Indian Institute of Technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD project

Project details	
Project title	Kinetics of ethanol production in *Pichia stipitis.*
Project description	**Background:** *Pichia stipitis* is among the very few yeasts that produce ethanol by fermenting both hexoses and pentoses. However, it is not used commercially because it is thought to produce ethanol over a very narrow range of operating conditions. The goal of this work is to test the validity of this claim. Our earlier chemostat studies have shown that during growth on glucose, ethanol is produced over a wide range of operating conditions [1,2]. In this work, we are interested in determining the acceptable range of operating conditions during growth on glucose + xylose since this reflects more closely the conditions during fermentation of lignocellulosic hydrolysates. **Objectives and Methodology:** The goal is to determine the range of operating conditions supporting ethanol production during growth of *Pichia stipitis* on mixtures of glucose and xylose. Kinetic studies will be carried out with a chemostat to determine biomass, glucose, ethanol, and dissolved oxygen concentrations at various dilution rates and feed concentrations of glucose + xylose.
Instruments required	Bio-reactors, HPLC
Any other comments	

PhD supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
PI	Prof. Atul Narang	DBEB	anarang@dbeb.iitd.ac.in

Skills required	
Qualification	B. Tech. or M. Tech. (Biotechnology or Biochemical Engineering)
Skills	Ability to run bioreactors as well as measure substrate/product concentrations and enzyme activities.

References

1. Maitra, Shraddha, and Atul Narang. "Quantifying the parametric sensitivity of ethanol production by Scheffersomyces (Pichia) stipitis: development and verification of a method based on the principles of growth on mixtures of complementary substrates." *Microbiology (Reading, England)* 164, no. 11 (2018): 1348-1360.
2. Maitra, Shraddha, and Atul Narang. "Existence of a scaling relation in continuous cultures of Scheffersomyces stipitis: the steady states are completely determined by the ratio of carbon and oxygen uptake rates." *Biotechnology for biofuels* 12, no. 1 (2019): 19.

Indian Institute of Technology Delhi
Department of Biochemical Engineering and Biotechnology
PhD project

Project details	
Project title	**Mechanisms of Cell Wall Remodeling and Population Dynamics in Microbial Dormancy**
Type of project	PhD
Project description	**Introduction**: Bacterial dormancy is a survival strategy that allows cells to withstand environmental stresses, including antibiotics, while retaining the ability to resuscitate and grow under favorable conditions. Dormant states contribute to persistent infections and play a crucial role in environmental microbial survival. The bacterial cell wall, as the primary structural barrier, is central to these transitions, yet the mechanisms governing its adaptation and potential reversibility of changes remain poorly understood. **Objectives**: This PhD project will address three interconnected questions- 1) Investigate how bacterial cell walls structurally and mechanically adapt as cells transition between susceptible, dormant, and resistant states, with a focus on hydrolase-mediated remodeling. 2) Examine how these molecular and enzymatic changes influence dynamics at the population level, linking single-cell behavior to broader population outcomes, and develop AI-based predictive models to identify dormancy depth and resuscitation probability. 3) Validate these predictions experimentally by observing single cells and colonies under varying environmental and antibiotic stressors using quantitative microscopy and tracking algorithms. Advanced imaging techniques will be used to observe real-time morphological and mechanical changes, while population-level assays will assess survival, growth heterogeneity, and recovery kinetics. Computational frameworks will be developed to describe cell wall remodeling and predict dormancy depth and resuscitation probability.
Instruments required	HPC workstation, automated microscope for time-lapse imaging, microplate reader, chemostat, and other microbiology laboratory equipment (e.g., shaker incubator, autoclave, biosafety cabinet, centrifuge)

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Garima Rani	DBEB	garimarani@dbeb.iitd.ac.in

Skills required	
Qualification	BTech/BE in Bioengineering OR MSc/MTech in Biophysics/Biosciences and allied subjects
Skills	Desirable: Knowledge of Computer programming, Mathematics, Basic microbiology lab experiments training

References

1- Gefen and Balaban, The importance of being persistent: heterogeneity of bacterial populations under antibiotic stress, FEMS Microbiology Reviews, 2009.
2- Schink et al, Analysis of proteome adaptation reveals a key role of the bacterial envelope in starvation survival. Molecular systems biology, 2022.
3- Sharma et al, Structure of the Bacterial Cell Envelope and Interactions with Antimicrobials: Insights from Molecular Dynamics Simulations, Langmuir 2024.

