

SIMON FRASER UNIVERSITY

MEMORANDUM

S.79-86

Senate

From Senate Committee on
Undergraduate Studies

Subject Proposed Curriculum Changes,
Department of Mathematics

Date 1979-09-13

Actions taken by the Senate Committee on Undergraduate Studies at its regular meeting of 11 September, 1979 give rise to the following motions:

MOTION 1

That Senate approve, and recommend approval to the Board of Governors, the proposed new courses and discontinuance of existing courses as specified in paper S79-86 and outlined below:

New Course Proposals, and discontinuance of courses

MATH 251-3 Calculus III	"	MATH 253-4
MATH 252-3 Vector Calculus I	"	MATH 312-4
MATH 272-3 Introduction to Probability and Statistics	"	MATH 371-3
MATH 313-3 Vector Calculus II	"	(MATH 312-4)
MATH 314-3 Boundary Value Problems	"	(MATH 413-4)
MATH 322-3 Complex Variables	"	MATH 422-4*
MATH 342-3 Elementary Number Theory	"	MATH 442-4
MATH 372-3 Mathematical Statis- tics I	"	MATH 490-4
MATH 375-3 Mathematical Statis- tics II	"	MATH 489-4
MATH 387-3 Introduction to Stochas- tic Processes	"	MATH 486-4
MATH 415-3 Ordinary Differential Equations	"	MATH 413-4
MATH 418-3 Partial Differential Equations	"	MATH 414-4
MATH 419-3 Linear Analysis	"	MATH 420-4
MATH 424-3 Applications of Complex Analysis	"	MATH 422-4*
MATH 425-3 Introduction to Metric Spaces	"	MATH 421-4
MATH 426-3 Introduction to Lebesgue Theory	"	MATH 423-4

MATH 438-3 Linear Algebra	"	MATH 431-4
MATH 439-3 Introduction to Algebraic Systems	"	MATH 432-4
MATH 440-3 Galois Theory	"	MATH 433-4
MATH 444-3 Topology	"	MATH 441-4
MATH 472-3 Linear Models in Stats.	"	MATH 490-4
MATH 479-3 Selected Topics: Stats.	"	
MATH 487-3 Probability		(MATH 486-4)

NOTE The Math Department has presented a number of reasons for its proposed curriculum revisions. Among these are the following:

1. to facilitate transfer credit to and from colleges and other universities (by offering three rather than four semester hour courses and by arranging lower division sequences to consist of six semester hours in each of the 100 and 200 divisions)
2. to strengthen slightly the lower division requirements for Majors and Honours
3. to strengthen and extend the "service" functions of the Mathematics curriculum
4. to reduce overlap where it has developed in related courses
5. in a few instances to extend an "overcrowded" course to two
6. to improve the transition from lower division to 400 division courses
7. on the basis of experience, student interest, and current faculty strengths to increase the coherence in several course sequences.

MOTION 2

That Senate approve, and recommend approval to Board of Governors, the proposed changes in requirements for a Major and for Honours in Mathematics as set forth in paper S79-86.

MOTION 3

That Senate approve, and recommend approval to the Board of Governors, the proposed revisions to existing courses as set forth in paper S79-86 and specified below:

Revisions to Existing Courses

Change in Prerequisites for:

1. Number, vector, prerequisite, MATH 480-3
2. Title and prerequisite MATH 320-3
3. Description, syllabus, vector, prerequisite
MATH 467-3
4. Description and prerequisite MATH 310-3
5. Vector MATH 443-4
6. Change in Prerequisites for:

MATH 242-3

MATH 302-3

MATH 361-3

MATH 404-3

MATH 466-4

MATH 468-4

MATH 469-4

MATH 470-4

MATH 471-4

NOTE subject to approval of the new courses by Senate and the Board
SCUS has approved a waiver of the time lag to permit scheduling of
the following courses in the spring and summer semesters of 1980:

SPRING 80:

MATH 251-3, Calculus III
MATH 426-3, Intro. to Lebesgue Theory
MATH 439-3, Intr. to Algebraic Systems
MATH 444-3, Topology

SUMMER 80:

MATH 251-3, Calculus III
MATH 252-3, Vector Calculus I
MATH 272-3, Intro. to Prob. & Stats.
MATH 314-3, Boundary Value Problems
MATH 342-3, Elementary Number Theory
MATH 440-3, Galois Theory

Members of SCUS were concerned that some students might possibly be disadvantaged by the offering of three credit courses in the spring semester, particularly if they had been planning to take the four semester hour predecessor course or courses. Should this be the case it might be particularly awkward for a student very close to graduation. However, it was ascertained that in providing advance information about course offerings for this spring semester 1980 the department has not listed any of the predecessor courses in the handbook and, therefore, the four courses for which a waiver has been granted will be offered in addition to those already listed and not as replacement for any course of courses a student could have been counting on. On this basis SCUS had no difficulty in granting the waiver.

Handwritten signature: D. A. Brick

SIMON FRASER UNIVERSITY

MEMORANDUM

RECEIVED

JUL 25 1979

REGISTRATION OFFICE
MAIL DESK

H. M. Evans, Secretary

From: N. Heath

Senate Committee for Undergraduate
StudiesAdministrative Assistant
to the Dean of Science

Subject: MATHEMATICS CURRICULUM CHANGES

Date: 1979 07 18

The Faculty of Science, at the meeting of 1979 07 10 approved the following changes to the Mathematics Curriculum. These are now submitted to SCUS for consideration and approval.

Please note that the Fall 1979 implementation for the new courses has been revised. It is now proposed that the new courses will be phased-in, starting in the Spring 1980 semester. A waiver of the two semester time lag of Senate will therefore be requested for some courses.

CONTENTS

1. Memorandum from G.A.C. Graham to C. L. Kemp dated 1979 02 14
(Revised Major & Honours requirements for Mathematics students).

2. Rationale for changes.

3. Summary of changes.

4. Summary Tables of courses showing prerequisites and calendar descriptions.

5. New course proposals (syllabus attached in each case):

MATH 251-3, 252-3, 272-3,
313-3, 314-3, 322-3, 342-3, 372-3, 375-3, 387-3,
415-3, 418-3, 419-3, 424-3, 425-3, 426-3, 438-3,
439-3, 440-3, 444-3, 472-3, 479-3, 487-3.

6. Revisions to existing MATH courses:

MATH 242-3 Prerequisite
302-3 Prerequisite
310-3 Prerequisite & calendar description
320-3 Prerequisite & title
361-3 Prerequisite
404-3 Prerequisite
443-3 Vector
466-4 Prerequisite
467-3 Prerequisite, vector, syllabus & calendar description
468-4 Prerequisite
469-4 Prerequisite
470-4 Prerequisite
471-4 Prerequisite
480-3 Prerequisite, number & vector.

NH/rcy

N. Heath

D. Smith

MEMORANDUM

To: Mr. Harry Evans, Secretary SCUS Registrar's Office	From: G.A.C. Graham, Chairman Undergraduate Studies Committee Mathematics Department
Subject: MATHEMATICS COURSE PROPOSALS/TIME WAIVER SCUS MEETING - SEPTEMBER 11, 1979	Date: September 4, 1979

This is to request a time waiver for the following courses, which the Mathematics Department would like to offer during SPRING 80.

MATH 251-3, Calculus III

MATH 426-3, Introduction to Lebesgue Theory

MATH 439-3, Introduction to Algebraic Systems

MATH 444-3, Topology

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REGISTRY OFFICE

MATH DEPT

Our motive in offering MATH 251-3, Calculus III in Spring 80 (followed by MATH 252-3, Vector Calculus I in Summer 80) is to optimize the phasing in of the majority of the new upper division courses in Fall 80.

MATH 426-3, Introduction to Lebesgue Theory, partly replaces our present MATH 423-4, Real Variable II, which has not been offered since 76-2. Unless a time waiver is granted the material of MATH 426-3 will likely not be offered this coming year which is a situation we wish to avoid.

MATH 439-3, Introduction to Algebraic Systems and MATH 444-3, Topology, partly replace the courses MATH 432-4, 441-4 that we have been offering each Spring. However in order to conserve resources (in view of the planned offering of MATH 426-3), we wish to offer MATH 439-3, 444-3 in Spring 80.

G.A.C. Graham
 G.A.C. Graham

GACG/dr

cc: Dr. C.L. Kemp, Chairman
 Faculty of Science Undergraduate Curriculum Committee
 Dr. M. Singh, Chairman of Mathematics

SIMON FRASER UNIVERSITY

MEMORANDUM

Dr. C.L. Kemp, Chairman
Faculty of Science Undergraduate
Curriculum Committee

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

Subject: COURSE PROPOSALS

Date: February 14, 1979

At its meeting held on February 12, 1979 the Mathematics Department approved of the changes in our course structure that are indicated on the attached summary sheets. Detailed syllabuses and course proposal forms are also enclosed.

Our intention is to begin offering the new courses in Fall 1979, if possible. To this end it would be appropriate that the courses are promptly brought before the Faculty of Science Undergraduate Curriculum Committee for its approval.

In addition, the Mathematics Department wishes to recommend that, upon approval of the new courses, the first paragraph of item #(1) of the requirements for Students Majoring or taking Honors in Mathematics (see page 409 of the 78-79 calendar) be changed to

"(1) to obtain credit for Mathematics 151-3, 152-3, 232-3, 251-3, 252-3, and at least 6 additional hours in lower division Mathematics (Math 100-3, 190-3 and 191-3 may not be included) or Computing Science 103-3, 105-3. This requirement would normally be met by the end of the fourth level."

This recommendation represents a slight strengthening of our current requirements and seems appropriate.

Would you please take these proposals before the Faculty of Science Undergraduate Curriculum Committee for its examination and, I hope, approval.

G.A.C. Graham

G.A.C. Graham

GACG/dr

Enclosures: Course proposal forms and relevant documentation

cc: Dr. M. Singh, Chairman
Mathematics Department

RATIONAL
MATHEMATICS COURSE PROPOSALS

During the past year the Mathematics Department has been involved in an extensive review and overhaul of certain elements of our course structure and resulting revisions have now been agreed upon by the Department.

