Ahamed Ali N | Curriculum Vitae

Project Associate,
Laboratory of Engineered Materials & Structures (LEMS),
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Research Interest –

Composite (UDC, MMC, Short fiber, Shaper memory polymers composite), Homogenization methods for heterogeneous materials with perfect / imperfect interfaces, Develop FEM solver on Python / C++, Develop FEM models of RVE on commercial software (Abaqus, Ansys), Design & analysis of aerospace morphing structure, Robotic metamaterials, Phononic crystals, Analysis & optimization of topological metamaterials.

Education –

1. **Indian Institute of Technology Bombay (IIT Bombay), Mumbai, India** (Jun 2021 – Jun 2023)
   Master of Technology (M.Tech), Department of Aerospace Engineering
   - Cumulative grade point average (CGPA/CPI): **9.1** (on scale of 10)
2. **Visvesvaraya Technological University (VTU), Belgaum, India** (Jun 2012 – Jun 2016)
   Bachelor of Engineering (B.E), Department of Mechanical Engineering
   - Graduated with a **First Class** with an overall score of **70 %** (on scale of 100 %)

Professional Experience –

1. **Indian Institute of Science Bangalore (IISc Bangalore), Bangalore, India**
   i. Project Associate, Department of Aerospace Engineering (Jul 2023 – Present)
   - Involved in the analysis, optimization of topological metamaterials & phononic crystals.
   - Involved in the development of the experiments to study the non-linear response & stability of topological metamaterials.
   - Advisor – Prof. Rajesh Chaunsali, Department of Aerospace Engineering, IISc Bangalore
2. **Indian Institute of Technology Bombay (IIT Bombay), Mumbai, India**
   i. MTech research scholar, Department of Aerospace Engineering (Jan 2022 – Jun 2023)
   - Developed a new framework based on Variational Asymptotic Method (VAM) for homogenizing heterogenous material with imperfect interfaces in collaboration with A*Star Singapore.
   - Assisted in a multidisciplinary project involving the design, analysis & fabrication of morphing structure of wing flap based on shape memory polymer composite (SMPC).
   - Performed stochastic modelling to understand damage evolution & failure in fiber reinforced composites to predict accurately its ultimate tensile strength.
   - Advisor – Prof. PJ Guruprasad, Department of Aerospace Engineering, IIT Bombay

   ii. Structural Design Engineering, Solar powered Airship racing team (SPART) (Jun 2022 – Jun 2023)
   - Performed design, analysis & fabrication of fin attachment, motor mount assemblies & envelope of airship for long range endurance flights (120 hours flight)

3. **SJA Enterprises , Bangalore, India**
    i. Purchase & Sales Manager (Jul 2017 – Apr 2021)
        - Performed scheduling, ordering & optimization of supply chain to maintain optimal inventory levels & lead times.
4. **Syscon Instruments Private Limited, Bangalore, India**
    i. Project Intern (Jan 2016 – Jun 2016)
        - Performed design, analysis & fabrication of automatic bush feeding mechanism of bush pressing machine used in the assembly line of Toyota corporation.

Publication –

1. Homogenization of heterogeneous materials with imperfect interfaces: A variational asymptotic method (VAM) based framework, **Ahamed Ali N**, Pandi Pitchai, Prof. PJ Guruprasad [In preparation].

Conferences –

1. **26th International Conference on Composites Structures (ICCS26) & 8th International Conference on Mechanics of Composites (MECHCOMP8), (held in Porto, Portugal, 27th – 30th June 2023)**
    - Presented my research work titled "**Homogenization of heterogeneous materials with imperfect interfaces: A variational asymptotic method (VAM) based framework**"
2. **8th Asian Conference on Mechanics of Functional Materials & Structures (ACFMS-2022), (held in IIT Guwahati, India, 11th – 14th December 2022)**
    - Presented our group research work titled "**Shape memory polymer composite based smart corrugated wing flap for aerospace morphing**"

Research Projects –

1. **Stability of topological edge states under strong non-linear effects** (Jul 2023 – Present)
   Advisor: Prof. Rajesh Chaunsali, Department of Aerospace Engineering, IISc Bangalore. (Research associate project)
    - Performing analysis & simulations to demonstrate the effect of non-linearity on the stability of topological metamaterials.
    - Developing experimental setup to demonstrate the effect of non-linearity on stability of topological metamaterials.
2. **Homogenization of heterogeneous materials with imperfect interfaces: a variational asymptotic method (VAM) based framework.** (Jan 2022 – Jun 2023)
   Advisors: Prof. PJ Guruprasad, Department of Aerospace Engineering, IIT Bombay and Dr. Pandi Pitchai, Scientist at department of Engineering mechanics, A*star, Singapore. (Master's Thesis)
    - Successfully developed a homogenization model for homogenization of heterogeneous materials with imperfect interfaces to predict the effective thermal properties.
    - Derived exact analytical expressions for predicting the effective thermal conductivity of layered composite with imperfect interfaces.
    - Developed Finite Element solver for predicting the effective thermal conductivity of 2D microstructure & 3D microstructure.
    - Successfully verified the predictions from our model to the predictions from well established literature models & FEM models of representative volume elements (RVE) on Abaqus.

