

UPDATING MATHEMATICS  
GRADUATE PROGRAM

MEMORANDUM

Date: November 29, 2010  
To: Chair, SES Faculty Council  
From: Dr. Adam Van Tuyl, Chair, Dept. of Math. Sci.  
Subject: Calendar Changes for the Department of Mathematical Sciences

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Please find attached the following calendar change for the Department of Mathematical Sciences:

- Updating Mathematics Graduate Program.

This calendar change was approved internally on Nov. 26, 2010. Please find attached the required documents, along with the necessary signatures.

Sincerely,



Adam Van Tuyl, Chair

Department of Mathematical Sciences

## Request for Calendar Change Form

Tracking No:  
(Senate Secretary's Office  
use only)  
Date:

To	Secretary of Senate	
From	Name(Dean):	Faculty
	Andrew P. Dean	Science and Environmental Studies
	Department the change relates to	
	Mathematical Sciences	
	Contact Person	
	Adam Van Tuyl	

Is the proposed calendar change Graduate

### Instructions:

- In all cases please complete and attach section 1 and 2
- If the calendar change affect other departments/schools/faculties complete and attach section 3
- If the answer to any of the questions below is yes, explain. Attach separate sheets with reference to the question

1. Do the proposed changes affect other departments/ schools/faculties in terms of their calendar change?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
2. Is a transition plan needed for student in progress?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
3. Are the proposed changes likely to affect student enrollment in your department/school/faculty?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
4. Are the proposed changes likely to affect student enrollment in other departments/schools/faculties at Lakehead University?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
5. Will the proposed changes require additional teaching space and/or teaching staff and/or equipment and/or other resources?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
6. Will the proposed changes affect existing teaching loads within your department/school/faculty?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
7. Will the proposed changes increase demand for teaching support services such as the library, computing services and technical staff ?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
8. Will the proposed change require direct or in-kind support from outside the academic unit?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
9. Do the proposed changes include change in course(s) which is/are required core course(s) for a major?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
10. Do the proposed changes include a change in course which is service/required course(s) in another program?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

- |  |                          |                                     |
|--|--------------------------|-------------------------------------|
|  | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 11. Do the proposed changes include change in course(s) which is/are open elective available to any student in any program?      | Yes                      | No                                  |
|  | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 12. Do the proposed changes include change in course(s) which is/are elective in a major i.e. restricted to students in a major? | Yes                      | No                                  |
|  | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Signatures:

Date approved by faculty council

### Section 1

#### Description of the Proposed Calendar Change:

Updating and revising the MSc program in mathematics

#### Rationale of the Proposed Calendar Change(s):

(Corresponding to Section 2 where required)

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In the fall of 2009, the Department of Mathematical Sciences underwent its graduate program review. A number of changes were suggested as part of this review. This calendar change reflects many of these changes. As well, we took the opportunity to revise our course offerings to better reflect the research strengths of the department.

Here are the highlights of the changes:

1. We have eliminated the M.A. in Mathematics. As pointed out in our program review, there is no clear difference between the M.A. and M.Sc. in mathematics. The program requirements between the two degrees were identical. As a department, we decided to eliminate the M.A. program. The program description has been rewritten to reflect this change.
2. We have clarified the program requirements for both the thesis masters and the course masters. Previously, the program requirements were vague, e.g. "normally required to take 5FCE". As well, we have rewritten the suggested course concentrations. The course concentrations were both out-of-date and still referred to computer science courses (a left over from when the two departments shared a master's program).
3. All year long courses, with the exception of Math 5301 (Honours Seminar) Math 5801 (Project) and Math 5901 (Master's Thesis), have been eliminated.
4. A number of new graduate courses have been introduced. These graduate courses better reflect the research interests of the current faculty. It should be pointed out that many of these courses have been run in the past, but under one of the reading course numbers. Our goal is to stop using the reading course numbers on courses that will be run at least twice in a 5 year period. Moreover, by having these courses in the calendar, potential students will have a better idea about the courses we will offer. Explicit calendar entries will also be useful for students who go on to do their PhD; their new universities will be able to have a sense of what topics the students covered while doing their master's degree.
5. We have eliminated all courses that were connected to the co-op program.



