SIMON FRASER UNIVERSITY

MEMORANDUM

To_____ SENATE _____ | From_____

Subject_ CURRICULUM AND CALENDAR CHANGES – | Date_____ DECEMBER 16, 1971
DEPARTMENT OF MATHEMATICS

MOTION: "That Senate approve, as set forth in S.72-15

1. New Course Proposal – Mathematics 305-4.

2. New Course Proposal – Mathematics 361-3 – with
   discontinuance of Mathematics 261-3.

3. Changes in Prerequisites for Mathematics Courses.

4. Change in Calendar Description for Mathematics
   152-3."

SIMON FRASER UNIVERSITY

MEMORANDUM

To __SENATE__

From __SENATE COMMITTEE ON UNDERGRADUATE STUDIES__

Subject __CURRICULUM AND CALENDAR CHANGES -__
__DEPARTMENT OF MATHEMATICS__

Date __DECEMBER 16, 1971__

The Senate Committee on Undergraduate Studies
approved the submission of the Department of
Mathematics, as set forth in SCUS 71-29, and
recommends approval to Senate.

SIMON FRASER UNIVERSITY

MEMORANDUM

To .... II. Evans, Secretary .... From .... S. Aronoff .... $

..... Senate Committee on Undergraduate Studies ..... / .... Dean of Science ....

Subject ..... Agenda Items, Department of Mathematics Date .... December 1, 1971 ....

The attached proposals have been approved by the Faculty
of Science Undergraduate Curriculum Committee and the
Executive Committee, acting on behalf of the Faculty.
They are now being forwarded for the approval of the Senate
Committee on Undergraduate Studies and Senate.

Included:

1. New Course Proposal, Math 305-4 (see memo of
   October 22, 1971)

2. Changes in Prerequisites for Mathematics
   Courses (see memo of October 27, 1971)

3. New Course Proposal, Math 361-3 (see memo of
   October 27, 1971)

4. Change in Calendar Description of Math 152-3
   (see memo of November 1, 1971)

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Enclosure

cc: J. Chase, Chairman of SCUS
    R. Lardner, Mathematics

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Department: Mathematics   Course Number: 305-4   Title: Statistical
                                             Analysis of Sample Surveys
Sub-title or Description:

An introduction to the major sample survey designs and their statistical
analysis. Considerations of cost and the use of prior information will
be included.

Credit Hours: 4   Vector Description: 4-1-0

Pre-requisite(s) Two courses in probability or statistics, one of which
may be taken concurrently. e.g. Math 101-3 plus 302-3 (102-3); Math
101-3 plus Psych 210-3; Econ 235-3 plus 236-3; Math 371-3 plus 489-4.

II ENROLMENT AND SCHEDULING

.Estimated Enrolment: 20 per offering

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

Yearly, Fall

When course will first be offered: Fall 1972

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?

      (See attached)

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

   Completely randomized surveys, stratified sampling, cluster sampling,
   double sampling, ratio estimation.

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

It will provide Mathematics students with an introduction to an area in which statistical theory is heavily used and will provide a service to students in Economics and Social Sciences.

D. How does this course affect degree requirements?

It is not required for any degree.

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

New entry.

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?

Students in Economics have requested such a course. Mathematics students interested in statistics will also take the course.

H. Other reasons for introducing the course.

It is in an area in which students have a reasonable chance of employment with a Bachelor's degree.

IV BUDGETARY AND SPACE FACTORS

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

Dr. D. Mallory, Dr. R. Rennie, Dr. C. Villegas

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

None beyond the computational facilities already available.

C. Any other budgetary implications of mounting this course:

None. Another course in the department will be offered less frequently to make provision for this course.

III. (A) The course will cover methods of choosing sample units, probability
           distribution of estimators, major designs and their statistical
           analysis.

           The course is not similar to any lower level course or to any other
           Mathematics course. A course on survey design (Psych 315-3) is
           listed by the Psychology Department; it is designed for
           Psychologists (Psych 201-3 is a prerequisite) and is not offered
           on a regular basis.

