-energy" compounds and universal and central role of ATP.

- 12-15 *Glycolysis:* Glucose sources (glycogenolysis, gluconeogenesis, gluconeogenesis), glucose activation, galactosaemia; individual reactions; most important variation of theme: pyruvic decarboxylase and ethanol dehydrogenase, and how to minimize formation of "fusel oils" and thus "accentuated unpleasant effects"; logic of glycolysis; control; reversal; energetics.
- 16-18 TCA cycle reactions including pyruvate dehydrogenase system; fate of carbons in cycle.
- 19 Removal of TCA intermediates and anaplerotic reactions.
- 20 Mitochondrial electron transport and total energy balance of glucose $\rightarrow$ CO₂; malate and glycerol-phosphate shuttles.
- 21 Microsomal el. transport and biol. significance (P-450; induction; detoxification and metabolism of xenobiotics).
- 22-23 Pentose phosphate shunt reactions, "reducing power" and biosynthesis; roles of DPN vs. those of TPN. General considerations of carbohydrate metabolism (central position and role of glucose) and abnormalities (hyper- and hypo-glycaemia and regulation).
- 24-27 *Lipid Metabolism:* Types of lipids; significance of triglycerides in energy storage; β -oxidation (including role of carnitine); energetics; glyoxylate shunt and significance; fatty acid synthesis; body fat and nutrition; polyphagia; cachexia; hypercholesterolemia; alcohol and fatty liver.
- 28-31 *Protein Metabolism:* Dynamics of protein metabolism; nitrogen balance; essential vs. non-essential amino acids; reactions involving α -amino-N; role and mode of pyridoxal phosphate; decarboxylations and biogenic amines; glucogenic vs. ketogenic a.a.'s. Nitrogen excretion (ammonotelic, ureotelic, uricotelic organisms) with emphasis on urea cycle.
- 32 Integration of carbohydrate, lipid, and protein metabolism and biochemical universals.
- 33-34 *Regulation and Control:* Cell level: membranes, endoplasmic reticulum, compartmentation, non-aqueous micelles. Chemical equilibria; regulatory enzymes; repression and induction. Organism level: hormonal system, nervous system, differentiation.
- 35 *Biochemistry and Diseases:* The molecular bases for diseases ("orthomolecular medicine") with several examples for reactions covered in the course.

SIMON FRASER UNIVERSITYFACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 311 Title:
Analytical Biochemistry
Laboratory

Sub-title or Description:

The biochemical analysis of amino acids, peptides, carbohydrates, lipids, nucleotides, and nucleic acids.

Credit Hours: 2

Vector Description: (0-0-4)

Pre-requisite(s): Chemistry 256-2, Biochemistry 301-3 will ordinarily be taken concurrently but may precede BICH 311-2.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: 20

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Yearly, every Fall

When course will first be offered: 74-3

III JUSTIFICATION

A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

Companion course to Biochemistry 301. By dropping Chemistry 426 no course content overlap will exist in the Chemistry Department. There is some overlap with experiments in Bio-Science 428 and 438.

B. What is the range of topics that may be dealt with in the course?
cf. course outline attached.

C. How does this course fit the goals of the program?

It is of fundamental importance to the Biochemistry Program.

D. How does this course affect degree requirements?

It is a core requirement of the Biochemistry Program.

- E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current description on p. 245 and p. 260.

- F. What course, if any, is being dropped from the calendar if this course is approved?

CHEM 426.

- G. What is the nature of student demand for this course?

There are approximately 80 students currently registered in the Biochemistry Program. In addition, Chemistry, Bio-Science and Kinesiology majors may wish to take this course as an elective.

- H. Other reasons for introducing the course.

N/A

IV BUDGETARY AND SPACE FACTORS

- A. Which faculty will be available to teach this course?

Members of the Biochemistry Committee, and any others seconded by Departments of the Faculty of Science and approved by the Chairman of the Biochemistry Committee.

- B. What are the special space and/or equipment requirements for this course?

Laboratory space is available in C9014, and most of the equipment is currently available.

