

SIMON FRASER UNIVERSITY

S.76-183

MEMORANDUM

To..... SENATE

From..... SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Subject..... Proposed Changes - Department of
..... Physics

Date..... 15th December, 1976

Action taken by the Senate Committee on Undergraduate Studies at its meeting of December 14, 1976 gives rise to the following motion:

MOTION

That Senate approve, and recommend approval by the Board of Governors, the Physics proposed changes, as set forth in S.76--183 including:

1. Deletion of existing courses:

PHYS 201-2	Introductory Mechanics
PHYS 202-2	Introductory Optics
PHYS 203-2	Intermediate Mechanics
PHYS 204-2	Introductory Electricity and Magnetism
PHYS 205-2	Intermediate Electricity and Magnetism
PHYS 206-2	Introductory Thermal and Modern Physics

These courses presently constitute the lower division program for physical science majors who enter S.F.U. with Physics 12.

2. Approval of new courses to replace those deleted:

PHYS 120-3	Physics I
PHYS 121-3	Physics II
PHYS 211-3	Intermediate Mechanics
PHYS 221-3	Intermediate Electricity and Magnetism.

3. A change in emphasis in PHYS 101-3 and 102-3 that will involve greater use of calculus and of life science applications.

4. Approval of a new course for those students who require a prerequisite for PHYS 101-3 and 120-3:

PHYS 100-3	Introduction to Physics.
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5. Change in description and prerequisite for PHYS 101-3 and in description for PHYS 102-3 and in prerequisites for PHYS 131-2, 231-2, 232-3, 233-2, 234-2, 235-2, 236-1, 333-4, 341-4, 351-4, 381-4.
6. Change in lower division requirements for a Physics major and for Physics honors.

NOTE -- The response of other postsecondary institutions to these proposals is very positive since they will make it easier for students to transfer between institutions.



Daniel R. Birch

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SCUS 76-55

SIMON FRASER UNIVERSITY

MEMORANDUM

To: H. Evans, Registrar

Secretary of SCUS and Senate

Subject: CHANGES TO THE PHYSICS UNDERGRADUATE CURRICULUM

From: J.M. Webster, Dean

Faculty of Science

Date: December 7, 1976

Attached you will find a proposal to modify the lower division Physics program. This proposal was approved by the Faculty of Science at its meeting of Thursday, December 2, 1976 and is herewith forwarded to SCUS for consideration.

Please note that this proposal has necessitated corresponding changes in the calendar entries for Biophysics and Biochemistry, which are also being forwarded today, and to Chemistry, Chemical Physics and Mathematical Physics. The latter three will be discussed at a meeting of the Faculty of Science Undergraduate Curriculum Committee on Thursday, December 9, and at an extraordinary meeting of the Faculty of Science on Friday, December 10. It is anticipated that the documentation on these changes will be forwarded to your office by Friday afternoon, in the hope that they will be considered by SCUS at its meeting of Tuesday, December 14, 1976.

MOTION:

"That SCUS approve the changes to the Physics undergraduate curriculum, including course proposals for PHYS 100-3, 101-3, 102-3, 120-3, 121-3, 211-3 and 221-3, and forward to Senate for consideration."

J.M. Webster

/pel
Encl.

A PROPOSAL TO MODIFY THE LOWER DIVISIONPHYSICS PROGRAM

In recent years, the Physics Department has received a number of complaints concerning its lower division program. These complaints have been received from our own faculty members as well as from faculty and students from other departments. Some of the features that have generated the criticism are:

- (1) The Biology Department would like to see more life science applications treated and more emphasis placed upon the use of calculus in Physics 101 and 102.
- (2) Students coming out of B.C. High School Physics 12 are reluctant to enroll in University courses numbered 200 or higher.
- (3) The students proceeding from our 200 level courses are not well enough prepared for the third year physics courses.
- (4) At present there is no six unit sequence that provides a comprehensive coverage for students in the physical sciences.
- (5) Our program structure is unique in B.C. and many difficulties are encountered by transferring students.

In summary, our present course structure is cumbersome, poorly matched to our surroundings, and finally, our offerings appear to provide an inadequate service to other departments.

The present proposal is a revision of an original submission (June 1976) that was submitted to other departments for discussion and comments. Encouraging and constructive comments have been received from Biology, Chemistry, and Biochemistry and each suggestion has led to a revision of our original previous proposal. It is felt that the resulting course structure, that is outlined in the following, alleviates most of the concerns that are listed above.

