S.05-22

SIMON FRASER UNIVERSITY

Senate Committee on University Priorities
Memorandum

TO:	Senate	**FROM:**	John Waterhouse Chair, SCUP Vice-President, Academic
RE:	Curriculum Changes: Department of Mathematics	**DATE:**	January 21, 2005

At its January 12, 2005 meeting the Senate Committee on University Priorities (SCUP) recommended the following motion:

Motion

That Senate approve and recommend to the Board of Governors the proposal for program changes to the MSc Program in the Department of Mathematics."

encl.

c: J. Driver
P. Mustard
I. Chen
G. Nicholls

SIMON FRASER UNIVERSITY
DEAN OF GRADUATE STUDIES
MEMORANDUM

TO:	SCUP
FROM:	Jonathan Driver, Dean of Graduate Studies
SUBJECT:	Curriculum changes: Department of Mathematics
DATE:	7th December 2004
cc:	Peter Mustard, Chair, Faculty of Science Graduate Program Committee;
	I. Chen, Chair, Department of Mathematics Graduate Program Committee

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At its 6th December 2004 meeting Senate Graduate Studies Committee unanimously approved the enclosed proposal for curriculum changes in the Department of Mathematics. Because this proposal involves significant structural changes to the MSc program, I am forwarding this to SCUP for approval, rather than to Senate for information.

I would like to draw your attention to three points.

First, for many years the Department of Mathematics has included in its Calendar entry the statement that graduate students may fulfil some of the departmental course requirements (but not the University's minimum requirements) by taking some 400 level undergraduate courses. This practice will now be changed. Courses taken by graduate students in conjunction with undergraduate students will receive a separate number at the 700 level. As a result, there are a large number of new course proposals included in this package, as well as a number of necessary editorial changes to the Calendar. There are a number of advantages to this change. For example, the Calendar will reflect the topics that are taught at the graduate level, and the requirements for graduate students taking 700 level courses can be differentiated from the requirements for undergraduate students taking the 400 level courses.

Second, the Department of Mathematics has introduced a project option. This has necessitated the addition of a number of new courses.

Third, a number of courses will be dropped from the Calendar. I have asked the Department of Mathematics to send a list of these courses directly to SCUP.

Jonathan

1.

SIMON FRASER UNIVERSITY
MEMORANDUM

To: J. Driver, Dean of Graduate Studies

From: M. Plischke, Dean, Faculty of Science

Subject: Faculty of Science Graduate Curriculum

Date: November 5, 2004

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The following items have been approved by the Faculty of Science and are forwarded for approval by the Senate Graduate Studies committee. Please include these on the next SGSC agenda.

Mathematics

Change to Applied Mathematics Program

Changes to the Mathematics Graduate Program

* New courses: MATH 701-4, MATH 716-3, MATH 718-3, MATH 719-3, MATH 724-3, MATH 725-3, MATH 738-3, MATH 739-3, MATH 740-3, MATH 743-3, MATH 745-3, MATH 747-4, MATH 761-3, MATH 762-3, MATH 767-3, MATH 817-4, MATH 818-4, MATH 842-4, MATH 843-4, MATH 845-4, MATH 878-0, MATH 879-0, MATH 880-6 and MATH 882-0

** Course Changes: APMA 935-4, MATH 814-4, MATH 820-4 and MATH 821-4

*/** DETAILED COURSE PROPOSALS/COURSE REVISION INFORMATION AVAILABLE FOR REVIEW BY CONTACTING BOBBIE GRANT, SENATE ASSISTANT AT 604 291-3168 OR EMAIL bgrant@sfu.ca

M. Plischke

c. P. Mustard, Chair, Faculty of Science Graduate Studies Committee

Memorandum

To: John Waterhouse, SCUP

CC: Jon Driver

From: Imin Chen, MATH GSC

Date: 1/4/2005

Re: List of courses to be deleted in the revisions to the Mathematics Graduate Program

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To whom it may concern:

Upon the request of Jon Driver, this is a clarification to the proposal to revise the Mathematics Graduate Program which is on route from the SGSC to the SCUP. Courses listed in the current calendar entry for the Mathematics Program which are not listed in the proposed calendar entry for the Mathematics Program are to be deleted from the program, namely, the following courses:

MATH 806-4 Mathematical Logic II

MATH 807-4 Mathematical Logic: Selected Topics

MATH 808-4 Mathematical Logic III

MATH 812-4 Algebra I

MATH 813-4 Algebra II

MATH 815-4 Algebra III

MATH 816-4 Algebra IV

MATH 825-4 Enumeration

MATH 832-4 Real Analysis II

MATH 837-4 Complex Analysis II

MATH 839-4 Topology I

MATH 840-4 Topology II

Yours truly,

Imin Chen Digitally signed by Imin Chen DN: CN = Imin Chen, O = VeriSign, Inc., OU = VeriSign Trust Network Date: 2005.01.04 15:21:02 -08'00'

Imin Chen
MATH GSC

Mathematics Graduate Program: Proposed Revision

This document describes a proposed revision of the calendar entry for the graduate program in mathematics.

The primary purpose of this revision is to bring the list of graduate courses found in the calendar in line with what we normally and expect to offer on a regular basis. In addition, we are taking the opportunity to introduce a number of changes to improve the graduate program.

1. a new project course MSc degree
2. the introduction of 7xx courses which may be offered in conjunction with a 4xx course
3. appropriate revisions to the MSc and PhD degree requirements

In addition to this document, the following paperwork is appended in support of the proposal:

1. For each new course number introduced, a completed New Course Approval Cover Sheet and a New Graduate Course Proposal Form (MATH 701, MATH 716, MATH 718, MATH 719, MATH 724, MATH 725, MATH 738, MATH 739, MATH 740, MATH 743, MATH 745, MATH 747, MATH 761, MATH 762, MATH 767, MATH 817, MATH 818, MATH 842, MATH 843, MATH 845, MATH 878, MATH 879, MATH 880, MATH 882).

2. A library assessment for the new courses introduced.

3. For each revision to a course in the current calendar, a completed Course Change Form (MATH 814, MATH 820, MATH 821)

Implementation Remarks:

1. Due to the number of changes to the program and the complexity of possible situations which may arise, the GSC will initially send out a memo on a regular basis which will give its official interpretation of the degree requirements. This includes clarifications on such issues as areas of mathematics, course selection, etc. Once a fairly standard set of interpretations is established, these may be incorporated into a further revision of the calendar entries at a future date.

2 The 7xx courses are categorized as graduate courses which may be offered in conjunction with a 4xx course. Normally more stringent course requirements will be imposed on graduate students taking such a co-offered course. There is a limit in the degree requirements on the number of such courses taken..

3. In order to address the issue of increased difficulty with the presence of graduate students, changes are being sought in the mathematics major program (not the honours program) to reduce the number of 4xx courses required while increasing the breadth of 3xx courses required. The situation will be monitored and changes introduced as necessary.

4. Courses in the old calendar which are not in the new calendar will be deleted from the program.

5. The program is designed so that students are not forced at the very start to decide which MSc option they would like to take.

6. The final examination MATH 882 for the course work MSc will be examined by an examination committee to be formed by two faculty members and held every semester. This will be a pass/fail course.

7. Guidelines for grading of the project course MATH 880 will be included in the GSC memo mentioned above. The passing grade will be the minimum pass grade for a graduate course (i.e. a C).

This proposal was approved at the departmental meeting held on 20 October 2004.

I.Chen, Chair of MATH GSC
22 October 2004

Change from:

Mathematics

MSc Program Requirements

A candidate normally obtains at least 20 credit hours beyond courses taken for the bachelor's degree. Of these, at least 12 are graduate courses or seminars, and the remaining eight may be from graduate courses or seminars or 400 division undergraduate courses. The student must also submit a satisfactory thesis and will attend an oral examination based on that thesis and related topics.

Note: APMA 900-990 (page 387) and STAT 800-890 (page 398) may be used to satisfy requirements for the master of science degree.

Change to:

Mathematics

MSc Program Requirements (Thesis Option)

A MSc candidate is normally required to complete at least 18 graduate credit hours beyond courses taken for the applicant's bachelor's degree. Of these, at least 12 credits should be from courses numbered 800 or above. The course work should normally involve at least two different areas of mathematics subject to the approval of the student's supervisory committee and the department's graduate studies committee. The candidate is also required to submit a satisfactory thesis and defend it at an oral examination based on the thesis and related topics (MATH 898).

See "Graduate General Regulations" on page 308 for further information and regulations.