In general these revisions are characterized by a broadening of our offerings at the 200 and 300 levels with a concomitant adjustment of offerings at the 400-level. This reflects a greater commitment to service aspects of our offerings; however, it was also felt that our present course structure has not given sufficient support to mathematics or other students in bridging the gap between 100-level courses and the more difficult 400-level courses. The 100-level courses have not been changed. Many of the proposed changes bring us more closely into line with common practice of other universities today. In particular we have been mindful of disadvantages, relating, for example, to over-exposure and transfer credit, involved in 4-credit courses that we have dropped, compared to the 3-credit courses that we are adopting. We have taken the opportunity to stretch out courses that had become materially overcrowded, and to contract where course-overlap had crept in over the years.

A key proposal is that Math 253-4, 312-4 are to be replaced by the Second Year Calculus sequence Math 251-3, 252-3 together with the course Math 313-3, Vector Calculus II. As a result of this our first and second year calculus sequence will now be similar to the corresponding sequences at most other universities and community colleges and this should be of particular value in streamlining transfer arrangements to and from SFU. The latter streamlining contributes, in particular, to the proposed Engineering transfer program.

The subsequent 3-credit courses in Differential Equations and Linear and Complex Analysis are also thought to constitute a more amenable package than the 4-credit courses they replace. In particular it is hoped that the courses Math 314-3, Boundary Value Problems and Math 322-3, Complex Variables will provide the students with helpful stepping stones to subsequent 400-level courses. Further development of our Mechanics offerings awaits the approval of the Engineering Mechanics courses Math 262-4, 263-4, which are currently being processed at the Faculty level.

With the restructuring of the Algebra courses it is hoped that a broader program can be made available than heretofore, in the sense that it may be found possible to offer the terminal course Math 440-3, Galois Theory, from time to time, whereas the course it replaces has not been offered since Fall 1975. By restricting its purpose to a training in pure rational deduction, the new Number Theory course Math 342-3, which has minimal prerequisites, is expected to be of more benefit to the general mathematics student than the course it replaces. In Combinatorial Theory the change is minimal.

continued...

One of the main reasons this course review was embarked upon was a certain lack of lustre in our Analysis sequence: with the replacement of Math 421-4, 423-4 by the new courses Math 425-3, 426-3 which supplement Math 242-3 and 320-3 the material has been streamlined and overlap minimized. It is hoped that the latter four courses together with Math 444-3, Topology, will now be an attractive package for students pursuing analysis. Students with more applied mathematical interests or students outside mathematics may find it useful to proceed only as far as Math 320-3, Advanced Calculus of One Variable.

In Probability and Statistics the proposed courses are felt to constitute an attractive package (though minimal compared to some universities) for students who wish to obtain a degree that is specialized in this area of mathematics. The major part of Math 371-3 has been brought to the second year level and called Math 272-3, Introduction to Probability and Statistics, consistent with practice at most universities. The new courses Math 272-3, 372-3, 472-3 then form a natural sequence which is expected to be more reasonably paced than the sequence 371-3, 490-4 that it replaces. The course Math 375-3 (which partly replaces 489-4) complements Math 372-3 by giving the Bayesian Theory of Inference and Bayesian Decision Theory, and also raises basic issues in theories of statistical inference. The course Math 473-3, Nonparametric Statistics, is essentially a renumbering of our present Math 480-3. The course Math 479-3, Statistics: Selected Topics, is being introduced so that Special Topics courses in Statistics may be offered under the Statistics title.

Finally, we are recommending that Math 486-4 be replaced by an essentially applied probability course Math 387-3 followed by Math 487-3 which will be devoted more to axiomatic and classical probability theory; the latter to be given less often than the former.

SIMON FRASER UNIVERSITY

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MEMORANDUM

To..... Mr. Nick Heath
..... Dean of Science Office
Subject..... MATHEMATICS CURRICULUM

From..... Dr. G.A.C. Graham, Chairman
..... Undergraduate Studies Committee
..... Mathematics Department
Date..... June 5, 1979

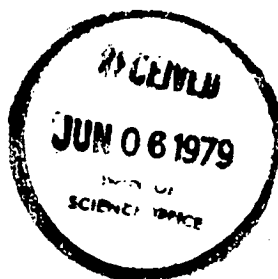
As a result of discussions with the Chemistry and Physics Departments the Mathematics Department has slightly altered the prerequisite for Math 252-3, Vector Calculus I, so that students may now take this course without having taken or concurrently taking Math 232-3, Elementary Linear Algebra. This will have the effect of allowing students (and in particular Chemistry students) to include both Physics 221-3, Intermediate Electricity and Magnetism and Math 252-3 in their program without having also to include Math 232-3. This seems desirable.

G.A.C. Graham

Dr. G.A.C. Graham, Chairman
Undergraduate Studies Committee

cc - Dr. E.J. Wells, Chairman, Chemistry
Dr. A.S. Arrott, Chairman, Physics
Dr. M. Singh, Chairman, Mathematics

ENCL: Revised Documentation



3/1

SUMMARY OF PROPOSED CHANGES

Calculus of Several Variables

253-4 and 312-4 are dropped and replaced by:

251-3, Calculus III	(3-1-0)
252-3, Vector Calculus I	(3-1-0)
313-3, Vector Calculus II	(3-1-0)

Differential Equations

310-3 and 467-3 are retained but with somewhat changed syllabuses (vectors 3-1-0 and 3-0-0 respectively).

413-4 and 414-4 are dropped and replaced by:

314-3, Boundary Value Problems	(3-1-0)
415-3, Ordinary Differential Equations	(3-0-0)
418-3, Partial Differential Equations	(3-0-0)

Linear Analysis

420-4 is dropped and replaced by

419-3, Linear Analysis	(3-0-0)
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Complex Analysis

422-4 is dropped and replaced by:

322-3, Complex Variables	(3-1-0)
424-3, Applications of Complex Analysis	(3-0-0)

Algebra

431-4, 432-4, 433-4 are dropped and replaced by:

438-3, Linear Algebra (3-1-0)

439-3, Introduction to Algebraic Systems (3-0-0)

440-3, Galois Theory (3-0-0)

Number Theory

442-4 is dropped and replaced by:

342-3, Elementary Number Theory (3-0-0)

Combinatorial Theory

The tutorial is dropped from Math 443-4 so that its vector will become (4-0-0)

Analysis

421-4, 423-4, are dropped and replaced by:

425-3, Introduction to Metric Spaces (3-0-0)

426-3, Introduction to Lebesgue Theory (3-0-0)

In addition it is proposed to slightly adapt the prerequisite and change the title of Math 320-3, "Theory of Convergence" to "Advanced Calculus of One Variable" and a slight modification has been proposed for the prerequisite to Math 242-3, "Introduction to Analysis."

Topology

441-4 is dropped and replaced by:

444-3, Topology (3-0-0)

SUMMARY OF PROPOSED CHANGES (cont.)Probability and Statistics

371-3, 480-3, 486-4, 489-4, 490-4 are dropped and replaced by:

272-3, Introduction to Probability and Statistics	(3-1-0)
372-3, Mathematical Statistics I	(3-1-0)
375-3, Mathematical Statistics II	(3-1-0)
387-3, Introduction to Stochastic Processes	(3-1-0)
472-3, Linear Models in Statistics	(3-1-0)
473-3, Nonparametric Statistics	(3-0-0)
487-3, Probability	(3-0-0)
479-3, Statistics: Selected Topics	(3-0-0)

In addition, certain minor changes become necessary in the prerequisites for Math 302-3 and 404-3.

FURTHER PROPOSED PREREQUISITE CHANGES

MATH 361-3: Math 252-3 (or Math 253-4) and Math 262-4 (or Math 161-3 or Phys 120-3 with permission of the Department).

MATH 466-4: Math 252-3 (or Math 253-4) and Math 232-3 or permission of the Department. Math 313-3 is recommended.

MATH 468-4: Math 314-3 or Physics 384-3 and 361-3.
Math 313-3 (or Math 312-4) should precede or be taken concurrently.

MATH 469-4: Math 361-3. Math 314-3 or Phys 384-3 should precede or be taken concurrently.

MATH 470-4: Math 310-3 and either Math 262-4 (or Math 161-3) or Phys 211-3.
Math 313-3 (or Math 312-4) or Phys 384-3 should precede or be taken concurrently.

MATH 471-4: Math 313-3 (or Math 312-4) or Phys 384-3.

APPLIED MATHEMATICS COURSE PROPOSALS

4/1

TITLE	PREREQUISITE	CALENDAR DESCRIPTION
251-3 Calculus III (3-1-0)	152-3 or 155-3; or 158-3 with a grade of A or B.	Polar coordinates, vectors, solid analytic geometry, differential calculus of several variables, multiple integrals, line integrals, Complex numbers.
252-3 Vector Calculus I (3-1-0)	251-3 (or 253-4); 232-3 <i>is</i> <i>recommended</i>	Differentials, Jacobians, transformation of multiple integrals, differentiation and integration of vector functions, integral theorems and their applications.
310-3 Introduction to O.D.E. (3-1-0)	152-3 or 155-3; or 158-3 with a grade of A or B.	First-order differential equations, 2nd & higher order linear equations, series solutions, introduction to Laplace transform, systems and numerical methods, applications in the physical, biological and social sciences
313-3 Vector Calculus II (3-1-0)	232-3, 252-3 (or 253-4)	Extrema of functions of several variables, Lagrange multipliers, curvilinear coordinates and vector differential calculus, space curves, Frenet formulae surfaces, curvature, Christoffel symbols.
314-3 Boundary Value Problems (3-1-0)	252-3 (or 253-4) and 310-3	Fourier series and integrals. Separation of variables for the conduction equation, the wave equations and Laplace's equation. Sturm-Liouville problems. Separation in polar coordinates. Laplace transforms.
315-3 Complex Variables (3-1-0)	251-3 (or 253-4).	Functions of a complex variable, differentiability, contour integrals, Cauchy's theorem, Taylor and Laurent expansions, method of residues
415-3 Ordinary Differ- ential Equations (3-0-0)	310-3. Math 314-3 & 322-3 are recommended	Existence and uniqueness theorems, Green's functions for second-order equations, plane autonomous systems, stability, expansions about ordinary and singular points
418-3 Partial Differ- ential Equations (3-0-0)	314-3 or Phys. 384-3 or permission of dept. 313-3 <i>is recommended.</i>	First-order equations, the wave equation, charac- teristics, Riemann's method, Laplace's equation, Green's and Neumann's functions, Poisson formula
419-3 Linear Analysis (3-0-0)	232-3, 251-3 (or 253-4) and 310-3. 314-3 and 320-3 are recommended.	Convergence in Euclidean spaces, Fourier series and their convergence, Legendre polynomials, Hermite and Laguerre polynomials.
424-3 Applications of Complex Analysis (3-0-0)	322-3	Conformal mapping, application to boundary value problems, Schwarz-Christoffel transformation, integral formulas, analytic continuation, argument principle
467-3 Vibrations (3-0-0)	232-3 and 310-3. 263-4, (or Phys 211-3) & 314-3 are recommended.	Vibrations of discrete systems with many degrees of freedom; matrix methods. Nonlinear vibrations; the phase plane; singular points and limit cycles. Perturbation methods; singular perturbation expansions.