Indian Institute of Technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD project

Project details	
Project title	Development of an Impedance based multiparametric high-throughput droplet screening platform.
Type of project	PhD project
Project description	High-throughput droplet microfluidic platforms allow for the screening of millions of cells from both murine and human immune repertoires in a single experiment, facilitating the discovery of therapeutic antibodies[1]. Similarly, it also enables the screening of numerous droplets containing solid tumors or tumor cells alongside various drug combinations, aiding in the identification of the most effective personalized therapy[2]. **For screening, droplets are analysed in real-time through a combination of optics, electronics and high-speed computational modules following which, the droplets demonstrating the desired activity are physically sorted using dielectrophoretic forces**[3]. While current screening platforms predominantly rely on fluorometric analysis to detect physiological changes within the droplet, morphological changes often remain unnoticed. **We aim to develop instrumentation capable of deciphering the morphology of single cells by measuring their dielectric properties within the droplets**[4,5]. These morphological readouts will not only offer a higher resolution for examining functional antibodies but will also be valuable in screening drug combinations for treating heterogeneous tumors, presenting a significant advancement in the precision and effectiveness of high-throughput screening platforms that are cost-effect and translatable to clinical setups.
Instruments required	Inverted microscope, Optical components (Lasers, photosensors, high-speed camera, optical bench etc.), Electronic components (Computers, FPGA systems for high-speed prcessing), Mammalian cell handling facility (biosafety hood, Co2 incubator etc.), Microfabrication facility (photolithography, thin film deposition, ion beam etching etc.)
Any other comments	A major part of the project would involve computer programming, signal processing and microfabrication.

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Dr. Jatin Panwar	DBEB	jatinpanwar@iitd.ac.in

Skills required	
Qualification	B.Tech in Chemical, Bio-chemical, Mechanical, electrical or related field
Skills	Experience and interest in basic fluid-flow process control, Electronic Signal Processing, Programming Microprocessors using LabVIEW, MATLAB etc.

References

1. Debs, Bachir El, et al. "Functional single-cell hybridoma screening using droplet-based microfluidics." Proceedings of the National Academy of Sciences 109.29 (2012): 11570-11575.
2. Eduati, F., Utharala, R., Madhavan, D. *et al.* A microfluidics platform for combinatorial drug screening on cancer biopsies. *Nat Commun* **9**, 2434 (2018).
3. Panwar, Jatin, Alexis Autour, and Christoph A. Merten. "Design and construction of a microfluidics workstation for high-throughput multi-wavelength fluorescence and transmittance activated droplet analysis and sorting." *Nature Protocols* 18.4 (2023): 1090-1136.
4. Panwar, Jatin, and Rahul Roy. "Integrated Field's metal microelectrodes based microfluidic impedance cytometry for cell-in-droplet quantification." Microelectronic Engineering 215 (2019): 111010.
5. Sun, Tao, and Hywel Morgan. "Single-cell microfluidic impedance cytometry: a review." Microfluidics and Nanofluidics 8 (2010): 423-443.