MSc Program Requirements (Project Course Option)

A MSc candidate is normally required to complete at least 30 graduate credit hours beyond courses taken for the applicant's bachelor's degree. Of these, at least 18 credits should be from courses numbered 800 or above. The course work should normally involve at least three different areas of mathematics subject to the approval of the student's supervisory committee and the department's graduate studies committee.

The candidate is required to take and pass the project course MATH 880 and the examination course MATH 882. At most one unsuccessful attempt each at MATH 880 and at MATH 882 is allowed.

See "Graduate General Regulations" on page 308 for further information and regulations.

Change from:

PhD Program Requirements

A candidate will generally obtain at least 28 credit hours beyond those for the bachelor's degree. Of these, at least 16 are graduate courses or seminars and the remaining 12 may be graduate courses, seminars or 400 level undergraduate courses. Students with an MSc in mathematics or statistics are deemed to have earned 12 of the 16 hours and eight of the 12 undergraduate or graduate hours required. Course work in all cases will involve study in at least four different areas of mathematics and/or statistics.

Candidates will normally pass a two stage general exam. The first stage covers a broad range of senior undergraduate material. In the second, students present to their supervisory committee a written thesis proposal and then defend this at an open oral defence. The supervisory committee evaluates the thesis proposal and defence and either passes or fails the student. A candidate ordinarily cannot take either stage of the general examination more than twice. Both stages must be completed within six full time semesters of initial enrolment in the PhD program.

The supervisory committee may require proficiency in reading mathematical papers in either French, German or Russian. Students must submit and successfully defend a thesis which embodies a significant contribution to mathematical knowledge. See "Graduate General Regulations" on page 308 for further information and regulations.
Note: APMA 900-990 (page 387) and STAT 800-890 (page 398) may be satisfy PhD requirements.

Change to:

PhD Program Requirements

A PhD candidate is normally required to complete the MSc requirements (either option) and at least 12 further graduate credit jours. Of these, at least 8 credits should be from courses numbered 800 or above. Subject to the approval of the department's graduate studies committee, a PhD candidate with a MSc is deemed to have completed the MSc requirements for the purposes of the PhD program requirements. The graduate course work should normally involve at least four different areas of mathematics subject to the approval of the student's supervisory committee and the department's graduate studies committee.

Candidates will normally be required to pass a two stage general exam. The first stage consists of successful completion of a comprehensive examination (MATH 878). In the second, students present to their supervisory committee a written thesis proposal and then defend this at an open oral defence (MATH 879). The supervisory committee evaluates the thesis proposal and defence and either passes or fails the student. A candidate cannot take either stage of the general examination more than twice. Both stages must be completed within six full time semesters of initial enrolment in the PhD program.

Students must submit and successfully defend a thesis which embodies a significant contribution to mathematical knowledge (MATH 899).

See "Graduate General Regulations" on page 308 for further information and regulations.

Change from:

Mathematics Graduate Courses

MATH 601-4 Discovering Mathematics I
Arithmetic and Geometry form the core of the elementary school curriculum. The fundamental concepts in both these areas of mathematics will be approached through exploratory exercises and problems as well as in projects. The students will work both singly and in groups to explore the ideas of mathematics. The presentations will be non-theoretical. Prerequisite: acceptance into the master's program in mathematics education or permission of the department. Graduate students in Department of Mathematics cannot take this course to satisfy their degree requirements.

MATH 602-4 Discovering Mathematics II
Discrete mathematics is used in computer communications, scheduling and transportation problems. Statistics is encountered by each of us every day in the newspapers and on television as medical findings, sporting results and economic strategies are discussed. These are two of the most accessible areas of modern applied mathematics and many problems and the ideas behind their solution can be understood and appreciated by students with only a modest mathematical background. Several topics in these areas and their relationship to real world problems will be explored. The exploration will be done through a series of projects with students often working in teams and making presentations of their discoveries. The presentation will be non-theoretical.

Prerequisite: MATH 601 and acceptance into the master's program in mathematics education or permission of the department. Graduate students in Department of Mathematics cannot take this course to satisfy their degree requirements.

Change to:

Mathematics Graduate Courses

MATH 601-4 Discovering Mathematics I
Arithmetic and Geometry form the core of the elementary school curriculum. The fundamental concepts in both these areas of mathematics will be approached through exploratory exercises and problems as well as in projects. The students will work both singly and in groups to explore the ideas of mathematics. The presentations will be non-theoretical. Prerequisite: acceptance into the master's program in mathematics education or permission of the department. Graduate students in Department of Mathematics cannot take this course to satisfy their degree requirements.

