

Department of Aerospace Engineering

Research Topics from Faculty members interested in
new PhD students

Admission Cycle : May 2021



Aerodynamics

Prof. Avijit Chatterjee

Hiring this season?: **Yes**

Research Areas:

1. Computational Electromagnetics (CEM): Algorithm development and electromagnetic scattering applications in aerospace engineering
2. Aerospace configuration design involving CFD & CEM
3. Problems in aeroacoustics, high-speed flow, Magnetohydrodynamics

URL to Lab Website / Profile: <https://www.aero.iitb.ac.in/~avijit/>

Primary nature of research project: Computational / Design

Prof. Prabhu Ramachandran



- Hiring this season? **Yes**
- **Research Areas:** Particle methods for continuum mechanics, parallel and high-performance scientific computing (HPC), AI/ML for PDEs
- **Projects available:** development of high-level tools and HPC algorithms for use in particle methods, application of AI/ML for solving continuum mechanics problems
- **Skills/experience:** Good programming background, interest in mathematical physics and computer science
- More information: <https://www.aero.iitb.ac.in/~prabhu/>

Prof. J. C. Mandal



- Hiring this season? Yes
- Research Areas: Development of novel Computational Fluid Dynamics algorithms for
 1. Incompressible flows involving Multiphase flows, Heat Transfer
 2. Compressible flows involving Hypersonic flows with real gas effect, All Mach number formulation
 3. Fluid-Structure Interactions
 4. Semi-analytic (Decomposition) Methods
- Nature of Research Projects: Computational/Theoretical
- Skill/Interest: C, C++ programming; Numerical methods; Mathematical Physics
- URL to Profile: <https://www.aero.iitb.ac.in/~mandal>

Prof. Vineeth Nair

Hiring this season?: **Yes**

Research Areas:

1. Thermoacoustics
2. Aeroacoustics - **position open**
3. Flow visualization
4. Computation of reacting flows

URL to Lab Website / Profile:

<https://www.aero.iitb.ac.in/home/people/faculty/vineeth>

Primary nature of research project: Experimental

Dynamics and Control

Prof. Arnab Maity

Hiring this season?: **Yes**

Research Areas:

- ❖ Guidance, Navigation and Control of Aerospace Vehicles
- ❖ Drone Delivery System, and IoT Solutions for Aerospace and Defence
- ❖ Optimal and Adaptive Control
- ❖ Control and Estimation of Distributed and Cyber Physical Systems
- ❖ Fault Tolerant Control and Estimation, Fault Detection and Diagnosis

URL to Lab Website/ Profile: <https://www.aero.iitb.ac.in/home/people/faculty/arnab>

Primary nature of research project: Theoretical / Simulation



Prof. Shashi Ranjan Kumar

Hiring this season?: **Yes**

Research Areas:

- Guidance and Control of Autonomous Vehicles
- Cooperative Active Aircraft Protection
- Consensus and Formation Control of Multi-Agent Systems
- Cooperative Control, Collision and Obstacle Avoidance, and Path Planning of UAVs

URL to Profile: <https://www.aero.iitb.ac.in/home/people/faculty/shashi>

Primary nature of research project: Theoretical/Computer Simulation

Useful skills/experience: Basic knowledge of control theory and solutions of ODE



Propulsion

Kowsik Bodi

Hiring this session? **Yes**

Projects available in:

1. High speed reacting flows
2. Hybrid (particle-fluid) codes for Plasma Propulsion
3. Laser propagation in a gas

URL to Lab website/profile: <https://www.aero.iitb.ac.in/~kbodi/>

Useful Skills/Experience: Numerical Methods, Programming experience
(C++/Fortran)

Hrishikesh Gadgil

Hiring this session? **Yes**

Projects available in:

1. Liquid atomization in engine combustors
2. Spray-acoustics interaction
3. Atomization of gel propellants (non-Newtonian liquids)
4. Secondary breakup and combustion of droplets

Primary nature of research project: Experimental and analytical

Useful Skills/Experience: Experimental methods, flow diagnostics

Krishnendu Sinha

Hiring this session? **Yes**

Projects available in:

1. High-enthalpy flows
2. Shock-turbulence interaction
3. Heat transfer
4. Scramjet application



URL to Lab website/profile:

<https://www.aero.iitb.ac.in/~krish/>

Primary nature of research project: Computational and analytical

Useful Skills/Experience: Code development, CFD simulation

Sudarshan Kumar

Hiring this session → YES



Project available

1. Flame speed measurement at high pressure and temperature conditions
2. Flameless combustion and its applications to gas turbines
3. Endothermic fuel development
4. Flame instabilities in micro-channels

Primary nature of work: Largely experimental and partly computational

Useful Skills/Experience: Experimental methods, flow diagnostics, Kinetic modeling, Image processing, Combustion modeling

URL: www.aero.iitb.ac.in/~sudar

Nagendra Kumar

Hiring this session → Yes

Projects available:

1. Two phase losses in solid rocket motor
2. Ageing studies of composite and double base propellants
3. Quantification of Binder melt
4. Erosive burning in solid rockets

Primary nature of work: Experimental and Computational

Useful Skills/Experience: Image processing, Programming experience (Fortran),
Experimental methods

A M Pradeep

Hiring this session → **Yes**

Projects available:

1. Turbomachines for ORC/SCO₂ waste heat recovery systems
2. Aerodynamics of tandem + contra-rotating compressors

Primary nature of work: Experimental and Computational

Useful Skills/Experience: Familiarity with experimental techniques, data analysis and interpretation, Use of computational tools such as Ansys-CFX or Numeca

URL: <https://www.aero.iitb.ac.in/~ampradeep/>

Prof. Shripad P. Mahulikar

<<https://www.aero.iitb.ac.in/home/people/faculty/spm>>

- 1) Will not be taking fresh PhD-scholar in Jul'2021.
- 2) PhD-candidate/s interested in my research at above link may contact me for discussion <spm@aero.iitb.ac.in> & I'll consider > 6-months.

Structures

Prof. Krishnendu Haldar

Hiring this season?: **Yes**

Research Areas:

1. Multiphysics (electromagnetic) coupling with solids
2. Continuum mechanics/nonlinear mechanics of solids
3. Nonlinear FE for coupled problem

URL to Lab Website / Profile: <https://haldarkrishnendu.wixsite.com/krishnendu>

Primary nature of research project: Theoretical/Computational

Prof. Amuthan Ramabathiran

Hiring this season? Yes

Research Areas:

1. Computational Solid Mechanics
2. Atomistic Simulation (Molecular Dynamics, Quasicontinuum method)
3. High Performance Computing
4. Machine Learning applied to Mechanics

Primary nature of work: Theoretical/Computational

Webpage: <https://amuthan.github.io/webpage/>

Prof. Chandra Sekher Yerramalli

Hiring this season?: **NO**

Research Areas :

Google Scholar Link : <https://scholar.google.co.in/citations?user=36hicnUAAAAJ&hl=en>

URL to Lab Website / Profile: <https://iitb.irins.org/profile/59571>

Primary nature of research project: Modeling and Experimentation

Preferred Background :