ALGEBRA AND ANALYSIS COURSE PROPOSALS

TITLE	PREREQUISITE(S)	CALENDAR DESCRIPTION
438-3 Linear Algebra (3-1-0)	232-3	Linear Algebra. Vector space and matrix theory.
439-3 Introduction to Algebraic Systems (3-0-0)	232-3	Algebraic systems including, for example, groups, rings. Polynomial theory.
440-3 Galois Theory (3-0-0)	434-3 (or 431-4) and 435-3 (or 432-4)	An introduction to the theory of fields, with emphasis on Galois Theory.
342-3 Elementary Number Theory (3-0-0)	Any 200 level mathematics course.	Divisibility, primes, congruences, arithmetic functions and related topics.
443-4 Combinatorial Theory (4-0-0) Vector change only.	Same	Unchanged.
425-3 Introduction to Metric Spaces (3-0-0)	320-3.	Metric spaces, convergence in metric spaces, continuity, compactness, connectedness and completeness, contraction mapping principle, and other useful theorems.
426-3 Introduction to Lebesgue Theory (3-0-0)	320-3	An introduction to the Lebesgue integral and some of its applications.
444-3 Topology (3-0-0)	425-3 (or 421-4) or permission of the department.	Development of elementary theory of topological spaces.
320-3 Advanced Calculus of One Variable (3-1-0) Title & prerequisite change only.	242-3 (or 241-2) and 251-3 (or 253-4)	Unchanged.
242-3 Introduction to Analysis (3-1-0) Prerequisite change only.	152-3 or 155-3.	Unchanged.

PROBABILITY AND STATISTICS COURSE PROPOSALS

4/3

TITLE	PREREQUISITE(S)	CALENDAR DESCRIPTION
272-3 Intro. to Prob. and Stats (3-1-0)	152-3 or 155-3 or 158-3	Basic laws of probability, sample distributions. Introduction to statistical applications.
372-3 Mathematical Statistics I (3-1-0)	251-3 (or 253-4) and 272-3 (or 371-3)	Techniques of estimation and testing hypotheses, one-sample and two-sample tests. Introduction to analysis of variance, regression and correlation.
375-3 Mathematical Statistics II (3-1-0)	251-3 (or 253-4) and 272-3 (or 371-3)	Sampling theory and Bayesian approaches to inference. Types of probability distributions. Bayesian decision theory. Method of maximum likelihood. Illustrations of the different methods.
387-3 Introduction to Stochastic Processes (3-1-0)	272-3 (or 371-3) or permission of the department	Markov chains. Random walks. Continuous time processes. The Poisson process. Markov processes Gaussian processes.
472-3 Linear Models in Statistics (3-1-0)	232-3 and 372-3 (or 371-3)	Linear models, analysis of variance and covariance, multiple regression, introduction to the design of experiments.
473-3 Nonparametric Statistics (3-0-0)	372-3 (or 371-3) or permission of the department	Same as for Math 480-3. This is a number change and vector change only.
487-3 Probability (3-0-0)	387-3 (or 486-3)	Probability spaces, prob. distributions, laws of large numbers, characteristic functions, central limit theorems, infinitely divisible distributions. Conditional distributions and expectations.
479-3 Statistics: Selected Topics (3-0-0)	Will be specified according to topics offered under this number.	Variable topics.
302-3 Statistical Methods (3-0-1)	101-3 or 272-3 (or 371-3), or Arc 376-5 or Econ 332-3	Unchanged
404-3 Statistical Design & Analysis of Experiments (4-1-0)	272-3 (or 371-3), or 302-3	Unchanged

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 251 Credit Hours: 3 Vector: 3-1-0

Title of Course: CALCULUS III

Calendar Description of Course:

Polar coordinates, vectors, solid analytic geometry, differential calculus of several variables, multiple integrals, line integrals. Complex numbers.

Nature of Course Lecture/tutorial

Prerequisites (or special instructions): MATH 152-3 or 155-3; or MATH 158-3 with a grade of A or B.

Students who have obtained credit for MATH 253-4 cannot receive ^{further} credit for MATH 251-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 253-4

2. Scheduling

How frequently will the course be offered? Every semester

Semester in which the course will first be offered? ~~Fall 1979~~ Spring 80-1

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

Objectives of the Course

Third course in mainstream calculus sequence. Would be taken by all majors in mathematics, physics and chemistry.

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: Feb. 16, 1979

Mansoor Singh
Department Chairman

12/7/79
Dean

SEP 11 79

Chairman, SCUS

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

MATHEMATICS 251-3

CALCULUS III

Chapter 12 - Polar Coordinates

(2 weeks)

- Section 12.1 Polar Coordinates
- Section 12.2 Graphs of Polar Equations
 - 12.3 Relations between Polar and Rectangular Coordinates
 - 12.4 Area in Polar Coordinates
 - 12.5 Arc Length in Polar Coordinates

Complex Numbers

(1 week)

The complex plane, algebra of complex numbers, quadratic equations, the Euler formulae.

Chapter 14 - Vectors and 3-Space

(3-4 weeks)

- Section 14.1 The 3-Dimensional Coordinate System
- 14.2 Distance
- 14.3 Sketching Graphs
- 14.4 Vectors
- 14.5 Dot and Cross Products
- 14.6 Equations of Lines and Planes
- 14.7 Functions from R^n to R^m
- 14.8 Limits and Continuity

Chapter 15 - Differential Calculus of Functions of Several Variables

(3 weeks)

- Section 15.1 Partial Derivatives
- 15.2 Chain Rules
- 15.3 The Gradient
- 15.4 Directional Derivatives
- 15.5 Local Extrema of Functions of Two Variables
- 15.6 Absolute Maxima and Minima

Chapter 16 - Multiple Integration

(2 weeks)

- Section 16.1 Double Integration
- 16.2 Iterated Integrals; The Fundamental Theorem for Double Integrals
- 16.5 Transformation of Multiple Integrals
- 16.6 Double Integrals in Polar Coordinates

Chapter 17 - Vector Calculus

- Section 17.1 Work and Line Integrals
- 17.2 Computation of Line Integrals

Though not part of the syllabus, you may also wish to study the material in Chapter 13 - Differential Equations. (This material is covered more thoroughly in Math 310-3.)

PREREQUISITES: MATH 152-3 or 155-3; or MATH 158-3 with a grade of A or B.

Students who have obtained credit for MATH 153-4 cannot receive credit for MATH 251-3.

TEXTBOOK: CALCULUS WITH ANALYTIC GEOMETRY, Second Edition
by Howard E. Campbell and Paul F. Dierker
Published by Prindle, Weber and Schmidt, Inc. (Wadsworth)

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 252 Credit Hours: 3 Vector: 3-1-0

Title of Course: VECTOR CALCULUS I

Calendar Description of Course:

Differentials, Jacobians, transformation of multiple integrals, differentiation and integration of vector functions, integral theorems and their applications.

Nature of Course Lecture/tutorial

Prerequisites (or special instructions): MATH 251-3 (or 253-4). It is recommended that
MATH 232-3 precede or be taken concurrently. Students who have obtained credit for MATH
312-4 cannot receive credit for MATH 252-3.

What course (courses), if any, is being dropped from the calendar if this course is
approved: MATH 253-4 and 312-4 are being replaced by MATH 251-3, 252-3 and 313-3.

2. Scheduling

How frequently will the course be offered? Every semester

Semester in which the course will first be offered? Fall 1979 Summer 80-2

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

Objectives of the Course

Fourth course in mainstream calculus sequence. Would be taken by all
majors in mathematics and physics.

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: Feb. 16, 1979

Manahan Smith
Department Chairman

12/1/79
Dean

SEP 11 79

Chairman, SCUS

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

Mathematics 252-3

Vector Calculus I

1. Multiple Integration (3 weeks)
Review of double integrals, iterated integrals. Surface area.
Triple integrals. Transformation of multiple integrals. Integrals
in cylindrical and spherical coordinates.
2. Vector integral calculus - introduction (3 weeks)
Review of line integrals. Green's theorem. Path independence.
Line and surface integrals in three dimensions. The divergence
theorem. Stokes' theorem.
3. Differential calculus of several variables (2 1/2 weeks)
Differentials and theorems on differentials (Note: differentials
are not discussed in Math 251-3). Implicit functions. Jacobians.
Partial derivatives and chain rule using Jacobians. Theorems on
Jacobians.
4. Vector differential calculus (2 weeks)
Vector differentiation. Space curves. Applications in mechanics.
Gradient, divergence and curl. Identities involving differential
operators.
5. Further integral calculus (2 1/2 weeks)
Green's theorem for multiply-connected regions. Divergence and
Stokes' theorem in terms of grad, div and curl. Path independence
and exact differentials in three dimensions.

PREREQUISITE: MATH 251-3 (or 253-4). It is recommended that MATH 250-2
precede or be taken concurrently. Students who have
obtained credit for MATH 312-4 cannot receive credit
for MATH 252-3.

TEXTBOOK: Calculus with Analytic Geometry, 2nd Edition, by Campbell &
Dierker. (Chapters 16 and 17 should be used for sections 1
and 2 of the course.) For sections 3 - 5, textbook is to be
chosen by the instructor.

References for syllabus outline:

Sections 1-2: Advanced Calculus, Schaum series, chapters 6 & 9.
Sections 3-5: Vector Analysis, Schaum series, chapters 3-5.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 272 Credit Hours: 3 Vector: 3-1-0

Title of Course: INTRODUCTION TO PROBABILITY AND STATISTICS

Calendar Description of Course:

Basic laws of probability, sample distributions. Introduction to statistical applications.