3. **Shape memory polymer composite based smart corrugated wing flap for aerospace morphing.** (Jun 2022 – Jun 2023)

   Advisors: Prof. PJ Guruprasad, Department of Aerospace Engineering, IIT Bombay and Prof. P. M. Mujumdar, Department of Aerospace Engineering, IIT Bombay. (Assisted as research scholar)

   - Assisted the primary researchers in the development of homogenization model to replace the complex corrugate with an equivalent plate to make design and optimization more simplified & tractable.
   - Assisted the primary researchers in the fabrication of shaper memory polymer composites.

Key Technical & Course Projects –

1. **Developed a Finite Element Solver in Python** (Spring 2022)

   Instructor: Prof. Prabhu Ramachandran, AE6102 – Parallel scientific computing & visualization

   - Developed a finite element solver for a plate with hole problem to predict the stress & strain distribution for given loading condition with built-in graphical user interface (GUI) in Python.
2. **Aeroelastic analysis of wing of an aircraft** (Spring 2022)

   Instructor: Prof. P. M. Mujumdar, AE678 – Aeroelasticity

   - Performed divergence analysis & predicted the aeroelastic response of a swept tapered wing of XB - 47 bomber aircraft using Ritz method with global trial function.
3. **Design and analysis of composites** (Autumn 2021)

   Instructor: Prof. Chandra Sekher Y, AE673 – Fiber Reinforced Composites

   - Developed MATLAB model of shear lag to predict the shear stress distribution in short fiber composites.
   - Developed MATLAB model to predict the effective properties of unidirectional composites (UDC) using concentric cylindrical assemblage (CCA) model.
   - Developed MATLAB model to predict stiffness, compliance & stress distribution in unidirectional composite (UDC) laminate for a given symmetric layup.
   - Designed and analyzed high pressure vessel made of unidirectional composite (CFRP) for storing CNG gas under pressure.
4. **Developed Python & MATLAB model of inertially damped vibrating system** (Autumn 2021)

   Instructor: Prof. P. M. Mujumdar, AE715 – Structural Dynamics

   - Developed a Python & MATLAB model to solve the Eigen value problem of spring mass system with inertial damping to predict the natural frequency, mode shapes & response of the system.
5. **Performing performance analysis & modifying the airfoil of an aircraft** (Autumn 2021)

   Instructor: Prof. R. K. Pant, AE705 – Introduction to Flight

   - Developed drag polar, flight envelope, climb performance & turn performance curves at different altitudes of Airbus A300 to predict its performance characteristics.
   - Modifying the airfoil of the wing & airfoil of the tail of Beechcraft Bonanza V35A aircraft for better lift & stability.

Scholastic Achievements –

1. Secured **AA** grade (10 out of scale of 10) for my **master thesis** at IIT Bombay.
2. With **CGPA/CPI** of **9.1** (on scale of 10), I was among the top scorers of our master batch in the aerospace engineering department of IIT Bombay.

3. Had **guided** a **tech team** at **IIT Bombay** for successful design & fabrication of airship for investor pitching event & racing competition.
4. Had qualified the **Gratitude Aptitude Test for Engineers (GATE 2020)**, and was among the top **1% scorers** out of **0.2 million candidates**.
5. Had qualified the **Indian Space Research Organization (ISRO)** entrance exam for **scientist C grade** in 2018.

Technical Strengths

1. **Software** – AutoCAD, Solidworks, Ansys, Abaqus, Simulink, MS Office, LaTex
2. **Programming** – Python, C/C++, MATLAB, Mathematica, Comsol
3. **Experimental** – Instron UTM, Polytec laser vibrometer, Polytec 3D scanning vibrometer

Relevant Courses Undertaken

1. **Mechanical** – Mechanics of rigid bodies, Mechanics of deformable bodies, Vibration analysis, Kinematics of machines, Machine design, Material science, Foundry engineering, Non-traditional/advanced manufacturing.
2. **Aerospace** – Aeroelasticity, Aerospace Structures, Fiber reinforced composites, Structural Dynamics, Parallel scientific computing & visualization, Finite element method.

Extracurriculars

1. Participated in the intercollege swimming competitions.
2. Participated in cycling marathons.
3. Participated in cleaning drives of lakes & other events organized by local NGO's.

References

1. **Prof. Rajesh Chaunsali**
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2. **Prof. PJ Guruprasad**
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3. **Prof. P. M. Mujumdar**
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4. **Dr. Pandi Pitchai**
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