**Section 2**

Existing Calendar Entries:  
(Page reference based on hard copy or URL based on electronic version of calendar)

Proposed Calendar Entries/Addition/ Deletion  
-If only addition, specify page number and placement in university calendar  
-If only deletion, write Deleted

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<http://mycoursecalendar.lakeheadu.ca/pg346.html>

Department of Mathematical Sciences

Professor and Dean of Science and Environmental Studies  
A.P. Dean  
Associate Professor and Chair  
A. Van Tuyl

MA and MSC (MATHEMATICAL SCIENCES)

Graduate Co-ordinator  
R. Anisca  
Core: Master's Thesis Supervisory

R. Anisca,  
Y. Chen,  
A.J. Dean,  
W. Huang,  
M. Ilie,  
G. Lee,  
D. Li,  
L. Liu,  
T. Miao,  
F. Ting  
A. Van Tuyl

MASTER OF ARTS OR SCIENCE DEGREE IN MATHEMATICAL SCIENCES  
Candidates are accepted under the regulations governing the Master's degree (see page 267-269) providing they also satisfy the requirements of the department as stated

Department of Mathematical Sciences

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A.P. Dean  
Associate Professor and Chair  
A. Van Tuyl

MASTER OF SCIENCE DEGREE IN MATHEMATICAL SCIENCES

Graduate Co-ordinator  
R. Anisca

Core: Master's Thesis Supervisory

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D. Li,  
L. Liu,  
T. Miao,  
F. Ting,  
A. Van Tuyl

MASTER OF SCIENCE DEGREE IN MATHEMATICAL SCIENCES  
Candidates are accepted under the regulations governing the Master's degree (see <http://mycoursecalendar.lakeheadu.ca/pg621.html>)

below:

A student entering the Master's program is expected to have at least a B grade average in an honours mathematics or computer science program from an accredited university and have had the necessary undergraduate prerequisites for the graduate courses he/she intends to take. None of the graduate courses are prerequisites for other graduate courses. Students who plan to obtain a Ph.D. degree in mathematics should enrol in the thesis program.

Application deadline is February 1. Late applications may be considered for admission, but may not be eligible for funding.

#### PROGRAMS

(a) The Thesis Program:

A candidate admitted to the MA or MSc program will normally be expected to complete three full courses, including Mathematics 5301 and one other 5000 level course designated by the Department. In addition, the candidate will be required to pursue a research program and complete a thesis which is normally considered the equivalent of two courses. A student may be required to undertake an oral examination near the completion of the program.

(b) The Course Program:

This program consists of five full graduate courses, including Mathematics 5301 and 5801.

(c) The MA/MSc Co-operative Option:

A graduate student normally will be admitted to this option after completion of three full graduate courses for a starting date in May. Co-op employment for a minimum of 8 months must be successfully completed to satisfy co-op requirements for the degree; however students may be employed on co-op for up to a maximum of 16 months as part of the program.

Students interested in a co-op placement should inform the Department's Co-op Advisor at least four months in advance of the proposed date of the placement (e.g., by late December for placements beginning in May). The Department's decision as to the suitability of each candidate will be based primarily on academic performance. Successful candidates will work with the Co-op office and the university Co-op Co-ordinator in their search for suitable employment. Upon completion of the co-op placement, the student will either complete a thesis (Thesis Program option) or take two additional full graduate courses, including Mathematics 5801 (Course Program option).

) providing they also satisfy the requirements of the department as stated below:

A student entering the Master's program is expected to have at least a B grade average in an honours program in mathematics or a closely related discipline from an accredited university and have had the necessary undergraduate prerequisites for the graduate courses he/she intends to take.

The application deadline is February 1. Late applications may be considered for admission, but may not be eligible for funding.