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions): MATH 152-3 or 155-3 or 158-3

Students who have obtained credit for MATH 371-3 cannot receive credit for 272-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 371-3

2. Scheduling

How frequently will the course be offered? Twice per year

Semester in which the course will first be offered? Fall 1979 Summer 80-2

Which of your present faculty would be available to make the proposed offering possible: Drs. Eaves, Stephens, Villegas, Weldon

Objectives of the Course

To provide a basic introduction to probability, applied probability and statistics to mathematically oriented students. This is the foundation course for students wishing to pursue a sequence in probability and mathematical statistics.

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: FEB. 12, 1979

Manoush Singh
Department Chairman

12/7/79
Dean

SEP 11 79
Chairman, SCUS

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

Introduction to Probability & Statistics

1. Elements of Probability (A Venn Diagram Approach)

Sets and operations on sets, Permutations, Combinations, Postulates of Probability, Frequency Definition of Probability. Additive and Multiplicative theorems, Conditional Probability, Independent and Mutually Exclusive Events. Bayes Theorem.

2. Probability Distributions

Random Variables, Distribution Functions, Binomial, Hypergeometric, Poisson, Multivariate-Discrete distributions with a discussion of conditional and marginal distributions.

3. Mathematical Expectation - Discrete Random Variables

Expectation, Moments, Chebycheff's Theorem, Law of Large Number, Moments of Distributions in Part 2, Moment Generating Function and its properties. Moment Generating Functions of Binomial and Poisson.

4. Probability Densities

Properties of Probability Densities and their Distribution Functions. The Uniform, Exponential, Gamma and Normal Densities. Change of Variable.

5. Mathematical Expectation. Continuous Random Variables

Expectation, Moments, Moments of Distributions in Part 4. Moment Generating Functions of Distributions in Part 4.

6. Sums of Random Variables

Sums of discrete random variables and their moment generating functions. Sums of continuous random variables and their moment generating functions. The distribution of the mean. Statement of Central Limit Theorem, Normal approximation of Binomial.

7. Sampling from Normal Populations

The distribution of $\bar{x}$, and the t-distribution.

PREREQUISITES: Either MATH 152-3 or 155-3 or 158-3. Students who have obtained credit for Math 371-3 cannot receive credit for Math 272-3.

TEXTBOOK: Mathematical Statistics by Freund
or
As noted on Mathematics Textbook List.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 313 Credit Hours: 3 Vector: 3-1-0

Title of Course: VECTOR CALCULUS II

Calendar Description of Course:

Extrema of functions of several variables, Lagrange multipliers, curvilinear coordinates and vector differential calculus; space curves, Frenet formulae; surfaces, curvature, Christoffel symbols.

Nature of Course Lecture/tutorial

Prerequisites (or special instructions): MATH 232-3 and 252-3 (or 253-4)

Students who have obtained credit for MATH 312-4 cannot receive credit for Math 313-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 312-4

2. Scheduling

How frequently will the course be offered? Twice per year

Semester in which the course will first be offered? Fall 1979 80-3

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

Objectives of the Course

The course covers a range of techniques of wide use in applications of mathematics, mainly concentrating on functions of several variables and vector calculus. It is a continuation of second year calculus courses.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library NONE

Audio Visual

Space

Equipment

5. Approval

Date: Feb 16 1979

Marshall Singh
Department Chairman

John R. Birch
12/1/79
Dean

SEP 11 '79

Chairman, SCUS

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

MATHEMATICS 313-3
VECTOR CALCULUS II

1. Review (1 week)
Quick review of vector calculus.
2. Applications of Partial Derivatives, Extrema (2 weeks)
Applications of partial derivatives to geometry. Envelopes.
Extrema of functions of several variables. Extrema under constraints. Applications.
3. Curvilinear Coordinates in Two and Three Dimensions (3 weeks)
Curvilinear coordinates. Coordinate curves and surfaces.
Orthogonal systems. Gradient curl, divergence, Laplacian etc.
in orthogonal curvilinear systems.
4. Space curves (2-3 weeks)
Parametric representation. Arc length. Tangent vector.
Normal and binormal. Curvature and torsion. Frenet formulae.
5. Surfaces (4-5 weeks)
Parametric representation. Tangent plane, normal. First
fundamental form. Second fundamental form and normal curvature.
Principal curvatures and directions. Gauss-Weingarten formulae.
Christoffel symbols.

PREREQUISITES: MATH 232-3 and 252-3 (or 253-4) Students who have obtained credit for
MATH 312-4 cannot receive credit for MATH 313-3.

TEXTBOOK: To be chosen by the Instructor to cover the above syllabus.

References for syllabus outline:

1. Advanced Calculus, Schaum Series, Chapter 8
2. Vector Analysis, Schaum Series, Chapter 7
3. Differential Geometry, Schaum Series, Chapters 3-5, 8-10.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 314 Credit Hours: 3 Vector: 3-1-0

Title of Course: BOUNDARY VALUE PROBLEMS

Calendar Description of Course: Fourier series and integrals. Separation of variables for the conduction equation, the wave equations and Laplace's equation. Sturm-Liouville problems. Separation in polar coordinates. Laplace transforms.

Nature of Course: Lecture/tutorial

Prerequisites (or special instructions): MATH 252-3 (or 253-4) and 310-3. *Students with credit for MATH 414-4 cannot take Math 314-3 for further credit. Those with credit for MATH 413-4 may take Math 314-3 for further credit.*

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 413-4 and 414-4 are being replaced by MATH 314-3, 415-3 and 418-3.

2. Scheduling

How frequently will the course be offered? Twice per year

Semester in which the course will first be offered? ~~Fall 1979~~ Summer 80-2

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

Objectives of the Course

Introductory course in partial differential equations covering separation of variables and transform methods.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

NONE

Audio Visual

Space

Equipment

5. Approval

Date: Feb. 16, 1979

Manish Singh
Department Chairman

12/7/79
Dean

SEP 11 79
Chairman, SCUS

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

MATHEMATICS 314-3
BOUNDARY VALUE PROBLEMS

1. Fourier Series and Integrals (2 weeks)

Periodic functions and Fourier series. Even and odd functions. Statement of convergence properties. Fourier integral. Applications.

2. Separation of Variables (5 weeks)

The heat equation in one dimension with various boundary conditions. Sturm-Liouville problems and eigenfunction expansions. Semi-infinite and infinite regions. The wave equation in one dimension, bounded and unbounded regions. The potential equation in rectangle, slot and disk.

3. Higher Dimensions (4 weeks)

Two dimensional heat equation in rectangular and polar coordinates; Bessel functions. Other applications of Bessel functions. Separation in spherical coordinates.

4. Laplace Transform (2 weeks)

Review of Laplace transform and its elementary properties. Partial fractions and convolutions. Application to partial differential equations (If time permits, other integral transforms should be discussed.)

PREREQUISITES: MATH 252-3 (or 253-4) and 310-3

TEXTBOOK: BOUNDARY VALUE PROBLEMS by D. L. Powers
OR As noted in the Mathematics Department textbook list.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 322 Credit Hours: 3 Vector: 3-1-0

Title of Course: COMPLEX VARIABLES

Calendar Description of Course: Functions of a complex variable, differentiability, contour integrals, Cauchy's theorem, Taylor and Laurent expansions, method of residues.

Nature of Course Lecture/tutorial

Prerequisites (or special instructions): MATH 251-3 (or 253-4).

Students who have obtained credit for MATH 422-4 cannot receive credit for MATH 322-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 422-4

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? Fall 1979 80-3

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

Objectives of the Course

Introductory course on functions of a complex variable.

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: Feb. 16, 1979

Manish Singh
Department Chairman

12/7/79
Dean

SEP 11 79

Chairman, SCUS

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

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: Mathematics

Abbreviation Code: MATH Course Number: 342 Credit Hours: 3 Vector: 3-0-0

Title of Course: ELEMENTARY NUMBER THEORY

Calendar Description of Course:

Divisibility, primes, congruences, arithmetic functions and related topics.

(Same as present Math 442-4)

Nature of Course Lecture

Prerequisites (or special instructions):

Any 200 level mathematics course. Students who have obtained credit for Math 442-4 cannot receive credit for Math 342-3.

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

MATH 442-4

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? Summer 1980

Which of your present faculty would be available to make the proposed offering possible: Drs. Freedman, Sember and others

Objectives of the Course The subject of elementary number theory has considerable value

as a medium through which students can get training and experience in pure rational deduction. Changing this course to 3 lectures and no tutorial and allowing the minimal prerequisites proposed above should benefit the students in the following ways: They may take the course early in their upper levels mathematics work so that it may serve as a transition course from the more elementary lower level work to the more sophisticated upper level work; also the pressure of a 4 hour lecture plus tutorial course has been

4. Budgetary and Space Requirements (for information only) reduced so that the student may find it a less strenuous transition.

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual

Space

Equipment

NONE

5. Approval

Date: Feb. 16, 1979

Manover Singh
Department Chairman

12/7/79
Dean

SEP 11 79

Chairman, SCUS

3-34b:- (When completing this form, for instructions see Memorandum SCUS 73-34a. Attach course outline).

MATH 322-3
COMPLEX VARIABLES

1. Complex Numbers

Arithmetic operations, complex conjugate, absolute value, geometric representations of complex numbers, powers and roots.

2. Complex Functions

Limits, continuity, derivatives, Cauchy-Riemann conditions, analytic functions.

3. Elementary Functions

The exponential, trigonometric and hyperbolic functions, the logarithmic functions, branch points and branch lines, inverse trigonometric functions.

4. Introduction to Conformal Mapping

Elementary properties of conformal mapping, linear fractional transformations, mapping by elementary functions.

5. Complex Integration

Line integrals in complex plane, Cauchy's theorem for simply and multiply connected regions. Cauchy's integral formula, higher derivatives of analytic functions. Morera's theorem, maximum modulus theorem, Liouville's theorem.

6. Power Series

Properties of power series; Taylor and Laurent series; differentiation and integration of power series; uniform convergence.

7. Calculus of Residues

Residues and poles; residue theorem, evaluation of residues; contour integration, evaluation of definite integrals; integration around a branch point.

PREREQUISITE: MATH 251-3 (or 253-4). Students who have obtained credit for MATH 422-4 cannot receive credit for MATH 322-3.