- C. Any other budgetary implications of mounting this course:

None

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:

COURSE OUTLINE

BICH 311-2 Analytical Biochemistry Laboratory

<u>No. of Labs</u>	<u>Experiments</u>
4	<u>Amino acids and peptides</u> : titration of unknown amino acid; sequence determination of a dipeptide and analysis by paper chromatography; demonstration of the use of the amino acid sequencer.
3	<u>Carbohydrates</u> : acid and enzymatic hydrolysis of polysaccharides and spectrophotometric assay; structure determination of a disaccharide by borohydride reduction and analysis by paper chromatography; mutarotation and other carbohydrate chemical tests.
2	<u>Lipids</u> : isolation and separation of phospholipids, neutral fats and steroids from various tissues and analysis by thin-layer or silica gel column chromatography.
4	<u>Nucleic acids</u> : isolation of DNA from E. coli; DNA and RNA assays; determination of base ratios of RNA.

SIMON FRASER UNIVERSITYFACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 312 Title:
Metabolism Laboratory

Sub-title or Description:

Experiments demonstrating the major energy yielding processes of metabolism and selected biosyntheses.

Credit Hours: 2

Vector Description: (0-0-4)

Pre-requisite(s): Chemistry 256-2, Biochemistry 302-3 will ordinarily be taken concurrently but may precede BICH 312-2.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: 20

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Yearly, every Spring

When course will first be offered: 75-1

III JUSTIFICATION

A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

Companion course to Biochemistry 302. By dropping Chemistry 426 and 427 no course content overlap will exist in any department.

B. What is the range of topics that may be dealt with in the course?

cf. course outline attached.

C. How does this course fit the goals of the program?

It is of fundamental importance to the Biochemistry Program.

D. How does this course affect degree requirements?

It is a core requirement of the Biochemistry Program.

- E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current descriptions on p. 245 and p. 260.

- F. What course, if any, is being dropped from the calendar if this course is approved?

CHEM 427.

- G. What is the nature of student demand for this course?

There are approximately 80 students currently registered in the Biochemistry Program. In addition, Chemistry, Bio-Science and Kinesiology majors may wish to take this course as an elective.

- H. Other reasons for introducing the course.

N/A

IV BUDGETARY AND SPACE FACTORS

- A. Which faculty will be available to teach this course?

Members of the Biochemistry Committee, and any others seconded by Departments of the Faculty of Science and approved by the Chairman of the Biochemistry Committee.

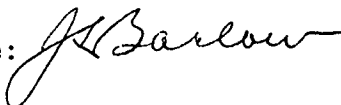
- B. What are the special space and/or equipment requirements for this course?

Laboratory space is available in C9014. Some new equipment will be required, e.g. spectrophotometer and respiration apparatus.

- C. Any other budgetary implications of mounting this course:

~ \$10,000

APPROVAL - Faculty Curriculum Committee:



Faculty:



Senate:

COURSE OUTLINE

BICH 312-2 Metabolism Laboratory

<u>No. of Labs</u>	<u>Experiments</u>
2	<u>Glycolysis Experiment</u> : demonstration of pyruvate and acetaldehyde formation in yeast by a trapping experiment; the effect of inhibitors of glycolysis.
3	<u>Oxygen uptake experiments</u> : studies with a Warburg apparatus or oxygen electrode with yeast, <u>E. coli</u> , and isolated mitochondria in the presence of various substrates and inhibitors of the citric acid cycle.
3	<u>Electron transport experiments</u> : spectrophotometric assays of NADH oxidation, cytochrome reduction and oxidative phosphorylation in isolated mitochondria; the effect of inhibitors of electron transport and uncouplers.
3	<u>Photosynthesis experiments</u> : demonstration of Hill reaction (dye reduction and oxygen evolution) and photophosphorylation in isolated chloroplasts; comparison with bacterial chromatophores; the effect of inhibitors or herbicides.
2	<u>Biosynthesis of ergosterol</u> : incorporation of radioactive acetate into and isolation of labeled ergosterol from yeast.

SIMON FRASER UNIVERSITYFACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 403 Title:
Physical Biochemistry

Sub-title or Description:

The physical properties of biopolymers and their use in molecular weight and structure determinations; modern methods of purification of proteins and nucleic acids; properties of membranes and methods of membrane analysis and study.

Credit Hours: 3

Vector Description: (3-1-0)

Pre-requisite(s): Physics 102-3 or Physics 202-2 and 204-2, Math 253-4 and Biochemistry 301-3. Biochemistry 413-2 will ordinarily be taken concurrently but may be taken subsequent to BICH 403-3.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: 10

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Yearly, every Spring

When course will first be offered: 75-1

III JUSTIFICATION

A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

There is no overlap with any other course in any department.