OUTLINE OF PROPOSED CHANGES

1. (a) Deletion of present lower division courses:
Phys 201-2, 202-2, 203-2, 204-2, 205-2, 206-2

These courses presently constitute our lower division program for physical science majors who enter SFU with Physics 12.

(b) Replace the courses listed under (a) with
Phys 120-3, 121-3, 211-3, 221-3
2. A change in emphasis in Phys 101-3 and Phys 102-3 that will involve a greater use of calculus and the discussion of additional life science applications. This necessitates having a physics prerequisite for Phys 101-3.
3. The introduction of Physics 100-3, a course designed for students with a relatively weak physics background. This course will serve as a prerequisite for Physics 101-3 and 120-3.

If frequency of offerings, present and proposed, are compared, the net effect of the proposal is to add seven semester hours to the present annual teaching load of the Physics Department. This seven hours is expected to be recovered by reducing the number of times per annum that some of our upper level courses are offered. (Physics 351-4 and 332-3 are likely candidates in this respect.) Thus no additional faculty should be required to mount the revised program. Additional TA's will be required however if the enrollment in Physics 100-3 is large.

The lower division course structure that is outlined in this proposal is similar to that at all the other post secondary institutions in B.C. This feature should greatly simplify problems for transferring students, both those coming to SFU and those preceeding from SFU to another institution. (See criticism number 5.) A description of the proposed new courses and a detailed rationale is presented in the following sections of this submission.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: PHYSICS

Abbreviation Code: PHYS Course Number: 100 Credit Hours: 3 Vector: (3-1-0)

Title of Course: Introduction to Physics

Calendar Description of Course: A course for students with a relatively weak background in physics. An introduction to fundamental concepts such as force, work, energy, heat, light, and electricity, and the use of trigonometry, graphs and vectors in Physics.

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions): B.C. High School Math 12 or Math 100-3 (may be taken concurrently). Students who have completed B.C. High School Physics 12 or any further physics course may not normally take this course for credit.

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? Every semester.

Semester in which the course will first be offered? 77-2

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

3. Objectives of the Course

Will bring students with a weak background to a level sufficient for entry into the first year physics program. The course should also be of interest to non-science students.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual Nil (See attached rationale.)

Space

Equipment

5. Approval

Date: 18 November 1976

A. E. Canyon
Department Chairman

[Signature]
7/12/76
Dean

14 Dec. 76

[Signature]
Chairman, SCUS

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

PHYSICS 100-3

Rationale

The introduction of Physics 100-3 is necessitated by the stipulation of a Physics prerequisite for Physics 101-3. There are, however, additional reasons for having a "make-up" course in Physics. Many students enter Physics 101-3 with a very weak background in physics. These students are required to do an excessive amount of work merely to "keep up" in the course. This is a very discouraging experience and some are required to make several attempts before completing their lower division physics requirement, sometimes in their final undergraduate semester. Physics 100-3 should help to ease the task faced by students with a weak background, with resulting benefits for all concerned.

Finally, the relatively few prerequisites associated with Physics 100-3 will make it available to many students outside the faculty of science.

JCI/mgj

PHYSICS 100

COURSE OUTLINE

PART I -- DYNAMICS

1. Kinematics -- introduction to velocity and acceleration with emphasis on the use of graphs -- 5 lectures.
2. Force -- introduction to concept of force with use of vectors. Will necessarily involve extensive use of trigonometry -- 4 lectures.
3. Newtons Laws of Motion and the equilibrium of a particle. Gravitation. 3 lectures.
4. Work, energy, power, and momentum and associated conservation laws -- 5 lectures.

PART II -- HEAT

1. Temperature, heat, units, calorimetry and thermal conductivity -- 3 lectures.
2. First law of thermodynamics and properties of gases, liquids, and solids -- 3 lectures.

PART III -- ELECTRODYNAMICS

1. Coulomb's law, electric field, potential, electric currents, ohm's law, single loop circuits -- 5 lectures.
2. Magnets, magnetic effects of currents, induction -- 2 lectures.

PART IV -- MODERN PHYSICS

1. Electron, photoelectric effect, atomic structure, energy levels and spectra X-rays, nucleus, radioactivity, fission, fusion -- 4 lectures.

