

Course Announcement

Model Theory

Math 223M, Spring Quarter 2010

MWF 2:00 PM–2:50 PM, MS 5217

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Description. Model theory is a branch of mathematical logic which applies the methods of logic to the study of mathematical structures, and thus has impact on other parts of mathematics (e.g., number theory, analytic geometry). Since its beginnings in the early decades of the last century, the perception of what the subject is about has gone through various incarnations. Because many of the mathematical structures studied in model theory have an algebraic origin, Chang and Keisler (1973) simply decreed that *universal algebra + logic = model theory*, whereas Hodges (1993) defined model theory more broadly as the *study of the construction and classification of structures within specified classes of structures*. A modern view holds that model theory is the *geography of tame mathematics* (Hrushovski, van den Dries). Here, the emphasis is on identifying those classes of structures whose first-order theories can be understood (in some well-defined technical sense), and exploiting such an understanding as a tool in other parts of mathematics. This course will serve as a first introduction to this multi-faceted subject. Both the development of general theory and some applications (mainly to algebra) will be presented.

Syllabus. Review of structures and theories. Quantifier elimination, model completeness. Types, saturation, omitting types. Totally transcendental theories, strong minimality, Morley's Theorem. Some o-minimality (time permitting).

Prerequisites. Basic first-order logic (Math 220A), especially the completeness theorem and elementary set theory. Some abstract algebra (Math 210), especially field theory.

Course text. I will follow my own notes. The following book will be a good companion:

D. Marker, *Model Theory. An Introduction*, Graduate Texts in Mathematics, vol. 217. Springer-Verlag, New York, 2002.

Other standard textbooks in model theory are:

C. C. Chang and H. J. Keisler, *Model Theory*, 3rd ed., Studies in Logic and the Foundations of Mathematics, vol. 73. North-Holland Publishing Co., Amsterdam, 1990.

W. Hodges, *Model Theory*, Encyclopedia of Mathematics and its Applications, vol. 42. Cambridge University Press, Cambridge, 1993.