#### PROGRAMS

(a) The Thesis Program: This program consists of five FCEs in mathematics at the 5000 level, three of which will be Mathematics 5301 and 5901. The candidate will be required to pursue a research program and complete a thesis. An oral examination near the completion of the program will also be required. In addition, the student must follow all regulations governing Master Theses as described by the Faculty of Graduate Studies. (see

<http://mycoursecalendar.lakeheadu.ca/pg621.html>)

(b) The Course Program: This program consists of five FCEs in mathematics at the 5000 level, two of which will be Mathematics 5301 and 5801.

Suggested Course Concentrations: Students must take Mathematics 5301, and either Mathematics 5801 or Mathematics 5901. As well, students may choose to concentrate courses in one of the following disciplines:

(a) Pure Mathematics: Mathematics 5AAA, 5BBB, 5CCC, 5DDD, 5EEE, 5FFF, 5GGG,

5HHH, 5III, 5KKK, 5LLL, 5MMM, 5NNN

(b) Statistics: Mathematics 5PPP, 5331, 5333, 5335

(c) Applied Mathematics: Mathematics 5JJJ, 5000, 5PPP, 5QQQ, 5351, 5371

Research Areas:

The research areas of the faculty of the Department of Mathematical Sciences are:

Commutative Algebra/Algebraic Geometry:  
Professor Van Tuyl

Noncommutative Algebra: Professor Lee

Suggested Course Concentrations:  
Students will take Mathematics 5301;  
Mathematics 5901 or Mathematics 5801; and,  
if the co-operative option is selected,  
Mathematics 5992. As well students may  
choose to concentrate courses in one of the  
following disciplines:

(a) Computing: Computer Science 5401,  
5410, 5411, 5413, 5415, 5417, 5435, 5437,  
5471

Mathematics 5273, 5351, 5371

(b) Mathematics: Mathematics 5101, 5221,  
5273, 5281, 5311, 5351, 5371

(c) Statistics: Mathematics 5331, 5333, 5335,  
5337

(d) Applied Mathematics: Mathematics 5273,  
5311, 5331, 5333, 5337, 5351, 5371

Research Areas:

The research areas of the faculty of the  
Department of Mathematical Sciences are:  
Commutative Algebra/Algebraic Geometry:  
Professor Van Tuyl

Noncommutative Algebra:

Professor Lee

Functional Analysis:

Professors Anisca, Chen

Abstract Harmonic Analysis:

Professors Miao, Ilie

Numerical Analysis:

Professor Liu

Operator Algebras: Professor Dean

Optimization/Operations

Research/Management Science:

Professors Huang, Liu

Partial Differential Equations/Mathematical

Physics:

Professor Ting

Probability and Statistics:

Professors Huang, Li

Functional Analysis: Professors Anisca, Chen  
Abstract Harmonic Analysis: Professors Miao, Ilie  
Numerical Analysis: Professor Liu  
Operator Algebras: Professors Dean, Viola  
Optimization/Operations Research: Professors  
Huang, Liu  
Partial Differential Equations/Mathematical  
Physics: Professor Ting  
Probability and Statistics: Professors Huang, Li

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<http://mycoursecalendar.lakeheadu.ca/pg550.html>

7. Master of Arts in Mathematical Sciences

[Delete]

See Faculty of Graduate Studies, Graduate  
Programs offered by the Department of  
Mathematical Sciences, page 323.

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<http://mycoursecalendar.lakeheadu.ca/pg130.html>

Mathematics Graduate Courses

Mathematics Graduate Courses

## GRADUATE COURSES

Courses not offered this academic year (fall/winter terms) are indicated by the words "NOT OFFERED THIS YEAR" below the course description. Nevertheless, students should refer to the Timetable as a final check.

The following courses are offered for Master's programs. Because the content of courses may vary from year to year, students may take certain courses more than once, with departmental permission.

### Mathematics 5101      Advanced Analysis

Credit Weight: 1

Description: May be a full course in any of the following: advanced measure theory, functional analysis, complex analysis; or a selection of topics from some or all of the preceding subjects. Content varied.

Special Topic: Y

Offering: 3-0; 3-0

### Mathematics 5201      Reading Course

Credit Weight: 1

Description: An examination of one or more aspects of modern mathematics.