Indian Institute of Technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD project

Project details	
Project title	Design of Nanomaterials for Engineering Tissues
Type of project	PhD
Project description	Cells prefer to function efficiently in the vicinity of their native topographical features and emerging biomaterial design strategies have been directed towards mimicking the extracellular nanoenvironment of tissues. Previously, we demonstrated that nanoparticles derived from polydimethylsiloxane can be useful for recreating the nanoenvironment of skin (pl. see references). During the proposed work, an array of polymers will be explored for fabricating nanoparticles targeted for favourable growth of specific tissues. Various computational tools will be employed for design of the nanoparticles before fabrication. The selected nanoparticles will also be combined with other suitable biomaterials for introducing nanotopography and the resulting nanocomposite scaffold will be utilized for developing engineered tissues.
Instruments required	DLS, FE-SEM, TEM, BSL-2 Cabinet, CO_2 Incubator, Fluorescent and Confocal Microscope
Any other comments	

PhD supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Auhin Kumar Maparu	DBEB	auhin@dbeb.iitd.ac.in

Skills required	
Qualification	BTech/MTech in Chemical/Biomedical/Biochemical Engineering or Biotechnology.
Skills	Experience in synthesis of nanomaterials and/or mammalian cell culture is desirable but not mandatory.

References

1. "Coating of Polydimethylsiloxane Nanoparticles Improves Bioactivity of Cellulose Paper for Culture of Fibroblasts", Auhin Kumar Maparu, Prerana Singh, Beena Rai, Ashutosh Sharma and Sri Sivakumar, *International Journal of Biological Macromolecules*, 2025, 143975
2. "PDMS Nanoparticles-Decorated PDMS Substrate Promotes Adhesion, Proliferation and Differentiation of Skin Cells", Auhin Kumar Maparu, Prerana Singh, Beena Rai, Ashutosh Sharma and Sri Sivakumar, *Journal of Colloid and Interface Science*, 659, 2024, 629-638
3. "Predicting Cytotoxicity of Nanoparticles: A Meta-Analysis using Machine Learning", Ashish Masarkar, Auhin Kumar Maparu, Yaswanth Sai Nukavarapu and Beena Rai, *ACS Applied Nano Materials*, 7, 2024, 19991-20002
4. "The Influence of Nanotopography on Cell Behaviour through Interactions with the Extracellular Matrix – A review", Jiajun Luo, Matthew Walker, Yinbo Xiao, Hannah Donnelly, Matthew J. Dalby and Manuel Salmeron-Sanchez, *Bioactive Materials*, 15, 2022, 145-159

Indian Institute of Technology Delhi
Department of Biochemical Engineering and Biotechnology
PhD project

Project details	
Project title	**Bacterial Microcompartments: a novel technology for recombinant protein production**
Type of project	PhD
Project description	Bacteria have often been the preferred choice of host owing to their ease of growth and availability of tools for genetic manipulation. A number of tools have been developed for the production of recombinant proteins in different bacterial hosts. Production of toxic proteins or proteins containing disulfide bridges however, remains a challenge. Several methods including the use of tightly regulated promoter or use of fusion partners for toxic proteins and secretion vectors for expression of proteins with disulfide bridges have been suggested. Here, we propose the use of bacterial microcompartments (BMCs) for the production of such proteins. The objectives will be i) Development of E. coli and Rhodococcus strains expressing BMC shell proteins; ii) Optimization of the EP sequences; iii) Construction of an indigenous universal plasmid vector for expression of recombinant proteins in BMCs; iv) Construction of multiple helper plasmids and expression of toxic proteins. The work would result in the development of an indigenous host vector system for the easy production of toxic proteins.
Instruments required	Transmission electron microscope, fluorescence microscope, other molecular biology equipments

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Preeti Srivastava	DBEB	preeti@dbeb.iitd.ac.in

Skills required	
Qualification	M.Sc/ M. Tech/B. Tech with JRF (CSIR/UGC/DBT-A)
Skills	Molecular biology skills

