

# Department of Aerospace Engineering

Research Topics from Faculty members interested in  
new PhD students

Admission Cycle : December 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

# Prabhu Ramachandran



- Hiring this season? **Yes**
- **Research Areas:**
  - Particle and meshless methods for continuum mechanics
  - Parallel and high-performance scientific computing (HPC)
  - AI and ML for PDEs
- **Skills/experience:** Background/interest in mathematical physics, numerical methods, and scientific computing
- More information: <https://www.aero.iitb.ac.in/~prabhu/>

# Aravind Balan

- Hiring this season? **Yes**
- **Research Areas:**
  - High-order numerical methods for CFD simulations
  - Mesh adaptation for CFD simulations
  - Use of machine learning (ML) for mesh adaptation
- **Skills/experience:** Numerical methods, and scientific computing
- More information: <https://www.aero.iitb.ac.in/home/people/faculty/aravind>

# 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

# Prof. Aniruddha Sinha



Hiring this season?: Yes

Research Areas: Aeroacoustics, Reduced-order modelling of flows, Hydrodynamic stability analysis

Skills/experience: Background/interest in mathematical physics, numerical methods, scientific computing, theoretical fluid dynamics

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

Primary nature of research project: Theoretical and moderately computational



# Dynamics and Control

# Prof. Arnab Maity



Hiring this season?: **Yes**

Research Areas:

- ❖ Guidance, Navigation and Control of Aerospace Vehicles
- ❖ Drone Delivery System, Drone Capturing, and Unmanned Traffic Management
- ❖ 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 Strategies for Aircraft Protection
- Spacecrafts: Attitude Control and Synchronization, Rendezvous and Docking
- UAVs/Drones: Cooperative Control, Collision Avoidance and Path Planning

URL to Profile: <https://www.aero.iitb.ac.in/~shashi>

Primary nature of research project: Theoretical/Computer Simulation

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



# Rohit Gupta

- Hiring this season? **Yes**
- **Research Areas:**
  1. Dynamical systems
  2. Geometric mechanics
  3. Geometric control theory and applications
  4. Optimal control theory and applications
  5. Optimization theory and applications
- **Primary nature of work:** Theoretical

# 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](http://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. Prediction of ballistics properties of composite propellants
4. Erosive burning: Modeling and Experimental studies

Primary nature of work: Experimental and Computational

Useful Skills/Experience: Programming, use of computational tools (Ansys),  
Experimental methods

# A M Pradeep

Hiring this session → **Yes**

Projects available:

1. Turbomachines for ORC/SCO<sub>2</sub> 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>>

Will not be taking fresh PhD-scholar in Dec'2021 (currently guiding 3)

# Structures

# 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 :