TEXTBOOK: Complex Variables and Applications by R.V. Churchill, J.W. Brown, and R.F. Verhey (Chapters 1 - 7)

1979-02-27

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 372 Credit Hours: 3 Vector: 3-1-0

Title of Course: MATHEMATICAL STATISTICS I

Calendar Description of Course: *Techniques of estimations and testing hypotheses, one-sample and two-sample tests. Introduction to analysis of variance, regression and correlation.*

Nature of Course *Lecture/tutorial*

Prerequisites (or special instructions):

MATH 251-3 (or 253-4) and 272-3 (or 371-3)

Students who have obtained credit for MATH 490-4 cannot receive credit for 372-3.
What course (courses), if any, is being dropped from the calendar if this course is approved:

Math 371-3, 490-4

2. Scheduling

How frequently will the course be offered? *Twice per year*

Semester in which the course will first be offered? *Fall 1979 80-3*

Which of your present faculty would be available to make the proposed offering possible: *Drs. Eaves, Stephens, Vallegas, Weldon*

Objectives of the Course

Continuation of Math 272 in Classical Statistical methods. Provides introduction to basic techniques used in applied statistics.

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

Approval

Date: FEB. 16, 1979

Harold Smith
Department Chairman

12/7/79
Dean

SEP 11 79
Chairman, SCUS

MATHEMATICS 342-3
ELEMENTARY NUMBER THEORY

I. Basic Material (order only approximate):

- A. The integers (brief)
- B. Divisibility, Euclidean algorithm gcd; lcm
- C. Primes, unique factorization
- D. Congruences, residue classes, systems of linear congruences
- E. Euler-Fermat Theorem (need ϕ = Euler ϕ -function)
- F. Arithmetic functions, ϕ , τ , σ , etc. Möbius inversion formula
- G. Distribution of prime numbers, sieve of Eratosthenes
- H. Quadratic reciprocity, Legendre symbol, quadratic reciprocity law

II. Additional material may be presented at the discretion of the instructor.

PREREQUISITE: Any 200 level mathematics course.
Students who have obtained credit for Math 442-4 cannot receive credit for Math 342-3

TEXTBOOK: The textbook will be chosen from the following list:

- 1. Topics from the Theory of Numbers by Grosswald
- 2. An Introduction to the Theory of Numbers by Niven and Zuckerman
- 3. Elementary Number Theory by Dudley
- 4. Number Theory by G. Andrews

PLEASE CHECK THE MATHEMATICS DEPARTMENT TEXTBOOK LIST FOR CURRENT TEXT IN USE.

MATHEMATICS 372-3

MATHEMATICAL STATISTICS I

Sampling distribution theory. The χ^2 and F distributions, and their applications.

Methods of estimation. Maximum likelihood, Bayes estimators. Introduction to Decision Theory.

Confidence intervals.

Tests of hypotheses. The bivariate normal distribution.

Introduction to regression and correlation.

Introduction to analysis of variance.

TEXTBOOK: John E. Freund, MATHEMATICAL STATISTICS

PUBLISHER: Prentice-Hall

PREREQUISITES: MATH 251-3 (or 253-4) and 272-3 (or 371-3)

Students who have obtained credit for MATH 490-4
cannot receive credit for MATH 372-3

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 375 Credit Hours: 3 Vector: 3-1-0

Title of Course: MATHEMATICAL STATISTICS II

Calendar Description of Course: *Sampling theory and Bayesian approaches to inference. Types of probability distributions. Bayesian decision theory. Method of maximum likelihood. Illustrations of the different methods.*

Nature of Course *Lecture/tutorial*

Prerequisites (or special instructions): *MATH 251-3 (or 253-4) and 272-3 (or 371-3)*
Students who have obtained credit for MATH 489-4 cannot receive credit for 375-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: *MATH 489-4*

2. Scheduling

How frequently will the course be offered? *Once per year*

Semester in which the course will first be offered? *Fall ~~1979~~ 80-3*

Which of your present faculty would be available to make the proposed offering possible: *Drs. Eaves, Stephens, Villegas, Weldon*

Objectives of the Course

To introduce students to difficult problems in statistical inference with particular emphasis on the Bayesian approach to inference and decision theory.

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: FEB. 16, 1979

Manoel R. Singh
Department Chairman

12/7/79
Dean

SEP 11 '79
Chairman, SCUS

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

MATHEMATICS 375-3

MATHEMATICAL STATISTICS II

1. Joint probability distributions. Marginal and conditional distributions. Transformations.
2. Bayesian inference. Prior, posterior and predictive distributions. Bernoulli, Poisson, exponential and normal models. Location and scale parameter models.
3. Bayesian decision theory. Utility Linear and quadratic losses. Bayes estimates. The value of information.
4. Likelihood methods. Maximum likelihood estimation. Posterior likelihood intervals. Bayesian testing of models.
5. Two sample problems. The Behrens-Fisher problem. The ratio of normal means.

TEXTBOOK: INTRODUCTION TO PROBABILITY AND STATISTICS FROM A BAYESIAN VIEWPOINT by Dennis V. Lindley.
Vol. II: Inference.

PUBLISHER: Cambridge University Press (1970)

PREREQUISITES: MATH 251-3 (or 253-4) and 272-3 (or 371-3)
Students who have obtained credit for MATH 489-4
cannot receive credit for MATH 375-3.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

1. Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 387 Credit Hours: 3 Vector: 3-1-0

Title of Course: INTRODUCTION TO STOCHASTIC PROCESSES

Calendar Description of Course:

Markov chains. Random walks. Continuous time processes. The Poisson process.
Markov processes. Gaussian processes.

Nature of Course Lecture/tutorial

Prerequisites (or special instructions):

MATH 272-3 (or 371-3) or permission of the department.

Students who have obtained credit for MATH 486-4 cannot receive credit for 387-3.
What course (courses), if any, is being dropped from the calendar if this course is approved: Math 486-4 is being replaced by Math 387-3 and 487-3

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? Fall 1979 80-3

Which of your present faculty would be available to make the proposed offering possible: Drs. Kim, Eaves, Thomson, Weldon, Stephens

Objectives of the Course

An introduction to stochastic processes.

This is an important course for students interested in applications of probability. Techniques like Markov chains, the Poisson Process, queuing theory, renewal theory are needed in many branches of science.

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: Feb. 16, 1979 [Signature]
[Signature] 12/7/79 SEP 11 79
Department Chairman Dean Chairman, SCUS

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

MATHEMATICS 387-3

INTRODUCTION TO STOCHASTIC PROCESSES

Random variables. Probability and generating functions expectation.

Markov chains. The Chapman-Kolmogorov equations.

Branching processes.

The Poisson Process.

Continuous time Markov chains. Queuing systems.

Introduction to renewal theory and reliability theory.

TEXTBOOK: INTRODUCTION TO PROBABILITY MODELS by Sheldon M. Ross

PUBLISHER: Academic Press

PREREQUISITE: MATH 272-3 (or 371-3) or permission of the department.
Students who have obtained credit for MATH 486-4
cannot receive credit for MATH 387-3.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 415 Credit Hours: 3 Vector: 3-0-0

Title of Course: ORDINARY DIFFERENTIAL EQUATIONS

Calendar Description of Course: Existence and uniqueness theorems, Green's functions for second-order equations, plane autonomous systems, stability, expansions about ordinary and singular points.

Nature of Course Lecture

Prerequisites (or special instructions): MATH 310-3; MATH 314-3 and 322-3
are recommended.

Students who have obtained credit for MATH 413-4 cannot receive credit for MATH 415-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 413-4

2. Scheduling

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

Semester in which the course will first be offered? Fall 79-80-3

Which of your present faculty would be available to make the proposed offering possible: Drs. Bojadziev, Graham, Lardner, Sharma or others.

Objectives of the Course

Advanced course on ordinary differential equations. Would be taken only by majors in mathematics or perhaps physics.

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: Feb. 16, 1979

Manohar Singh
Department Chairman

12/7/79
Dean

SEP 11 79
Chairman, SCUS

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

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

General Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 418 Credit Hours: 3 Vector: 3-0-0

Title of Course: PARTIAL DIFFERENTIAL EQUATIONS

Calendar Description of Course: First-order equations, the wave equations, characteristics, Riemann's method, Laplace's equation, Green's and Neumann's functions, Poisson formula.

Nature of Course Lecture

Prerequisites (or special instructions): MATH 314-3 (or Phys 384-3) or permission of the Dept.
MATH 313-3 is recommended

Students who have obtained credit for MATH 414-4 cannot receive credit for MATH 418-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 414-4

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? Fall 79 80-3

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

Objectives of the Course

Advanced course in partial differential equations. Would be taken only by majors in applied mathematics or physics, but would be an important course for such 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

NONE

5. Approval

Date: Feb. 16, 1979

Mansoor Singh
Department Chairman

12/7/79
Dean

SEP 11 79

Chairman, SCUS

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

MATH 415-1
ORDINARY DIFFERENTIAL EQUATIONS

1. First-order Equations

Review of solution methods; initial value problems; comparison theorem.

2. Second-order Linear Equations

Initial value problem; properties of the Wronskian; separation and comparison theorems; adjoint operator and Lagrange identity; Green's functions.

3. Linear Equations with Constant Coefficients

Characteristic polynomial; solution bases; stability; inhomogeneous equations; the transfer function; Green's function.

4. Power Series Solutions

Method of undetermined coefficients; Bessel functions; analytic functions; method of majorants; first-order equations.

5. Plane Autonomous Systems

The phase plane; linear autonomous systems; linear equivalence; stability and classification of critical points; Liapunov method and applications; limit cycles.

6. Existence and Uniqueness Theorems

Well-posed problems; Picard iteration process; linear systems.

7. Regular Singular Points (Brief treatment if time is short)

Continuation principle; first order equations; regular singular points for second order equations; Bessel equation; hypergeometric function.

PREREQUISITES: MATH 310-3; MATH 314-3 and 322-3 are recommended. Students who have obtained credit for MATH 413-4 cannot receive credit for MATH 415-3.

TEXTBOOK: Ordinary Differential Equations (3rd Edition), Chapter 1 - 6 & 9
by G. Birkhoff & G.C. Rota

MATH 418-3
PARTIAL DIFFERENTIAL EQUATIONS

I. First Order Equations

Linear first order equations, characteristic variables; quasi-linear equations, method of Lagrange.

II. The Wave Equation (one space-dimension)

Vibrating string. D'Alembert's formula, boundary-value problems, integral form of the wave equation, characteristics, well-posed problems, discontinuities of the solution, separation of variables*, Riemann's method.