1. STATISTICAL CONCEPTS

   Types of Variables

   Review of Probability, Distributions, Parameters, Estimators, Confidence
   Intervals. Central Limit Theorem

2. BASIC SAMPLE SURVEY CONCEPTS

   Reasons for Sample Surveying

   Sample Survey Terms (population, frame, etc.)

   Types of Sample Survey Sampling (Simple, Random, stratified, Multi-stage, etc.)

3. SIMPLE RANDOM SAMPLING

   Use of Random Number Tables and Generators

   Estimators, Variance of Estimators, confidence Intervals

   Choice of Sample Size

4. STRATIFIED RANDOM SAMPLING

   Purpose, Choice of Strata

   Estimators, Variance of Estimators, Confidence Intervals

   Methods of Allocating samples among strata

   Choice of Sample Size

   Comparison with Simple Random Sampling (Accuracy, Cost, etc.)

   Post Sample Stratification

5. CLUSTER SAMPLING

   Purpose, Sample Units, Examples

   Estimators, Variance of Estimators, Confidence Intervals

   Choice of Sample Size

   Comparison with Simple Random Sampling (cost, etc.)

6. MULTI-STAGE SAMPLING

   Purpose, Choice of Sample Units, Examples

   Two Stage Sampling

   Estimators, etc.

   Choice of Sample Size

   Extension to three or more stages

   Comparison with single stage methods

7. RATIO AND REGRESSION ESTIMATION

    Review of Covariance, Correlation, Regression
    Purpose and examples
    Ratio Estimates, Variance of Estimates, etc.
    Regression Estimates, Variance of Estimate
    Choice of Sample Size
    Comparison with other methods

8. SYSTEMATIC SAMPLING

    Purpose and examples
    Estimators, Accuracy of Estimators
    Choice of Sample Size
    Problems of Inference

9. APPLICATIONS

    Census Surveys
    Market Surveys
    Opinion Polls
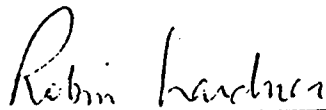   Wildlife Surveys

SIMON FRASER UNIVERSITY

MEMORANDUM

To............ Dr. S. Aronoff, Chairman Undergraduate Studies Committee Faculty of Science	From............ Dr. R. W. Lardner, Acting Head Mathematics Department
Subject............ NEW COURSE PROPOSAL Mathematics 305-4	Date............ October 22, 1971

I have attached copies of a new course proposal for a course entitled "Statistical Analysis of Sample Surveys'. The proposal is the result of requests from the Department of Economics and Commerce and from individual students. We expect to receive a memo from the Department of Economics and Commerce in support of this proposal in the near future. We will forward a copy of this memo to you when it is received.

Robin Lardner

R. W. Lardner

SIMON FRASER UNIVERSITY

MEMORANDUM

To.......... D. Mallory	From.......... R. Holmes
.... Mathematics	.... Economics and Commerce
Subject.......... sampling methods course	Date.......... October 25, 1971

As you know, I think that a course in sampling methods would be very useful for students of economics and commerce. I have had feedback from a graduate of this University who is employed by the Census Bureau and his major complaint is that he was inadequately prepared in this area through his course work at Simon Fraser. More and more, research in economics and commerce involves sample survey work, and at present our course offerings are inadequate in this area. The text you mentioned by Mendenhall, Ott and Scheaffer which would have our present Economics 236 (proposed Economics 333) as its prerequisite would, I think, suit our programme very well.

R. A. Holmes

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SIMON FRASER UNIVERSITY

**DEPARTMENT OF
ECONOMICS AND COMMERCE**

BURNABY 2, BRITISH COLUMBIA
Telephone 291-3111 Area code 604

December 3, 1971

D. Sharma
Undergraduate Program Chairman
Mathematics Department
Simon Fraser University

Dear Professor Sharma:

I understand that the mathematics department is considering offering a course in the statistical analysis of sample surveys. It is my belief that such a course would be of great value to economics and commerce students who are quantitatively oriented or who are interested in employment in government (or other) agencies using sample surveys.