Special Topic: Y

Offering: 3-0; 3-0

### Mathematics 5211      Reading Course

Credit Weight: 0.5

Description: An examination of one or more aspects of modern mathematics.

Special Topic: Y

Offering: 3-0; or 3-0

### Mathematics 5213      Reading Course

Credit Weight: 0.5

Description: Directed studies in some area of Mathematical Sciences

Special Topic: Y

Offering: 3-0; or 3-0

### Mathematics 5221      Advanced Topics in Topology

Credit Weight: 1

Prerequisite(s): Permission of the Department  
Description: Topics from point set, algebraic and differential topology. Content varied.

Special Topic: Y

Offering: 3-0; 3-0

## GRADUATE COURSES

Courses not offered this academic year (fall/winter terms) are indicated by the words "NOT OFFERED THIS YEAR" below the course description.

Nevertheless, students should refer to the timetable as a final check. The following courses are offered for Master's programs.

### Mathematics 5AAA Measure Theory

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Measure spaces, measurable functions, measures, the integral, integrable functions, the Lebesgue dominated convergence theorem, modes of convergence, Egoroff's theorem, the Hahn and Jordan decomposition theorems, the Radon-Nikodym theorem, Lebesgue spaces, and the Riesz representation theorem for Lebesgue spaces.

Special Topic: Y

Offering: 3-0; or 3-0

### Mathematics 5BBB Topology

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Topological spaces; neighbourhoods, bases, and sub-bases; product spaces and weak topologies; nets and filters; convergence; separation axioms, including Urysohn's lemma and Tietze's extension theorem; compact and locally compact spaces, including Tychonoff's theorem and compactifications; metrizability; and connectedness.

Special Topic: Y

Offering: 3-0; or 3-0

### Mathematics 5CCC Functional Analysis I

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: This course covers normed vector spaces, bounded operators, Baire category, the Banach-Steinhaus theorem, the open mapping theorem, the closed graph theorem, the Hahn-Banach theorems, Hilbert spaces, the Riesz representation theorem, and compact operators.

Special Topic: Y

Offering: 3-0; or 3-0

### Mathematics 5DDD Functional Analysis II

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Banach algebras, the spectrum and spectral radius, the Gelfand transform, function



Mathematics 5281    Advanced Topics in Algebra  
Credit Weight: 1  
Prerequisite(s): Permission of the Department  
Description: Topics from category theory, universal algebra, group theory, ring theory. Content varied.  
Special Topic: Y  
Offering: 3-0; 3-0

Mathematics 5301    Graduate Seminar  
Credit Weight: 1  
Description: Seminars are normally presented by the instructor(s), and by students who are asked to prepare and present a number of papers. There may be separate course sections for students studying mathematics, statistics, or applied mathematics.  
Offering: 3-0; 3-0

Mathematics 5331    Advanced Topics in Statistics  
Credit Weight: 0.5  
Description: Topics in statistics.  
Special Topic: Y  
Offering: 3-0; or 3-0

Mathematics 5333    Advanced Topics in Probability  
Credit Weight: 0.5  
Description: Topics in probability.  
Special Topic: Y  
Offering: 3-0; or 3-0

Mathematics 5335    Statistical Consulting  
Credit Weight: 0.5  
Description: Students will review recent research articles pertaining to the role of the statistical consultant and to the operation of a statistical consulting laboratory, and will present short seminars on the content of these articles. Students will also be expected to engage in statistical consulting (under supervision) and to provide a written summary of their activities.  
Offering: 1-3; or 1-3

Mathematics 5351    Advanced Numerical Analysis I  
Credit Weight: 0.5  
Description: Content will vary. Advanced topics in numerical analysis may include:

algebras, involution in Banach algebras,  $C^*$ -algebras, continuous functional calculus, Borel functional calculus, spectral measures, spectral projections, and eigenvalues.  
Special Topic: Y  
Offering: 3-0; or 3-0

Mathematics 5EEE Fourier Analysis  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Fourier analysis on the circle, Dirichlet kernel, Fejer's theorem, convergence of Fourier series.  
Special Topic: Y  
Offering: 3-0; or 3-0