B. What is the range of topics that may be dealt with in the course?

cf. course outline attached.

C. How does this course fit the goals of the program?

It is of fundamental importance to the Biochemistry Program.

D. How does this course affect degree requirements?

It is a core requirement of the biochemistry Program.

E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current description on p. 245 and p. 260.

F. What course, if any, is being dropped from the calendar if this course is approved?

None.

G. What is the nature of student demand for this course?

There are approximately 80 students currently registered in the Biochemistry Program. In addition, Chemistry, Bio-Science and Kinesiology majors may wish to take this course as an elective.

H. Other reasons for introducing the course.

This course represents an important area in modern biochemistry which has not been treated at all in the current course offerings.

IV BUDGETARY AND SPACE FACTORS

A. Which faculty will be available to teach this course?

A new faculty member will be required for which a position has already been budgeted and a search is in progress in the Chemistry Department.

B. What are the special space and/or equipment requirements for this course?

None.

C. Any other budgetary implications of mounting this course?

None.

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:

S. Druff *J. Carlson*

COURSE OUTLINE

BICH 403-3 Physical Biochemistry

No. of Lect.

Topic

- | | |
|---|---|
| 7 | <u>Introduction and Review of Biopolymers--Their Structures and Physical Properties:</u> A brief review of the major types of biopolymers and their physical properties; how X-ray diffraction has been used to determine tertiary structure; electron microscopy; quaternary structure, aggregation and disaggregation; denaturation; solubility; crystallization; salting out; density; dipole moments. |
| 2 | <u>Colligative Properties:</u> Osmotic pressure and osmosis; the effect of solutes on vapor pressure, boiling and freezing points; Donnan equilibrium. |
| 6 | <u>Optical Properties:</u> Refraction, birefringence, optical rotation, ORD, CD, light scattering, NMR, ESR, UV, visible, IR, Raman, dichroism, fluorescence and polarization of fluorescence. |
| 6 | <u>Surface Properties and Membranes:</u> Surfaces and interfaces; adsorption chromatography; affinity chromatography; monolayers and films; membrane structure; detergent action on membranes; isolation of multienzyme complexes from membranes (e.g. mitochondria, ER, and chloroplasts). |
| 6 | <u>Ordinary Transport Properties:</u> A review of flow processes in solution; viscosity; diffusion; Schlieren optical system; diffusion in gels and gel filtration; diffusion through membranes and dialysis; flow birefringence; dielectric dispersion; electric birefringence; and depolarization of fluorescence. |
| 5 | <u>Ionic and Electrokinetic Properties:</u> Biopolymers as polyions; conductance; membrane potentials; active transport; ion-exchange chromatography; |

No. of Lect.

Topic

electrophoresis; electrofocusing, pH and density gradient electrophoresis; detergent-gel electrophoresis; immunoelectrophoresis.

3

Sedimentation Properties: Sedimentation in the ultracentrifuge; sedimentation velocity and optical measurements; approach to equilibrium and zonal and density gradient centrifugation.

SIMON FRASER UNIVERSITYFACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 411 Title:
Enzymology Laboratory

Sub-title or Description:

Experiments on enzyme kinetics, enzyme activation, and inhibition.

Credit Hours: 2

Vector Description: (0-0-4)

Pre-requisite(s): Biochemistry 311-2 or 312-2, Bio-Science 401-3 will
ordinarily be taken concurrently but may precede
BICH 411-2.II ENROLMENT AND SCHEDULING

Estimated Enrolment: 10

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Yearly, every Fall

When course will first be offered: 75-3

III JUSTIFICATIONA. What is the detailed description of the course including differentiation
from lower level courses, from similar courses in the same department
and from courses in other departments in the University?Companion course to Bio-Science 401-3. By dropping Chemistry 427, no course
content overlap will exist in any department.B. What is the range of topics that may be dealt with in the course?
cf. course outline attached.

C. How does this course fit the goals of the program?

It is of fundamental importance to the Biochemistry Program.

D. How does this course affect degree requirements?

It is a core requirement of the Biochemistry Program.

E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current descriptions on p. 245 and p. 260.

F. What course, if any, is being dropped from the calendar if this course is approved?

None.

