Mathematics is a fundamental basis for a large number of activities in the modern world and is a gateway to numerous professions. Pursuing a Mathematics program will give you knowledge in various branches of pure and applied mathematics, such as analysis, linear and modern algebra, topology and geometry, probability and statistics, and financial mathematics.

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FOR COURSE DESCRIPTIONS, PLEASE SEE INSERT
OUR DEPARTMENT

In the spring of 1984, the Senate of York University approved the establishment of a bilingual Department of Mathematics at Glendon. The Fall/Winter 2013-2014 academic session marks the 30th year of operation of our department.

Glendon is a liberal arts faculty and therefore places emphasis on general education, the humanities and the social sciences. The mathematics programs of our department complement the range of studies offered by Glendon because:

- Mathematics is an essential component of a general education and it will become even more so in the future;
- Mathematics is an important methodological tool used in all of the social sciences (economics, political science, psychology, sociology, etc.) as well as in the humanities;
- Mathematics is one of the liberal arts in the full sense of the term which is studied for its own sake and its merits outshine its almost unlimited applications in the real world.

This document is the mini calendar of the Mathematics Department. It intends to describe in full details the courses offered by our department in 2013-2014.

OUR PROGRAMS

We offer 6 BA Programs and 4 International BA (iBA) Programs in Mathematics.

- Specialized Honours BA
- Specialized Honours iBA
- Honours BA
- Honours iBA
- Honours Double Major BA
- Honours Double Major iBA
- Honours Major/Minor BA
- Honours Major/Minor iBA
- Honours Minor BA
- Bachelor of Arts

For detailed program requirements, please refer to the York University Undergraduate Calendar applicable to your year of entry into the program.
OUR PROFESSORS

Jean-Claude's areas of specialization and research are probability theory, statistics and econometrics.

Samia is working in the fields of dynamical systems and fractal geometry. More precisely, he is conducting research on iterated function systems and graph directed Markov systems.

ALEXANDER NENASHEV, ASSOCIATE PROFESSOR AND CHAIR OF THE DEPARTMENT

Research Areas:
(a) Algebraic K-theory
(b) Balmer-Witt theory and other cohomology theories for algebraic varieties
(c) Algebraic cobordism

Recent Publications:

MARIO ROY, ASSOCIATE PROFESSOR

Research Areas:

Mario is working in the fields of dynamical systems and fractal geometry. More precisely, he is conducting research on iterated function systems and graph directed Markov systems.

Recent Publications:
(1) "A new variation of Bowen’s formula for graph directed Markov systems", Discrete and Continuous Dynamical Systems --- Series A 32 (2012), no. 7, 2533-2551.
(2) "Random graph directed Markov systems" (with Mariusz Urbanski), Discrete and Continuous Dynamical Systems --- Series A 30 (2011), no. 1, 261-298.
(3) "Multifractal analysis for conformal graph directed Markov systems" (with Mariusz Urbanski), Discrete and Continuous Dynamical Systems --- Series A 25 (2009), no. 2, 627-650.
(4) "Lambda-topology vs. pointwise topology” (with Hiroki Sumi and Mariusz Urbanski), Ergodic Theory and Dynamical Systems 29 (2009), no. 2, 685-713.
DAVID SPRING, FULL PROFESSOR

Research Areas:

Immersion-theoretic topology, with applications to solving partial differential equations. Mathematical economics, specifically the theory of interest.

Recent Publications:

Author of a mathematics book and of several articles in research mathematics journals.


WHY STUDY MATHEMATICS AT GLENDON?

- Small classes will ensure you receive personalized attention from dedicated, approachable and qualified professors through the various stages of your learning.
- Study with high-profile professors working in a variety of mainstream branches of modern mathematics. Jean-Claude Bouhénic specializes in probability and statistics. Alexander Nenashev’s research focuses on modern algebra (more specifically, in algebraic K-theory, Witt theory, and algebraic geometry). Mario Roy pursues research in analysis (more precisely, in the field of dynamical systems and ergodic theory, with an emphasis on thermodynamics). David Spring’s interests are in the areas of differential geometry and topology and the history of these disciplines.
- Studying mathematics in our liberal arts context gives you the flexibility to explore other academic areas of interest. Combine your mathematics studies with economics, business economics, linguistics, psychology, or another discipline of your choice for a well-rounded education and open yourself the doors to a wide range of professions.
- Mathematics can be a useful tool for analysis in all of the liberal arts.
- Mathematics is available as a bilingual or trilingual international Bachelor of Arts.

