SPECTRAL METHODS FOR SOLVING SYSTEMS OF ODEs & PDEs

……

Overview

Spectral Methods are very powerful computational techniques for solving differential equations and other problems in applied mathematics, engineering and other areas of applied sciences. Compared to other traditional methods for solving ODEs and PDEs, such as finite differences and finite elements methods, the spectral methods have superior accuracy are relatively easy to implement numerically through the use of Fourier and Chebyshev expansions, and polynomial interpolation functions. This course offers a hands-on introduction to some spectral collocation methods with emphasis on implementation in MATHEMATICA (or MAPLE) and MATLAB. Particular focus will be directed to designing accurate and efficient spectral collocation based algorithms for solving ODEs and PDEs of practical interest. Selected problems from Mathematical Biology, Mathematics of Finance and Fluid Mechanics will be discussed for numerical experimentation.

Objectives

The primary objectives of the course are as follows

i) Introducing the fundaments of numerical methods to participants.
ii) Demonstrating the fundamentals of Matlab and Mathematica.
iii) Providing advanced numerical techniques to participants to help solving their respective research problems involving systems of ODEs and PDEs.

This course will be presented by formal lectures that will be supported by practical, hands-on implementation of the algorithms in MATHEMATICA and MATLAB. Participants will be given prepared lecture notes and hand-outs that will guide them through the learning process.

Modules	1. Polynomial Interpolation 2. Introduction to Mathematica and Matlab 3. Spectral Collocation using interpolation with polynomial basis functions 4. Quasi-linearisation Method 5. Spectral Quasi-Linearization 6. Chebyshev Spectral Collocation method (CSCM) 7. Solving Linear and Non-linear Boundary Value problems using the CSCM 8. Solving systems of coupled nonlinear ODEs using SQLM 9. Pseudo-spectral methods for Partial Differential Equations 10. Application in real-life problems
You should attend if...	1. Honours, MSc, PhD, Post Doc research students with interests in efficient ways of solving differential equations. 2. Faculty members involved in teaching numerical methods of solution.

Fees	**Participants from Abroad**: US $600 **Industry/ Research Organizations**: Rs. 6000/- **Faculty Members / Researchers:** Rs. 3000/- **Students (pursuing PhD/ Masters / Bachelors courses):** Rs 2000/- **NIT Mizoram**: Free (Faculty / Student / Researcher) *The above fee includes all instructional materials, computer use for tutorials, free internet facility. The participants will be provided with single bedded accommodation on payment basis.* To register or for any questions please send an email to surender.math@nitmz.ac.in, vinay.math@nitmz.ac.in

Professor Sandile Motsa joined the University of KwaZulu-Natal (UKZN) in November 2011 after having taught at the University of Swaziland for 10 years. He holds a BSc degree in mathematics and chemistry from the University of Swaziland and he obtained both his MSc and PhD degrees in applied mathematics from the University of Zimbabwe in 1998 and 2001, respectively. He is currently attached to the School of Mathematics, Statistics and Computer Science at the Pietermaritzburg campus of UKZN where he serves as the Academic Leader for the discipline of Mathematics. His research projects are mainly focused on developing new methods for solving mathematical models that emanate from all areas of science and engineering. His research articles have appeared in over 100 leading academic journals in applied mathematics, physics and engineering. He is currently on the editorial board of two international journals, Journal of Applied Fluid Mechanics and Journal of Interpolation and Approximation in Scientific Computing and was lead guest editor of a special issue of Mathematical Problems in Engineering in 2014. He also serves as the Vice President of the Southern Africa Mathematical Sciences Association (SAMSA).

June 20, 2016 – June, 29, 2016

National Institute of Technology Mizoram

Dr. Surender Ontela is an Assistant Professor in the Department of Mathematics, National Institute of Technology, Mizoram. His research areas of interest include Heat and Mass Transfer in Porous Media, Boundary Layer Flows, Nanofluids, Computational Methods, etc.

Dr. Vinay Singh is Head & Assistant Professor in the Department of Mathematics, National Institute of Technology, Mizoram. His research areas of interest are Robust Optimization, Polynomial Optimization, Fractional Calculus, Nonsmooth Optimization, Convex Optimization, Vanishing Constraints Optimization Problems.

Course Coordinators

Dr. Surender Ontela & Dr. Vinay Singh
Mobile: 09436792174, 08414951405
Email: surender.math@nitmz.ac.in, vinay.math@nitmz.ac.in

……

http://www.gian.iitkgp.ac.in/