SIMON FRASER UNIVERSITY

S.81-48

MEMORANDUM

To SENATE

From SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Subject CURRICULUM CHANGES - FACULTY OF SCIENCE - MATHEMATICS, PHYSICS

Date FEBRUARY 12, 1981

Action undertaken by the Senate Committee on Undergraduate Studies at its meeting of February 10, 1981 gives rise to the following action.

MOTION: That Senate approve and recommend approval to the Board of Governors, as set forth in S 81-48 , the proposed new courses including

MATH 144-3, Introduction to Pure Mathematics

MATH 265-4, Engineering Mechanics III

MATH 362-3, Fluid Mechanics I

MATH 462-3, Fluid Mechanics II

PHYS. 346-3, Energy Sources and Energy Conversion

For Information:

Subject to approval of the courses by Senate and the Board, the Senate Committee on Undergraduate Studies has approved waiver of the normal two semester time lag requirement to permit first offering of MATH 144-3, MATH 362-3 and PHYS 346-3, in Fall 81-3.

Attachment

/mm

SCUS 81-6

SIMON FRASER UNIVERSITY

MEMORANDUM

To	Mr. H.M. Evans, Secretary SCUS	From	J.F. Cochran, Dean Faculty of Science
Subject	CURRICULUM CHANGES FOR THE FACULTY OF SCIENCE	Date	1981 02 02

The Faculty of Science approved the proposal of five new courses for which the appropriate documents are enclosed. Could you please place these items on the agenda of the next SCUS meeting?

Thank you.

J.F. Cochran

J.F. Cochran

JFC/mgj

Enclosures :

New Course Proposal MATH 144-3, Introduction to Pure Mathematics
New Course Proposal MATH 265-4, Engineering Mechanics III
New Course Proposal MATH 362-3, Fluid Mechanics I
New Course Proposal MATH 462-3, Fluid Mechanics II
New Course Proposal PHYS 346-3, Energy Sources and Energy Conversion

RECEIVED
FEB 3 1981
REGISTRAR'S OFFICE
MAIL DESK

MEMORANDUM

To: Dr. A.G. Sherwood, Chairman
Faculty of Science Undergraduate
Curriculum Committee

From: G.A.C. Graham, Chairman
Undergraduate Studies Committee
Mathematics Department

Subject: MATH 144-3, Introduction to Pure Mathematics

Date: October 9, 1980

The Department of Mathematics has approved the course

MATH 144-3, Introduction to Pure Mathematics (3-1-0)

Our current course MATH 141-2, Introduction to Pure Mathematics (2-1-0) is to be dropped upon final adoption of MATH 144-3.

Originally, Math 141-2 was the first of a sequence of 2-hour courses intended to be taken concurrently with the calculus sequence. In that context it made sense, but we no longer have the sequence. Students are reluctant to enroll in 141-2, since it is now our only 2-hour course. They often enroll (or decline to enroll, we may hope) in the misguided belief that the 2-hour designation connotes "easier" rather than "less". Even if these problems could be overcome, the subject matter of 141-2 has a certain lack of content which students can recognize as "mathematical". The proposed course 144-3 attempts to remedy this defect by including a logically sophisticated (by first-year standards) treatment of the system of natural numbers.

I hope the proposal can be approved by your Committee.

G.A.C. Graham

G.A.C. Graham

GACG/dr

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: Mathematics

Abbreviation Code: MATH Course Number: 144 Credit Hours: 3 Vector: (3-1-0)

Title of Course: Introduction to Pure Mathematics

Calendar Description of Course: The fundamental notions of modern Pure Mathematics (logic, sets, functions, relations, etc.) are presented, and are applied in an investigation of the "counting numbers" 1,2,3,... as an abstract axiomatic system. Other applications as time permits.

Nature of Course lecture/tutorial

Prerequisites (or special instructions): B.C. High School Math 12, or MATH 100-3, or permission of the Department. Students with credit for MATH 141-2 may not receive credit for MATH 144-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 141-2

2. Scheduling

How frequently will the course be offered? once/year

Semester in which the course will first be offered? 81-3

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

. Objectives of the Course To introduce the fundamental notions of modern Pure Mathematics to students considering majoring or taking honors in Mathematics.

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

NONE

5. Approval

Date: October 6, 1980	November 24, 1980	
Department Chairman	Dean	Chairman, SCUS

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

Proposed syllabus MATH 144-3

INTRODUCTION TO PURE MATHEMATICS

LOGIC: Statements and connectives, tautologies, quantifiers, proofs.

SETS: Subsets, union, intersection, and complement, relations, functions, operations.

NATURAL NUMBERS: Order, induction, Peano's axioms, cardinal numbers.