Mathematics 5FFF Harmonic Analysis  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Topics include abelian locally compact groups, Haar measure, convolutions, dual group, the Fourier transform, Fourier Stieltjes transform, Plancherel theorem, Pontryagin duality theorem, basic representation theory.  
Special Topic: Y  
Offering: 3-0; or 3-0

Mathematics 5GGG Introduction to Banach Space Theory  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Schauder basis, Mazur's theorem, unconditional basis, approximation property, the spaces  $c_0$  and  $l_p$ .  
Special Topic: Y  
Offering 3-0; or 3-0

Mathematics 5HHH Introductory Algebraic Topology  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Categories and functors, the fundamental group, free groups and free products of groups, the Siefert and v. Kampen theorem, covering spaces, applications of the fundamental group to group theory, CW complexes and the fundamental group of higher dimensional spaces.  
Special Topic: Y  
Offering: 3-0; or 3-0

Math 5III Introduction to Operator Algebras  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: An introduction to  $C^*$ -algebras. Topics will include: axioms; homomorphisms, ideals, and quotients; positivity; states,

computational linear algebra, solution of ordinary and partial differential equations, approximation of functions, optimization, iterative methods, and problems of current research interest. Topics will be picked to complement those in Mathematics 5371.  
Offering: 3-0; or 3-0

**Mathematics 5371    Advanced Numerical Analysis II**

Credit Weight: 0.5

Description: Content will vary. Advanced topics in numerical analysis may include: computational linear algebra, solution of ordinary and partial differential equations, approximation of functions, optimization, iterative methods, and problems of current research interest. Topics will be picked to complement those in Mathematics 5351.  
Offering: 3-0; or 3-0

**Mathematics 5801 (9801)    Project**

**Mathematics 5901 (9901)    Master's Thesis**

**Mathematics 5991    Co-op Work Term I**  
Credit Weight: 0.5

**Mathematics 5992    Co-op Work Term II**  
Credit Weight: 0.5

**Mathematics 5993    Co-op Work Term III**  
Credit Weight: 0.5  
Description: (Optional)

representations, and the GNS construction; weak topologies; von Neumann algebras; and density theorems. Additional topics may include: K-theory, applications to group representations and harmonic analysis, and applications in physics.  
Special Topic: Y  
Offering: 3-0; or 0-3

**Mathematics 5JJJ Partial Differential Equations**  
Credit Weight: 0.5

Prerequisite(s): Permission of the Department  
Description: The analysis of partial differential equations arising from Physics, Geometry and Optimization. Topics include well-posedness; fundamental solutions; non-homogeneous PDEs, Sobolev spaces and inequalities; linear evolution equations; Calculus of Variations; Conservation Laws and symmetry; fixed point theorems; nonlinear PDEs.  
Special Topic: Y  
Offering: 3-0; or 3-0

**Mathematics 5KKK Abstract Algebra**  
Credit Weight: 0.5

Prerequisite(s): Permission of the Department  
Description: Topics from group theory and ring theory. Content varied.  
Special Topic: Y  
Offering: 3-0; or 3-0

**Mathematics 5LLL Commutative Algebra**  
Credit Weight: 0.5

Prerequisite(s): Permission of the Department  
Description: Topics from commutative algebra: rings and ideals, modules, local rings, primary decomposition, chain conditions, Noetherian rings, Hilbert functions and dimension theory, Stanley-Reisner rings.  
Special Topic: Y  
Offering: 3-0; or 3-0

**Mathematics 5MMM Algebraic Geometry**  
Credit Weight: 0.5

Prerequisite(s): Permission of the Department  
Description: Affine and projective varieties over algebraically closed fields: coordinate rings, function fields, singularities, morphisms and birational isomorphisms; Bezout's theorem.  
Special Topic: Y  
Offering: 3-0; or 3-0

**Mathematics 5NNN Group Rings**  
Credit Weight: 0.5

Prerequisite(s): Permission of the Department  
Description: An introduction to group rings.

Topics include: units, idempotents, polynomial identities, group identities, prime and semiprime group rings.