References

1. Chandrakanta, C., Karmakar, S., Jain, P., Kumar, V., Shefrin, S., Sundar, D. and **Srivastava, P.** (2025) Construction and characterization of cloning vector and Temperature sensitive vectors for Gordonia sp. IITR100. ***Gene***. 951, 149376. IF 2.6
2. Bagchi, A., Karmakar, S., Bisaria, V.S. and **Srivastava, P.** (2023) Recombineering. ***Methods in Microbiology*** (accepted). IF 3.0
3. Jaishankar, J., Keshav, A., Jayaram, B., Chavan, S. and **Srivastava, P.** (2022) Characterization and regulation of divergent promoters PmaiA and Phyd from *Gordonia*: coexpression and regulation by CRP. ***BBA Gene regulatory mechanisms*** (2022). 1865 (6):194843. IF 6.3

Indian Institute of Technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD/MSR project

Project details	
Project title	An Automated and AI based microscopy for digital pathology
Whether PhD or MSR project	PhD
Project description	In the realm of cervical cancer detection, digital pathology and AI technologies represent a revolutionary paradigm shift. High-resolution imaging afforded by digital microscopy allows for meticulous examination of cervical tissue, enabling the identification of subtle cellular abnormalities indicative of cervical cancer. Augmented by AI algorithms, this process becomes exponentially more efficient, automating the analysis of vast amounts of data to aid pathologists in accurate diagnosis. This PhD position is dedicated to advancing AI techniques specifically tailored for cervical cancer screening, with the overarching goal of enhancing early detection rates and improving patient outcomes. By joining our research team, candidates will play a pivotal role in pioneering AI-driven digital pathology solutions that have the potential to transform cervical cancer care globally.

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Ravikrishnan Elangovan	DBEB	elangovan@iitd.ac.in

Skills required	
Qualification	The prospective candidate for this Ph.D. position should ideally possess a background in Biotechnology with experience in computation biology.
Skills	**Academics:** A solid academic foundation in Biotechnology or related fields is a prerequisite. The successful candidate should have excelled in coursework related to molecular biology, genetics, and biotechnological techniques. **Research Experience:** We seek candidates who have actively engaged in research activities, preferably in areas relevant to molecular diagnostics, infectious diseases, or biotechnology-driven innovations. Previous research experience will be highly valued. **Experience in Industry/Innovation:** While academic research is essential, candidates with exposure to the industry or innovation sector will have a distinct advantage. Practical experience in translating research into tangible solutions or products is desirable.

	If you are a driven and highly motivated individual with a passion for biotechnology, a keen interest in addressing global health challenges, and a commitment to making a meaningful impact, we encourage you to apply. This Ph.D. opportunity offers a unique platform for research, innovation, and the advancement of scientific knowledge with real-world implications in modernizing cancer screening.

References

Bahadir, C.D., Omar, M., Rosenthal, J. *et al.* Artificial intelligence applications in histopathology. *Nat Rev Electr Eng* **1**, 93–108 (2024). https://doi.org/10.1038/s44287-023-00012-7

Indian Institute of Technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD/MSR project

Project details	
Project title	Developmend of multiplex PCR cartidge system for blood stream infections
Whether PhD or MSR project	PhD
Project description	Millions of people die every year from bloodstream infections (BSI), which pose a severe risk to the global public healthcare system. (Travis, 1994) According to the studies the annual number of BSI episodes in Europe is approximately 1.3 million and 0.7 million in North America with large annual numbers of BSI-associated deaths. Hospital mortality rates have been shown to be at least 40% in developed countries. Blood culture is the current gold standard for diagnosis of BSI, but these traditional practices have a long turnaround time where a quicker diagnosis is needed to improve patient care. Therefore this study aims to develop a multiplex PCR panel specifically designed for ESKAPE pathogens, which are the key pathogens of bloodstream infection.