INTEGERS: Ordered pairs, well-definedness.

Other topics as time permits.

PREREQUISITES: B.C. High School Math 12, or MATH 100-3, or permission of the Department.

Students with credit for MATH 141-2 may not receive credit for MATH 144-3.

7/80

F-81-2

SIMON FRASER UNIVERSITY

MEMORANDUM

To: Dr. A.G. Sherwood, Chairman
Faculty of Science Undergraduate
Curriculum Committee

From: D. Ryeburn, Chairman
Undergraduate Studies Committee
Mathematics Department

Subject: MATH 265-4, ENGINEERING MECHANICS III
MATH 362-3,462-3, FLUID MECHANICS I, II

Date: October 28, 1980

Yesterday at a departmental meeting the Mathematics Department approved the courses

MATH 265-4	ENGINEERING MECHANICS III	(3-2-0)
MATH 362-3	FLUID MECHANICS I	(3-1-0)
MATH 462-3	FLUID MECHANICS II	(3-0-0)

and we now seek their approval at the faculty curriculum committee level. These courses will make a valuable addition to our existing applied mathematics option. They will as well be useful within our engineering transfer program, and should be appropriate courses for students in the proposed SFU engineering program. MATH 265-4 is a new course, while MATH 362-3 and 462-3 are to replace the existing MATH 469-4 (Fluid Dynamics).

You will note that these courses, if implemented, will require a total of 6 hours per year (on the average) more faculty lecture and tutorial time than are required by MATH 469-4 (4-1-0) as it is now offered (once every two years). The department will be able, on a temporary basis, to meet all its teaching commitments, including these, since additional teaching hours are available using the NSERC Fellows we expect to have in our department.

I am sending copies of the course proposals to the other faculties for their inspection in case of course overlap, and to Dr. T.W. Calvert, Director of Engineering.

David Ryeburn
D. Ryeburn

DR/dr

Encl. Course proposal forms and syllabi

cc: Dr. T.W. Calvert, Director of Engineering
Dr. M.K. Egan, Chairman, Faculty of Education UCC
Dr. C.T. Griffiths, Chairman, Faculty of Interdisciplinary Studies UCC
Dr. E.W. Roberts, Chairman, Faculty of Arts UCC
Mr. N. Heath, Dean of Science Office
Dr. M. Singh, Chairman, Department of Mathematics

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

1. Calendar Information — Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 265 Credit Hours: 4 Vector: 3-2-0

Title of Course: ENGINEERING MECHANICS III

Calendar Description of Course: An introductory course dealing with fundamental concepts of stress, strain and constitutive equations and applications to torsion, beam bending and column buckling. (The material covered in this course is commonly called Strength of Materials.)

Nature of Course: Lecture/Tutorial (Problem Session)

Prerequisites (or special instructions):

MATH 152-3 (preferably) or MATH 155-3. MATH 262-4.

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? Once/year

Semester in which the course will first be offered? SPRING 82

Which of your present faculty would be available to make the proposed offering possible: Profs. Pechlaner, Shen, Singh and others.

3. Objectives of the Course

This is SFU's first course in Solid Mechanics and will be taken by students of science and engineering. It constitutes a natural extension of our current engineering transfer program.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty - Overall instructional resources sufficient to allow the offering of MATH
Staff 265, 362, 462, at the frequency indicated, are temporarily being generated by hiring one NSERC Fellow in Mathematics. This course will require 1/4 faculty member full time teaching load.

Audio Visual

Space

Equipment - In future we may need a small amount of equipment for demonstrations

Library - Some additional books may be required.

5. Approval

Date: October 28/80	November 24, 1980	
Manohar Singh	B P Clayman	
Department Chairman	Dean	Chairman, SCUS

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

MATHEMATICS 265

(3-2-0)

ENGINEERING MECHANICS III

Course Outline

Introduction to solving engineering problems

Internal forces & moments in beams

Stress

Strain and deformation

Constitutive relations

Torsion

Beam deflections

Transformation of Stress & Strain

Yield criteria

Stability and buckling of columns

PREREQUISITE: MATH 152-3 (preferably) or MATH 155-3. MATH 262-4.

TEXTBOOKS:
1) Introduction to Mechanics of Solids by Popov
   PUB: Prentice-Hall

2) An Introduction to the Mechanics of Solids by Nathan
   NOTES - University of B.C.

FORMAT: *No tutorial is scheduled for this course. There will be a weekly two-hour problem session attendance at which is mandatory. In addition, homework is assigned and counts towards the final grade.*

10/80

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

1. Calendar Information   Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 362 Credit Hours: 3 Vector: 3-1-0

Title of Course: FLUID MECHANICS I

Calendar Description of Course: Fluid properties, fluid pressure, hydrostatics. Equations of motion, Bernoulli equation, rotational and irrotational flow, similarity and dimensional analysis of fluid flows, laminar and turbulent flows, flow measurement.

