

SIMON FRASER UNIVERSITY

S. 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:-

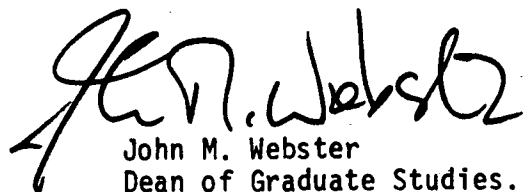
MOTION: "That Senate approve and recommend approval to the Board of Governors, as set forth in S.84-23, the proposed new graduate courses:

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

To.....J.M. Webster.....	From.....J.F. Cochran, Dean.....
.....Dean of Graduate Studies.....	Faculty of Science.....
Subject.....NUMERICAL ANALYSIS COURSES.....	Date...January 24, 1984.....

Dear John:

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

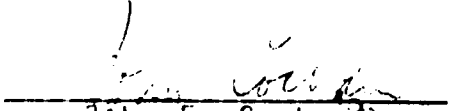
MATH 850-4
MATH 851-4
MATH 852-4

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 independent 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.

/mgj


John F. Cochran

cc: Chairmen, Faculty of Science

JAN 25 1984
DEAN OF GRADUATE
STUDIES OFFICE

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 [REDACTED], additional new courses presented in the documentation be approved."

MOTION CARRIED.

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

SIMON FRASER UNIVERSITY
New Graduate Course Proposal Form

(5)

CALENDAR INFORMATION:

Department: Mathematics Course Number: Math 850-4
Title: Numerical Linear Algebra
Description: Direct methods for numerical solution of linear systems of equations are considered with emphasis on various applications such as statistical computing.
Credit Hours: 4 Vector: 4-0-0 Prerequisite(s) if any: _____

ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 7 When will the course first be offered: _____
How often will the course be offered: Once every two years.

JUSTIFICATION: (see attached)

The course has been regularly offered (4 times in the last 5 years) under "Selected Topics in Applied Mathematics", and it is desirable to give the course a more accurate label.

RESOURCES:

Which Faculty member will normally teach the course: R. Russell, B. Bhattacharya (Compt. Sc.)

What are the budgetary implications of mounting the course: 1/6 of a faculty member.

This is not an incremental increase - the course has already been offered on a regular basis. JFC

Are there sufficient Library resources (append details): Yes.

- Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course.
c) Library resources

Approved: Departmental Graduate Studies Committee [Signature] Date: Nov 19/82
Faculty Graduate Studies Committee [Signature] Date: Nov 19/82
Faculty: J.F. Cochran Date: Nov 19/82
Senate Graduate Studies Committee [Signature] Date: 14/1/84
Senate: _____ Date: _____

NUMERICAL LINEAR ALGEBRA

Course Outline

- (a) I. Errors in Floating Point Computation (2 weeks)
 Number representatives, truncation error, roundoff error, ill-posed (ill-conditioned) problems, inverse error analysis.
- II. Direct Methods for Solving Linear Systems (4 weeks)
- (a) Special matrices and matrix properties, vector and matrix norms, error analysis of Gaussian elimination, iterative improvement.
- (b) Orthogonal Factorizations-Householder and Givens transformations, modified Gram-Schmidt, singular value decomposition.
- III. Linear Least Squares (2 1/2 weeks)
 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 (4 1/2 weeks)
 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.

SINX FRASER UNIVERSITY

New Graduate Course Proposal FormCALENDAR INFORMATION:

Department: Mathematics Course Number: Math 851-4
 Title: Numerical Solution of Ordinary Differential Equations
 Description: Study of the practical numerical methods for solving initial and boundary value problems for ordinary differential equations.
 Credit Hours: 4 Vector: 4-0-0 Prerequisite(s) if any: _____

ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 5 When will the course first be offered: _____
 How often will the course be offered: Once every two years.

JUSTIFICATION:

This course has previously been offered as Selected Topics in Applied Mathematics and it is expected that numerical analysis, applied mathematics and physical sciences students will regularly take the course.

RESOURCES:

Which Faculty member will normally teach the course: R. Russell

What are the budgetary implications of mounting the course: 1/6 of a faculty member.

This does not represent an incremental increase in required faculty because it has been offered regularly as a Special Topics course.

Are there sufficient Library resources (append details): Yes

- Appended: a) Outline of the Course
 b) An indication of the competence of the Faculty member to give the course.
 c) Library resources

Approved: Departmental Graduate Studies Committee: [Signature] Date: Nov 19/82
 Faculty Graduate Studies Committee: [Signature] Date: Nov. 19/82
 Faculty: J. F. [Signature] Date: Nov 19/82
 Senate Graduate Studies Committee: [Signature] Date: 14/2/84
 Senator: _____ Date: _____

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Course Outline

- (a) I. Introduction to Ordinary Differential Equations (2 weeks)
model problems, general 1st order systems,
existence and uniqueness, problem stability,
Green's functions.
- II. Initial Value Problems (5 1/2 weeks)
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, predictor-
corrector methods).
- III. Boundary Value Problems (5 1/2 weeks)
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.

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: Mathematics Course Number: Math 852-4
 Title: Selected Topics in Numerical Analysis
 Description: Study of a specialized area of numerical analysis such as partial differential equations, continuous optimization, or approximation theory.
 Credit Hours: 4 Vector: 4-0-0 Prerequisite(s) if any: _____

ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 5 When will the course first be offered: _____
 How often will the course be offered: Once every two years.

JUSTIFICATION:

With an increasing number of students doing mathematical computation or studying numerical analysis, there is need to provide regularly what have previously been reading courses.

RESOURCES:

Which Faculty member will normally teach the course: R. Russell, B. Bhattacharya (Cmpt. Sci.)

What are the budgetary implications of mounting the course: 1/6 of a faculty member.

This course has been offered as a special topic. It should require no new faculty to mount it as a new course. JFC

Are there sufficient Library resources (append details): Yes.

- Appended:
- a) Outline of the Course
 - b) An indication of the competence of the Faculty member to give the course.
 - c) Library resources

Approved: Departmental Graduate Studies Committee: _____

Date: Nov 15/82

Faculty Graduate Studies Committee: _____

Date: Nov. 19/82

Faculty: J. F. Burke

Date: Nov 19/82

Senate Graduate Studies Committee: _____

Date: 14/1/84

Senates: _____

Date: _____

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.