G. What is the nature of student demand for this course?

There are approximately 80 students currently registered in the Biochemistry Program. In addition, Chemistry, Bio-Science and Kinesiology majors may wish to take this course as an elective.

H. Other reasons for introducing the course.

N/A

IV BUDGETARY AND SPACE FACTORS

A. Which faculty will be available to teach this course?

Members of the Biochemistry Committee, and any others seconded by Departments of the Faculty of Science and approved by the Chairman of the Biochemistry Committee.

B. What are the special space and/or equipment requirements for this course?

Laboratory space is available in C9014. Some new equipment will be required, e.g. a temperature jump apparatus.

C. Any other budgetary implications of mounting this course?

\$5,000

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:

COURSE OUTLINE

BICH 411-2 Enzymology Laboratory

<u>No. of Labs</u>	<u>Experiments</u>
6	<u>Enzyme kinetics (normal saturation)</u> : kinetic assays and protein determination, pH optimum, activation energy, K_m , and inhibition (competitive and non-competitive) ^m of β -galactosidase.
5	<u>Enzyme kinetics (sigmoidal)</u> : Determination of Hill parameters; demonstration of positive and negative effectors for e.g. phosphofructo kinase or glutamine synthetase.
2	Temperature-Jump/Relaxation experiment or Demonstration of induction of lactose metabolism in <u>E. coli</u> .

SIMON FRASER UNIVERSITYFACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 413 Title:
Physical Biochemistry Laboratory

Sub-title or Description:

Enzyme isolation and purification; the measurement of physical properties of macromolecules; studies with bio-membranes.

Credit Hours: 2

Vector Description: (0-0-4)

Pre-requisite(s): Biochemistry 411-2, Biochemistry 403-3 will ordinarily be taken concurrently, but may precede BICH 413-2.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: 10

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Yearly, every Spring

When course will first be offered: 76-1

III JUSTIFICATION

A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

Companion course to Biochemistry 403. By dropping Chemistry 427, no course content overlap will exist in any department.

B. What is the range of topics that may be dealt with in the course?

cf. course outline attached.

C. How does this course fit the goals of the program?

It is of fundamental importance to the Biochemistry Program.

D. How does this course affect degree requirements?

It is a core requirement of the Biochemistry Program.

- E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current descriptions on p. 245 and p. 260.

- F. What course, if any, is being dropped from the calendar if this course is approved?

None.

- G. What is the nature of student demand for this course?

There are approximately 80 students currently registered in the Biochemistry Program. In addition, Chemistry, Bio-Sciences and Kinesiology majors may wish to take this course as an elective.

- H. Other reasons for introducing this course?

The majority of the experiments deal with important techniques in modern biochemistry which have not been employed in current course offerings.

IV BUDGETARY AND SPACE FACTORS

- A. Which faculty will be available to teach this course?

A new faculty member will be required for which a position has already been budgeted and a search is in progress in the Chemistry Department.

- B. What are the special space and/or equipment requirements for this course?

Laboratory space is available in C9014. Quite a bit of new equipment will be required as this course represents a new subject area.

- C. Any other budgetary implications of mounting this course?

Not Known

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:

COURSE OUTLINE

BICH 413-2 Physical Biochemistry Laboratory

<u>No. of Labs</u>	<u>Experiment</u>
7	<u>Isolation of an Enzyme:</u> This may be an enzyme of the student's own choice; to involve: a) salting out and crystallization; b) purification by dialysis and chromatography (e.g. Sephadex, ion-exchange, adsorption etc.); c) enzyme assay and study of denaturation or disaggregation; d) analysis of purity by electrophoresis or ultracentrifugation.
1	<u>Osmotic Pressure Experiment:</u> With a given protein.
2	<u>Optical Methods Experiment:</u> Determination of helix-coil transition of a protein or "melting point" of a nucleic acid by a suitable method (e.g. ORD, CD or spectroscopy).
2	<u>Membrane Dissolution Experiment:</u> Dissolution of mitochondrial membrane with detergents and isolation of an enzyme complex or separation of membrane proteins by detergent-gel electrophoresis.
1	<u>Viscosity or Diffusion Experiment:</u> With a given protein.

SIMON FRASER UNIVERSITYFACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 420 Title:
Selected Topics in Contemporary
Biochemistry

Sub-title or Description:

A course of selected topics of contemporary interest to biochemists, such as a drug research, pollution, cancer research, genetic engineering, aging, memory research, etc.

