SIMON FRASER UNIVERSITY

5.84-23

MEMORANDUM

To....Senate....

From. Office.of. the. Dean. of. Graduate. Studies

New Graduate Courses, Math 850-4, Subject...851-4 and 852-4.....

Date......February. 14., 1984.....

Action undertaken by the Executive Committee, Senate Graduate Studies Committee, gives rise to the following motion:-

MOTION: "That Senate approve and recommend approval to the Board of Governors, as set forth in S.84-23, the proposed new graduate courses:

MATH 850-4 Numerical Linear Algebra

MATH 851-4 Numerical Solution of Ordinary Differential Equations

MATH 852-4 Selected Topics in Numerical Analysis

These courses were approved by the Executive Committee, Senate Graduate Studies Committee at its meeting on February 13, 1984.

John M. Webster Dean of Graduate Studies.

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SIMON FRASER UNIVERSITY

MEMORANDUM

ToJ.M. Webster	From
Dean of Graduate Studies	F.acu.ltyofScience
Subjed. NUMERICAL ANALYSIS COURSES	DateJanuary24.,1984

Dear John:

I am replying to your memo of January 13, 1984 concerning the Faculty approval of Mathematics graduate courses:

MATH 850-4 MATH 851-4 MATH 852-4

These courses were approved by the Faculty of Science at its meeting on Monday, October 18, 1982. A copy of the appropriate motion is attached. Note that two items were approved independently in that motion:

(1) the M.Sc. Program in Applied Statistics;
(2) the new graduate courses in Mathematics.

Subsequent to the Faculty Meeting I wished to assure myself that everyone had been clear on what we had passed at that meeting. I therefore distributed the memo of October 26, 1982 to the Chairmen (copy attached). My memo made it very clear that we had passed the adoption of new math graduate courses <u>independent</u> of the new Applied Statistics Program. I received no representations that anyone wanted the matter of the Math graduate courses to be reconsidered. In my view, these new courses have been approved on the basis of their intrinsic merit.

Cochran

/mqj

cc: Chairmen, Faculty of Science

JAN 25 1984 DEAN OF GRADUATE STUDIES OFFICE of the Faculty of Science ing of Monday, October 18, 1982....Page 6

2. MATHEMATICS

New Project Option in Statistics (Paper F-82-28)

There was considerable discussion on the proposed project option in statistics and questions were raised as to whether this would be a professional degree or an academic degree, and would this option not be changing the pattern of original work carried out for a Master's thesis. Faculty were advised that an M.Sc. in Mathematics does not have to be original work; it can be expository. The M.Sc. in Mathematics is not necessarily a research degree.

One of the major issues raised was the labelling of the program as an M.Sc. and the possibility of labelling it differently. The M.Sc. is a research degree and should stand as such.

After discussion the following was moved by G.A.C. Graham seconded by M. Stephens:

MOTION "That the M.Sc. Program in Applied Statistics and Probability with a project requirement additional new courses presented in the documentation be approved."

MOTION CARRIED.

The meeting was adjourned at 5:45 p.m.

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New Graduate Course Pronosal Fors

	nt: Mathematics	Course Numbe	r: Math 850-4
Title:	Numerical Linear A	gebra	
Descripti	ion: Direct methods	or numerical solution of linear syst	ms of equations
onsider	ed with emphasis on	various applications such as statist	ical computing.
Credit Ho	bu rs:4	Vectors 4-0-0 Proregulait	c(m) 1f env:
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stimated	f Enrollment: 7	When will the course first be offered:	
iow often	will the course be off	red: Once every two years.	
USTIFICA he cour	<u>11031</u> (see attached) se has been regul ar	y offered (4 times in the last 5 year	(s) under "Select
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MATHPMATICS 850-4

NUMERICAL LINEAR ALGEBRA

Course Outline

- I. Errors in Ploating Point Computation Number representatives, truncation error, roundoff error, ill-posed (ill-conditioned) problems, inverse error analysis.
- II. Direct Methods for Solving Linear Systems

(a)

- (a) Special matrices and matrix properties, vector and matrix norms, error analysis of Gaussian elimination, iterative improvement.
- (b) Orthogonal Pactorizations-Householder and Givens transformations, modified Gram-Schmidt, singular value decomposition.
- II. Linear Least Squares Methods using orthogonal factorization, sweep operations and normal equations, iterative refinement, low rank changes and singular value decomposition, all possible regressions, stepwise regression, regression under linear equality/inequality constraints.
- IV. Special Topics Chosen from among the following:
 - A. Computational methods for classification models fixed-effects models (special case of balance and completeness and general problem), computing expected mean squares and estimates of variance components.
 - B. Selected Multivariate Methods canonical correlations, principal components, Factor analysis, multivariate analysis of variance.
 - C. Algebraic eigenvalue problem similarity transformations, reduction to canonical form, sensitivity of eigenvalues and eigenvectors, QR algorithm, computation of singular value decomposition.
 - D. Unconstrained optimization and nonlinear regression steepest descent, Newton's method and variants conjugate gradients, modified Gauss-Newton and Levenberg-Marquardt, alternative gradient methods, minimization without derivatives.
- (b) The material covered in this course is standard in the backgrounds of those doing research in numerical analysis.
- (c) The library is well-supplied with texts in this area and subscribes to most major numerical analysis journals.

(2 weeks)

(4 weeks)

(2 1/2 weeks)

(4 1/2 weeks)

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New Graduate Course Prononal Form

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Department:	Mathematics		Course Number: Math 851-4
itle: Num	érical Solution	of Ordinary Different	tial Equations
Description:	Study of the p	ractical numerical me	thods for solving initial and
oundary val	ue problems for	ordinary differential	equations.
Credit Hours:	4	Vector: 4-0-0	Prorequisite(n) if anvi
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JUSTIFICATION			
This co	u rse has previou	asly been offered as	Selected Topics in Applied
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d physical	sciences student	s will regularly tak	e the course.
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MATHEMATICS 851-4

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Course Outline

I. Introduction to Ordinary Differential Equations model problems, general 1st order systems, existence and uniqueness, problem stability, Green's functions.

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(a)

- II. Initial Value Problems Euler's method for illustration, higher order one-step methods (Taylor series method and explicit/implicit Runge Kutta), convergence and stability, error bounds and error estimates, step size choice, extrapolation methods, multistep methods (Adams methods, predictorcorrector methods).
- III. Boundary Value Problems Initial value approaches (simple and multiple shooting), finite difference methods, stability and convergence, acceleration methods, collocation methods, mesh selection, special methods for solution of linear and nonlinear systems.
- (b) The material covered in this course is standard in the backgrounds of those doing research in numerical analysis.
- (c) The library is well-supplied with texts in this area and subscribes to most major numerical analysis journals.

(2 weeks)

(5 1/2 weeks)

(5 1/2 weeks)

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New Graduate: Course Prononal Port

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Sele	cted Topics in 1	Numerical Analys	18	
	Study of a spec	ialized area of	numerical analysis	such as partial
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Further information regarding

MATH 852-4 (Selected Topics in Numerical Analysis)

- (a) Course outline varies with topic selected,
- (b) The material covered in this course is standard in the backgrounds of those doing research in numerical analysis.
- (c) The library is well-supplied with texts in this area and subscribes to most major numerical analysis journals.

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