III. Laplace's Equation

Physical examples, harmonic functions, separation of variables*, fundamental solution, Green's formula, Green's and Neumann's functions, maximum principle and uniqueness, method of images, Poisson's formulae for circle, sphere and half-space.

* "Separation of variables" method is to be done very briefly or not at all. This method is discussed in Mathematics 314-3.

PREREQUISITES: MATH 314-3 or permission of the department.

MATH 313-3 is recommended. Students who have obtained credit for MATH 414-4 cannot receive credit for MATH 418-3.

TEXTBOOK: Partial Differential Equations of Mathematical Physics
by Tychonov & Samarski (out of print as of October 1977)

Partial Differential Equations of Mathematical Physics
by Tyn Myint-u

Partial Differential Equations: An Introduction
by E. C. Young (out of print as of July 1975)

Please check the Mathematics Textbook List for current text in use.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 419 Credit Hours: 3 Vector: 3-0-0

Title of Course: LINEAR ANALYSIS

Calendar Description of Course: Convergence in Euclidean spaces, Fourier series and their convergence, Legendre polynomials, Hermite and Laguerre polynomials.

Nature of Course Lecture

Prerequisites (or special instructions): MATH 232-3, 251-3 (or 253-4) and 310-3.
MATH 314-3 and 320-3 are recommended.

Students who have obtained credit for MATH 420-4 cannot receive credit for MATH 419-3.
What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 420-4

2. Scheduling

How frequently will the course be offered? Once per year or less

Semester in which the course will first be offered? Fall 79 80-3

Which of your present faculty would be available to make the proposed offering possible: Most faculty in the department

Objectives of the Course

This course, bridging pure and applied mathematics, gives an introduction to applied functional analysis.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

NONE

Audio Visual

Space

Equipment

5. Approval

Date: Feb. 16, 1979 Attilio D. R. Birch

Manshar Singh
Department Chairman

12/2/79
Dean

SEP 11 79

Chairman, SCUS

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

MATH 419-3
LINEAR ANALYSIS

The following syllabus refers to the recommended textbook.

1. Vector Spaces

Quick review of real vector spaces and linear transformations and matrices (Chapters 1 & 2). (5 lectures)

2. Euclidean Spaces

Euclidean vector spaces; convergence in Euclidean spaces. (7-8 lectures)
(Chapters 7 & 8 - omit 7.6 & 7.7)

3. Fourier Series

Fourier series; convergence properties of Fourier series. (10 lectures)
(Chapters 9 & 10; Chapter 10 probably cannot be covered thoroughly in the time allowed).

4. Orthogonal Systems

Legendre, Hermite & Laguerre polynomials. (12 lectures)
(Chapters 11 & 12 - omit 12.9 - 11).

PREREQUISITES: MATH 232-3, (or PHYS 384-3) or permission of the Department.
MATH 314-3 and 320-3 are recommended.

Students who have obtained credit for MATH 420-4
cannot receive credit for MATH 419-3.

TEXTBOOK: An Introduction to Linear Analysis
by Kreider, Kuller, Ostberg and Perkins
OR As noted in the Mathematics Department textbook list.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 424 Credit Hours: 3 Vector: 3-0-0

Title of Course: APPLICATIONS OF COMPLEX ANALYSIS

Calendar Description of Course: Conformal mapping, application to boundary value problems, Schwarz-Christoffel transformation, integral formulas, analytic continuation, argument principle.

Nature of Course Lecture

Prerequisites (or special instructions): MATH 322-3.

Students who have obtained credit for MATH 422-4 cannot receive credit for MATH 424-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 422-4

Scheduling

How frequently will the course be offered? Approximately every second year

Semester in which the course will first be offered? Spring 1980 81-1 or Fall 80-3

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

Objectives of the Course

To give an introduction to the use of complex variable methods in the solution of boundary value problems in the physical sciences and engineering.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library NONE

Audio Visual

Space

Equipment

5. Approval

Date: Jul. 16, 1979

Manshar Singh
Department Chairman

12/7/79
Dean

SEP 11 79

Chairman, SCUS

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

APPLICATIONS OF COMPLEX ANALYSIS

1. Mapping by Elementary Functions (Review)

Mapping by linear functions; linear fractional transformations; the functions z^n , $z^{1/2}$, $\exp z$, $\sin z$.

2. Conformal Mapping

Properties of conformal mapping; conjugate harmonic functions; boundary value problems; transformation of boundary conditions.

3. Applications of Conformal Mapping

Boundary value problems for steady temperature distributions, electrostatic potentials and fluid flow; introduction to aerofoil theory.

4. Schwarz-Christoffel Transformation

Mapping of real axis onto general polygon; triangles and rectangles; infinite strip; channels with slit or offset.

5. Integral Formulas

Dirichlet and Neumann problems for disk and half-plane; Poisson integral formula and related formulas.

6. Further Topics

- (a) Analytic continuation, reflection principle;
- (b) Poles and zeros, essential singularities, the argument principle;
- (c) Riemann surfaces.

PREREQUISITE: MATH 322-3. Students who have obtained credit for MATH 422-4 cannot receive credit for MATH 424-3.

TEXTBOOK: Complex Variables and Applications
by R.V. Churchill, J.W. Brown and R.F. Verhey (Chapters 4, 8-12)

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

1. Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 425 Credit Hours: 3 Vector: 3-0-0

Title of Course: INTRODUCTION TO METRIC SPACES

Calendar Description of Course:

Metric spaces, convergence in metric spaces, continuity, compactness, connectedness and completeness, contraction mapping principle, and other useful theorems.

Nature of Course *Lecture*

Prerequisites (or special instructions): *MATH 320-3. Students who have obtained credit for MATH 421-4 cannot receive credit for MATH 425-3.*

What course (courses), if any, is being dropped from the calendar if this course is approved: *MATH 421-4*

2. Scheduling

How frequently will the course be offered? *Once per year*

Semester in which the course will first be offered? *Fall 1979 86-3*

Which of your present faculty would be available to make the proposed offering possible: *Drs. Eaves, Kim, Ryeburn, Sember, Shen, Thomson and others*

3. Objectives of the Course

This course is a revision of Math 421-4. It is designed to eliminate some of the overlap existing between Math 342-3, 320-3 and 421-4. Together with the other two new proposed courses (Math 426-3 and 444-3) it will streamline our overall offerings in Analysis.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

NONE

Audio Visual

Space

Equipment

5. Approval

Date: Feb. 16, 1979

Manuel Singh
Department Chairman

12/7/79
Dean

[Signature]
Chairman, SCUS

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

MATH 425-3

INTRODUCTION TO METRIC SPACES

1. Metric Spaces
2. Convergence in Metric Spaces
3. Open Sets, Closed Sets and Bounded Sets
4. Continuous Functions on Metric Spaces
5. Uniform Continuity
6. Compactness, Connectedness and Completeness
7. Weierstrass Approximation Theorem, Arzela Theorem and Fixed-point Theorem

PREREQUISITES: MATH 320-3

Students who have obtained credit for Math 421-4 cannot receive credit for Math 425-3.

SUGGESTED TEXTBOOK: Methods of Real Analysis by R. Goldberg

(Chapters 4, 5, 6, 10 and possibly parts of 9)

PLEASE CHECK MATHEMATICS TEXTBOOK FOR CURRENT TEXT IN USE.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 426 Credit Hours: 3 Vector: 3-0-0

Title of Course: INTRODUCTION TO LEBESGUE THEORY

Calendar Description of Course:

An introduction to the Lebesgue integral and some of its applications.

Nature of Course *Lecture*

Prerequisites (or special instructions): *MATH 320-3. Students who have obtained credit for MATH 423-4 cannot receive credit for MATH 426-3.*

What course (courses), if any, is being dropped from the calendar if this course is approved: *MATH 423-4*

2. Scheduling

How frequently will the course be offered? *Once per year*

Semester in which the course will first be offered? *Spring 1980*

Which of your present faculty would be available to make the proposed offering possible: *Drs. Eaves, Freedman, Kim, Sember, Shen, Thomson and others*

3. Objectives of the Course

This course is a slight revision of Math 423-4. This course constitutes an introduction to Lebesgue integration. It is an integral part of the package designed to streamline our Analysis offerings.

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: *Feb 16, 1979*

Manish Singh
Department Chairman

12/7/79
Dean

Don R. Birch
SEP 11 79
Chairman, SCUS

MATH 426-3

INTRODUCTION TO LEBESGUE THEORY

1. Measurable Sets
2. Measurable Functions
3. Definition of the Lebesgue Integral
4. Convergence Theorems of the Lebesgue Integral
5. Applications (e.g. The L^2 Theory of Fourier Series).

PREREQUISITES: MATH 320-3. Students who have
obtained credit for Math 423-4 cannot receive credit for Math 426-3.

SUGGESTED

TEXTBOOK: Methods of Real Analysis by R. Goldberg (Chapters 11 and 12)

PLEASE CHECK MATHEMATICS TEXTBOOK FOR CURRENT TEXT IN USE.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: Mathematics

Abbreviation Code: MATH Course Number: 438 Credit Hours: 3 Vector: 3-1-0

Title of Course: LINEAR ALGEBRA

Calendar Description of Course:

Linear Algebra. Vector space and matrix theory

Nature of Course Lecture/Tutorial

Prerequisites (or special instructions): Math 232-3

Students who have obtained credit for Math 431-4 cannot receive credit for Math 438-3.

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

Math 431-4

2. Scheduling

How frequently will the course be offered? Twice per year

Semester in which the course will first be offered? Fall 1979-80-3

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

Drs. Berggren, Brown, Gerber, Reilly, and others.

Objectives of the Course

The course is the present Math 431-4 less the theory of annihilators, the functional characterization of determinants, and the spectral theorem - replacing the latter by diagonalizable operators.

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: Feb. 16, 1979

Mansoor Singh
Department Chairman

12/7/79
Dean

SEP 11 79
Chairman, SCUS

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

LINEAR ALGEBRA

- I. Brief review of matrices and systems of linear equations.
 - A. Matrices over a field.
 - B. Operations on matrices.
 - C. Invertible matrices.
 - D. Complete solution of a system of linear equations.
- II. Vector Spaces.
 - A. Subspaces.
 - B. Bases and dimension.
 - C. Coordinates and computations involving subspaces.
- III. Linear transformations.
 - A. The space $L(V,W)$.
 - B. Representation by matrices.
 - C. Linear functionals & dual space.
 - D. Transpose of a transformation.
- IV. A brief review of polynomials, factorization.
- V. Properties of Determinants.
- VI. Direct-sum decompositions.
- II. Inner Product Spaces.
 - A. Inner product spaces.
 - B. Linear functionals and adjoints.
 - C. Positive, unitary and normal operators.
- VIII. Diagonalizable operators.

