

SIMON FRASER UNIVERSITY

S. 84-30

MEMORANDUM

To..... SENATE

From..... SENATE COMMITTEE ON ACADEMIC PLANNING
SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Subjed..... CURRICULUM CHANGES - PHYSICS.

Date..... APRIL 26, 1984.

Actions undertaken by the Senate Committee on Undergraduate Studies at its meeting of March 20, 1984 and by the Senate Committee on Academic Planning at its meeting of April 4, 1984, gives rise to the following motions:

MOTION 1:

"That Senate approve and recommend approval to the Board of Governors, as set forth in S.84-30 , the discontinuance of the Biophysics Program and deletion of the program from the Calendar."

It is intended that this be effective from September 1, 1984.

MOTION 2:

"That Senate approve and recommend approval to the Board of Governors, as set forth in S.84-30 , deletion of the following courses:

PHYS 333-4 - Introduction to Instrumentation in the Life Sciences
PHYS 433-3 - Biophysics Laboratory
PHYS 482-3 - The Physics of Biological Membranes and Membrane Models
PHYS 483-3 - Topics in Mathematical Biophysics"

Note: The deletion of these courses follows from the discontinuation of the Biophysics Program.

Action undertaken by the Senate Committee on Undergraduate Studies at its meeting of March 20, 1984 gives rise to the following motion:

MOTION: "That Senate approve and recommend approval to the Board of Governors as set forth in S.84-30 , the proposed new courses

PHYS 324-3 - Electromagnetics
PHYS 365-3 - Semiconductor Device Physics
PHYS 455-3 - Laser Physics"

Subject to the approval of courses by Senate and the Board of Governors the Senate Committee on Undergraduate Studies approved waiver of the normal two-semester time lag requirement to permit first offering of PHYS 342-3 in Fall 84-3 and of PHYS 365-3 in Spring 85-1.

FOR INFORMATION:

Acting under delegated authority at its meeting of March 20, 1984, the Senate Committee on Undergraduate Studies approved prerequisite change as follows:

Add to PHYS 325 "Students with credit for PHYS 324 may not take PHYS 325 for further credit."

SIMON FRASER UNIVERSITY

MEMORANDUM

SCUS 84-8

H. Evans
.....
Secretary to Senate
.....
Subject..... FACULTY OF SCIENCE
RECOMMENDATIONS TO SCUS

From..... P. Dobud
Administrative Assistant
..... to the Dean of Science.....
Date..... March 6, 1984.....

The following items, described in the enclosed documentation, have been approved by the Faculty of Science. Could you please place these items on the Agenda of the next SCUS meeting for consideration and approval?

(a) Department of Physics

- (i) That the following courses be removed from the course offerings in Physics:

PHYS 001-3 The Nature of Physical Laws
PHYS 333-4 Introduction to Instrumentation in the Life Sciences
PHYS 433-3 Biophysics Laboratory
PHYS 482-3 The Physics of Biological Membranes and Membrane Models
PHYS 483-3 Topics in Mathematical Biophysics

(Paper F-84-1)

- (ii) That the following new courses be approved as part of the Physics course offerings:

PHYS 324-3 Electromagnetics
PHYS 365-3 Semiconductor Device Physics
PHYS 455-3 Laser Physics

(Paper F-84-2)

(b) Biophysics Program

That the Biophysics Program be deleted from the Calendar.

(Paper F-84-3)

.../

SIMON FRASER UNIVERSITY

F-84-3

MEMORANDUM

To.....J. F. Cochran, Dean.....
.....Faculty of Science.....
Subject....Biophysics Programme.....

From.....R. F. Frindt, Chairman.....
.....Faculty of Science.....
.....UGCC.....
Date....February 22, 1984.....

Because of low enrolments the Physics Department wishes to drop the four upper level Biophysics courses that are currently listed in the Calendar. Dr. Colbow, the Chairman of the Biophysics Programme has proposed that these courses be replaced by four Physics courses. After considering the effect this change would have on the Biophysics Programme, along with a discussion with the Biophysics Committee, the Faculty of Science Undergraduate Curriculum Committee recommends that the Biophysics Programme be deleted from the Calendar.

The arguments for retaining the programme are made in Dr. Colbow's memo of September 21, 1983.

