SIFAT ABDUL BARI

Email Website Google Scholar

Research Interests

Advanced Material Design | High Entropy Alloys (HEAs) | Computational Materials Science | Mechanics of Materials | Atomistic Modelling | Molecular Dynamics (MD) Simulation | Density Functional Theory (DFT) Calculations |

Education

Master of Science in Mechanical Engineering **CGPA: 3.92/4.00**

Islamic University of Technology (IUT), Board Bazar, Gazipur, Bangladesh 2023-Present

Courses Completed | Thesis Ongoing

Bachelor of Science in Mechanical Engineering **CGPA: 3.87/4.00**

Islamic University of Technology (IUT), Board Bazar, Gazipur, Bangladesh **2nd out of 82 Students**

2019-2023

Technical Competence

MD Simulations:	LAMMPS, OVITO, ATOMSK, VESTA, Quantum ESPRESSO
Programming:	C++, Python, MATLAB, Arduino IDE
Machine Learning Models:	Random Forest (RF), XGBoost, ANN
3D Molding & Simulation:	SOLIDWORKS, ANSYS Workbench, ANSYS Fluent
Post Processing and Data Visualization:	Origin, Python, MATLAB
Scientific Writing and Presentation:	MS Office Suite, LATEX
Image Processing and Illustration:	Adobe Illustrator, Adobe Photoshop
Hardware Equipment:	UTM, FDM 3D printer, Oscilloscope, Beam Apparatus, Torsion Testing, Drop Testing, Impact Testing, Fatigue Testing

Publications

Journal Articles

1. **Sifat Abdul Bari**, Mohtasim Fuad, Kazi Fahad Labib, M Monjurul Ehsan, Yasin Khan, Muhammad Mahmood Hasan, "Enhancement of thermal power plant performance through solar-assisted feed water heaters: An innovative repowering approach" Energy Conversion and Management: X (100550) Impact factor-7.6, Cite Score-11.3, SJR rank-Q-1 https://doi.org/10.1016/j.ecmx.2024.100550.

2. **Sifat Abdul Bari**, Chowdhury Sadid Alam, M Shafiqur Rahman, "Enhancing Microstructure and Mechanical Stability of High-Entropy Alloys via Shear-Assisted Solidification: An Atomistic Study". (Under Review)

Conference Articles

1. **Sifat Abdul Bari**, Chowdhury Sadid Alam, Ashfak Siraj Shuvo, Sakib Al Razi Khan, M Shafiqur Rahman, 2025, "A Molecular Dynamics Study of Shear Driven Solidification and High Temperature Mechanical Properties of Al0.3CoCrFeNi High Entropy Alloy" Proceedings of the ASME 2025 International Mechanical Engineering Congress and Exposition, Memphis, Tennessee, USA, November 16-20, 2025. (Accepted)

2. **Sifat Abdul Bari**, Mohtasim Fuad, Arafat Ahmed Bhuiyan, M. Ahiduzzaman, 2025, "Thermodynamic Analysis of Hybrid Solar-Biomass Drying Systems: Energy and Exergy Perspectives" International Conference on Agricultural Machinery and Bioresource Engineering (ICAMBE 2025)

Research Experiences

Thesis Projects

1. **Master's Thesis:** Enhancing Microstructure and Mechanical Stability of High-Entropy Alloys Via Shear-Assisted Solidification: An Atomistic Study

- Simulated solidification of $Al_{0.3}CoCrFeNi$ HEA under shear flow using LAMMPS to investigate microstructural evolution.
- Characterized grain refinement, twin boundary density, and fivefold twin formation; correlated these with tensile strength.
- Obtained Tensile properties at Room and High Temperature.
- Studied dislocation motion and deformation mechanics.
- Quantified Chemical Short-Range Order (CSRO) using Warren–Cowley parameters.
- Performed nanoindentation simulations to assess hardness and sub-surface defect evolution.
- Conducted Primary Knock-on Atom (PKA) simulations to analyze radiation damage mechanisms.

2. **Undergrade Thesis:** Design and Evolution of a Novel Solar Biomass Hybrid Dryer

- Fabricated an advanced hybrid solar drier after thorough literature study, design and analysis.
- Obtained related parameters from the drying experiment.
- Thermodynamic Exergy and Energy efficiency has been obtained for three different modes of drying.