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Ravikrishnan Elangovan	DBEB	elangovan@iitd.ac.in

Skills required	
Qualification	The prospective candidate for this Ph.D. position should ideally possess a background in Biotechnology with experience in computation biology.
Skills	**Academics:** A solid academic foundation in Biotechnology or related fields is a prerequisite. The successful candidate should have excelled in coursework related to molecular biology, genetics, and biotechnological techniques. **Research Experience:** We seek candidates who have actively engaged in research activities, preferably in areas relevant to molecular diagnostics, infectious diseases, or biotechnology-driven innovations. Previous research experience will be highly valued. **Experience in Industry/Innovation:** While academic research is essential, candidates with exposure to the industry or innovation sector will have a distinct advantage. Practical experience in translating research into tangible solutions or products is desirable. If you are a driven and highly motivated individual with a passion for biotechnology, a keen interest in addressing global health challenges, and a commitment to making a

	meaningful impact, we encourage you to apply. This Ph.D. opportunity offers a unique platform for research, innovation, and the advancement of scientific knowledge with real-world implications in modernizing ICU infection management.

References

Clinical Diagnostic Performance of Droplet Digital PCR for Suspected Bloodstream Infections. Microbiol Spectr. 2023 Feb 14;11(1):e0137822. doi: 10.1128/spectrum.01378-22. Epub 2023 Jan 5.

Indian Institute of Technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD/MSR project

Project details	
Project title	Quick Library Prep Cartridge for DNA Sequencing
Whether PhD or MSR project	PhD
Project description	Library preparation is the step that turns a raw sample into DNA/RNA that a sequencer can actually read. It tags the pieces, trims them to the right size, and cleans everything up. In most labs this is slow and costly: lots of pipetting, cold-chain reagents, magnets, strict timing, and a skilled person watching every step. That makes sequencing hard to do outside well-equipped labs and slows results when speed matters. We want to fix that with microfluidics. Imagine a sealed, palm-sized cartridge that moves tiny drops through built-in channels. Pre-loaded (dry) reagents remove cold storage. Simple heaters and valves run the steps for you, and tiny magnets inside the chip do the clean-ups—no open tubes, no manual transfers. The goal: faster, cheaper, more consistent library prep with just a few clicks.

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Ravikrishnan Elangovan	DBEB	elangovan@iitd.ac.in

Skills required	
Qualification	The prospective candidate for this Ph.D. position should ideally possess a background in Biotechnology with experience in computation biology.
Skills	**Academics:** A solid academic foundation in Biotechnology or related fields is a prerequisite. The successful candidate should have excelled in coursework related to molecular biology, genetics, and biotechnological techniques. **Research Experience:** We seek candidates who have actively engaged in research activities, preferably in areas relevant to molecular diagnostics, infectious diseases, or biotechnology-driven innovations. Previous research experience will be highly valued. **Experience in Industry/Innovation:** While academic research is essential, candidates with exposure to the industry or innovation sector will have a distinct advantage. Practical experience in translating research into tangible solutions or products is desirable.

	If you are a driven and highly motivated individual with a passion for biotechnology, a keen interest in addressing global health challenges, and a commitment to making a meaningful impact, we encourage you to apply. This Ph.D. opportunity offers a unique platform for research, innovation, and the advancement of scientific knowledge with real-world implications in modernizing ICU infection management.

References

Automation of customizable library preparation for next-generation sequencing into an open microfluidic platform. *Sci Rep* **14**, 17150 (2024). https://doi.org/10.1038/s41598-024-67950-6

Indian Institute of Technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD/MSR project

Project details	
Project title	**Synthesis of valine by metabolic engineering**
Whether PhD or MSR project	MSR or PhD project
Project description	Valine, an α-branched-chain amino acid (BCAA), is used in the pharmaceutical, animal feed, and cosmetic industries. Traditionally, *C. glutamicum* has been investigated extensively for large-scale valine production. Various strategies have been employed in *C. glutamicum* to increase valine production, including increasing pyruvate availability by deleting competing pathway genes, deleting isoleucine biosynthesis pathway genes to reduce competition for the same intermediates within the BCAA pathway, overexpressing valine pathway genes. This project will involve metabolic engineering of a microbial host for valine production. This will be done by overexpression of the four valine pathway genes - acetohydroxyacid synthase (AHAS) or acetolactate synthase (ALS), acetohydroxyacid isomeroreductase (IlvC), dihydroxyacid dehydratase (IlvD), and transaminase (TA) or leucine dehydrogenase (BCD). The engineered strains will be grown in bioreactors for improving valine titres and yields
Instruments required	Bioreactor, HPLC
Any other comments	

