# DEPARTMENT OF MATHEMATICS

Head: Ronald Harrop

The Department offers programs leading to the B.Sc. Degree with a major in Mathematics or with honours in Mathematics. Several courses offered in these programs are ones which are also required or considered desirable for students wishing to major or take honours in other Science Departments or in certain Departments in the Faculty of Arts. This applies particularly, though by no means exclusively, to courses in the 100 and 200 series. At the graduate level the Department offers programs leading to M.Sc. or Ph.D. Degrees in Mathematics.

## REQUIREMENTS FOR STUDENTS MAJORING OR TAKING HONOURS IN MATHEMATICS

Students majoring or taking honours in Mathematics are subject to the general regulations of the Faculty of Science. They will normally be required by the Mathematics Department -

(i) to obtain credit by the end of their sophomore year for the following six lower level Mathematics courses:

111-3, 112-3, 213-3, 214-3, 221-2, 231-3

(a major student could defer one of 221-2, 231-3 to his junior year if he wished to do so.)

(ii) to obtain at least 50 credits in the case of honours students and at least 30 credits in the case of major students in upper level Mathematics courses in such a way that, both for major and for honours students, credit is obtained for:

(a) At least one of 411-4, 412-4, 413-4, 414-4,

(b) 421-4 and 422-4,

and    (c) at least one of 431-4, 432-4.

For the purpose of satisfaction of condition (ii) above, Physics 411-4 may be counted as a Mathematics course.

Foreign languages: Most graduate schools require some proficiency in one or two foreign languages. Those who contemplate graduate studies in Mathematics are advised to include foreign language courses in their program.

## PRESENTATION OF COURSES

It is intended that all Mathematics courses mentioned below will be offered at least once during the period ending with the summer semester 1967. The courses to be offered during the three semesters covered by the present calendar are as follows:

(i)  Math 101-3, 111-3, 112-3, 213-3, 214-3 each semester

(ii) Summer semester 1966:  Math 231-3, 412-4, 421-4, 432-4, 482-4.
Fall semester 1966:  Math 221-2, 411-4, 414-3, 422-4, 431-4, 481-3.
Spring semester 1967:  Math 231-3, 412-4, 414-4, 421-4, 424-3, 432-4, 441-4, 451-3, 461-3, 462-3, 482-4.

Graduate courses to be offered will be listed in the Graduate Calendar.

## DESCRIPTION OF COURSES

Note:  The Prerequisites listed below are ones which are considered to be normally essential on mathematical grounds.  They may be waived under special circumstances by permission of the Head of the Mathematics Department.

## Mathematics

### 101-3    INTRODUCTION TO STATISTICS

A pre-calculus course in random variables and their distributions, estimating and hypothesis testing.                                           (2-0-2)

### 111-3    FUNDAMENTAL MATHEMATICS I

Algebra, geometry, trigonometry, introduction to calculus.
(3-1-0)

### 112-3    FUNDAMENTAL MATHEMATICS II

Continuation of Mathematics 111-3.                              (3-1-0)

Prerequisite:  Mathematics 111-3.

### 213-3    CALCULUS I

Differential and integral calculus with applications.    (3-1-0)

Prerequisite:  Mathematics 112-3.

### 214-3    CALCULUS II

Continuation of work covered in Mathematics 213-3 with introduction to ordinary differential equations.              (3-1-0)

Prerequisite:  Mathematics 213-3.

ЗМ 31 166

**221-2    INTRODUCTION TO ANALYSIS**

Foundations of mathematical analysis.                    (2-1-0)

Prerequisite:  Mathematics 112-3.


**231-3    INTRODUCTION TO ALGEBRA**

Matrices, Determinants, Solution of Linear Equations.    (3-1-0)

Prerequisite:  Mathematics 112-3.


**411-4    METHODS I**

Functions of several variables and vector field theory.
                                                         (4-1-0)
Prerequisite:   Mathematics 214-3.