Special Topic: Y

Offering: 3-0; or 3-0

Mathematics 5000 Continuous Optimization

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Convexity. Mathematical programming including linear and nonlinear programming. Necessary conditions of the first and second orders. Optimization methods including descent methods, Newton and Quasi-Newton methods, feasible direction methods, penalty methods, and Lagrange methods.

Special Topic: Y

Offering: 3-0; or 3-0

Mathematics 5PPP Estimation and Hypothesis Testing

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Statistics and sampling distributions, Point estimation, Sufficiency and completeness, Interval estimation, Tests of hypothesis, Contingency Tables and goodness-of-fit, Nonparametric methods, Regression and Linear Models, Reliability and Distributions.

Special Topic: Y

Offering: 3-0; or 3-0

Mathematics 5QQQ Operations Research - Deterministic Models

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Selected topics from deterministic optimization models in various industries and management sciences.

Special Topic: Y

Offering: 3-0; or 3-0

Mathematics 5RRR Operations Research - Probabilistic Models

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Selected topics from probabilistic optimization models in various industries, management sciences, and finance.

Special Topic: Y

Offering: 3-0; or 3-0

Mathematics 5211 Reading Course

Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Directed studies in some area of  
Mathematical Sciences.  
Special Topic: Y  
Offering: 3-0; or 0-0

Mathematics 5213      Reading Course  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Directed studies in some area of  
Mathematical Sciences.  
Special Topic: Y  
Offering: 0-0; or 3-0

Mathematics 5301      Graduate Seminar  
Credit Weight: 1  
Prerequisite(s): Permission of the Department  
Description: Seminars are normally presented by  
the instructor(s), and by students who are asked  
to prepare and present a number of  
papers. There may be separate course sections  
for students studying mathematics, statistics, or  
applied mathematics.  
Offering: 3-0; 3-0

Mathematics 5331      Advanced Topics in Statistics  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Topics in statistics.  
Special Topic: Y  
Offering: 3-0; or 3-0

Mathematics 5333      Advanced Topics in  
Probability  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Topics in probability.  
Special Topic: Y  
Offering: 3-0; or 3-0

Mathematics 5335      Statistical Consulting  
Credit Weight: 0.5  
Prerequisite(s): Permission of the Department  
Description: Students will review recent research  
articles pertaining to the role of the statistical  
consultant and to the operation of a statistical  
consulting laboratory, and will present short  
seminars on the content of these articles.  
Students will also be expected to engage in  
statistical consulting (under supervision) and to  
provide a written summary of their activities.  
Offering: 1-3; or 1-3

Mathematics 5351      Advanced Numerical

**Analysis I**

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Content will vary. Advanced topics in numerical analysis may include: computational linear algebra, solution of ordinary and partial differential equations, approximation of functions, optimization, iterative methods, and problems of current research interest. Topics will be picked to complement those in Mathematics 5371.

Offering: 3-0; or 3-0

Mathematics 5371      Advanced Numerical

**Analysis II**

Credit Weight: 0.5

Prerequisite(s): Permission of the Department

Description: Content will vary. Advanced topics in numerical analysis may include: computational linear algebra, solution of ordinary and partial differential equations, approximation of functions, optimization, iterative methods, and problems of current research interest. Topics will be picked to complement those in Mathematics 5351.

Offering: 3-0; or 3-0

Mathematics 5801 (9801)      Project

Credit Weight: 1.0

Mathematics 5901 (9901)      Master's Thesis

Credit Weight: 2.0


**Section 3**

The Faculty(ies) affected by the proposed calendar change

Science and Environmental Studies (Mathematical Sciences)

**I have been consulted regarding the attached calendar change and understand the academic and budgetary implication on my Dept./ School/Faculty.**

I agree to this calendar change proposal      Yes       No

      Nov. 29, 2010

Name:

Adam Van Tuyl

Faculty:

Dept. of Math Sciences

Date:

22/11/2010

Signature of Dean

I agree to this calendar change proposal      Yes       No

\_\_\_\_\_

Name:

Andrew P. Dean

Faculty:

SES

Date:

Dec. 7/10

Signature of Dean