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Ashish Misra	DBEB	ashishmisra@dbeb.iitd.ac.in

Skills required	
Qualification	M. Tech/B. Tech Biochemical Engg/ Biotechnology/ Chemical Engg

Skills	Molecular biology/ Biochemistry/ Bioprocess Engg

References

1. Oldiges, M., Eikmanns, B.J. and Blombach, B., 2014. Application of metabolic engineering for the biotechnological production of L-valine. *Applied microbiology and biotechnology*, *98*(13), pp.5859-5870.
2. Blombach, B., Schreiner, M.E., Bartek, T., Oldiges, M. and Eikmanns, B.J., 2008. Corynebacterium glutamicum tailored for high-yield L-valine production. *Applied microbiology and biotechnology, 79*(3), pp.471-479.

Indian Institute of Technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD/MSR project

Project details	
Project title	**Synthesis of cis-3-hexanol by metabolic engineering**
Whether PhD or MSR project	PhD project
Project description	Cis-3-hexenol is a high value flavour and aroma compound that is produced by plants. A drawback with deriving the compound from plants is the small quantities it is produced in. Metabolic engineering involves pathway manipulation for production of desired compounds in a cost-effective manner. Recent developments in metabolic engineering have involved use of cell-free systems as a new approach that overcomes the limitations of existing cell-based systems and accelerate biological design. In this project a cell-free pathway will be designed for the in-vitro synthesis of cis-3-hexenol starting with a relatively low priced substrate. Iniitially, scouting and selection of enzymes will be done based on literature followed by cloning and expression of the enzymes in a suitable recombinant host. Kinetic models will be developed to find enzymes for optimizing bioconversion. Further, processes for producing the enzymes in reactors will be developed, followed by bioconvesrion for producing cis-3-hexenol.
Instruments required	Bioreactor, HPLC
Any other comments	

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor 1	Ashish Misra	DBEB	ashishmisra@dbeb.iitd.ac.in
Supervisor 2	Preeti Srivastava	DBEB	preeti@dbeb.iitd.ac.in

Skills required	
Qualification	M. Tech/B. Tech Biochemical Engg/ MSc in Life Sciences/Biotechnology

Skills	Molecular biology/ Biochemistry/ Bioprocess Engg

References

1. Dudley, Quentin M., Ashty S. Karim, and Michael C. Jewett. "Cell-free metabolic engineering: biomanufacturing beyond the cell." Biotechnology journal 10, no. 1 (2015): 69-82.
2. Misra, Ashish, Matthew F. Conway, Joseph Johnnie, Tabish M. Qureshi, Bao Lige, Anne M. Derrick, Eddy C. Agbo, and Ganesh Sriram. "Metabolic analyses elucidate non-trivial gene targets for amplifying dihydroartemisinic acid production in yeast." Frontiers in Microbiology 4 (2013): 200.

Indian Institute of technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD project

Project details	
Project title	Development of a Lab-on-a-Chip Platform for Electromechanical Characterization of Human Blood Cells toward Vascular Disease Detection
Type of project	PhD project
Project description	Human health is profoundly influenced by the physiological functions of blood cells. Any alteration in these functions can disrupt circulatory dynamics and contribute to the onset of various vascular diseases. Therefore, characterizing the mechanical properties of red blood cells (RBCs) is essential for addressing challenges associated with blood dynamics and achieving targeted biomedical objectives. This research aims to investigate the interplay between electric fields, hydrodynamic flow, and cellular mechanics within the microchannels of a lab-on-a-chip device. The proposed approach involves developing a contactless, non-invasive, flow-based technique to assess the mechanical and biochemical properties of both healthy and diseased cells under physiological and pathological conditions. Furthermore, the platform is envisioned to support a broad range of applications—enhancing our understanding of cellular dysfunction and its implications, and advancing research in vascular biology, biomedical engineering, and hematology.
Instruments required	Inverted microscope, Electrical equipments
Any other comments	