The Committee felt that the structure of interdisciplinary programmes should be such that the disciplines were tied together or related in some reasonable way, as is done for example by the Biochemistry courses in the Biochemistry Programme and the Physical Chemistry and other courses in the Chemical-Physics Programme. For fields as different as Physics and Bio sciences it was felt that the four upper level Biophysics courses were vital and without them the grey area between the two disciplines was not properly addressed and the disciplines were not tied together in a reasonable way.

The committee felt that prospective students would be mis-led if the Biophysics programme were retained in the Calendar.

R. Frindt

R. F. Frindt

MEMORANDUM

Dean of Science

From..... K. Colbow

Chairman, Biophysics Committee

Subject..... Biophysics Report

Date..... 21 September 1983

Biophysics Program

The low enrollment in Biophysics led us to considerations of deleting the Program. However, it is strongly felt that it is desirable to keep the program, but change the course offerings such that no additional resources are required. A proposal to this effect has been submitted to the Science Undergraduate Committee.

Our Biophysics Program provides an option in highschool advisory booklets, which is not available at U.B.C. and the University of Victoria. Good students find the program very useful, since it leaves more options at time of graduation than most other Science Programs. (2 recent graduates are now finishing Ph.Ds on NSERC Scholarships at SFU in Chemistry and Biology/Physics, respectively). Weaker students find it hard to handle simultaneously 2nd year Physics and Biology; and the students are advised accordingly.

Recently there has been a new revival of undergraduates who declared their intention to proceed with Biophysics.



K. Colbow

KC/bem

SIMON FRASER UNIVERSITY

MEMORANDUM

~~U-83-5~~

To..... Prof. A. Sherwood Chairman Fac. Science Undergrad. Curr. Committee	From..... K. Colbow Dept. of Phys. Chairman, Biophysics Committee
Subject..... Biophysics Program	Date..... Feb. 22, 1983

Please forward the following recommendations for the next calender entry for the Biophysics Program:

- | | |
|---|--|
| <p>1. <u>Drop Phys. 333-4</u>
(instead present alternate:</p> | <p>Introd. to Instrumentation in the Life Sciences
Phys. 331-3 Electronics Laboratory)</p> |
| <p>2. <u>Drop Phys. 482-3</u>
<u>Drop Phys. 483-3</u>
<u>Drop Phys. 433-3</u>
and replace with:</p> | <p>The Physics of Biological Membranes and Membrane Models
Topics in Mathematical Biophysics
Biophysics Laboratory
Phys. 326-3 Electronics and Instrumentation.
Phys. 355-3 Optics
Phys. 332-3 Intermediate Phys. Laboratory</p> |

Rational: Lack of enrollment in Phys. 333-4, 482-3, 483-3 and 433-3 makes is advisable not to offer these courses any longer in the calendar (they were in effect not given in the last 2 years).

The content under Phys. 482-3 and/or 483-3 will be offered when demand requires under Phys. 493-3 (Special Topics). Phys. 331-3 and Phys. 332-3 will be suitable Laboratory replacements for the dropped Lab courses Phys. 333-4 and Phys. 433-3. Phys. 326-3 and Phys. 355-3 are co-requisites to the new lab courses.

The new changes will save resources with the minimum of detriment to the program.

Kenneth Colbow
K. Colbow

KC/mlb

Registrar's Note - Science did not approve this proposal.

SIMON FRASER UNIVERSITY

SCUS 84-

MEMORANDUM

To..... Dr. H.F. Frindt, Chairman
 Faculty of Science UGCC
 Subject..... PHYSICS CURRICULUM

From..... J.C. Irwin, Chairman
 Department of Physics
 Date..... 1983-12-16

Dear Bob:

The following course deletions and new course proposals were recently approved by the Physics Department. They are being submitted for consideration by the Faculty of Science UGCC and approval by the Faculty of Science:

A. COURSE DELETIONS

We wish to delete the following courses from our present offerings primarily because of small enrolments:

- (1) Physics 001-3. The Nature of Physical Laws
- (2) Physics 433-3. Biophysics Laboratory.
- (3) Physics 482-3. The Physics of Biological Membranes and Membrane Models.
- (4) Physics 483-3. Topics in Mathematical Biophysics.
- (5) Physics 333-4. Introduction to Instrumentation in the Life Sciences.

