



Project Proposal for Ph.D.

Project Details (The research problem must clearly indicate the need for an interdisciplinary approach)

Project Title	An automated microfluidic platform for syndromic molecular detection of diarrheal pathogens and antimicrobial resistance markers from stool.
Project Summary (Minimum 500 and maximum 2000 characters)	Diarrheal disease is one of the leading causes of death in young children worldwide and a major cause of mortality in India. Knowing which pathogen is responsible determines the treatment: bacterial infections may require antibiotics, whereas viral infections require only supportive care. The proposing laboratories have developed a pneumatic, cartridge-based device that automates DNA binding, washing and elution, together with a multiplex qPCR assay for Shigella/EIEC, Salmonella and Vibrio cholerae. This project, therefore, has three objectives. (1) Re-engineer the cartridge and instrument: redesign the channels so that buffers do not mix, replace adhesive with welded assembly, and add on-chip mixing and heating so that lysis occurs inside the cartridge, giving reproducible, near sample-to-answer extraction. (2) Extend the extraction chemistry and multiplex qPCR panel to Campylobacter, enteric viruses (rotavirus, norovirus, adenovirus 40/41; RNA targets need a reverse-transcription step) and protozoa (Giardia, Cryptosporidium, Entamoeba histolytica; cysts need robust lysis), using in silico primer design and cross-reactivity testing, with selected AMR genes as an exploratory module. (3) Validate analytical and prospective clinical performance, in a blinded design, against culture and a commercial panel, and measure turnaround time, hands-on time and cost per test.

Ph.D. Supervisors ⁺ (Supervisor 1 and Supervisor 2 cannot be from the same department of IITD)				
Role	Name of Faculty	Date of Superannuation [§] (DD/MM/YYYY)	Academic Unit in IITD/Institute/University	Email ID (Official) & Contact Number
Supervisor 1*	Prof.Vivekanandan Perumal	13/03/2041	KSBS	vperumal@bioschool.iitd.ac.in
Supervisor 2	Prof. Ravikrishnan Elangovan	14/01/2047	DBEB	elangovan@dbeb.iitd.ac.in

⁺Supervisor 1 must be from IIT, Delhi.

⁺All cells in this table are mandatory fields that need to be filled by faculty for consideration of proposal.

[§]The date of superannuation of supervisors should be at least three years from the date of registration of selected candidates.

Project requirements (Student qualifications, experience required, etc)

*The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)

- BTech/MTech/MSc (or equivalent) in Biomedical Engineering, Biotechnology, Biochemical Engineering, Microbiology, Life Sciences, Instrumentation/Mechanical/Electronics Engineering or a related discipline, with working knowledge of molecular biology and/or microfluidics and instrumentation.
- Minimum 60% marks (or equivalent) throughout the academic career.
- Candidates with experience/expertise in PCR-based diagnostics, microfluidic devices or medical diagnostic devices may be desirable.

Source of fellowship/funding and project number (CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
A valid JRF for full-time applicants.

Role of Faculty Members involved:	
Supervisor-1	Will provide expertise in molecular assay development (primer/probe design, multiplex qPCR and RT-qPCR, digital PCR/NGS confirmation), analytical validation, and clinical sample collection and testing with clinical collaborators (e.g., AIIMS Delhi).
Supervisor-2	Will provide expertise in microfluidic cartridge design and fabrication, pneumatic instrumentation and automation, and device quality control.

- Note :-**
- Approval from the respective DRC/CRC/ScRC of your Department/Centre/School will be required for using the "Full-time Institute Assistantship (Category-wise) (FIA)" for selecting the students in SRe.**
 - Declaration:- Faculty members, please ensure that you have at least 3 years of service left before superannuation along with adequate sitting space & lab facilities for the SRe student.**
 - PI/s are also encouraged to submit joint proposals with AIIMS, NII, JNU and institutes with which IITD has an existing MoU. If the Co-PI (Supervisor 2) is from outside IITD, kindly share his/her detailed CV.**
 - If a research scholar is to be considered for selection under the project fellowship, then the project should have a minimum of two-year duration remaining.**
 - A candidate applying with a valid JRF/INSPIRE/any national level fellowship should have at least two-year validity from the date of joining the Ph.D. program.**
 - The third supervisor's name (if required) can be added only after the formation of Student Research Committee (SRC) subject to a strong recommendation of SRC and subsequent approval from the competent authority.**
 - If Institute fellowship is being sought, then DRC approval of the parent department of Supervisor 1 is required at the time of selection.**