Credit Hours: 3

Vector Description: (3-1-0)

Pre-requisite(s): Permission of the Biochemistry Committee. Upper levels standing (at least 60 semester hours) in a Faculty of Science degree program will usually be required.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: 10-20 (?)

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Yearly, at any semester

When course will first be offered: 75-1 (?)

III JUSTIFICATION

- A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

The course will be completely different from any of the current courses. It deals with many contemporary topics for which there will be no time for discussion in the core courses.

- B. What is the range of topics that may be dealt with in the course?

cf. sub-title or description above.

- C. How does this course fit the goals of the program?

It will apply many of the fundamental principles of the core program to issues of contemporary interest to biochemists and concerned citizens alike.

- D. How does this course affect degree requirements?

It will be available as an elective to majors and honours students in the upper division of any degree program in the Faculty of Science.

E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current descriptions on p. 245 and p. 260.

F. What course, if any, is being dropped from the calendar if this course is approved?

None.

G. What is the nature of student demand for this course?

Not known.

H. Other reasons for introducing the course.

Contemporary issues are often of extreme interest to students but receive little or no attention in courses. This course will attempt to present current approaches to these problems to upper division science students, in order to try and bridge the gap between theory and practical application of biochemical principles.

IV BUDGETARY AND SPACE FACTORS

A. Which faculty will be available to teach this course?

Members of the Biochemistry Committee, and any others seconded by Departments of the Faculty of Science and approved by the Chairman of the Biochemistry Committee.

B. What are the special space and/or equipment requirements for this course?

None.

C. Any other budgetary implications of mounting this course?

None.

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:



SIMON FRASER UNIVERSITYFACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 490 Title:
Directed Study in Advanced Topics
of Biochemistry

Sub-title or Description:

Directed reading in a topic chosen in consultation with a supervisor.

Credit Hours: 3

Vector Description: None

Pre-requisite(s): Permission of the Biochemistry Committee. Upper levels standing (with at least 75 semester hours) in the Biochemistry Program will usually be required.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: Not known.

Semster Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):
Available every semester

When course will first be offered: 74-3

III JUSTIFICATION

A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

Directed reading course dealing with biochemical topics.

B. What is the range of topics that may be dealt with in the course?

As decided upon by consultation between the student and a member or members of the Biochemistry faculty.

C. How does this course fit the goals of the program?

This course will provide an opportunity for interested students to thoroughly pursue an area of interest to them with the individual guidance of a member or members of the Biochemistry faculty.

D. How does this course affect degree requirements?

It will be available as an elective to majors or honours students in their 7th or later semester, with the permission of the Biochemistry Committee.

E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current descriptions on p. 245 and p. 260.

F. What course, if any, is being dropped from the calendar if this course is approved?

None.

G. What is the nature of student demand for this course?

Not known.

H. Other reasons for introducing the course.

N/A

IV BUDGETARY AND SPACE FACTORS

A. Which faculty will be available to teach this course?

Members of the Biochemistry Committee, and any others seconded by Departments of the Faculty of Science and approved by the Chairman of the Biochemistry Committee.

B. What are the special space and/or equipment requirements for this course?

None.

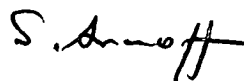
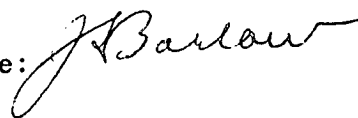
C. Any other budgetary implications of mounting this course?

None.

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:



SIMON FRASER UNIVERSITY

FACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Program: Biochemistry

Course Number: 491 Title:
Undergraduate Research

Sub-title or Description:

Laboratory research for preparation of a thesis for the honors degree in Biochemistry.

Credit Hours: 5

Vector Description: None

Pre-requisite(s): Permission of the Biochemistry Committee.

II ENROLMENT AND SCHEDULING

Estimated Enrolment: Not known.

Semester Offered (e.g. Yearly, every Spring; twice yearly, Fall and Spring):

Available every semester.

When course will first be offered: 74-3

III JUSTIFICATION

A. What is the detailed description of the course including differentiation from lower level courses, from similar courses in the same department and from courses in other departments in the University?

Research course dealing with biochemical topics.

B. What is the range of topics that may be dealt with in the course?

As decided upon by consultation between the student and a member or members of the Biochemistry faculty.

