

Department of Mathematics, University of Manitoba PRELIMINARY COURSE ANNOUNCEMENTS 2018–2019

MATH 3410(3) (2018F) Introduction to Mathematical Logic
MATH 4920(3) (2019W) [Topics I] Intermediate Mathematical Logic
MATH 8720(6) (2018F/2019W) Topics in Foundations 2: Mathematical Logic

MATH 3410 will be offered in the fall of 2018 as part of the regular rotation of undergraduate courses.
MATH 4920/MATH 8720 will be offered in 2018/2019, if there is **sufficient advance interest shown**.

These courses may be of interest to advanced students in Computer Science or Computer Engineering. Auditors are welcome!

MATH 3410 is an introduction to core aspects of Mathematical Logic at an intermediate level. The only prerequisite is a basic familiarity with the processes of mathematical reasoning and the processes of abstraction and proof, as can be gained through second year courses such as MATH 2020. In the Winter Term, MATH 4920 will complete the standard introduction to Mathematical Logic at the Honours level. MATH 8720 covers the same material and is taught with MATH 3410 and MATH 4920, with additional independent work designed to bring it to the level of a graduate course.

These courses are intended:

- (i) to give students a broad-based appreciation of the different aspects of the Foundations of Mathematics;
- (ii) to give students a sufficient knowledge of the concepts of Mathematical Logic so that they can understand and use these concepts when encountered in other areas of Mathematics;
- (iii) to prepare students for graduate level work in Mathematical Logic.

The enrolment in MATH 4920 and MATH 8720 will be assessed during the registration revision period in September 2018, and a final decision as to whether we can offer these courses will be made at that time. MATH 3410 on its own is not suitable for credit at the graduate level, but may be included as an undergraduate course in a graduate program.

MATH 3410:

Propositional Logic: Syntax, truth tables, formal deductions, completeness and compactness, etc.

Predicate Logic: Syntax and semantics of first order languages. Semantic consequence, structures and isomorphism.

Elements of Recursion Theory “Effective” or “algorithmic” functions and relations. Decidability. Primitive recursive and recursive functions and relations, recursively enumerable functions and relations.

MATH 4920:

Predicate Logic and Model Theory: First order theories, special syntactic forms, introduction to model theory. Formal deductions, Completeness and compactness, Lowenheim-Skolem Theorems, etc.

Recursion Theory: Effective computability: recursiveness, machine models, and equivalent methods. Recursive and recursively enumerable sets. Church’s Thesis. Kleene normal form and consequences.

Limitations on formal methods: Gödel’s arithmetization of syntax; first order “Arithmetic”. Undecidability, incompleteness, etc. Church’s Thesis.

References: [available in Library]

Peter Hinman, **Fundamentals of Mathematical Logic**.

Bell and Machover, **A Course in Mathematical Logic**.

A supplementary reading list will be available.

The class will meet 3 hours per week, both terms. There are no tests or exams, but there will be very extensive written assignments. Graduate students in addition will do at least two independent study projects, with an oral presentation on one of them.

All interested students should contact (via e-mail):

Prof. T. Kucera

430 Machray Hall

Thomas.Kucera@UManitoba.CA

<http://server.math.umanitoba.ca/homepages/tkucera.html/>