TOTAL -- 34 LECTURES

POSSIBLE TEXTS "Adventures in Physics" -- P.E. Smith & A.S. Howard
"Invitation to Physics" -- K. Greider

SENATE COMMITTEE ON UNDERGRADUATE STUDIESDescription and
prerequisite change only~~NEW COURSE PROPOSAL FORM~~1. Calendar InformationDepartment: PHYSICSAbbreviation Code: PHYS Course Number: 101 Credit Hours: 3 Vector: (3-1-0)Title of Course: GENERAL PHYSICS I

Calendar Description of Course: A general survey course for life science students.
Statics, kinematics, dynamics, work, energy and power, simple harmonic motion, acoustics, and properties of matter, with applications to the life sciences.

Nature of Course Lecture/TutorialPrerequisites (or special instructions): B.C. High School Physics 12 or Physics 100-3Corequisite: MATH 154-3 or MATH 151-3 (or MATH 150-3 with the permission of the Department) must precede or be taken concurrently.What course (courses), if any, is being dropped from the calendar if this course is approved: Nil2. SchedulingHow frequently will the course be offered? Every semesterSemester in which the course will first be offered? ContinuesWhich of your present faculty would be available to make the proposed offering possible? All.3. Objectives of the Course

See attached.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual Nil

Space

Equipment

5. ApprovalDate: 18 November 1976

A. E. Curry
Department Chairman

7/12/76
[Signature]
Dean

14 Dec. 76

[Signature]
Chairman, SCUS

CHANGE IN CALENDAR ENTRY ONLY

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Description change
only

~~NEW COURSE PROPOSAL FORM~~

1. Calendar Information

Department: PHYSICS

Abbreviation Code: PHYS Course Number: 102 Credit Hours: 3 Vector: (3-1-0)

Title of Course: GENERAL PHYSICS II

Calendar Description of Course: A general survey course for life science students. Heat, kinetic theory, temperature, thermodynamics, electricity, magnetism, optics, and atomic physics, with applications to the life sciences.

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions): Phys 101-3

Corequisite: Math 155-3 (or Math 152-3) must precede or be taken concurrently.

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? Every semester.

Semester in which the course will first be offered? Continues.

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

3. Objectives of the Course

See attached.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual Nil

Space

Equipment

5. Approval

Date: 18 November 1976

7/12/76

14 Dec. 76

A. E. Cingon
Department Chairman

[Signature]
Dean

[Signature]
Chairman, SCUS

PHYSICS 101-3

PHYSICS 102-3

Rational for Proposed Changes

During the last five years these courses have been taught essentially as non-calculus courses. Calculus has been used to some extent by most instructors during the lectures but questions have been posed in such a manner that calculus was not required to successfully complete examinations. (See criticism number 1). In addition, although an attempt has been made to include life science applications in the course, our efforts need to be increased in this direction. (See criticism number 1).

The inclusion of a physics prerequisite for Physics 101-3 should enable the inclusion of additional applications and the use of calculus to a greater extent in both Physics 101-3 and Physics 102-3. It is hoped that these courses will then provide a more suitable treatment for life science students. The topic selection will remain essentially the same with an emphasis on mechanics, optics, and electricity, and related applications to the life sciences.

Some departments may wish to specify that Math 151-3 precede Physics 101-3 but the Physics Department feels that a calculus corequisite is sufficient. In fact, if Physics 101-3 and Math 151-3 (or 154-3) are taken concurrently, the physics applications can aid in the mathematical learning and vice versa.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: PHYSICS

Abbreviation Code: PHYS Course Number: 120 Credit Hours: 3 Vector: (3-1-0)

Title of Course: PHYSICS I

Calendar Description of Course: A general survey course for students who plan to take higher level courses in physics. Statics, kinematics, dynamics, work, energy, simple harmonic motion, waves, and thermodynamics.

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions): B.C. High School Physics 12 or Physics 100-3.
Corequisite: Math 151-3 (or 154-3) must precede or be taken concurrently.

What course (courses), if any, is being dropped from the calendar if this course is approved: Physics 201-2 and 206-2 approximately (see attached rationale).

2. Scheduling

How frequently will the course be offered? Every semester.

Semester in which the course will first be offered? 77-3.