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Priti Sinha	DBEB	sinhapriti@iitd.ac.in
Co-Supervisor			

Skills required	
Qualification	ONLY B.Tech./M.Tech. in Chemical/Mechanical/Electronics/Biochemical engineering or Biotechnology or B.Sc./M.Sc. Physics students will be considered for this position
Skills	Microscopy techniques, Microfabrication (not mandatory)

References

Grigorev, G.V.; Lebedev, A.V.; Wang, X.; Qian, X.; Maksimov, G.V.; Lin, L. Advances in Microfluidics for Single Red Blood Cell Analysis. Biosensors 2023, 13, 117

Indian Institute of technology Delhi

Department of Biochemical Engineering and Biotechnology

PhD project

Project details	
Project title	Development of a Lab-on-a-Chip Platform for Electromechanical Characterization of Human Blood Cells toward Vascular Disease Detection
Type of project	PhD project
Project description	Human health is profoundly influenced by the physiological functions of blood cells. Any alteration in these functions can disrupt circulatory dynamics and contribute to the onset of various vascular diseases. Therefore, characterizing the mechanical properties of red blood cells (RBCs) is essential for addressing challenges associated with blood dynamics and achieving targeted biomedical objectives. This research aims to investigate the interplay between electric fields, hydrodynamic flow, and cellular mechanics within the microchannels of a lab-on-a-chip device. The proposed approach involves developing a contactless, non-invasive, flow-based technique to assess the mechanical and biochemical properties of both healthy and diseased cells under physiological and pathological conditions. Furthermore, the platform is envisioned to support a broad range of applications—enhancing our understanding of cellular dysfunction and its implications, and advancing research in vascular biology, biomedical engineering, and hematology.
Instruments required	Inverted microscope, Electrical equipments
Any other comments	

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Priti Sinha	DBEB	sinhapriti@iitd.ac.in
Co-Supervisor			

Skills required	
Qualification	ONLY B.Tech. in Chemical/Mechanical/Electronics/Biochemical engineering or Biotechnology or B.Sc./M.Sc. Physics students will be considered for this position
Skills	Microscopy techniques, Microfabrication (not mandatory)

References

Grigorev, G.V.; Lebedev, A.V.; Wang, X.; Qian, X.; Maksimov, G.V.; Lin, L. Advances in Microfluidics for Single Red Blood Cell Analysis. Biosensors 2023, 13, 117

Indian Institute of Technology Delhi
Department of Biochemical Engineering and Biotechnology
PhD/MSR project

Project details	
Project title	**Microbial biosurfactant as next generation bioformulations for agricultural sustainability**
Type of project	PhD
Project description	Biosurfactants can serve as eco-friendly alternatives to chemicals for controlling phytopathogens and plant growth promotion. This project aims to employ biosurfactant producing rhizobacterial strains as next generation bioformulations and establish their mechanism of action in enhancing soil and plant health. The specific objectives will be (1) Isolation and screening of potent biosurfactant producing bacteria from host rhizosphere, (2) Establishment of its impact on soil health, (3) Assessment of its effect on plant health, (4) Development of bioformulation
Instruments required	Basic molecular microbiology equipments, plant growth chamber

PhD/MSR supervisors			
Role	**Faculty**	**Academic unit at IITD**	**E-mail**
Supervisor	Shilpi Sharma	DBEB	shilpi@dbeb.iitd.ac.in
Supervisor	Preeti Srivastava	DBEB	preeti@dbeb.iitd.ac.in

Skills required	
Qualification	BTech/BE in Bioengineering/Biotechnology OR MSc/MTech in Biosciences/Life Sciences and allied subjects
Skills	Desirable: Basic microbiology and molecular biology training

References

1-