MATH 602-4 Discovering Mathematics II
Discrete mathematics is used in computer communications, scheduling and transportation problems. Statistics is encountered by each of us every day in the newspapers and on television as medical findings, sporting results and economic strategies are discussed. These are two of the most accessible areas of modern applied mathematics and many problems and the ideas behind their solution can be understood and appreciated by students with only a modest mathematical background. Several topics in these areas and their relationship to real world problems will be explored. The exploration will be done through a series of projects with students often working in teams and making presentations of their discoveries. The presentation will be non-theoretical.

Prerequisite: MATH 601 and acceptance into the master's program in mathematics education or permission of the department. Graduate students in Department of Mathematics cannot take this course to satisfy their degree requirements.

Change from:

MATH 603-4 Foundations of Mathematics
Crises in mathematics, their historical and philosophical background and their resolution. Prerequisite: acceptance into the MSc program in mathematics education or permission of the department. Graduate students in the Department of Mathematics cannot take this course to satisfy their degree requirements.

MATH 604-4 Geometry
Euclidean and non-Euclidean geometries. Klein's erlangen program. Prerequisite: entrance into the MSc in mathematics education program or permission of the department. Graduate students in the Department of Mathematics cannot take this course to satisfy their degree requirements.

MATH 605-4 Mathematics in Context
Mathematical modeling in the largest sense with a focus on topics and issues related to doing and discovering mathematics, including explorations of available computational resources, e.g. Maple. Prerequisite: acceptance into the MSc program in mathematics education and one year of university level calculus. Graduate students in the Department of Mathematics cannot take this course to satisfy their degree requirements.

Change to:

MATH 603-4 Foundations of Mathematics
Crises in mathematics, their historical and philosophical background and their resolution. Prerequisite: acceptance into the MSc program in mathematics education or permission of the department. Graduate students in the Department of Mathematics cannot take this course to satisfy their degree requirements.

MATH 604-4 Geometry
Euclidean and non-Euclidean geometries. Klein's Erlangen program. Prerequisite: entrance into the MSc in mathematics education program or permission of the department. Graduate students in the Department of Mathematics cannot take this course to satisfy their degree requirements.

MATH 605-4 Mathematics in Context
Mathematical modeling in the largest sense with a focus on topics and issues related to doing and discovering mathematics, including explorations of available computational resources, e.g. Maple. Prerequisite: acceptance into the MSc program in mathematics education and one year of university level calculus. Graduate students in the Department of Mathematics cannot take this course to satisfy their degree requirements.

Change from:

Change to:

* 700 division courses may be offered in conjunction with a 400 division course. Students may not take a 700 division course if it is being offered in conjunction with a 400 division course which they have taken previously.

MATH 701-4 Computer Algebra
Data-structures and algorithms for mathematical objects, including polynomials, general mathematical formulae, long integer arithmetic, polynomial greatest common divisors, the Risch integration algorithm. Other topics include symbolic differentiation, simplification of formulae, and polynomial factorization. Students will learn Maple for use on assignments.

MATH 716-3 Numerical Analysis II
The numerical solution of ordinary differential equations and elliptic, hyperbolic and parabolic partial differential equations will be considered.

MATH 718-3 Partial Differential Equations
First-order linear equations, the method of characteristics. The wave equation. Harmonic functions, the maximum principle, Green's functions. The heat equation. Distributions and transforms. Higher dimensional eigenvalue problems. An introduction to nonlinear equations. Burgers' equation and shock waves.

MATH 719-3 Linear Analysis
Convergence in Euclidean spaces, Fourier series and their convergence, Legendre polynomials, Hermite and Laguerre polynomials.

MATH 724-3 Applications of Complex Analysis
Conformal mapping, application to boundary value problems, Schwarz-Christoffel transformation, integral formulas, analytic continuation, argument principle.

MATH 725-3 Real Analysis
Metric spaces, normed vector spaces, measure and integration, an introduction to functional analysis.

Change from:

Change to:

MATH 738-3 Linear Algebra
Linear Algebra. vector space and matrix theory.

MATH 739-3 Algebraic Systems
Algebraic systems including, for example, groups, rings. Polynomial theory.