If time permits additional topics may be chosen from IX, X, XI or XII.
- IX.
 - A. The Spectral Theorem.
 - B. Simultaneous diagonalization of normal operators.
 - C. The primary decomposition theorems.
- OR
- X. Bilinear forms.

OR
- XI. Jordan forms.

OR
- XII. Numerical methods in linear algebra.

PLEASE CHECK MATHEMATICS TEXTBOOK LIST FOR CURRENT TEST IN USE.

PREREQUISITE: Math 232-3

Students who have obtained credit for Math 431-4 cannot receive credit for Math 438-3.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: Mathematics

Abbreviation Code: MATH Course Number: 439 Credit Hours: 3 Vector: 3-0-0

Title of Course: INTRODUCTION TO ALGEBRAIC SYSTEMS

Calendar Description of Course:

Algebraic systems including, for example, groups, rings. Polynomial theory.

Nature of Course: Lecture

Prerequisites (or special instructions): MATH 232-3

Students who have obtained credit for Math 432-4
cannot receive credit for Math 439-3.

What course (courses), if any, is being dropped from the calendar if this course is
approved: Math 432-4

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? Spring 1980

Which of your present faculty would be available to make the proposed offering
possible: Drs. Berggren, Brown, Gerber, Reilly and others.

Objectives of the Course

This course is the present Math 432-4 with the elimination of material on
categories, semigroups, and tensor products of abelian groups.

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: Feb. 16, 1979 [Signature] Jan R Birch

[Signature]
Department Chairman

12/2/79
Dean

SEP 11 79

Chairman, SCUS

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

MATHEMATICS 439-3

INTRODUCTION TO ALGEBRAIC SYSTEMS

- I. Brief review of sets, functions and relations.
- II. Groups.
 - A. Subgroups.
 - B. Homomorphisms.
 - C. Quotient groups.
 - D. Finite groups - Lagrange's Theorem, Cayley's Theorem, permutation groups, Sylow subgroups.
 - E. Direct products.
- III. Abelian Groups.
 - A. Free abelian groups.
 - B. Decomposition of cyclic groups.
 - C. Finitely generated Abelian groups.
- IV. Rings and Integral Domains.
 - A. Subrings and ideals.
 - B. Homomorphisms.
 - C. Polynomial rings, unique factorization.
- V. Introduction to Fields.
 - A. Characteristic of a field.
 - B. Finite fields.
 - C. Algebraic extensions.

As time permits topics chosen from the following will be introduced.

Free Groups, Semigroups, Categories and Functors.

PREREQUISITE: Math 232-3
Students who have obtained credit for Math 432-4
cannot receive credit for Math 435-3.

PLEASE CHECK MATHEMATICS DEPARTMENT TEXTBOOK LIST FOR CURRENT TEXT IN USE.

July 1978

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: Mathematics

Abbreviation Code: MATH Course Number: 440-3 Credit Hours: 3 Vector: 3-0-0-

Title of Course: GALOIS THEORY

Calendar Description of Course: An introduction to the theory of fields, with emphasis on Galois theory.

Nature of Course Lecture

Prerequisites (or special instructions): MATH 438-3 (or 431-4) and 439-3 (or 432-4)

Students who have obtained credit for Math 433-4 cannot receive credit for Math ~~436-3~~ 440-3.

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

Math 433-4

2. Scheduling

How frequently will the course be offered? Once every two years.

Semester in which the course will first be offered? Fall 1979 Summer 80-2

Which of your present faculty would be available to make the proposed offering possible: Drs. Berggren, Brown, Gerber, Reilly and others.

Objectives of the Course

This is the present Math 433-4 course with the elimination of topics from valuations, ordered fields, and algebraic number theory. It is expected that the elimination of one hour will make the course more accessible to a larger number of 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

NONE

5. Approval

Date: Sept. 16, 1979

Manohar Singh
Department Chairman

12/7/79
Dean

SEP 11 '79
Chairman, SCUS

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

MATHEMATICS 440-3

GALOIS THEORY

I. Field Theory.

- (1) Finite and algebraic extensions: Conjugate elements.
- (2) Characteristic, prime subfields, separable and inseparable extensions, perfect fields.
- (3) Separability of extensions.
- (4) Normal extensions, splitting fields.
- (5) Finite fields, $GF(p^n)$, multiplicative group of a finite field is cyclic.
- (6) Primitive elements.
- (7) Algebraically closed fields.
- (8) Galois extensions.
- (9) Fundamental Theory of Galois Theory.
- (10) Cyclotomic fields.
- (11) Solutions of polynomial equations by radicals.

PREREQUISITE: MATH 438-3 (or 431-4) and 439-3 (or 432-4). Students who have obtained credit for MATH 433-4 cannot receive credit for MATH ~~436-3~~.
440-3

Recommended Text : Algebraic Extensions of Fields

by P. McCarthy

or

As noted on the Mathematics Department Textbook list.

DRAFT: July 1978

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 444 Credit Hours: 3 Vector: 3-0-0

Title of Course: TOPOLOGY

Calendar Description of Course:

Development of elementary theory of topological spaces.

Nature of Course *Lecture*

Prerequisites (or special instructions): *MATH 425-3 (or 421-4), or permission of the*
Students who have obtained credit for MATH 441-4 cannot receive credit Department.
for MATH 444-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: *MATH 441-4*

2. Scheduling

How frequently will the course be offered? *Once per year*

Semester in which the course will first be offered? *Spring 1980*

Which of your present faculty would be available to make the proposed offering possible: *Drs. Gerber, Ryeburn, Sember, Thomason, Thomson and others*

3. Objectives of the Course

This course will be a natural follow-up for the proposed MATH 425-3 in which metric spaces are examined. The metric space material now present in Math 441-4 has been eliminated; it is covered in the new course Math 425-3.

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:

Feb. 16, 1979

Mansoor Singh

Department Chairman

12/7/79
Dean

SEP 11 79

Dan R. Birch
Chairman, SCUS

MATHEMATICS 444-3

TOPOLOGY

I. Core topics. (The order is subject to variation, depending upon the text used and the wishes of the instructor.)

- A. Topological spaces and methods of definition
- B. Continuity, subspaces, product spaces, quotient spaces
- C. Special properties
 - 1. Separation properties
 - 2. Connectedness properties
 - 3. Compactness properties
 - 4. Countability properties

II. Additional topics, to be chosen by the instructor, which may include some of the following.

- A. Convergence
- B. Metrizability
- C. Covering properties
- D. Homotopy theory; the fundamental group
- E. Function Spaces
- F. Uniform Spaces

PREREQUISITE: MATH 425-3 (or 421-4), or permission of the department. Students who have obtained credit for MATH 441-4 cannot receive credit for MATH 444-3.

TEXTBOOK: As noted in the textbook list of the Mathematics Department

Possible Textbooks:

Elementary Topology by Genignani

Introduction to General Topology by Hu

Undergraduate Topology by Kasriel

Foundations of General Topology by Perkin

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

1. Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 472 Credit Hours: 3 Vector: 3-1-0

Title of Course: LINEAR MODELS IN STATISTICS

Calendar Description of Course:

Linear models, analysis of variance and covariance, multiple regression, introduction to the design of experiments.

Nature of Course Lecture/tutorial

Prerequisites (or special instructions): MATH 232-3 and 372-3 (or 371-3)

Students who have obtained credit for MATH 490-4 cannot receive credit for 472-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 490-4

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? Spring 1980 80-81 ~~1980 80-81~~ Fall 80-81

Which of your present faculty would be available to make the proposed offering possible: Drs. Stephens, Weldon, Eaves

Objectives of the Course

To teach students some of the most widely used methods of statistical analysis, and to give a good mathematical formulation and understanding.

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: 16 Feb 1979

Manohar Singh
Department Chairman

12/7/79
Dean

SEP 11 79

Chairman, SCUS

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

MATHEMATICS 472-3

LINEAR MODELS IN STATISTICS

1. The general linear model: matrix formulation.
2. Application of the linear model to analysis of variance,
with distribution theory of the ANOVA table. Tests of appropriate
hypotheses. Effects of failure in model assumptions.
3. Applications of the linear model to (a) multiple regression
(b) curvilinear models
including use of orthogonal polynomials
(c) analysis of covariance
4. Introduction to design of experiments.

TEXTBOOK: THEORY AND APPLICATION OF THE LINEAR MODEL by Franklin A. Graybill

PUBLISHER: Duxbury

PREREQUISITES: MATH 232-3 and 372-3 (or 371-3)

Students who have obtained credit for MATH 490-4
cannot receive credit for MATH 472-3.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 479 Credit Hours: 3 Vector: 3-0-0

Title of Course: STATISTICS: SELECTED TOPICS

Calendar Description of Course:

Nature of Course Lecture/tutorial

Prerequisites (or special instructions): Will be specified according to topics offered under these numbers.

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 every 2 or 3 years

Semester in which the course will first be offered? Fall 1980 or Spring 1981

Which of your present faculty would be available to make the proposed offering possible: Drs. Eaves, Villegas, Weldon, Stephens

Objectives of the Course

Statistics is developing rapidly and a selected topics course will provide the opportunity to introduce additional subjects, (e.g. multivariate analysis) to students. Useful to have the selected topics labelled Statistics for student transcripts.