C. How does this course fit the goals of the program?

This course will provide an opportunity for interested students to pursue an area of research in biochemistry under the guidance of a member or members of the Biochemistry faculty. It is of fundamental importance for honours students in the degree program.

D. How does this course affect degree requirements?

It is required of honours students, and will be available to majors students in their 7th or later semester, with the permission of the Biochemistry Committee.

E. What are the calendar changes necessary to reflect the addition of this course?

Substitution of new Biochemistry Program (cf. attached) for current descriptions on p. 245 and p. 260.

F. What course, if any, is being dropped to reflect the addition of this course?

None.

G. What is the nature of student demand for this course?

Not known.

H. Other reasons for introducing the course.

N/A

IV BUDGETARY AND SPACE FACTORS

A. Which faculty will be available to teach this course?

Members of the Biochemistry Committee, and any others seconded by Departments of the Faculty of Science and approved by the Chairman of the Biochemistry Committee.

B. What are the special space and/or equipment requirements for this course?

The research equipment of the faculty member or members involved will be employed by the student.

C. Any other budgetary implications of mounting this course?

Support to the faculty member(s) involved for the purchase of special chemicals and equipment will amount to approximately \$200 per student.

APPROVAL - Faculty Curriculum Committee:

Faculty:

Senate:

P A R T I I

CHANGEOVER PROCEDURES

and

FREQUENCY OF COURSE OFFERINGS

BIOCHEMISTRY PROGRAM

A. Changeover from Old to New Program

Students who have declared a Majors or Honors degree program in Biochemistry or who will do so up to and including the Summer Semester, 1974, may either complete the program as outlined in the 1973-74 Calendar or make the changeover from the old to the new program as outlined below, whichever is most convenient. Students declaring a Majors or Honors degree program in Biochemistry during or after the Fall Semester, 1974, must follow the new degree program.

I. Majors Students

1. Courses unaffected. The following courses are required by both programs: Bio-Science 101-4*, 102-4*, 202-3, 401-3 and 402-3; Chemistry 104-3, 105-3, 115-2, 117-2, 251-3, 252-3, 256-2, 261-3, and 356-2; Mathematics 151-3, 152-3, and 253-4; Physics 101-3 and 102-3 (or 201-2, 202-2, and 204-2).
2. Courses requiring equivalents. The following courses or combinations of courses will be considered equivalent. If for some reason it is impossible to obtain any of these combinations see the Biochemistry faculty for counselling. You may take:

<u>EITHER</u>	<u>OR</u>
CHEM 232-3	CHEM 233-2
CHEM 421-3 <u>and</u> 422-3	BICH 301-3 <u>and</u> 302-3
CHEM 426-2 <u>and</u> 427-2	BICH 311-2 <u>and</u> 312-2
<u>One</u> of BISC 428-3, 438-3, <u>or</u> 448-3	BICH 411-2 <u>and</u> 413-2
3. Courses no longer required. The following courses will no longer be required. You may, of course, use them as electives: Bio-Science 201-3, 303-3, 305-3, and 315-3; Chemistry 457-3; Mathematics 352-2.
4. New course requirements. The following courses represent new requirements: Biochemistry 403-3 and Bio-Science 302-3.

*These courses are strongly recommended in the new program.

II. Honors Students

Honors students will follow the procedures as outlined for Majors students above with the following additions:

1. Courses requiring equivalents. You may take either Biochemistry 491-5 or one of Chemistry 481-5 or Bio-Science 498-3.
2. Courses no longer required. The following courses will no longer be required. You may, of course, use them as electives: Bio-Science 455-3 and 481-3; two of Chemistry 341-3, 351-3, 361-3; Physics 202-2 (if not taken in the Core), 206-2, and 233-2.

B. Frequency of Course Offerings

The following schedule will be maintained during the first two years of operation of the new Biochemistry Program. Subsequent years will follow the 1975-76 schedule.

Fall, 1974
BICH 301-3
BICH 311-2

Spring, 1975
BICH 302-3
BICH 312-2
BICH 403-3

Fall, 1975
BICH 301-3
BICH 311-2
BICH 411-2

Spring, 1976
BICH 302-3
BICH 312-2
BICH 403-3
BICH 413-2

Note: Biochemistry 490-3 and 491-5 will be available during all semesters. Biochemistry 420-3 will be available at least once a year.