MATH 740-3 Galois Theory
An introduction to the theory of fields, with emphasis on Galois theory.

MATH 743-3 Combinatorial Theory
Graph colouring, Hamiltonian graphs, planar graphs, random graphs, Ramsey theory, extremal problems, additional topics.

MATH 745-3 Graph Theory
Graph colouring, Hamiltonian graphs, planar graphs, random graphs, Ramsey theory, extremal problems, additional topics.

MATH 747-4 Coding Theory
An introduction to the theory and practice of error-correcting codes. Topics will include finite fields, polynomial rings, linear and non-linear codes, BCH codes, convolutional codes, majority logic decoding, weight distribution of codes, and bounds on the size of codes.

MATH 761-3 Continuous Mathematical Models
Formulation, analysis and numerical solution of continuous mathematical models. Applications may be selected from topics in physics, biology, engineering and economics.

MATH 762-3 Fluid Dynamics
Incompressible fluid flow phenomena: kinematics and equations of motion, viscous flow and boundary layer theory, potential flow, water waves. Aerodynamics.

MATH 767-3 Dynamical Systems
Stability and bifurcation in vector fields and discrete maps. Centre manifold theory and applications of normal forms. Introduction to chaos, Lyapunov exponents, and normal hyperbolicity.

Change from:

MATH 800-4 Pure Mathematics: Selected Topics

MATH 806-4 Mathematical Logic II
First-order theories. Some syntactical theorems concerning provability, such as the equivalence and equality theorems; the completeness theorem and some of its consequences for equivalence of syntactical and semantical notions, and introduction to model theory; incompleteness of formal arithmetic.

MATH 807-4 Mathematical Logic: Selected Topics

MATH 808-4 Mathematical Logic III
Introduction to recursion theory. Church's Thesis, Godel-Rosser incompleteness theorem, undecidability. Kleen's normal form theorem and enumerations theorem, the recursion theorem. The arithmetic hierarchy, the analytical hierarchy. Degrees of unsolvability. Basic theorems. Additional topics, if time permits. Prerequisite: MATH 806.

MATH 812-4 Algebra I
Theory of fields. Topics covered will include separable, normal, Galois, and transcendental extensions; finite fields and algebraically closed fields. Additional topics may include infinite Galois groups, valuation, Kummer extensions and Galois cohomology, further material in algebraic number theory.

Change to:

MATH 800-4 Mathematics: Selected Topics

Change from:

MATH 813-4 Algebra II
Group theory. Generators and relations, normalizers and centralizers, composition series. Permutation groups, Sylow theory, abelian groups. Other topics covered will be the theory of p-groups, nilpotent and solvable groups, and some aspects of simple groups.

MATH 814-4 Algebra: Selected Topics

MATH 815-4 Algebra III
Rings and modules. Commutative and noncommutative associate rings with ascending or descending chain condition. Jacobson radical Chevalley-Jacobson density theorem, Wedderburn-Artin theorems, Goldie theorems, with applications to matrix groups and group algebras. As time permits, homological and local methods.

MATH 816-4 Algebra IV
Homology. Categories, functors, adjoint functors, homology, and cohomology of a complex. Universal coefficient theorem; Extn cohomology of groups; Schurs theorem. Tensor and torsion products. Global dimension of rings.

Change to:

MATH 817-4 Groups and Rings
A survey of graduate group and/or ring theory. Possible topics include generators and relations, composition series, Sylow theory, permutation groups, abelian groups, p-groups, nilpotent and solvable groups, aspects of simple groups, representation theory, group algebras, chain conditions, Jacobson radical, Chevalley-Jacobson density theorem, Wedderburn-Artin theorems.

MATH 818-4 Algebra and Geometry
An introduction to algebraic geometry with supporting commutative algebra. Possible topics include Hilbert basis theorem, Hilbert's Nullstellensatz, Groebner bases, ideal decomposition, local rings, dimension, tangent and cotangent spaces, differentials, varieties, morphisms, rational maps, non-singularity, intersections in projective space, cohomology theory, curves, surfaces, homological algebra.

MATH 819-4 Algebra: Selected Topics

Change from:

MATH 820-4 Graph Theory
A first graduate course in graph theory dealing with some of the following: algebraic graph theory, extremal graph theory, coloring problems, applications of graphs, hypergraphs, and current research topics.

