**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

**Group Members**

<table>
<thead>
<tr>
<th>S #</th>
<th>Name</th>
<th>Expertise</th>
</tr>
</thead>
</table>
| 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  
   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  
   Email: aaziz@cheme.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  
   Email: drmazhar@cheme.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

<table>
<thead>
<tr>
<th>S#</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Internet access</td>
</tr>
<tr>
<td>2</td>
<td>Journal access</td>
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<tr>
<td>3</td>
<td>Computing facilities</td>
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</tbody>
</table>

Research Projects

<table>
<thead>
<tr>
<th>S#</th>
<th>Project Title</th>
<th>Names of PI &amp; Co-PI</th>
<th>Sponsored By</th>
<th>Cost (PKR)</th>
<th>Status</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Peristaltic flows of nanofluids with different flow geometries</td>
<td>Dr. Noreen Sher Akbar (PI)</td>
<td>HEC</td>
<td>13,27,040</td>
<td>In progress</td>
<td>-</td>
</tr>
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</table>

International Collaborations

<table>
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<tr>
<th>S#</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>King Abdulaziz University, Jeddah, Saudi Arabia</td>
</tr>
<tr>
<td>2</td>
<td>Islamic Azad University, Iran</td>
</tr>
<tr>
<td>3</td>
<td>University of Cluj, Romania</td>
</tr>
<tr>
<td>4</td>
<td>Qatar University, Doha, Qatar</td>
</tr>
<tr>
<td>5</td>
<td>University of Auckland, Newzealand</td>
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Achievements

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<th>S#</th>
<th>Description</th>
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<tr>
<td>1</td>
<td>The group has produced 13 MPhil students so far.</td>
</tr>
<tr>
<td>2</td>
<td>Currently 03 PhD and 09 MPhil students have been working in this group.</td>
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Contact of Focal Person

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Assistant Professor  
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