P A R T I I I

ADMINISTRATIVE STRUCTURE

of the

BIOCHEMISTRY CURRICULUM COMMITTEE

FACULTY OF SCIENCE BIOCHEMISTRY COMMITTEE

J.S. Barlow	Associate Dean of Science Chairman
S. Aronoff	Dean of Science
A.H. Burr	Biological Sciences
I. Glen	Biological Sciences
G.R. Lister	Biological Sciences
P. Oloffs	Biological Sciences
J.E. Rahe	Biological Sciences
A.C. Oehlschlager	Chemistry
W.R. Richards	Chemistry
K.N. Slessor	Chemistry
A.M. Unrau	Chemistry
N.M.G. Bhakthan	Kinesiology
A.J. Davison	Kinesiology
R. Hallett	Undergraduate Student
A. Koat	Undergraduate Student

BIOCHEMISTRY CURRICULUM COMMITTEE

As passed by the Faculty of Science at its meeting of March 21, 1972.

I. Establishment of Committee

1. The Dean shall establish a Biochemistry Curriculum Committee consisting of all those members of the Faculty whose regular teaching responsibilities would or could include a course within the *Biochemistry* curricula (i.e., not including service courses for the Program, as provided by the several Departments), plus two students majoring in Biochemistry and at least one of whom must be an undergraduate. By consent of the majority of the Committee, and with the approval of the Dean, members of Simon Fraser University outside the Faculty of Science whose regular teaching responsibilities would or could be included in the *Biochemistry* curricula may also become members of this Committee. The composition shall be reviewed and, if necessary, altered by the Dean, at periods not to exceed three years and no more frequent than one.
2. Within this Curriculum Committee there shall be established by the Dean, with the approval of the Committee, an Executive Panel whose membership shall consist of four members of the Faculty of Science, each of whose *major* teaching responsibilities lie in the discipline of Biochemistry, plus two students majoring in Biochemistry and at least one of whom shall be an undergraduate. In addition, there will be a Chairman of this Panel, appointed by the Dean, who will also be the Chairman of the Committee.
3. The Executive Panel shall have the following responsibilities:
 - a. To report to the Faculty of Science on behalf of the Biochemistry Curriculum Committee.
 - b. To consider and bring forward reports on policy matters to the Faculty of Science as appropriate.
 - c. To recommend on behalf of the Biochemistry Curriculum Committee to the Faculty of Science courses for approval, candidates for degrees, scholarships and awards, and other such matters when empowered to do so by the Faculty of Science.
 - d. To act for the Biochemistry Curriculum Committee in all matters specified in this document in circumstances where a full meeting of the Committee is not possible. Any actions taken in this way shall be subject to ratification by the Faculty of Science.

4. The Dean of Science shall be a member *ex-officio* of the Executive Panel.
5. The Quorum for a meeting of the Curriculum Committee shall be half of its membership; and of the Executive Panel, the Chairman, 2 additional Faculty members and 1 student member.

II. Responsibilities of the Committee

1. It shall be a responsibility of the Curriculum Committee to develop an undergraduate curriculum in Biochemistry, and, if desirable, a graduate and professional one. The Biochemistry Committee shall establish no course beyond its immediate discipline. It shall seek to interdigitate its curriculum with those of existing Departments and shall depend upon them for service curricula. The Committee reports to the Faculty on matters of curricula.
2. The Committee will have the responsibility for all normal, non-budgetary matters relating to instruction, e.g. counseling and evaluation of students, developing seminars, short courses, lecture series, etc.

III. Relation of the Committee to Existing Departments

1. Faculty members of the Curriculum Committee will be members of existing Departments, or equivalent administrative units, without prejudice. New faculty will be appointed by a *Department* and seconded to the Committee for instructional purposes in whole or in part. The Department will be responsible for all administrative matters relating to a Faculty committee member, including tenure, promotion, contract renewal, and salary. Further, the Chairman of the Curriculum Committee shall provide annually at the appropriate time, or at other times upon request, to the Chairman of the Faculty member's Department, such evaluations and recommendations as the Department Chairman may require with regard to instructional performance and related matters.
2. All research matters of the Faculty member will be the responsibility of his Department.
3. It will be the responsibility of the Faculty member's Department to assist him in budgetary matters relating to instruction, e.g. the assignment of T.A.'s, purchase of instructional equipment, allocation of teaching space, etc.