

SIMON FRASER UNIVERSITY

S.75-184

MEMORANDUM

To.....SENATE

From.....SENATE COMMITTEE ON UNDERGRADUATE

STUDIES

Subject.....NEW COURSE PROPOSAL -
PHYS 131-2

Date.....NOVEMBER 13, 1975

- MOTION 1: "That Senate approve and recommend approval to the Board of Governors, as set forth in S.75-184, PHYS 131-2 - General Physics Laboratory."
- MOTION 2: "That Senate approve the offering of PHYS 131-2 - General Physics Laboratory first in the Summer Semester 1976-2."

SIMON FRASER UNIVERSITY

S.75-184

MEMORANDUM

To SENATE

From SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Subject New Course Proposal - PHYS.131-2 Date November 13th, 1975

Action taken by the Senate Committee on Undergraduate Studies at its meeting of November 12th, 1975 gives rise to the following motion:

MOTION 1

That Senate approve and recommend approval to the Board of Governors PHYS.131-2 - General Physics Laboratory.

MOTION 2

That Senate approve the offering of PHYS.131-2 - General Physics Laboratory first in the Summer semester, 1976 *


Daniel R. Birch

:ams

att.

* Offering will be contingent on approval of resources.
Approval of the course by SCUS and Senate does not imply allocation of resources.

SCUS 75-49

SIMON FRASER UNIVERSITY

MEMORANDUM

To..... H. Evans
Secretary of SCUS
Subject..... NEW COURSE PHYS 131-2

From..... S. Aronoff *S. Aronoff*
Dean of Science
Date..... October 24, 1975

At its meeting of October 16, 1975, the Faculty of Science passed the following motion:

"That the Faculty approve the proposal for a new course, PHYS 131-2, General Physics Laboratory, and forward to SCUS for consideration."

This course is intended to prepare students in Physics for 200-level lab courses, and also to simplify a problem with regard to transfer credit from other institutions. It will result in no change to the 200-level lab course.

The supporting documentation for this proposal is attached.

/pel

Encl.

SIMON FRASER UNIVERSITY

F-75-7

MEMORANDUM

To..... Faculty Members

From..... E. Lambert

..... Faculty of Science

..... Faculty Secretary

Subject..... New Course Proposal PHYS 131-2

Date..... October 6, 1975

At its meeting of August 6, 1975 the Undergraduate Curriculum Committee of the Faculty of Science discussed a proposal for a new course, PHYS 131-2, "General Physics Laboratory" which would be a first year lab offering students experience with the equipment and practices used in Physics experiments. It was noted that in the future the Physics Department might require that students take PHYS 131 in conjunction with PHYS 102, but that this would not be necessary at the present time.

The Committee passed the following motion unanimously:

"That the Committee approve new course proposal PHYS 131-2 'General Physics Laboratory' and forward to Faculty for consideration."

The Department requests that PHYS 131 be scheduled for offering in the Summer Semester 76-2.

Supporting documentation for this proposal is attached.

E. Lambert

/pel
Encl.

SIMON FRASER UNIVERSITY

MEMORANDUM

To.....Dr. S. Aronoff

From.....Dr. A.E. Curzon, Chairman

.....Dean of Science

.....Department of Physics

Subject.....New Course P131-2

Date.....8 July 1975

The attached documentation describes a proposed new laboratory course, P131-2. The course has been approved by the Physics Department and is being submitted for consideration by the faculty. It is hoped that the course can be first offered in the Summer Semester of 1976.

AEC/mgj

A.E. Curzon

NEW COURSE PROPOSAL FORMCalendar InformationDepartment: PHYSICSAbbreviation Code: PHYS Course Number: 131 Credit Hours: 2 Vector: (0-0-4)Title of Course: GENERAL PHYSICS LABORATORYCalendar Description of Course:

Elementary experiments in optics, electricity, mechanics and heat, that are designed to augment General Physics I and II.

Nature of Course LaboratoryPrerequisites (or special instructions):

Physics 102, or equivalent, 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: None

2. Scheduling

How frequently will the course be offered? Two or three times per annum in accordance with demand.

Semester in which the course will first be offered? Summer 1976

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

3. Objectives of the Course

To familiarize the student with the basic instrumentation that is commonly used in making physical measurements. To provide the student with experience in carrying out, and interpreting the results of quantitative physical experiments with due recognition of systematic and statistical errors of observation. To illustrate in practical terms the basic physical principles presented in the first year Physics courses.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty The course can be mounted on a temporary basis with the present faculty and with the assistance of post doctoral fellows.

Staff NilLibrary NilAudio Visual Nil

Space Nil--Adoption of this course will entail complete utilization of present space.

Equipment \$23,790.005. Approval

Date: 8 July 1975 17 Oct. 75

A. E. Curzon
Department Chairman

S. R. Smith
Dean

Chairman, SCUS

INTRODUCTION

The laboratory courses presently offered by the Physics Department are at the 200-, 300- and 400- level. Over the years it has become increasingly clear that a 100-level physics laboratory course should be included as an integral part of the course offerings in physics. A 100-level Physics laboratory would enhance the success of students in our upper level laboratories, provide a much needed experience and background for all first year science students and at the same time help to alleviate many of the transfer credit problems that we have encountered in recent years.