We would certainly recommend such a course to any of our students in either of the above two categories should the mathematics department offer it as a regular or as a selected topics course. I feel equally certain that such a course would fit similar interests of students in other departments.

Yours truly,

P. E. Kennedy
Undergraduate Program Chairman

lh

FACULTY OF SCIENCE

NEW COURSE PROPOSAL

I CALENDAR INFORMATION

Department: Mathematics   Course Number: 361-3 Title: Mechanics of
                                                          Deformable Media

Sub-title or Description:

Analysis of deformation and stress and an introduction to constitutive
equations for different materials.

Credit Hours: 3   Vector Description: (3-1-0)

Pre-requisite(s):

$\longrightarrow$ (See attached)

II ENROLMENT AND SCHEDULING

Estimated Enrolment: 15 per offering

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

  Yearly, every Spring

When course will first be offered:

  Spring 1973

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?

    No similar course is offered either in this Department or other
    Departments in the University. There is no overlap with other courses.

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

    Mechanics of deformation, materials and their mechanical behaviour,
    stress analysis, kinematics of deformation, infinitesimal deformations.

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

This course is essential to our undergraduate program in
Applied Mathematics. The level of the material formerly
covered in 261-3 will be increased and the orientation
of the courses will be changed from an engineering emphasis

D. How does this course affect degree requirements?

This course has no effect on degree requirements.

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

New entry.

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

Mathematics 261-3.

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

It provides necessary background for undergraduate applied
mathematics students.

H. Other reasons for introducing the course.

It is a prerequisite for most of the upper level applied
mathematics courses.

IV **BUDGETARY AND SPACE FACTORS**

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

All applied mathematics faculty: Drs. Graham, Lardner, Pechlaner,
Shadman, Sharma and Shoemaker.

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

    No special requirements.

C. Any other budgetary implications of mounting this course:

    Since this course will replace Mathematics 261-3 and will be
    offered less frequently than that course was, this teaching
    commitment can be met from existing resources.

I.   Pre-requisite(s): Mathematics 161-3 or equivalent* and
      Mathematics 251-4. *Students who have not had Math 161-3
      but who have taken Physics 201-2, may be allowed to take
      Math 361-3 (provided they have completed Math 251-4) with
      the permission of the Department.

III. C.   to a 'strength' materials emphasis. This will allow us
           to assume greater mathematical maturity on the part of
           students taking the course which will therefore allow
           the course to be more mathematical in nature.

1. Mathematical Preliminaries: Summation convention. Vector transformation. Gradient, Curl and Divergence. Cartesian tensors of rank two.   (2 weeks)

2. Forces in Space: Moment of a force about a point, about an axis, vector moment of a couple, composition of couples in space, reduction of a force system to a given centre, resultant of a force system in space, conditions of equilibrium.

         (CHAPTER 7, Targ's book).

3. Curvilinear Motion of a Particle

         (CHAPTER 10, Targ's book).

4. Mechanics of Deformation: Forces in a deformable body. Applications of equilibrium conditions to deformable body. Concept of a Continuum. Formulation of problems in Continuum Mechanics.   ($\frac{1}{2}$ week)

5. Materials and their Mechanical Behaviour: Microscopic point of view. Crystalline solids, Amorphous solids, high polymers, fluids. Observed Mechanical Behaviour of Solids - macroscopic point of view. Uniaxial loading of a bar. Stress strain curve. Linear elastic, nonlinear elastic, plastic behaviours in uniaxial loading. Time dependent and rate independent behaviours. Stress concentration, temperature effects, failure and fracture, fatigue, buckling. Idealised models of perfect fluids, perfectly elastic, perfectly plastic, rigid perfectly plastic, linear elastic - perfectly plastic behaviours. Care and caution in employing idealised models to real physical problems in mechanics.   ($1\frac{1}{2}$ weeks)

