



# Indian Institute of Technology Gandhinagar

## Advertisement for Junior/ Senior Research Fellow in the discipline of Electrical Engineering

IIT Gandhinagar invites applications for the position of Junior Research Fellow (JRF) / Senior Research Fellow (SRF) in a research project titled “Real-time concentration measurement of methane, water vapour, carbon dioxide and carbon monoxide in ethanol autothermal reforming using tunable diode laser spectroscopy” sponsored by the Science and Engineering Research Board (SERB), Government of India.

### **Project title:**

Real-time concentration measurement of methane, water vapour, carbon dioxide and carbon monoxide in ethanol autothermal reforming using tunable diode laser spectroscopy

### **Principal Investigator:**

Dr Arup Lal Chakraborty  
Associate Professor, Electrical Engineering  
Indian Institute of Technology Gandhinagar  
Gandhinagar – 382355, Gujarat

### **Project description:**

A tunable diode laser spectroscopy (TDLS) system is currently under development to simultaneously make absolute measurements of the mole fraction of methane, water vapour, carbon dioxide and carbon monoxide for real-time monitoring of the ethanol autothermal reformation (ATR) process. Ethanol ATR is an important process for the generation of hydrogen from hydrocarbon compounds. The key to commercialization of the reformer system is its ability to operate in real-time under variable load condition. This requires extensive characterization of the reformation process with respect to their dynamics and response to fluctuating load, i.e. hydrogen demand. Real-time continuous monitoring of the reformat is essential to ascertain the system’s operating parameters. This project uses the powerful TDLS technique comprising four narrow linewidth mid-infrared quantum cascade laser diodes whose emissions wavelengths are matched to non-overlapping absorption lines of these gases. TDLS is ideally suited for this purpose because the measurements are absolute in nature (no calibration required), high-sensitivity (low ppm to ppb), in situ, non-invasive concentration measurements of the four gases can be made simultaneously with very low cross-sensitivity. The project will use recently developed calibration-free second harmonic wavelength modulation spectroscopy (2f WMS) algorithms to extract the mole fraction of the four gases at temperatures as high as 900 Celcius. Such a system will help to optimize the reformation process and to detect catalyst degradation.

### **Required background/skills:**

The successful candidate will work in an inter-disciplinary environment in the Photonic Sensors Lab at IITGN. The work will be at the intersection of photonics, electronics and mechanical engineering. The following skill set is required –

- a) practical experience of experimental work in photonics and particularly photonic sensors
- b) strong background in physics and optoelectronics
- c) proficiency in scientific programming using Matlab/Octave is essential
- d) knowledge of instrument control using LabVIEW would be helpful but not essential

**Eligibility Criteria:**

Postgraduate degree in Basic Sciences with NET qualification or graduate degree in a professional course with NET qualification or postgraduate degree in a professional course. The tests that can be considered as NET are available on the SERB website at <http://www.serb.gov.in/pdfs/Results/OM-Research%20Fellowship-JRF-SRF-RA.pdf>. In addition to the academic qualifications the candidate must have two years of research experience.

**Compensation:**

As per SERB norms for the JRF/SRF position.

**Duration of appointment:**

The appointment will initially be for **1 year** with the possibility of renewal for up to one more year depending on the performance. This will be at the discretion of the appointing authority.

**How to apply:**

Please email your application as a **single zipped file** to [arup@iitgn.ac.in](mailto:arup@iitgn.ac.in). Your application must contain the following -

- (i) Curriculum vitae highlighting your expertise and experience
- (ii) List of referees who can comment on your skills and their contact details
- (iii) a 1-page statement of purpose outlining why you consider yourself suitable for this position

Please note that your **single zipped file** should be named as **<your last name>\_serb\_srf\_iitgn.zip** and the **subject line of the email should be "SERB-SRF-IITGN"**. Candidates shortlisted for the interview would be required to submit the hardcopies of all these documents if they are selected. Incomplete application forms i.e. resumes only without the application form and applications without statement of purpose will be rejected.

**Deadline:** The last date for application is **25 Oct 2018**.

Prospective candidates may contact Dr Arup Lal Chakraborty at [arup@iitgn.ac.in](mailto:arup@iitgn.ac.in) for clarifications in this regard.