WHAT CAN YOU DO WITH A DEGREE IN MATHEMATICS?

A mathematics degree can lead to work in teaching, banking, finance, insurance, actuarial science, statistics, business analysis and research, among others.
MATHEMATICS DEPARTMENT GUIDELINES

FOR ALL GLENDON MATHEMATICS MAJORS

Students planning a Mathematics degree should take the following courses in their first two years of studies:

- First-Year: GL/MATH 1650 3.00 Modes of Mathematical Reasoning
  GL/MATH 1930 3.00 & 1940 3.00 Calculus I & II
- First- or Second-Year: GL/MATH 2650 & 2660 3.00 Linear Algebra I & II
- Second-Year: GL/MATH 2670 6.00 Second-Year Calculus

In their third and fourth years, students should choose their courses in consultation with the Chair of the Department of Mathematics. This is all the more important because some of the higher-level mathematics courses are offered in alternate years.

IMPORTANT NOTICE

COMPULSORY COURSE

to get a Mathematics degree from Glendon

GL/MATH 2670 6.00 SECOND-YEAR CALCULUS

Students must take this course to fulfill the requirements of their Glendon Mathematics’ degree.

This course cannot be replaced by similar courses offered at the Keele campus. The two courses SC/MATH 2310 3.00 (Calculus of Several Variables with Applications) and SC/MATH 3010 3.00 (Vector Integral Calculus) offered by the Mathematics Department of the Faculty of Science will not count as equivalent credits to GL/MATH 2670 6.00 Second-Year Calculus.

Due to budgetary constraints, the Department of Mathematics at Glendon cannot always offer all the courses required for a Specialized Honours BA Program.

For that reason, students pursuing that program at Glendon may have to take some 3000 or 4000 level mathematics courses at the Keele campus in order to complete their degree. Those courses should be selected in consultation with the Chair of the Department of Mathematics at Glendon.
ACADEMIC ADVISING & RESOURCES

Glendon’s Office of Academic Services provides a range of registration and support services to students. This office is responsible for maintaining the integrity of student academic records and offers information on University and College rules and regulations, courses and registration, grade reporting and degree audit, graduation and transcripts, and academic advising. You will be able to obtain information on all academic matters from initial registration through to graduation.

ACADEMIC SERVICES

Room C102 York Hall
2275 Bayview Avenue
Toronto, Ontario
M4N 3M6
Canada
Telephone: 416.487.6715
Fax: 416.487.6813
Email: acadservices@glendon.yorku.ca
Website: www.glendon.yorku.ca/acadservices

QUICK LINKS:

Undergraduate Calendar: http://calendars.registrar.yorku.ca

Lecture Schedule: https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm

Policies, Procedures and Regulations (incl. Academic Honesty):
http://www.yorku.ca/secretariat/policies/index-policies.html

LANGUAGE TRAINING CENTRE FOR STUDIES IN FRENCH

The Language Training Centre for Studies in French welcomes students who want to improve their knowledge of French in order to meet Glendon’s base bilingual requirement, which is the minimum requirement to graduate from Glendon. The FSL courses are open to all students majoring and minoring in fields other than French Studies or Translation.

The Language Training Centre for Studies in French
fsl@glendon.yorku.ca
416-736-2100 x88222
## COURSE LISTINGS/LISTE DE COURS

### 2015-2016

### CORE COURSES/COURS DE BASE:

- GL/MATH 1650 3.00
- GL/MATH 1930 3.00 and GL/MATH 1940 3.00
- GL/MATH 2650 3.00 and GL/MATH 2660 3.00
- GL/MATH 2670 6.00

**Note:** Course substitutes must be approved by the Department's Chair.

**Remarque :** Tout cours de remplacement doit recevoir l'approbation du Directeur du département

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GL/MATH/MODR 1610 3.00 (EN) INTRODUCTION TO STATISTICAL METHODS I (FALL)

GL/MATH/MODR 1620 3.00 (EN) INTRODUCTION TO STATISTICAL METHODS II (WINTER)

The purpose of these two courses is to introduce students to some of the fundamental concepts and methods of statistics. It is expected that students who complete these courses will be able to understand the most commonly used statistical methods in social science research.