B. We wish to add the following to our list of course offerings (new course proposals attached):

- (1) Physics 324-3. Electromagnetics.
- (2) Physics 365-3. Semiconductor Device Physics.
- (3) Physics 455-3. Laser Physics.

These three courses are intended primarily for Engineering Science students and will constitute an important part of the Engineering Science Program. It should be noted that each course will be offered once per annum. In the past year we have dropped Physics 150-3 (Elementary Physics of Electronic Devices) and now plan to drop four more courses. In the past these courses were offered on an annual basis - that is Physics 150-3, Physics 001-3 and one of the Biophysics courses were each taught once per annum. Thus no additional faculty are required. There could, however, be additional T.A. requirements generated dependent on the enrolment in these courses.

JCI/dy

Attach.
 C.C. Ms. N. Fisher
 Ms. M. Jacques

J.C. Irwin
 J.C. Irwin, Chairman

F-84-1

F-84-2

Additions

SIMON FRASER UNIVERSITY

MEMORANDUM

.....Dr. H. Evans.....
.....Registrar.....
Subject..NEW COURSES.....

From.....J. C. Irwin, Chairman.....
.....Department of Physics.....
Date.....1984.03.08.....

Dear Harry:

We presently have three new course proposals that will arrive at SCUS shortly. These are:

PHYS 324-3
PHYS 365-3
PHYS 455-3

All are designed to serve the Engineering Science Program and two (324 and 365) will be required. PHYS 324 is scheduled for the semester 84-3 and PHYS 365 for 85-1. Since these courses are an integral part of the Engineering program we would like to request a waiver of the eight-month lead time that is normally required between Senate approval and first offering.

Chuck

J. C. Irwin

JCI/ml

c.c. Dr. R. F. Frindt
Physics Department
Dr. D. George
Dean of Engineering
Dr. P. Dobud✓
Admin. Asst. Dean of Science

O.K.
JFC

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Physics

Abbreviation Code: PHYS Course Number: 324 Credit Hours: 3 Vector: 3-1-0

Title of Course: ELECTROMAGNETICS

Calendar Description of Course:

Electrostatics, magnetostatics, electromagnetic waves, transmission lines, waveguides, antennas and radiating systems.

Nature of Course Lecture

Prerequisites (or special instructions):

PHYS 221-3, MATH 252-3 Students with credit for PHYS 325 may not take PHYS 324 for further credit.

What course (courses), if any, is being dropped from the calendar if this course is approved: PHYS 150-3

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? 84-3

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

All faculty

3. Objectives of the Course

An intermediate course in electromagnetism and applications, particularly appropriate for Engineering Science students.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty None

Staff None

Library None

Audio Visual None

Space None

Equipment None

5. Approval

Date: Dec 19/83

MAR 05 1984

J. O. Irwin
Department Chairman

J. F. Cochran
Dean

Chairman, SCUS

PHYSICS 324-3

ELECTROMAGNETICS

1. Brief review of vector analysis.
2. Static electric fields, dielectrics, capacitance.
3. Electrostatics. Poisson's and Laplace's equations, method of images, solutions to electrostatic boundary value problems.
4. Static magnetic fields. Magnetic forces, vector magnetic potential, Biot-Savart law and applications, magnetic field intensity, magnetic materials.
5. Time-varying fields and Maxwell's equations.
6. Plane electromagnetic waves in free space, conducting and non-conducting media, reflection and refraction.
7. Transmission lines: parallel plate, two wire and coaxial lines; transmission line parameters.
8. Waveguides, TE and TEM waves in parallel plate and rectangular waveguides, cavity resonators.
9. Half-wave antenna, antenna arrays.

Suggested text: Field and Wave Electromagnetics,
D.K. Cheng, Addison-Wesley 1983.

SIMON FRASER UNIVERSITY

MEMORANDUM

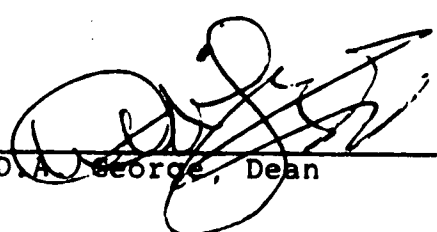
To..... Dr. J.C. Irwin, Chairman.....
..... Department of Physics.....
Subject... Physics Courses in the.....
Engineering Science Program.