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions):
MATH 252-3 and MATH 263-4 (or PHYS 211-2). Students with credit for MATH 469-4 may not receive credit for MATH 362-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 469-4, Fluid Dynamics, is being replaced by MATH 362-3, 462-3, Fluid Mechanics I, II.

2. Scheduling

How frequently will the course be offered? Once/year

Semester in which the course will first be offered? FALL 1981

Which of your present faculty would be available to make the proposed offering possible: Profs. Das, Lardner, Pechlaner, Shen, Sharma, Singh and others.

3. Objectives of the Course

This is SFU's first course in Fluid Mechanics and will be taken by students of science and engineering.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty - Overall instructional resources sufficient to allow the offering of MATH 265, 362, 462, at the frequency indicated, are temporarily being generated by hiring one NSERC Fellow in Mathematics. This course will require 1/8 faculty member full time teaching load in excess of the existing Math 469 requirements.

Staff

Library

Audio Visual

Space

Equipment

NONE

5. Approval

Date: October 28/80   November 24, 1980

Department Chairman   Dean   Chairman, SCUS

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

(3-1-0)

FLUID MECHANICS I

1. **Fundamental Concepts in Fluid Mechanics**

   i) Basic fluid properties
   ii) Classification of the branches of fluid mechanics according to fluid properties
   iii) Continuity equation
   iv) Stream lines and stream function
   v) Equations of motion neglecting viscosity

2. **Hydrostatics**

   i) The hydrostatic stress state
   ii) Hydrostatic forces on submerged surfaces and floating bodies
   iii) Stability of submerged and floating bodies

3. **Viscous Fluid**

   i) Equations of motion for a viscous fluid
   ii) Discussion of the Newtonian Law of friction
   iii) Boundary conditions
   iv) Energy equation
   v) Couette flow, Poiseulle flow in a channel

4. **Bernoulli Equation**

   i) A simple form of Bernoulli equation
   ii) Bernoulli equation with conservative body forces
   iii) Bernoulli equation for nonsteady flow, and baratropic fluids

5. **Rotational and Irrotational Fluid Motion**

   i) Rotationality, irrotationality, and circulation in fluid flows
   ii) The Bjerknes circulation theorem
   iii) The velocity potential
   iv) Fundamentals of steady, potential flow of an ideal fluid in two dimensions
   v) Fundamentals of rotational flow

6. **Similarity and Dimensional Analysis of Fluid Flows**

   i) Model studies and the concept of similarity between fluid flows
   ii) Determination of conditions for similarity between fluid mechanics to nondimensional forms
   iii) Dimensional analysis of fluid flows

7. **Fundamentals of Laminar and Turbulent Flow**

   i) Laminar-flow fundamentals and examples
   ii) Principles of turbulent flow
   iii) Development of the velocity profile in pipe flow

8. **Fluid Velocity Determination and Flow Measurement**

   i) Static pressure, velocity pressure, and stagnation pressure
   ii) Determination of the magnitude and direction of a fluid velocity
   iii) Measurement of flow

PREREQUISITES: MATH 252-3 and MATH 263-4 (or PHYS 211-3). Students with credit for MATH 469-4 may not receive credit for MATH 362-3.
TEXTBOOK: Engineering Fluid Mechanics by John E. Plapp; PUB: Prentice-Hall (1968)

10/80

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

1. Calendar Information Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 462 Credit Hours: 3 Vector: 3-0-0

Title of Course: FLUID MECHANICS II

Calendar Description of Course:

Kinematics, Navier-Stokes equations of motion, viscous flows, dynamical similarity, Reynolds number, Boundary layer theory.

Nature of Course Lecture

Prerequisites (or special instructions):

MATH 362-3; MATH 314-3 (or PHYS 384-3) should precede or be taken concurrently. Students with credit for MATH 469-4 may not receive credit for MATH 462-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 469-4, Fluid Dynamics, is being replaced by MATH 362-3, 462-3, Fluid Mechanics I, II

2. Scheduling

How frequently will the course be offered? Once in two years

Semester in which the course will first be offered? SPRING 83

Which of your present faculty would be available to make the proposed offering possible: Profs. Das, Lardner, Pechlaner, Shen, Sharma, Singh and others.

3. Objectives of the Course

This is SFU's second course in Fluid Mechanics and will be taken by students of science and engineering.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty - Overall instructional resources sufficient to allow the offering of MATH 265, 362, 462, at the frequency indicated, are temporarily being generated by hiring one NSERC Fellow in Mathematics. This couse will require 1/8 faculty member full time teaching load.