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

3. Objectives of the Course

To provide, in conjunction with Physics 121, a comprehensive coverage of introductory physics for students in the physical sciences.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual Nil

Space

Equipment

5. Approval

Date: 18 November 1976

A. E. Curzon
Department Chairman

7/12/76
[Signature]
Dean

14/12/76
[Signature]
Chairman, SCUS

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

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: PHYSICS

Abbreviation Code: PHYS Course Number: 121 Credit Hours: 3 Vector: (3-1-0)

Title of Course: PHYSICS II

Calendar Description of Course: A general survey course for students who plan to take higher level courses in physics. Electricity, magnetism, waves, optics, special relativity, quantum physics.

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions): Physics 120-3

Corequisite: Math 152-3 (or 155-3) must precede or be taken concurrently.

What course (courses), if any, is being dropped from the calendar if this course is approved: Physics 202-2 and Physics 204-2. approximately (see attached rationale).

2. Scheduling

How frequently will the course be offered? Every semester.

Semester in which the course will first be offered? 77-3.

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

3. Objectives of the Course

To provide, in conjunction with Phys 120, a comprehensive coverage of introductory physics for students in the physical sciences.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual Nil

Space

Equipment

5. Approval

Date: 18 November 1976

A. S. Canyon
Department Chairman

[Signature]
7/12/76
Dean

14/12/76
[Signature]
Chairman, SCUS

PHYSICS 120-3

PHYSICS 121-3

Rationale

These two courses are intended to provide a comprehensive coverage of introductory Physics for students who plan to proceed to higher level courses in Physics. (See criticism numbers 2 and 4.) The topic selection will be broad (similar to that of Physics 101-3 and Physics 102-3) but the areas concerned with wave motion, optics, thermodynamics, and modern physics (including special relativity) will be emphasized. The emphasis is to be placed on these particular topics because of their proposed deletion from the second year of the Physics program.

Physics 120-3 replaces most of Phys 201-2 and parts of Phys 202-2 and 206-2. Physics 121-3 replaces most of Phys 204-2 and parts of Phys 202-2 and 206-2. Thus the equivalences listed on the course proposal forms are only approximate and are meant only to indicate the predominant previous source of the material.

JCI/mgj

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

Department: PHYSICS

1. Calendar Information

Abbreviation Code: PHYS Course Number: 211 Credit Hours: 3 Vector: (3-1-0)

Title of Course: INTERMEDIATE MECHANICS

Calendar Description of Course: An intermediate mechanics course covering kinematics, dynamics, energy, momentum, free, forced and damped oscillations, rigid body motion, gravitation.

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions): Phys 121-3 (or Phys 102-3)

Corequisite: Math 253-4 must precede or be taken concurrently.

What course (courses), if any, is being dropped from the calendar if this course is approved: Phys 203-2. approximately (see attached rationale).

2. Scheduling

How frequently will the course be offered? Twice per annum.

Semester in which the course will first be offered? 77-3.

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

3. Objectives of the Course

To provide the student with the background in mechanics that is essential for success in upper division physics.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual Nil

Space

Equipment

5. Approval

Date: A. E. Curzon

18 November 1976
Department Chairman

7/12/76
[Signature]
Dean

14/12/76
[Signature]
Chairman, SCUS

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

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

Department: PHYSICS

1. Calendar Information

Abbreviation Code: PHYS Course Number: 221 Credit Hours: 3 Vector: (3-1-0)

Title of Course: INTERMEDIATE ELECTRICITY AND MAGNETISM

Calendar Description of Course: Electrostatics, magnetostatics, capacitance, inductance, DC and AC circuits, concepts of electric and magnetic fields, Maxwells equations.

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions): Phys 121-3 (or Physics 102-3)

Corequisite: Math 253-4 must precede or be taken concurrently.

What course (courses), if any, is being dropped from the calendar if this course is approved: Phys 205-2. approximately (see attached rationale).

2. Scheduling

How frequently will the course be offered? Twice per annum.

Semester in which the course will first be offered? 77-3.

