

(—; 3-0-0) or (3-0-0;—) **Our Number System - An Advanced Perspective** MATH-386*

This course is suitable for all students in a MATH Honours programme. It is one of the courses in the department's Teaching Focus.

Textbook: *Custom Notes* (selections from various texts, including most of *Continued Fractions* by C.D. Olds)

Prerequisite: MATH 281*, or 120 and 221*; MATH 211 or 212*.

Instructor: M. Orzech

Evaluation:	Homework	25%
	Midterm Test	20%
	Group Report (and possibly Presentation)	25%
	Final Examination	30%

Outline:

This course examines some fundamental properties of real numbers (and related systems such as the rationals and complexes), and the connection of these properties to calculus and to other mathematical topics encountered earlier by the students. Continued fractions, and ideas arising in their study, are used as a tool for representing and classifying real numbers (as rational or irrational, algebraic or transcendental) and as a vehicle for studying convergence of sequences and equivalent conditions for completeness of the real number system. The construction of the real number system via Dedekind cuts is outlined, and set in historical context as a response to a growing sense that real analysis was founded on seemingly ungrounded beliefs. It is also used as a vehicle for practice in verifying that operations and relations on equivalence classes are well-defined. Depending on time available, non-standard variations of the real number system, such as hyperreal numbers, or p-adic numbers, are introduced.

Students will work in a small group on a substantial independent study of one of several assigned topics. This work will be written up as a report, and insofar as class size permits, each group will do a lively and intellectually stimulating class presentation based on its work.