MATH 821-4 Combinatorics
An introduction to the theory of block designs, finite geometries and related topics.

Change to:

MATH 820-4 Graph Theory
Algebraic graph theory, extremal graph theory, colouring problems, path and cycle structure of graphs, application of graphs, hypergraphs, and current research topics.

MATH 821-4 Combinatorics
An introduction to the theory of incidence structures (finite geometries, block designs) and their relation to linear codes. Algebraic techniques - finite group actions, orbit enumeration, generation of orbit representatives. Exact and asymptotic enumeration of labelled and unlabelled structures.

Change from:

MATH 825-4 Enumeration
Enumeration problems concerned with permutations, sequences, partitions, lattice walks and graphs, algebraic and analytic properties of generating functions, asymptotic analysis.

MATH 826-4 Posets and Matroids
An introduction to the theory of posets, geometric lattices and matroids.

MATH 827-4 Discrete Mathematics: Selected Topics

MATH 831-4 Real Analysis I
An intensive study of Lebesque measure, integration and the Lebesque convergence theorems together with the treatment of such topics as absolute continuity, the fundamental theorem of calculus, the Lp-spaces, comparison of types of convergence in function spaces, the Baire category theorem.

MATH 832-4 Real Analysis II
This course normally covers abstract measure and integration, and material which collectively might be called an introduction to functional analysis (e.g. complete metric spaces, normal spaces, the Stone-Weierstrass theorem, linear functionals and the Hahn-Banach theorem). Other specialized topics in modern analysis. Prerequisite: MATH 831.

MATH 833-4 Analysis: Selected Topics

Change to:

MATH 826-4 Posets and Matroids
An introduction to the theory of posets, geometric lattices and matroids.

MATH 827-4 Discrete Mathematics: Selected Topics

MATH 831-4 Real Analysis I
An intensive study of Lebesque measure, integration and the Lebesque convergence theorems together with the treatment of such topics as absolute continuity, the fundamental theorem of calculus, the Lp-spaces, comparison of types of convergence in function spaces, the Baire category theorem.

MATH 833-4 Analysis: Selected Topics

Change from:

MATH 836-4 Complex Analysis I
Topics covered normally will include: Riemann surfaces, complex conjugate co-ordinates; the maximum principle, boundary value problems; conformal mappings, Schwartz-Christoffel formula; the symmetry principle, analytic continuation.

MATH 837-4 Complex Analysis II
Topics covered will include some of the following: entire functions, normal families, Hilbert space of analytic functions; conformal mappings of special functions; Picard's theorem. Prerequisite: MATH 836.

MATH 839-4 Topology I
A first graduate course in general topology, dealing with some of the following topics: set-theoretic preliminaries, topological spaces, filters and nets, connectedness notions, separation properties, countability properties, compactness properties, paracompactness, metrization, uniform spaces, function spaces.

MATH 840-4 Topology II
A second graduate course in general topology dealing with additional topics among those listed for MATH 839. Prerequisite: MATH 839.

MATH 841-4 Topology: Selected Topics

Change to:

MATH 836-4 Complex Analysis I
Topics covered normally will include: Riemann surfaces, complex conjugate co-ordinates; the maximum principle, boundary value problems; conformal mappings, Schwartz-Christoffel formula; the symmetry principle, analytic continuation.

MATH 841-4 Topology: Selected Topics

MATH 842-4 Algebraic Number Theory
Review of Galois theory, integrality, rings of integers, traces, norms, discriminants, ideals, Dedekind domains, class groups, unit groups, Minkowski theory, ramification, cyclotomic fields, valuations, completions, applications.

MATH 843-4 Analytic and Diophantine Number Theory
Arithmetical functions, distribution of prime numbers, theory of Dirichlet characters, Dirichlet series, theory of Riemann Zeta functions and Dirichlet L-functions, exponential sums, character sums, Diophantine equations, Diophantine approximations, applications.

MATH 845-4 Number Theory: Selected Topics

Change from:

MATH 877-1 Supplementary Reading

Change to:

MATH 877-1 Supplementary Reading

MATH 878-0 PhD Comprehensive Examination
A comprehensive written examination covering a broad range of senior undergraduate and graduate material.

MATH 879-0 PhD Thesis Proposal
An open oral defence of a written thesis proposal presented to the student's supervisory committee.