The topics that are covered in the first course include: data analysis, descriptive statistics, elements of probability theory, a number of discrete and continuous distributions, sampling distributions, estimation, and hypothesis testing.

The second course deals with comparisons of two populations, nonparametric methods, goodness of fit and contingency table tests, regressions and correlation analysis, analysis of variance, forecasting and time series.

NOTE: The successful completion of both GL/MATH/MODR 1610 3.00 and GL/MATH/MODR 1620 3.00 with a grade of C or better is required in order to obtain transfer credits from the Certified General Accountants of Ontario (CGA).

Prerequisites:
- For GL/MATH/MODR 1610 3.00: Any grade 12 Mathematics course.
- For GL/MATH/MODR 1620 3.00: GL/MATH/MODR 1610 3.00.

Cross-listings:
- For GL/MATH/MODR 1610 3.00: GL/POLS 2610 3.00 & GL/SOCI 2610 3.00.
- For GL/MATH/MODR 1620 3.00: GL/POLS 2620 3.00 & GL/SOCI 2620 3.00.

Course credit exclusions:
- For GL/MATH/MODR 1610 3.00: SC/MATH 1131 3.00 & SC/MATH 2560 3.00
- For GL/MATH/MODR 1620 3.00: SC/MATH 2570 3.00

These courses are open to all students who meet the prerequisites.

GL/MATH/MODR 1650 3.00 (EN) MODES OF MATHEMATICAL REASONING (FALL)

This proof-based course introduces the student to various proof techniques. Its main objective is to familiarize the student with mathematical proofs, as opposed to mathematical calculations.

The course develops practical logic: true and false statements; correct and incorrect conclusions; quantifiers. The language of sets is also studied: set operations; Cartesian products; finite and infinite sets; composite functions (mappings); invertible functions; direct and inverse images. Mathematical induction and combinatorics will also be discussed.

Designed as a first-year course, this course has not been offered over the last few years. For this reason, we recommend it to the 2nd-, 3rd- and 4th-year students as well. It constitutes an excellent preparation for GL/MATH 2660 and for the 3000 and 4000 level courses.

Prerequisite: Any grade 12 Mathematics course.
Course credit exclusion: SC/MATH 1190 3.00.

This course is open to all students who meet the prerequisite.

GL/MATH/MODR 1670 6.00 (EN) FUNDAMENTALS OF MATHEMATICS (YEAR)

Intended for the student whose high school mathematical background is either weak or incomplete, this precalculus course is designed to train and improve the logical and technical skills in the use of basic mathematics and is a good preparation for calculus. Topics are chosen from: basic algebra; linear, quadratic, polynomial, exponential, logarithmic and trigonometric functions; systems of equations; inequalities; probability; series; and derivatives.

Course credit exclusion: SC/MATH 1510 6.00.

This course is open to all.
AVIS AUX ÉTUDIANTS :

Les étudiants qui comptent prendre le cours GL/MATH/MODR 1930 3.00 Calcul différentiel et intégral I doivent avoir terminé un cours de douzième année en mathématiques. Les étudiants qui n’ont pas ce prérequis, qui ont de la difficulté avec les mathématiques ou qui retournent aux études après plusieurs années d’absence devraient tout d’abord prendre le cours préparatoire GL/MATH/MODR 1670 6.00 Fundamentals of Mathematics pour améliorer leurs compétences en algèbre, en trigonométrie et dans des sujets connexes et afin de profiter plus pleinement des cours de mathématiques de niveau universitaire comme les cours de calcul.

GL/MATH/MODR 1930 3.00 (FR) CALCUL DIFFÉRENTIEL ET INTÉGRAL I (AUTOMNE)

GL/MATH/MODR 1940 3.00 (FR) CALCUL DIFFÉRENTIEL ET INTÉGRAL II (HIVER)

PROFESSEUR : TBA lundi 16:00 – 18:00 et mercredi 15:00 – 17:00

Les cours GL/MATH/MODR 1930 et 1940 sont offerts en anglais et en français et sont conçus :

i) pour fournir aux étudiants une base solide en calcul différentiel et intégral pouvant servir dans d’autres disciplines comme les sciences économiques et les sciences sociales ;

ii) pour préparer adéquatement les étudiants qui souhaitent poursuivre des études plus avancées en mathématiques.

