

# CoE-MaSS weekly seminar series

THE DST-NRF CENTRE OF EXCELLENCE IN  
MATHEMATICAL AND STATISTICAL SCIENCES (CoE-MaSS)  
PRESENTS A SEMINAR BY

**Dr. Nick Hale**  
*(Applied Mathematics, Stellenbosch University)*

## ***“Ultraspherical Spectral Methods”***

Friday, 08 June 2018

10h30-11h30

CoE-MaSS Seminar Room, 1<sup>st</sup> floor,  
Math Sci Bldg, West Campus, Wits University.



Chebyshev-Galerkin spectral methods were introduced by Lanczos in the late 50s and further developed by Ortiz and Orszag in the late 60s and early 70s. These methods are still widely used today for the high-accuracy solution of many ordinary and partial differential equations in fields spanning fluid dynamics, quantum mechanics, weather prediction, and more. Recently, Olver and Townsend have suggested a Petrov-Galerkin approach (which they call the "ultraspherical spectral method") that is similar in nature, but results in "almost-banded" linear systems which can be solved with linear complexity. In this seminar I will outline the ultraspherical method of Olver and Townsend before describing some of my own recent work on this area, namely ultraspherical spectral methods for integro-differential equations with convolution-type kernels and fractional differential equations of rational order. Email: [nickhale@sun.ac.za](mailto:nickhale@sun.ac.za)

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