MATH 880-6 MSc Project
A project leading to research in mathematics completed under the supervision of a faculty member. The project will consist of a written report and a public presentation. This course can only be used for credit towards the MSc project course option.

MATH 882-0 MSc Final Examination
A written examination covering senior undergraduate and basic graduate material.

Change from:

MATH 890-0 Practicum I
First semester of work experience in a co-operative education program. (0-0-0)

MATH 891-0 Practicum II
Second semester of work experience in a co-operative education program. (0-0-0)

MATH 892-0 Practicum III
Third semester of work experience in the Co-operative Education Program. (0-0-0)
Prerequisite: MATH 891.

MATH 893-0 Practicum IV
Fourth semester of work experience in the Co-operative Education Program. (0-0-0)
Prerequisite: MATH 892.

MATH 894-2 Reading

MATH 895-4 Reading

MATH 896-2 Introductory Seminar

MATH 897-2 Advanced Seminar

MATH 898-0 MSc Thesis

MATH 899-0 PhD Thesis

Change to:

MATH 890-0 Practicum I
First semester of work experience in a co-operative education program. (0-0-0)

MATH 891-0 Practicum II
Second semester of work experience in a co-operative education program. (0-0-0)

MATH 892-0 Practicum III
Third semester of work experience in the Co-operative Education Program. (0-0-0)
Prerequisite: MATH 891.

MATH 893-0 Practicum IV
Fourth semester of work experience in the Co-operative Education Program.
(0-0-0) Prerequisite: MATH 892.

MATH 894-2 Reading

MATH 895-4 Reading

MATH 896-2 Introductory Seminar

MATH 897-2 Advanced Seminar

MATH 898-6 MSc Thesis*

MATH 899-6 PhD Thesis

* The credit values assigned to MATH 898 and MATH 899 are for administrative purposes only and cannot be used towards degree course work requirements.

Memo: Modified Calendar Entry for Graduate Applied Math Program

1 Rationale

With the cross-listing of fourth year courses at the 700-level students could take undergraduate courses to fulfill graduate course requirements. This was not the intention of the program, so we propose that the following be added to the calendar entry: "Normally courses that are cross-listed as undergraduate courses cannot be used to satisfy graduate level course requirements."

Furthermore, it is sometimes the case that students take courses that are credited at 3-credit hours (eg, 400 level undergraduate courses and graduate courses outside of mathematics). To take this into account, the total requirement for credit hours should be dropped to 26 credit hours.

2 Proposed Calendar Entry

A candidate for the MSc will normally be required to obtain a total of 26 credit hours beyond courses taken for the bachelor's degree. These 26 hours will consist of at least four courses chosen from the list of core courses below with at least one course from each of the pairs APMA 900,901; APMA 920, 922; APMA 930, 935; a further seven credit hours at the graduate level; and a further three credit hours which may be at the graduate level or at the 400 undergraduate level. Normally courses that are cross-listed as undergraduate courses cannot be used to satisfy graduate level course requirements. The six core courses are

APMA 900-4 Advanced Mathematical Methods I
APMA 901-4 Advanced Mathematical Methods II
APMA 920-4 Numerical Linear Algebra
APMA 922-4 Numerical Solution of Partial Differential Equations
APMA 930-4 Fluid Dynamics
APMA 935-4 Analysis and Computation of Models

In addition to this course requirement (normally completed in five semesters), the student completes a project which involves a significant computational component and submits and successfully defends a project report. This project should be completed within about one semester.

3 Current Calendar Entry

A candidate for the MSc will normally be required to obtain a total of 28 credit hours beyond courses taken for the bachelor's degree. These 28 hours will consist of at least four courses chosen from the list of core courses below with at least one course from each of the pairs APMA 900,901; APMA 920, 922; APMA 930, 935; a further eight credit hours at the graduate level; and a further four credit hours which may be at the graduate level or at the 400 undergraduate level. The six core courses are

APMA 900-4 Advanced Mathematical Methods I
APMA 901-4 Advanced Mathematical Methods II
APMA 920-4 Numerical Linear Algebra
APMA 922-4 Numerical Solution of Partial Differential Equations
APMA 930-4 Fluid Dynamics
APMA 935-4 Mechanics of Solids

In addition to this course requirement (normally completed in five semesters), the student completes a project which involves a significant computational component and submits and successfully defends a project report. This project should be completed within about one semester.