

# ALGEBRA SEMINAR

## *Unifying relaxed notions of modular forms*

Martin Raum

Chalmers Technical University, Gothenburg, Sweden

**Abstract:** Elliptic modular forms are functions on the complex upper half plane that are invariant under a certain action of the special linear group with integer entries. Their history comprises close to two centuries of amazing discoveries and application: The proof of Fermat's Last Theorem is probably the most famous; The theory of theta functions is among its most frequently employed parts.

During the past decade it has been la mode to study relaxed notions of modularity. Relevant keywords that we will discuss are mock modular forms and higher order modular forms. We have witnessed their application, equally stunning as surprising, to conformal field theory, string theory, combinatorics, and many more areas.

In this talk, we suggest a change of perspective on such generalizations. Most of the novel variants of modular forms (with one prominent exception) can be viewed as components of vector-valued modular forms. This unification draws its charm from the past and the future. On the one hand, we integrate results by Kuga and Shimura that hitherto seemed almost forgotten. On the other hand, we can point out connections, for example, between mock modular forms and so-called iterated integrals that have not yet been noticed. Experts will be pleased to have in the future a "Petersson pairing" for mixed mock modular forms at their disposal.

This is joint work with Michael Mertens

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