SIMON FRASER UNIVERSITY
MEMORANDUM

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

Subject...New Graduate Courses, Math 850-4, 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.
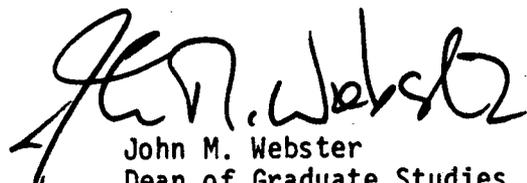
John M. Webster
Dean of Graduate Studies.

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SIMON FRASER UNIVERSITY
MEMORANDUM

To...... J.M. Webster ....

...... Dean of Graduate Studies ....

Subject.... NUMERICAL ANALYSIS COURSES ......

From...... J.F. Cochran, Dean ....

...... Faculty of Science ....

Date... January 24, 1984 ....

Dear John:

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

<div style="text-align:center">

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

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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.

/mqj
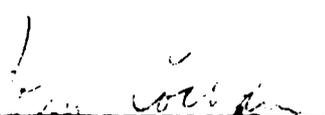
John F. Cochran

cc: Chairmen, Faculty of Science

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.

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 desireable 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: _____ Date: __Nov 19/82__

           Faculty Graduate Studies Committee: _____ Date: __Nov 19/82__

           Faculty: __J.F. Cochran__ Date: __Nov 19/82__

           Senate Graduate Studies Committee: _____ Date: __14/1/84__

           Senate: _____ Date: _____

MATHEMATICS 850-4

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.

II. **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.

CALENDAR 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: _____ Date: 11/15/82

 Faculty Graduate Studies Committee: _____ Date: Nov. 19/82

 Faculty: J.F. Cochran _____ Date: Nov 19/82

 Senate Graduate Studies Committee: _____ Date: 14/2/84

 Senate: _____ Date: _____

MATHEMATICS 851-4

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.

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

           Faculty Graduate Studies Committee: _____ Date: Nov. 19/82

           Faculty: _____ Date: Nov 19/82

           Senate Graduate Studies Committee: _____ Date: 14/1/84

           Senate: _____ Date: _____

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.