From..... Dr. D.A. George, Dean.....
..... Faculty of Engineering Science.....
Date..... 10 January 1984.....

I am writing to indicate my strong support (and thanks) for the proposed new arrangements for Physics courses suitable for the Engineering Science Program.

In our basic Electronics Engineering option, students would take PHYS 324, Electromagnetics (rather than PHYS 425 which was used simply as a "place holder") and PHYS 365, Semiconductor Device Physics (rather than ENSC 324, also a "place holder"). This latter requires PHYS 385 as a pre-requisite which can be accommodated within the curriculum.

The new course PHYS 455, Laser Physics, will be listed as an elective and should be of considerable interest to our students.


D.A. George, Dean

DAG:mm

cc J.K. Cavers

✓ B. Frindt

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: PHYSICS

Abbreviation Code: PHYS Course Number: 365 Credit Hours: 3 Vector: 3-1-0

Title of Course: Semiconductor Device Physics

Calendar Description of Course:

Structure and properties of semiconductors, semiconductor theory, theory and operation of semiconductor devices, semiconductor device technology.

Nature of Course

Prerequisites (or special instructions):

PHYS 385-3

What course (courses), if any, is being dropped from the calendar if this course is approved: PHYS 001-3

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? 85-1

Which of your present faculty would be available to make the proposed offering possible? M. Thewalt, S.R. Morrison, K. Colbow, R.F. Frindt, J.C. Irwin and others.

3. Objectives of the Course

To provide the elements of semiconductor and semiconductor device physics and technology for Physics and Engineering Science students.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty None

Staff None

Library None

Audio Visual None

Space None

Equipment None

5. Approval

Date: Dec 19 / 83

MAR 05 1984

J.C. Irwin
Department Chairman

J.F. Cochran
Dean

Chairman, SCUS

Semiconductor Device Physics

a) Introduction to Condensed Matter Physics:

- the crystal lattice - phonons, energy bands
- semiconductors - electrons, holes, density-of-states, effective mass
- carrier concentration, doping, recombination
- the Fermi Energy, quasi-Fermi energies
- mobility, conductivity, Hall effect
- optical properties of semiconductors

b) Semiconductor Devices:

- diodes (junction, Schottky, LED's, laser diodes, photocells and photodiodes)
- JFET's and MOSFET's
- bipolar transistors
- special devices: tunnel diodes, IMPATT diodes, Gunn Effect oscillators, unijunction transistors, varactor diodes

c) Device Technology:

- crystal growth - (Czochralski, float-zoning, epitaxy)
- compound semiconductors, alloys
- doping - diffusion, implantation, annealing
- contacts
- integrated circuit technology - lithography, etching

Suggested Texts/References:

1. A. Bar-Lev, Semiconductor and Electronic Devices, Prentice Hall, 1979.
2. S.M. Sze, Physics of Semiconductor Devices, Wiley 1981 (2nd Edition)
3. R.A. Smith, Semiconductors 2nd Ed., Cambridge U.P., 1978.

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Physics

Abbreviation Code: PHYS Course Number: 455 Credit Hours: 3 Vector: 3-1-0

Title of Course: Laser Physics

Calendar Description of Course:

Review of atomic and molecular energy levels, transition probabilities, population inversion, rate equations and line-broadening mechanisms. Properties and design of laser cavities, and the gain, saturation and power output of laser oscillators. Crystal optics and laser related optical devices and components. Applications of lasers.

Nature of Course Lecture

Prerequisites (or special instructions):

PHYS 355-3, PHYS 385-3

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

PHYS 433-3

PHYS 482-3

PHYS 483-3

2. Scheduling

How frequently will the course be offered? Maximum of once per year.