Les notions abordées en Calcul I sont les fonctions d’une variable, leurs limites, leur continuité, leur dérivation et ses applications, de même que le théorème de la valeur moyenne et ses applications à la représentation graphique et à l’optimisation des fonctions.

Le cours Calcul II est la suite du cours Calcul I. Il traite des primitives des fonctions d’une variable, de leur intégrale de Riemann et des techniques d’intégration. Il discute en outre des fonctions inversibles, dont les fonctions logarithmiques et exponentielles, les fonctions trigonométriques et leurs inverses, et les fonctions hyperboliques. Enfin, ce cours s’intéresse aux formes indéterminées et à la levée d’indéterminations au moyen de la règle de l’Hôpital. Une introduction aux fonctions de plusieurs variables et leurs dérivées partielles sera donnée si le temps le permet.

Conditions préalables :
• Pour GL/MATH/MODR 1930 3.00: Un cours de 12e année en mathématiques.
• Pour GL/MATH/MODR 1940 3.00: GL/MATH/MODR 1930 3.00.

Cours incompatibles :
• Pour GL/MATH/MODR 1930 3.00: SC/MATH 1300 3.00.
• Pour GL/MATH/MODR 1940 3.00: SC/MATH 1310 3.00.

Ces cours sont ouverts aux étudiants qui satisfont aux conditions préalables.

REMARQUE :

Les cours Calcul différentiel et intégral I et II font partie des exigences des baccalauréats spécialisés en Économie et en Economie et Commerce de Glendon. Dans ce cadre, ces cours doivent être complétés avant la fin de la deuxième année d’études. De plus, ces cours satisfont à l’une des conditions d’admission au programme de Baccalauréat en Administration.

CALCULUS I
NOTICE TO STUDENTS:

Students who plan to take the course GL/MATH/MODR 1930 3.00 Calculus I, should have passed one grade 12 course in mathematics. Students who do not fulfill this requirement, have weak backgrounds in mathematics or who are returning to school after an absence of several years should take GL/MATH/MODR 1670 6.00 Fundamentals of Mathematics before undertaking Calculus I, in order to improve their skills in algebra, trigonometry, and related topics in preparation for university level mathematics courses such as calculus.
GL/MATH/MODR 1930 3.00 (EN) CALCULUS I (FALL)

GL/MATH/MODR 1940 3.00 (EN) CALCULUS II (WINTER)

INSTRUCTOR: S. Challal  
MON 16:00 – 18:00 & WED 15:00 – 17:00

The courses GL/MATH/MODR 1930 and 1940 are offered in English and French and are designed:

i) to provide students with a sound foundation in calculus for application to other disciplines such as economics and the other social sciences;

ii) to adequately prepare students wishing to undertake more advanced studies in mathematics.

The topics covered in Calculus I are functions of one variable, their limits, their continuity, their differentiation and its applications, the mean value theorem and its applications to curve sketching and optimization of functions.

Calculus II is the sequel of Calculus I. It deals with antiderivatives of functions of one variable, of their Riemann integral, and of various integration techniques. It also discusses invertible functions, among which logarithmic and exponential functions, trigonometric and inverse trigonometric functions, and hyperbolic functions. Finally, it examines indeterminate forms and the removal of indetermination using l'Hôpital's Rule. An introduction to functions of several variables and their partial derivatives will be given, time permitting.

Prerequisites:

• For GL/MATH/MODR 1930 3.00: Any grade 12 Mathematics course.
• For GL/MATH/MODR 1940 3.00: GL/MATH/MODR 1930 3.00.

Course credit exclusions:

• For GL/MATH/MODR 1930 3.00: SC/MATH 1300 3.00.
• For GL/MATH/MODR 1940 3.00: SC/MATH 1310 3.00.

These courses are open to all students who meet the prerequisites.