When the physics programme was originally set-up, we felt that university physics laboratory courses should be postponed until students had taken a first-year physics course: then more interesting and more sophisticated experiments could be offered to students in a 200-level laboratory (this idea was probably unique in Canadian universities). Such an approach has been successful and stimulating for exceptional students, however difficulties have been experienced by the vast majority of others, most of whom lack adequate high-school physics laboratory training. The department now recognizes that there is a definite need for a first-year university physics laboratory as a

pre-requisite to our 200-level laboratory.

The inclusion of a first-year physics laboratory will also provide our students with a background that is more comparable with that obtained by students from other universities and colleges.

To the best of our knowledge all the post secondary institutions in British Columbia provide their first year science students with Physics laboratory experience. We have also found from a brief survey that at most Canadian universities a physics laboratory is part of the undergraduate requirement in science. This seems to make good sense to us, considering the increasing use of sophisticated instrumentation in all of the natural sciences. Also it is thus clear that a first year physics laboratory course at SFU would help to alleviate many actual and anticipated transfer credit problems.

We realize that a considerable fraction of the students taking a first year physics laboratory would be those majoring in the biological sciences, and intend to offer laboratory experiments that will be both interesting and useful to such students. To this end the attached list of experiments was drawn up with the assistance of Dr. Belton and Dr. Burr of the Department

of Biological Sciences. It is hoped that further additions and modifications will occur as result of consultation with other members of the faculty of science.

In summary, the physics department recognizes the need for a first-year physics laboratory course. The introduction of such a course would enable SFU Science students to obtain a background in physics comparable to that provided by the vast majority of Canadian Universities and Colleges. Physics 131-2 would also adequately prepare inexperienced physics students for their second year and would simplify the granting and obtaining of transfer credit for incoming and outgoing students respectively.

We recommend that it consist of one 4 hour session per week, and that it be designated

Physics 131-2, General Physics Laboratory. We also recommend that physics 131-2 be taken concurrently with Physics 102-3.

Object of the First-Year Physics Laboratory

The object of the laboratory includes the following:

- (i) To familiarize the student with the basic instrumentation that is commonly used in making physical measurements.
- (ii) To offer the student experience in carrying out quantitative physical experiments, with due recognition of systematic and statistical errors of observation.
- (iii) To illustrate in practical terms the basic physical principles presented in our first year physics courses, particularly Physics 102-3.

Calendar Description

Physics 131-2. General Physics Laboratory.

Experiments in optics, electricity, mechanics, and heat.

(0-0-4)

Prerequisite: Physics 102-3 must precede or be taken concurrently.

Physics 131-3. Introductory Physics Laboratory.

List of Experiments

1. Refraction of Light

Ray tracing to verify Snells Law and determine refractive index of glass slab; ray tracing for a glass prism and a water prism, find the refractive indices by minimum deviation.

2. Thin Lenses

Determination of the focal lengths of converging and diverging lenses; verification of the thin lens formula, magnification.

3. The Compound Microscope

Includes setting up a simple compound microscope on an optical rail, location of images, determination of magnification and comparison with simple theory; demonstration of the basic components of a modern optical microscope.

4. The Spectrometer

Use of the prism and grating spectrometer, including observations on the spectral distribution from tungsten, sodium and mercury lamps; measurement of wavelength.

5. Periodic Motion

Oscillation of a simple pendulum is observed and compared with the theory for small displacements and g is determined; centripetal force is measured using a conical pendulum.

6. Calorimetry

Measurement of the specific heat of copper; the latent heat of fusion of ice; use and calibration of a thermocouple.

7. D.C. Measurements

Resistance measurements using a voltmeter and ammeter, resistance in series and parallel; the EMF and terminal voltage of a battery using a slidewire potentiometer.

8. Alternating Current and the Oscilloscope

Principles of operation of an oscilloscope, observation of various waveforms; the half-wave rectifier; AC and DC meters; decay of current in a capacitor-resistor circuit.

9. Particle Size by Diffraction

Determination of mean particle size of, for example, lycopodium powder by means of laser diffraction; comparison with measurement of mean particle size with a microscope, and also by weighing a large quantity of powder.

10. Polarized Light

Production of polarized light; verification of the Law of Malus; determination of refractive index from the Brewster angle for glass; measurement of optical rotation.

11. Resolution of a Microscope and the Principles of Phase Contrast

Experimental determination of the resolution of an objective lens using a grating as object and comparison with simple theory; use of the phase contrast technique to observe a phase grating object. Both of these experiments use a simple set-up on an optical rail.

12. Particle Counting

Determination of the characteristics of a Geiger tube; the absorption of β particles in aluminum and other materials.

13. Measurement of Surface Tension of a Liquid

Two techniques are used: the capillary tube method and measurement of the angle of contact; measurement of variation in surface tension with temperature using Jaeger's method.

14. Wave Motion and Standing Waves

Observation of standing waves in wires and air.

References

For most experiments the textbook used for Physics 101 and 102 will be adequate.

For experiments 9 and 11, supplemental notes will be provided in the laboratory.

For experiment 13, "Experimental Physics for Students", R.M. Whittle and J. Yarwood, Chapman and Hall, 1973, p. 172.