Name / Title of Group

Computational Mathematics and Fluid Mechanics

Introduction

There has been significant progress in developing analytical techniques for solving different types of mathematical equations like algebraic equation, differential equation, integral equation or a system of such equations. However, in most of the cases the techniques are developed for limited types or classes of equations. Especially, for non-linear cases there is very little known. So, it is often required to look for some other non-analytical (numerical or computational) techniques to obtain solutions or approximate solutions. Numerical techniques are also commonly used in situations where application of available analytical methods is complicated or tedious (like solving a large system of linear algebraic equations). Computational Mathematics is emerged as a distinct part of applied mathematics by the early 1950s. Currently, it can refer to or include: computational science, also known as scientific computation or computational engineering; solving mathematical problems by computer simulation as opposed to analytic methods of applied mathematics; numerical methods used in scientific computation, for example numerical linear algebra and numerical solution of partial differential equations; symbolic computation and computer algebra systems etc.

Fluid Mechanics is a comprehensive scientific field which deals with flow and transport phenomena concerning atoms, molecules and nanoscale particles, any fluid, any material, energy and so forth. It addresses multiscale and multidisciplinary problems and deals with non-linear phenomena in science and engineering. The group members are working in several influential topics which cover a wide spectrum of subjects including peristalsis, blood flow, gliding motility of bacteria, mathematical modeling, mathematical methods, industrial and environmental heat and mass transfer, deformable porous media, MHD, rheology and mechanics of porous substrates. Such topics have relevance in several engineering applications including solar energy generation, manufacturing, biomedical, water treatment, sanitation etc.

Research Areas

a. Computational Mathematics

b. Fluid Mechanics

GroupMembers

S #	Name	Expertise
1.	**Prof. Azad Akhter Siddiqui (SNS)**	PhD, Mathematics (QAU, Pakistan) Specialization: Applied Mathematics Research Interests**:** Finding Closed Form Approximations of Numerical Solutions of Differential Equations 05190855550 Email: azad@sns.nust.edu.pk
2.	**Dr. Moniba Shams (SNS)**	PhD, Mathematics (Glasgow University, UK) Specialization: Elastodynamics Research Interest: Elastodynamics, Solid Mechanics, Wave Motion 051-90855582 Email: moniba.shams@sns.nust.edu.pk
3.	**Dr. Yousaf Habib (SNS)**	PhD, Mathematics (Auckland University, New Zealand) Specialization: Numerical Analysis Research Interests: Geometric Numerical Integration, General Linear Methods for Ordinary Differential Equations 051-90855587 Email: yhabib@sns.nust.edu.pk
4.	**Dr. M. Asif Farooq (SNS)**	PhD, Mathematics (NTNU-Norway) Specialization: Computational Fluid Dynamics Research Interests: Compressible Flows, Spectral Method, Numerical Solutions of PDEs/ODEs, Non-Newtonian Fluids 051-90855594 Email: asiffarooq.2007@gmail.com

5.	**Dr. Meraj Mustafa Hashmi (SNS)**	PhD, Mathematics (QAU, Pakistan) Specialization: Fluid Mechanics Research Interests: Computational Fluid Dynamics, Numerical Analysis, Nanofluid Flows, Heat Transfer, Analytic solutions of Non-linear Differential Equations 051-90855596 Email: merajmustafa@sns.nust.edu.pk
6.	**Dr. Asim Aziz (Associate Member from College of EME)**	PhD, Mathematics (Glasgow University, UK) Specialization: Wave Propagation, Blood Flow Modeling Research Interests: Mathematical Biology 051-9278050-4534 Email: aaziz@ceme.nust.edu.pk
7.	**Dr. Mazhar Iqbal (Associate Member from College of EME)**	PhD, Mathematics (BZU, Pakistan) Specialization: Fluid Mechanics Research Interests: Computational Fluid Dynamics, Interpolation, Numerical Solutions of Differential Equations 051-9278041 Email: drmazhar@ceme.nust.edu.pk
8.	**Dr. Noreen Sher Akbar (Associate Member from College of EME)**	PhD, Mathematics (QAU, Pakistan) Specialization: Non-Newtonian Fluids Research Interests: Mathematical Biology Email: noreensher@yahoo.com

Research Facilities Available

S #	Description
1	Internet access
2	Journal access
3	Computing facilities

Research Projects

S #	Project Title	Names of PI & Co-PI	Sponsored By	Cost (PKR)	Status	Impact
1.	Peristaltic flows of nanofluids with different flow geometries	Dr. Noreen Sher Akbar **(PI)**	HEC	13,27,040	In progress	-

International Collaborations

S #	Description
1	King Abdulaziz University, Jeddah, Saudi Arabia
2	Islamic Azad University, Iran
3	University of Cluj, Romania
4	Qatar University, Doha, Qatar
5	University of Auckland, Newzealand

Achievements

S #	Description
1	The group has produced 13 MPhil students so far.
2	Currently 03 PhD and 09 MPhil students have been working in this group.

Contact of Focal Person

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