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: Feb 16 1979

Marshall Smith
Department Chairman

12/7/79
Dean

SEP 11 '79
Chairman, SCUS

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

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE PROPOSAL FORM

1. Calendar Information

Department: MATHEMATICS

Abbreviation Code: MATH Course Number: 487 Credit Hours: 3 Vector: 3-0-0

Title of Course: PROBABILITY

Calendar Description of Course: *Probability spaces, distribution, laws of large numbers, characteristic functions, central limit theorems, infinitely divisible distributions. Conditional distributions and expectations.*

Nature of Course *Lecture*

Prerequisites (or special instructions): MATH 387-3 (or 486-4)

What course (courses), if any, is being dropped from the calendar if this course is approved: MATH 486-4 is being replaced by Math 387-3 and 487-3

2. Scheduling

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

Semester in which the course will first be offered? Fall ¹⁹⁸¹ 1979 or Spring 1980

Which of your present faculty would be available to make the proposed offering possible: Drs. Kim, Eaves, Thomson

Objectives of the Course

To provide the axiomatic treatment of probability theory. A much deeper treatment than can be given in Math 272 is given here.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library NONE

Audio Visual

Space

Equipment

5. Approval

Date: Feb. 16, 1979

Manshar Singh
Department Chairman

John Webster
Dean

SEP 11 79

Chairman, SCUS

MATHEMATICS 487-3

PROBABILITY

Classical probability. Axiomatic probability.

Conditional probability and Independence. Limit Theorems.

Random walks.

Martingales.

TEXTBOOK: PROBABILITY WITH APPLICATIONS by Michael Woodroffe

PREREQUISITE: MATH 387-3 (or 486-4)

SIMON FRASER UNIVERSITY

SCUS 79-24A

MEMORANDUM

H. M. Evans
SCUS
Subject Appendix to memorandum -
Mathematics Curriculum Changes

From N. Heath
Assistant to the Dean of Science
Date 1979 07 23

Item 6. Mathematics Curriculum Changes - Revisions to existing Mathematics courses.

(see pp. 416-423 of 1979-80 Calendar for current listings of prerequisites etc.)

MATH 242-3 Introduction to Analysis.

New prerequisite statement to read:

"MATH 152-3 or 155-3. Students who have obtained credit for MATH 241-2 cannot take MATH 242-3 for further credit."

The revision deletes MATH 158-3 as an alternative prerequisite.

MATH 302-3 Statistical Methods

New prerequisite statement to read:

"MATH 101-3 or 272-3 (or 371-3) or ARC 376-5 or ECON 332-3 (Mathematics major and honors students may not use this course to satisfy the required number of semester hours of upper division Mathematics courses. However, they may include the course to satisfy the total number of required hours of upper division credit)."

The revision reflects the replacement of MATH 371-3 by MATH 272-3.

MATH 310-3 Introduction to Ordinary Differential Equations

New calendar description to read:

"First-order differential equations, second and higher order linear equations, series solutions, introduction to Laplace transform, systems and numerical methods, applications in the physical, biological and social sciences."

New prerequisite statement to read:

"MATH 152-3 or 155-3; or MATH 158-3 with a grade of A or B."

These revisions follow from the deletion of the MATH 253-4.

Appendix to Mathematics
Curriculum Changes

MATH 320-3 Theory of Convergence.

New title to read, "Advanced Calculus of One Variable."

New prerequisite statement to read:

"MATH 242-3 (or 241-2) and 251-3 (or 253-4)."

The new title is one traditionally given to courses with a similar content to MATH 320. The prerequisite revision arises from the deletion of MATH 253-4.

MATH 361-3 Mechanics of Deformable Media.

New prerequisite statement to read:

"MATH 252-3 (or MATH 253-4) and MATH 262-4 (or MATH 161-3 or PHYS 120-3 with permission of the Department)."

The revision follows from the deletion of MATH 161-3 and MATH 253-4.

MATH 443-4 Combinatorial Theory

Vector changed from (4-1-0) to (4-0-0). The nature of the subject matter makes tutorials unnecessary.

MATH 466-4 Tensor Calculus

New Prerequisite statement to read:

"MATH 252-3 (or MATH 253-4) and MATH 232-3 or permission of the Department. MATH 313-3 is recommended."

The revision follows from the deletion of MATH 253-4 and MATH 312-4.

MATH 467-3 Vibrations

Vector changed from (3-1-0) to (3-0-0). Tutorials have been found to be unnecessary in this course.

New Calendar description to read:

"Vibrations of discrete systems with many degrees of freedom; matrix methods. Nonlinear vibrations; the phase plane; singular points and limit cycles. Perturbation methods; singular perturbation expansions."

MATH 467-3 Vibrations cont.

Revised Syllabus - See appendix attached.

New prerequisite statement to read:

"MATH 232-3 and 310-3. MATH 263-4 (or PHYS 211-3) and MATH 314-3 are recommended."

The revision in prerequisites follows from the deletion of MATH 161-3 and from the syllabus change.

MATH 468-4 Continuum Mechanics

New prerequisite statement to read:

"MATH 314-3 and 361-3. MATH 313-3 (or MATH 312-4) should precede or be taken concurrently."

The revision follows from the deletion of MATH 312-4.

MATH 469-4 Fluid Dynamics

New prerequisite statement to read:

"MATH 361-3. MATH 314-3 or PHYS 384-3 should precede or be taken concurrently."

The revision follows from the deletion of MATH 312-4 and PHYS 382-4.

MATH 470-4 Variational Calculus

New prerequisite statement to read:

"MATH 310-3 and either MATH 262-4 (or MATH 161-3) or PHYS 211-3. MATH 313-3 (or MATH 312-4) or PHYS 384-3 should precede or be taken concurrently."

The revision follows from the deletion of MATH 161-3, PHYS 382-4 and MATH 312-4.

MATH 471-4 Special Relativity

New prerequisite statement to read:

"MATH 313-3 (or MATH 312-4) or PHYS 384-3."

The revision follows from the deletion of MATH 312-4 and PHYS 382-4.

Appendix to Mathematics
Curriculum Changes

MATH 480-3 Non-Parametric Statistics

New course number to read:

"MATH 473-3."

New prerequisite statement to read:

"MATH 372-3 (or 371-3) or permission of the Department.
Students who have obtained credit for MATH 480-3 cannot receive
credit for MATH 473-3."

The prerequisite revision follows from the upgrading of the
statistics stream of courses, including the introduction of MATH 272-3
and the replacement of MATH 371-3 by MATH 372-3.

New vector, (3-0-0).

Tutorials are not considered to be necessary in this course.

NH/rcw



N. Heath

Revised Syllabus for:

MATHEMATICS 467-3

VIBRATIONS

1. Discrete Systems

Linear systems of differential equations; examples of mechanical or electrical vibrations. Matrix methods. Complex eigenvalues; repeated eigenvalues. Fundamental matrices. Inhomogeneous linear systems.

2. Nonlinear Vibrations

The phase plane; classification of singular points; solutions close to singular points. Isoclines. Periodic solutions; limit cycles. Poincaré-Bendixson theorem. Applications to nonlinear mechanical and electrical vibrations.

3. Perturbation Methods

Regular perturbation expansions and their non-uniformities. Linstedt-Poincaré method. K-B-M method. Method of averaging. Two-timing. Matched asymptotic expansions and boundary layers. Many-variable expansions.

MEMORANDUM

To H.M. Evans, Secretary
Senate Committee on
Undergraduate Studies

Subject MATHEMATICS CURRICULUM CHANGES

From N. Heath
Administrative Assistant
to the Dean of Science

Date 1979 09 05

The following minor change to the Mathematics curriculum should have been included in my earlier memo of 1979 07 23.

MATH 404-3 Statistical Design and Analysis of Experiments

New prerequisite statement to read:

"MATH 272-3 (or 371-3) or 302-3. Permission will be given to students from other departments with suitable backgrounds."

The revision reflects the replacement of MATH 371-3 by MATH 272-3.

NH/mgj


N. Heath

Distributed at Meeting

SIMON FRASER UNIVERSITY

SCUS 79-24C

MEMORANDUM

..... Mr. Harry Evans..... Registrar Subject..... NEW MATH CURRICULUM.....	From..... M. Singh, Chairman..... Mathematics Department..... Date..... September 5, 1979.....
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I thank you very much for your care and interest in the proposed math curriculum changes to be brought before the SCUS meeting next Tuesday.

Regarding your first enquiry during our telephone conversation today:

The material in the existing MATH 414-4 (Partial Differential Equations) has been supplemented and rearranged to bring forth the new proposed courses MATH 314-3 (Boundary Value Problems) and MATH 418-3 (Partial Differential Equations). The contents of the existing MATH 413-4 (Ordinary Differential Equations) has been modified to bring about the proposed MATH 415-3 (Ordinary Differential Equations). Thus, the syllabus for MATH 314-3 should contain the following additional statement under prerequisites:

'Students who have obtained credit for MATH 414-4 cannot receive credit for MATH 314-3. However, students who have obtained credit for MATH 413-4 can receive credit for MATH 314-3.'

Mr. N. Heath has informed me that your concern about MATH 404-3 has been taken care of.

None of the new proposed courses are scheduled for Fall 79. However, we have already scheduled the following proposed courses for Spring 80 and Summer 80:

SPRING 80:

MATH 251-3, Calculus III
 MATH 426-3, Intro. to Lebesgue Theory
 MATH 439-3, Intr. to Algebraic Systems
 MATH 444-3, Topology

SUMMER 80:

MATH 251-3, Calculus III
 MATH 252-3, Vector Calculus I
 MATH 272-3, Intro. to Prob. & Stats.
 MATH 314-3, Boundary Value Problems
 MATH 342-3, Elementary Number Theory
 MATH 440-3, Galois Theory

It shall be a real hardship for us to undo this scheduling at this late stage. If, however, SCUS does not have enough time to approve the entire math package, then I would appreciate it if at least the above listed courses are approved.

Thank you.

M. Singh
 M. Singh

SIMON FRASER UNIVERSITY

MEMORANDUM

To .. Mr. Harry Evans
 Registrar and Secretary to SCUS
 Registrar's Office

Subject. MATHEMATICS COURSE PROPOSALS:
 COURSE OVERLAP AND LIBRARY RESOURCES

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

Date..... August 30, 1979

Enclosed are copies of memos sent to other faculties, in compliance with course overlap regulations, informing them of those of our course proposals that are soon to go before SCUS. There were no responses from the other faculties indicating any course overlap.

Also enclosed is a copy of a letter to Mr. Larry Thomas, Library, requesting confirmation that the Library resources are adequate in the areas covered by the new courses. Mr. Thomas provided a written statement that the Library collection is indeed adequate and this statement was passed along to the Dean of Science Office.

I hope the provision of these memo copies will satisfy the needs of SCUS.

RECEIVED

AUG 31 1979

REGISTRAR'S OFFICE

MAIL DESK

G.A.C. Graham
 G.A.C. Graham

cc: Mr. Nick Heath
 Dean of Science Office