NOTE: Calculus I and II are both required for all Economics and Business Economics Honours degrees at Glendon. As part of these programs, they must be taken by the end of the second year of study. Moreover, their successful completion will fulfill one of the mathematics prerequisites for admission to the BBA Programme.
GL/MATH/MODR 2670 6.00 (EN) SECOND YEAR CALCULUS (YEAR)

PROFESSEUR : S. Challal TUE 10:00 – 12:00 & THU 10:00 – 12:00

Ce cours porte principalement sur l'étude des fonctions de plusieurs variables, de leurs dérivées partielles, de leurs intégrales (doubles et triples, en particulier), de leur optimisation, et de leur développement en série de Taylor. Le calcul vectoriel dans \( \mathbb{R}^n \) ainsi que les suites et les séries numériques sont aussi discutés.

Condition préalable : GL/MATH/MODR 1940 3.00.
Cours incompatible : SC/MATH 2310 3.00.

Ce cours est ouvert aux étudiants qui satisfont la condition préalable.

GL/MATH/MODR 2680 6.00 (EN) MATHEMATICS OF INVESTMENT AND ACTUARIAL SCIENCE (YEAR)

INSTRUCTOR: M. Roy  Mon. 15:00 – 19:00

The first part of the course deals with simple, compound and continuous interest. It introduces the main concept of finance, the time value of money, and applies it to various familiar problems such as the calculation of mortgage payments, of payments on instalment loans like car leases, and of the yield on bonds. Other topics include annuities, perpetuities, dividend pricing models, sinking funds, depreciation, and capitalization. In the second part of the course the theory of interest is applied to life annuities and life insurance.

This course is of interest to all students, especially those who are interested in business, finance or economics. The emphasis will be on practical problems.

Prerequisites: GL/MATH/MODR 1930 3.00 & 1940 3.00.
Course credit exclusions: SC/MATH 1581 3.00, SC/MATH 2581 3.00, SC/MATH 2580 6.00, SC/MATH 2280 3.00.

This course is open to all students who meet the prerequisites.

3000 LEVEL COURSES/COURS DE TROISIÈME ANNÉE

GL/MATH 3515 3.00 (EN) – MODERN ALGEBRA II (WINTER)

INSTRUCTOR: A. Nenashev Mon & Wed 13:30 – 15:00

This course is a continuation of Modern Algebra I, and it also is an introduction to ring theory and to field theory. The topics considered will be an introduction to ring theory, ideals and factor rings, ring homomorphisms, polynomial rings, factorization of polynomials, and an introduction to field theory.

Prerequisite: GL/MATH/MODR 3510 3.00.
Course credit exclusions: GL/MATH 3650 6.00, SC/MATH 3020 6.00.

Open to students in second-, third- or fourth-year who meet the prerequisite.

GL/MATH 3645 3.00(EN) OPTIMIZATION (WINTER)

INSTRUCTOR: S. Challal Mon 11:00 – 12:00 & Wed 10:00 – 12:00

This is an introductory course in optimization. Topics include local and global extremum, convex functions, Lagrange multipliers, the Kuhn-Tucker conditions, and optimal control. Applications to a variety of problems in Economics.

Prerequisites: GL/MATH 1940 3.00, GL/MATH 2650 3.00.
Open to students in second-, third- or fourth-year who meet the prerequisite.
4000 LEVEL COURSE/ COURS DE QUATRIÈME ANNÉE

GL/MATH 4240 6.00 (FR) – ANALYSE RÉELLE (ANNUEL)

INSTRUCTOR: TBA      mardi et jeudi 15:00 – 16:30

Ce cours propose une étude rigoureuse de l'analyse réelle. Parmi les sujets traités figurent les notions de base de topologie; limite et continuité, fonctions à variations bornées, l'intégrale de Riemann-Stieltjes, les suites et séries de fonctions, l'intégrale de Lebesgue; et eventuellement des séries de Fourier.

Condition préalable : GL/MATH 2670 6.00 ou la permission du département.
Cours incompatibles : SC/MATH 4010 6.00, SC/MATH 3001 3.00, SC/MATH 4001 6.00, SC/MATH 4011 3.00 et SC/MATH 4012 3.00.

Ce cours est ouvert aux étudiants qui satisfont la condition préalable.