6. Stress Analysis: Surface tractions and body forces. The stress vector. The dependence of the Stress Vector on Orientation. The Stress Tensor. The Equations of Motion. Symmetry of stress tensor. Properties of stress tensor, principal stresses, maximum and minimum stress, stress conditions at the boundary. Plane state of stress. (4 weeks)

7. Kinematics of Deformation: Field quantities. The material time derivative. Velocity and acceleration of a generic particle. Lagrangian and Eulerian variables. Lagrangian and Eulerian description of deformation, geo-

metrical comparison of a neighbourhood
of the deformed body with that of the
undeformed body by means of Lagrangian
Strain Tensor. Extensions, angle changes,
volume changes, and local rotations.
Principal strains. Special Deformations -
such as rigid deformation, homogeneous
deformation, uniform translation, pure
rotation. Displacement conditions at
the boundary.   (4 weeks)

8. Infinitesimal Deformations: Assumptions of infinitesimal theory.
Linear strain tensor. Extensions,
Angle changes, volume changes, local
rotations in terms of linear strain
tensor. Continuity of deformation
(compatibility conditions). Solution
for displacements with given strains.
Strain rates. Deformation of flow.   (1 week)

TEXTS: - "Mechanics of Solids and Fluids"-by Robert R. Long, Prentice-Hall Inc.

"Theoretical Mechanics, a Short Course" by S. Targ, Gordon & Breach, Science
        Publishers.

SIMON FRASER UNIVERSITY

MEMORANDUM

To....Dr. S. Aronoff....................................

........Dean of Science.............................

Subject..

From.......Dr. R. W. Lardner.............................
Acting Head
.........Mathematics Department........................

Date........October 21, 1971.............................

As requested in your memo of October 13, 1971, the following is a list of the proposed modifications to the prerequisite listings for mathematics courses offered in the Spring Semester 72.

1. Mathematics 302-3, ELEMENTARY STATISTICAL METHODS:

Economics 235-3 should be added as an alternate prerequisite for this course, and this should be noted as follows:

Prerequisite: Mathematics 101-3 or 371-3 or Economics 235-3.

2. Mathematics 152-3, CALCULUS II:

Mathematics 150-3 should be added as a conditional alternate prerequisite for this course and this should be noted as follows:

Prerequisite: Mathematics 150-3 (with a grade of A or B), or
Mathematics 151-3.

3. Mathematics 241-2, PURE MATHEMATICS III:

The present prerequisite listing should be deleted and replaced by the following statement:

Prerequisite: Mathematics 152-3.

4. Mathematics 470-4, VARIATIONAL CALCULUS:

Mathematics 161-3 should be substituted for Mathematics 261-3 as one of the prerequisites for this course, and this should be noted as follows:

Prerequisites: Mathematics 161-3 or Physics 203-2. Mathematics 311-4 or Physics 382-4 should precede or be taken concurrently.

Robin Lardner

R. W. Lardner

Mathematics Department
October 27, 1971

CHANGES IN PREREQUISITES FOR UNDERGRADUATE MATHEMATICS COURSES

1. MATHEMATICS 241-3, PURE MATHEMATICS III:

    Delete: 'Mathematics 141-2 or 142-2 or 151-3.'

    Add: 'Mathematics 152-3.'

2. MATHEMATICS 352-2, INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS:

    Delete: 'Mathematics 152-3.'

    Add: 'Mathematics 253-4 should precede or be taken concurrently.'

3. MATHEMATICS 443-3, COMBINATORIAL THEORY:

    Delete: 'Mathematics 432-4 should precede or be taken concurrently.'

    Add: '15 semester hours of Mathematics recommended.'

4. MATHEMATICS 467-3, VIBRATIONS:

    Delete: 'Mathematics 251-3 (or 214-3) and 261-3 and 352-2.'

    Add: 'Mathematics 161-3 and 352-2, and 361-3 is recommended strongly.'