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

3. Objectives of the Course

To provide the student with the background in electromagnetism that is required for upper division physics.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual Nil

Space

Equipment

5. Approval

Date: A. P. Canyon

7/12/76

14/12/76

18 November 1976
Department Chairman

[Signature]
Dean

[Signature]
Chairman, SCUS

PHYSICS 211-3

PHYSICS 221-3

Rationale

Physics 211-3 replaces Phys 203-2 and a small part of Phys 201-2. Physics 221-3 replaces all of Phys 205-2 and a small part of Phys 204-2. It is anticipated, however, that the material that is being replaced will not require the full three credit hours that is associated with each of the new courses. The remaining time in each of the new 200 level courses can be utilized to enable students to attain an added degree of proficiency that will leave them better prepared for their third year in Physics.

JCI/mgj

CHANGE IN PREREQUISITE ONLY
SENATE COMMITTEE ON UNDERGRADUATE STUDIES

~~NEW COURSE PROPOSAL FORM~~

1. Calendar Information

Department: PHYSICS

Abbreviation Code: PHYS Course Number: 131 Credit Hours: 2 Vector: (0-0-4)

Title of Course: GENERAL PHYSICS LABORATORY

Calendar Description of Course:

No change.

Nature of Course Laboratory

Prerequisites (or special instructions): Physics 102-3 or Physics 121-3 should precede or be taken concurrently; or by permission of the department.

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

2. Scheduling

How frequently will the course be offered?

Semester in which the course will first be offered?

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

3. Objectives of the Course

N/A

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual

N/A

Space

Equipment

5. Approval

Date: A. E. Cuyper

[Signature]

14/12/76

18 November 1976
Department Chairman

7/12/76
Dean

[Signature]
Chairman, SCUS

CHANGE IN PREREQUISITE ONLY
SENATE COMMITTEE ON UNDERGRADUATE STUDIES

~~NEW COLLEGE PROPOSAL FORM~~

1. Calendar Information

Department: PHYSICS

Abbreviation Code: PHYS Course Number: 231 to 236 inclusive Credit Hours: Vector:

Title of Course: INTRODUCTORY PHYSICS LABORATORY

Calendar Description of Course:

No change.

Nature of Course Laboratory

Prerequisites (or special instructions): Physics 121-3 (or 102-3) and B.C. High School Physics 12; or Physics 121-3 (or 102-3) and Physics 131-2. A total of no more than six semester hours of these courses may be taken for credit.

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

2. Scheduling

How frequently will the course be offered?

Semester in which the course will first be offered?

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

3. Objectives of the Course

N/A

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual

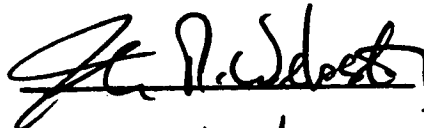
N/A

Space

Equipment

5. Approval

Date: A. E. Canyon



14 / 12 / 76

18 November 1976
Department Chairman

7/14/76
Dean


Chairman, SCUS

LOWER DIVISION PHYSICS PROGRAM

CALENDAR REVISIONS

The proposed modifications to the lower division physics program would require revision of the calendar entries under "Required Courses for the Physics Major" (page 385 of 1976-77 Calendar) and "Physics Honors" (page 386 of 1976-77 Calendar). Under both these entries the listings for the first four levels should be revised to read:

Levels 1 and 2 - Phys 120-3, 121-3
Math 151-3, 152-3, 232-3
Chem 104-3, 105-3
9 semester hours of electives

Levels 3 and 4 - Phys 211-3, 221-3, 231-3, 232-3
Math 253-4, 310-3
11 semester hours of electives

Please add the following notes to each entry (Major and Honors).

Students should note:

- (1) The prerequisites for the second year laboratory courses (Phys 231-3 to Phys 236-1) include either B.C. High School Physics 12 or Phys 131-2.
- (2) The six semester hours of second year laboratory that are required may be taken in groupings other than 231-3, 232-3. For example, if the student found it convenient he could elect the sequence Phys 233-2, 234-2, 235-2.

The prerequisites for the following upper division courses should be revised to read as indicated.

- PHYS 333-4 Prerequisites: Phys 102-3 (or 121-3)
- PHYS 341-4 Prerequisites: Math 253-4 and Phys 102-3 or
121-3 or 206-2
- PHYS 351-4 Prerequisites: Math 253-4 and Phys 221-3
(or 205-2)
- PHYS 381-4 Prerequisites: Phys 221-3 (or 205-2)
Math 310-3 should precede or be taken concurrently.