Staff

Library

Audio Visual

Space

Equipment

} NONE

5. Approval

Date: October 28/80	November 24, 1980	
Department Chairman	Dean	Chairman, SCUS

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

MATHEMATICS 462-3

(3-0-0)

FLUID MECHANICS II

1. Basic Concepts

Lagrangian and Eulerian descriptions of motion of a continuous fluid.

2. Complex Variable Method for Two Dimensional Problems

Conformal transformations and developments including Joukowski's transformation. Blasius' theorem. Von-Karman street of vortices. Surface waves.

3. Other Methods for Non-Viscous Incompressible Flow

Separation of variables and applications, Method of images and applications, Stokes' stream function and applications, the hodograph method, Numerical methods.

4. Compressible Flow

The linearized theory of compressible flow, Thermodynamics and the energy equations, Plane and oblique shock waves, the Prantl-Meyer expansion, The hodograph characteristics diagram, Hodograph method for compressible flow and applications.

5. Viscous Flow

The Navier-Stokes equation, Dissipation of energy, Diffusion of vorticity in an incompressible viscous fluid, Noslip condition, Exact solution of Navier-Stokes, Reynolds number, Slow motion and Boundary layers.

PREREQUISITES: MATH 362-3; MATH 314-3 (or PHYS 384-3) should precede or be taken concurrently. Students with credit for MATH 469-4 may not receive credit for MATH 462-3.

TEXTBOOK: FUNDAMENTAL MECHANICS OF FLUIDS
by I.G. Curie
PUB: McGraw-Hill (1974)

10/80

F-81-3

NEW COURSE PROPOSAL FORM

Calendar Information

Department: Physics

Abbreviation Code: PHYS Course Number: 346 Course Hours: 3 Vector: (3-1-0)

Title of Course: Energy Sources and Energy Conversion

Calendar Description of Course:

The physical principles and limitations of renewable energy source utilization and energy conversion.

A quantitative introduction to energy conversion and storage systems, including solar power and heating; wind, tidal, geothermal, hydroelectric and nuclear power, hydrogen technology, electrical and mechanical energy storage.

Nature of Course: Lecture Course

Prerequisites (or special instructions):

PHYS 344-3 (or CHEM 261-3 and MATH 251-3), or permission of instructor.

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

None (a similar course has been taught twice as an upper level Physics Special Topics course, PHYS 493-3).

Scheduling:

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? Fall 1981

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

Members of Energy Research Institute

Objectives of the Course

To provide an introduction to energy sources and energy conversion at a quantitative level, including the determination of efficiences and theoretical and practical limitations of various energy systems.

Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library - books $1250

Audio Visual

Space

Equipment

New Physics Faculty associated with the Energy Research Institute will allow this course to be offered on a regular basis.

Approval:

Date: Jan 12/81 Feb. 2/81

Department Chairman Dean Chairman, SCUS

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

Energy Sources and Energy Conversion

Course Outline

- Brief review of energy forms, Laws of Thermodynamics, Carnot engine and efficiency, refrigerator and heat pumps.

- Thermal conductivity, thermal insulation, thermal energy storage. The Stirling engine. Heat pumps and applications. Thermal power from the sea.

- Solar power: Spectral distribution of solar power. Solar power distribution in Canada.

- Solar heating: Black-body radiation, emission and absorption, heat transfer, conduction and insulation, physical limitations of simple solar heating systems.

- Solar electricity: Photocells, spectral response, interference filters. The power tower, solar power sattelite.

- Hydroelectric power: Generation, transmission, efficiency.

- Tidal power: Generation systems and calculations on Canadian sites.

- Geothermal energy: Heat within the earth, heat transfer systems.

- Wind power: Physical limitations, maximum efficiency, Canadian systems.

- Energy storage: Static and dynamic mechanical storage, batteries, applications to motor vehicle propulsion, electrical load levelling.

- Hydrogen technology

- Nuclear fission and fusion: Survey of energetics of reactors and electrical power generation. The Candu reactor. Fusion and future possibilities.

Course References

Standard physics texts, eg: Tipler, "Physics"

Sears and Zemansky, "Heat and Thermodynamics"

Standard texts on introductory quantum physics, such as Richtmeyer eta 1, "Introduction to Modern Physics"

Plus energy-related books, and various sources of factual information. Some of these references at present tend to be a lower level than the course being offered. The references include:

J.O. Bockris, "Energy - The Solar Hydrogen Alternative"
A.I.P. Conference Proceedings, "Efficient use of Energy"
F. Daniels, "Solar Energy"