5. MATHEMATICS 468-4, CONTINUUM MECHANICS:
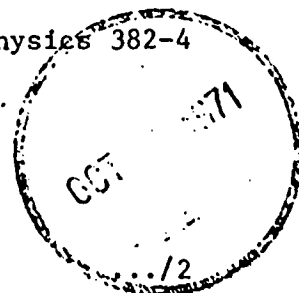
    Delete: 'Mathematics 251-3 and 261-3 and 352-2 (Mathematics 214-3
               may be used in place of 251-3 and 352-2).'

    Add: 'Mathematics 311-4 and 361-3.'

6. MATHEMATICS 469-4, FLUID DYNAMICS:

    Delete: 'Mathematics 261-3. Mathematics 411-4 or Physics 382-4
               should precede or be taken concurrently.'

    Add: 'Mathematics 361-3. Mathematics 311-4 or Physics 382-4
               should precede or be taken concurrently.'

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7. MATHEMATICS 471-4, SPECIAL RELATIVITY:

   Delete: 'Mathematics 261-3 or Physics 203-2. Mathematics 411-4 or
             Physics 382-4 must precede or be taken concurrently.'

   Add: 'Mathematics 311-4 or Physics 382-4.'

8. MATHEMATICS 486-4, PROBABILITY:

   Delete: 'Mathematics 251-3 and 371-3 and 241-2 or permission of the
             instructor.'

   Add: 'Mathematics 253-4 and 371-3 .'
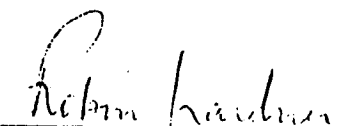
SIMON FRASER UNIVERSITY

MEMORANDUM

To Dr. S. Aronoff, Chairman
Undergraduate Studies Committee
Faculty of Science

From Dr. R.W. Lardner
Acting Head
Mathematics Department

Subject REVISIONS TO THE MATHEMATICS
UNDERGRADUATE CALENDAR SUBMISSION

Date October 27, 1971

I am now forwarding to you the remainder of the proposed changes and additions to the Mathematics undergraduate Calendar submission for next year. I have attached a new course proposal form for a course entitled, Mathematics 361-3, Mechanics of Deformable Media, a memo from Dr. Holmes of the Department of Economics and Commerce in support of the new course proposal, Mathematics 305-4 – Statistical Analysis of Sample Surveys, and a list of changes in prerequisites for mathematics courses. The recommendations for changes in prerequisites have been made on the basis of the changes in syllabus for the calculus courses and the changes in requirements for mathematics majors and honors students.

R.W. Lardner

RWL/lt

SIMON FRASER UNIVERSITY

MEMORANDUM

Dr. S. Aronoff, Chairman Undergraduate Studies Committee Faculty of Science	From Dr. R. W. Lardner Acting Head Mathematics Department
Subject MATHEMATICS UNDERGRADUATE CALENDAR SUBMISSION - Mathematics 152-3	Date November 1, 1971

The recently approved changes in the syllabus for Mathematics 251-4 (Calculus III) make it necessary to change the calendar description for Mathematics 152-3 (Calculus II). Further, in recent attempts to clarify the prerequisite listings for the latest edition of the Course Guide, we have been informed by the Registrar's Office the Senate approval is required for the requested change in the prerequisite listing for Mathematics 152-3. Even though the present calendar states that Mathematics 151-3 (Calculus I) may be either a prerequisite or a co-requisite for Math 152-3, it has not been possible for students to take these courses concurrently since their lecture times have been scheduled to clash.

The requested changes are as follows:

1. DELETE:

"152-3 Calculus II

Conic sections. Definite and indefinite integrals, techniques of integration. Improper integrals. Taylor's formula. Sequences and series. Conditional, absolute and uniform convergence. Differentiation and integration of series. Introduction to vectors.   (3-1-0)

Prerequisite: Mathematics 151-3 must precede or be taken concurrently."

2. ADD:

"152-3 Calculus II

Conic sections. Definite and indefinite integrals. Techniques and applications of integration. Polar co-ordinates.
                                             (3-1-0)

Prerequisites: Mathematics 150-3 (with a grade of A or B), or Mathematics 151-3."

NOV 1 1971

R. W. Lardner

Editorial change: ...