



Project Proposal for Ph.D.

Project Details	
Project Title	Microfluidics of biological cells in lab-on-a-chip platform
Project Summary (Minimum 500 and maximum 2000 characters)	In human blood, circulatory cells (red blood cells, white blood cells, and platelets) are the prognostic markers of underlying health condition. Therefore, any abnormality in their behavior and function during diseased state may lead to alteration in their mechanical properties, such as increased membrane stiffness, decreased deformability, etc. In this project, we plan to investigate RBCs/WBCs dynamic response in lab-on-a-chip devices using both experimental and computational approaches. Low Reynolds number hydrodynamic studies will be carried out in the confined microchannels of the devices, and an estimation of their altered mechanical properties under the influence of hydrodynamic and membrane forces will be made. RBCs/WBCs are exposed to hydrodynamic forces throughout their life span. Therefore, hydrodynamic stimuli can be used to study their deformation, interactions and migration under externally imposed flow conditions. This project is aimed to develop techniques for the characterization of biological cells using external stimuli (such as hydrodynamic or electric field stimuli). This study would have implications in the healthcare sector, specifically in the development of diagnostic devices and biomimetic systems for blood flow study, also to distinguish healthy and diseased cells based on their mechanical response.

Ph.D. Supervisors			
Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Bahini Ray	Mechanical Engg., IIT Delhi	bray@mech.iitd.ac.in
Supervisor 2	Priti Sinha	Department of Biochemical Engg. and Biotechnology, IIT Delhi	sinhapriti@iitd.ac.in

Project requirements (Student qualifications, experience required, etc) *The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)
- Students with background in Mechanical engineering/Chemical engineering - Experimental skill: Microscopy techniques, Microfabrication, Mammalian cell handling (Not mandatory) - Computational skill: Knowledge of C/C++, MATLAB, Mathematica (Not mandatory)

Source of fellowship/funding (CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
Institute fellowship

Role of Faculty Members involved:	
Supervisor-1	CFD simulation on microfluidic systems

Supervisor-2	Experimental investigations on microfluidics of biological cells