

Course Title: Model Theory of Fields

Course #: 71300

Time and Location: Friday 9:30-11:30

Instructor Name: Alfred Dolich

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Pre-Requisites: _____

Office Hours: Fridays 11:30-12:30

Description:

Model Theory of Fields

This course will focus on the model theory of three essential classes of fields: algebraically closed fields, real closed fields, and the p -adic fields. For each of these classes the course will develop the necessary algebra and basic model theory necessary for their study and then explore how a model theoretic perspective helps develop new insight into the algebraic and geometric properties of these fields. Furthermore the course will also emphasize how these classes of fields may be seen as archetypes of considerably more general model theoretic classes.

A widely optimistic selection of topics may include:

1) Algebraically closed fields:

- Basic field theory, algebraic closures.
- Model theoretic background: quantifier elimination, model completeness, and model companions.
- Quantifier elimination for algebraically closed fields.
- Consequences: completeness and decidability, the Lefschetz principle, nullstellensatz, Ax's theorem.
- More general model theory: strong minimality and omega-stability.

2) Real Closed Fields:

- Basic theory of ordered fields, real closures.
- Quantifier elimination for real closed fields.
- Consequences: completeness and decidability, basic properties of semi-algebraic sets and functions, Hilbert's 17th problem.
- More general model theory: o-minimality.

3) P -adic fields:

- Valued fields and constructing the p -adics, Hensel's lemma.
- Quantifier elimination for the p -adics.
- Consequences: completeness and decidability, the structure of p -adic semi-algebraic sets.