

---

**ALMUT BURCHARD**, University of Toronto, Department of Mathematics, 40 St. George Street, Toronto, Ontario M5S 2E4  
*On computing the instability index of certain non-selfadjoint operators*

This talk will discuss recent joint work with M. Chugunova on the problem of finding the instability index of certain non-selfadjoint fourth order differential operators. The work is motivated by linearizations of coating and rimming flows, where a thin fluid film moves on a horizontal rotating cylinder.

Our main result states that the instability index of such operators is determined by its restriction to a finite-dimensional space of trigonometric polynomials, and provides a condition on the dimension of this space. The proof uses Lyapunov's method to associate the differential operator with a quadratic form whose maximal positive subspace has dimension equal to the instability index. The quadratic form is determined by a solution of Lyapunov's equation, which here takes the form of a fourth order linear PDE in two variables. Elliptic estimates for the solution of this PDE play a key role.