**412-4    METHODS II**

Series, harmonic analysis, matrices and eigenvalue problems.
Some special functions.                                  (4-1-0)

Prerequisite:   Mathematics 214-3.


**413-4    ORDINARY DIFFERENTIAL EQUATIONS**

A Study of ordinary differential equations with applications.
                                                         (4-1-0)
Prerequisite:  Mathematics 214-3.


**414-4    PARTIAL DIFFERENTIAL EQUATIONS**

An introductory course in partial differential equations with
applications.                                            (4-1-0)

Prerequisite:  Mathematics 214-3.


**421-4    REAL VARIABLE I**

Sequences and series.  Elementary theory of functions of a real variable.
Introduction to metric spaces.                           (4-1-0)

Prerequisite:  Mathematics 221-2.  (With special permission 221-2 and
421-4 can be taken concurrently by persons who have at least junior standing.)


**422-4    COMPLEX VARIABLE I**

Complex numbers.  Functions of a complex variable.  Differentiation
and integration. Cauchy's Theorem and applications.      (4-1-0)

Prerequisite:  Mathematics 214-3, or else both Mathematics 213-3 and
Mathematics 221-2.

**423-4   REAL VARIABLE II**

Extension of subjects introduced in Mathematics 421-4 with a discussion
of Lebesgue measure.                                    (4-1-0)

Prerequisite:  Mathematics 421-4.


**424-3   COMPLEX VARIABLE II**

Continuation of Mathematics 422-4 with introduction of some more
advanced aspects of complex variable theory.            (3-1-0)

Prerequisite:  Mathematics 422-4.


**431-4   ALGEBRA I**

Linear Algebra.  Vector space and matric theory.        (4-1-0)

Prerequisite:  Mathematics 231-3 (with special permission 231-3 and
431-4 can be taken concurrently by persons who have at least junior
standing.)


**432-4   ALGEBRA II**

Algebraic systems including, for example, groups, rings.

Polynomial theory.                                      (4-1-0)

Prerequisite:  Mathematics 213-3 or preferably Mathematics 231-3.


**441-4   TOPOLOGY**

Development of elementary theory of topological spaces.
                                                        (4-1-0)
Prerequisite:  Mathematics 213-3 or 221-2.


**442-4   ELEMENTARY NUMBER THEORY**

Divisibility, primes, congruences, arithmetic functions and related
topics.                                                 (4-1-0)

Prerequisite:  Mathematics 213-3 or 221-2.


**451-3   MATHEMATICAL LOGIC**

Introduction to the theory of formal systems and to the theory of
recursion.                                              (3-1-0)

Prerequisite:  Junior standing with preferably some Mathematics course
at sophomore level.

461-3   VIBRATIONS AND WAVE MOTION

Dynamical behaviour of discrete and continuous systems as governed by
linear and nonlinear differential equations.

(3-1-0)

Prerequisite:  Mathematics 214-3 and preferably at least one of
Mathematics 413-4, 414-4.


462-3   CONTINUUM MECHANICS I

The mechanics of deformable media emphasizing fundamental concepts
and principles.  Kinematics, conservation laws, the stress principle
and the formulation of constitutive relations.          (3-1-0)

Prerequisite:  One of Mathematics 411-4, 412-4, 413-4, 414-4.


463-4   CONTINUUM MECHANICS II

Continuation of Mathematics 462-3.                      (4-1-0)

Prerequisite:  Mathematics 462-3.


481-3   PROBABILITY

Events and probability measure functions.  Random variables, their
distributions and characteristic functions.  Limit theorems.  Examples
and applications.                                       (3-1-0)

Prerequisite:  Mathematics 213-3.


482-4   STATISTICS

Sample random variables and their distributions.  Theory of estimation,
hypothesis testing, analysis of variance.  Selected additional topics.

(4-1-0) or (3-1-2)

Prerequisite:  Mathematics 213-3 and preferably also Mathematics 481-3.
This latter prerequisite does not apply for Mathematics 482-4 when it is
first given, namely, in the summer semester 1966.