Semester in which the course will first be offered? Fall 1985

Which of your present faculty would be available to make the proposed offering possible? Dr. B.P. Clayman, Dr. J.C. Irwin, Dr. K.E. Rieckhoff,
Dr. M.L.W. Thewalt, Dr. E.D. Crozier, Dr. L.H. Palmer

3. Objectives of the Course

To acquaint students with the principles of operation of lasers, the properties and capabilities of different types of lasers and their various applications. Suitable for Physics and Engineering 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

Space

Equipment

Nil

5. Approval

Date: Dec 19/83

MAR 05 1984

J.C. Irwin
Department Chairman

J.F. Cochran
Dean

Chairman, SCUS

PHYSICS 455-3

LASER PHYSICS

(1) REVIEW OF ATOMIC AND MOLECULAR SPECTROSCOPY:

Atomic Energy Levels (Notation)
Molecular Energy Levels
Electric Dipole Transitions
(Probabilities, Selection Rules)
Broadening Mechanisms
(Natural Linewidth, Doppler, Collision)

(2) LIGHT AMPLIFICATION AND RATE EQUATIONS:

Population Inversion
Two-level systems
Limiting Cases

(3) OPTICAL RESONATORS:

Diffraction Approach
Gaussian Lightbeams
Mode properties of stable resonators
Planar, confocal, spherical mirror cavities
Design considerations

(4) LASER OSCILLATORS:

Pumping Methods
Gain
Rate equations for oscillators
Saturation and Power output
Optimum output coupling

(5) LASERS:

Neutral atom - e.g. He-Ne
Ion - e.g. Argon
Molecular - e.g. CO₂
Solid State - e.g. Nd-YAG
Dye Lasers - e.g. CW - Rhodamine 6G
Others - e.g. excimer

(6) LASER OPTICS

Crystal Optics -
Birefringence, optical activity,
polarizers, wave plates

Non-Linear Optics -
Pockel's cell, Kerr effect,
modulators

Fibre Optics

APPLICATIONS

A. Associated with

- (a) Power - e.g. Welding, cutting, etching.
- (b) Collimation, coherence - e.g. Surveying,
diffraction codes, quality control.

B. In Research and Development

Light scattering, excitation sources, laser
spectroscopy, standards.

POSSIBLE TLXIS:

- (1) "An Introduction to Lasers and Their Applications"
by D. O'Shea, W. R. Cameron and W. T. Rhodes,
Addison Wesley, 1977.
- (2) "Quantum Electronics"
by A. Yariv
Wiley, 1975

REFERENCES:

- "An Introduction to Lasers and Masers"
by A. E. Siegman
McGraw-Hill, 1971
- "Lasers"
by B. A. Lengyel
Wiley, 1971
- "Dye Lasers"
by F. P. Schafer
Vol. 1 of Topics in Applied Physics
Springer Verlag, 1973
- "Optics and Lasers"
by M. Young
Vol. 5 in Optical Sciences Series
Springer Verlag, 1975
- "Laser Theory"
by F. S. Barnes
IEEE Press, 1972
- "Glass Lasers"
by K. Patel
Butterworth, 1970
- "Principles of Lasers"
by O. Svelto
Plenum, 1976
- "The Physics of Gas Lasers"
by W.R. Bennett, Jr.
Gordon and Breach, 1977

OTHER REFERENCES:

- Handbook of Lasers
Chemical Rubber Company
- Optical Encyclopedia
Published by Laser Focus
- Current Journals:
- IEEE Transactions
 - Laser Focus
 - Photonics
 - American Journal of Physics

SIMON FRASER UNIVERSITY

MEMORANDUM

To..... SENATE COMMITTEE ON ACADEMIC
PLANNING
.....
Subject..... BIOPHYSICS ENROLLMENTS
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From..... W. WATTAMANIUK, SECRETARY,
SENATE COMMITTEE ON ACADEMIC PLANNING
.....
Date..... MARCH 30, 1984
.....

Historical enrollments in the biophysics program at SFU are detailed in the table below.

	<u>#</u> <u>HONORS</u>	<u>#</u> <u>MAJORS</u>
1980-2	1	1
1980-3	1	-
1981-1	-	1
1981-2	-	1
1981-3	-	1
1982-1	-	2
1982-2	-	-
1982-3	-	1
1983-1	-	1
1983-2	1	2
1983-3	-	2
* 1984-1	-	2

- * The academic record of these students is such that they are unlikely to complete the program.