LAMMPS-based Molecular Dynamics Projects

1. **AlHfNbTaTiZr Refractory High Entropy Alloy (RHEA)**

- Modeled rapid solidification and revealed amorphous phase (metallic glass) formation upon quenching.
- Evaluated tensile response and dislocation behavior under uniaxial loading.
- Investigated nanoindentation-induced plasticity and local deformation mechanisms.
- Performed radiation damage studies using PKA simulations.

2. **Zr-Nb Alloy**

- Simulated annealing and tensile loading to assess the influence of Nb content on mechanical response.
- Investigated high-temperature creep behavior and dislocation evolution.
- Conducted nanoindentation to study hardness and subsurface shear bands.

3. **Transition metal dichalcogenides (TMDs)**

- Constructed monolayer models of h-BN, MoS_2, and WSe_2 using VESTA and Atomsk.
- Obtained Tensile properties at Room Temperature.
- Analyzed the crack propagation and deformation mechanism.
- Simulated nanoindentation to evaluate hardness

Academic Projects

1. **Applied Thermodynamics Project: Power-Plant Design and Optimization**

- Designed an actual operational power plant using EES and validated against the archive database.
- Identified potential room for further improvement and modification for renewable energy integration.
- Studied Energy, Exergy efficiency and economic feasibility of repowering the power plant with parabolic trough collector for 17 distinct cases

Academic and Professional Experience

Lecturer

August, 2023 - Present

Department of Mechanical and Production Engineering

Islamic University of Technology, Bangladesh

Course Responsibilities

Conducted Theoretical Course and Labs on: Machine Design I | Mechanics of Materials | Statics and Dynamics.

Additional Labs on: 3D Modeling and Assembling | Basic Thermodynamics Lab | Applied Thermodynamics Lab | Fluid Mechanics and Machineries | Workshop Practice.

Departmental Responsibilities

Organizing Course Files for OBE Accreditation | Exam and Class Routine Scheduling | Preparing and Scrutinizing results for regular, referred, backlog, and short-semester courses | Industrial Training Scheduling and Management | Student Advising | Lab Manual Development.

Student Supervision

- **Co-Supervising** Undergrade thesis on "Mechanical Properties and Cracking mechanism in pristine and defected WSe2 2D TMD: A MD Study"
  Conceptualization, *Validation*, *Software*, *Investigation*, *Formal analysis*, *Data curation*.
- **Co-Supervising** Undergrade thesis on "MD study of Deformation Mechanism and Mechanical Properties of AlHfNbTaTiZr Refractory High Entropy Alloy (RHEA)"
  Conceptualization, *Validation*, *Software*, *Investigation*, *Formal analysis*, *Data curation*.
- **Co-Supervised** Measurement, Instrumentation and Control Projects: Teams designed, calibrated, and tested sensor-based systems with DAQ and feedback control to produce controlled motion/actuation.

Extra-Curricular Activities and Projects

1. Team Lead, IUT Mars Rover 2022-2023

IUT Mars Rover is a student team project for the prestigious competitions such as 'University Rover Challenge' (USA), 'European Rover Challenge' (Europe), 'International Rover Challenge'(India) and 'International Rover Design Challenge'.

- Designed and manufactured a fully functional autonomous rover with the team. Shifted from the Rocker-Bogie suspension system to Four-Bar Linkage suspension in order to achieve an efficient run on the rough terrains of Mars.
- Incorporate in-wheel motor system for smooth motion and on spot 360° rotations.
- Equipped a robotic arm with 6 DoF for precise control and movements.
- Designed and fabricated onboard science box capable of testing collected rock and soil samples.

Participation and Achievements

- **ERC 2021 (On-site):** Qualified with 2nd highest points among 58 participating teams
- **ERC 2021 (Remote):** 10th out of 38 teams
- **IRC 2022:** Qualified for the Final Round
- **IRDC 2022:** 13th out of 24 teams
- Rover Showcasing, **Dubai Expo-2022**
- Project Showcasing, **BASIS Soft Expo-2023**. Recipient, **Golden Honor Crest.**

2. **Chair, IMechE IUT Student Chapter** 2022-2023

- Organized sessions on contemporary innovations and technical report writings
- Arranged Speak out for Engineering (SOFE), events of IMechE.
- Organized intra-IUT Robo Race Competitions
- Organizing member, Mecceleration 2019 by IUT MPE Department

3. **Vice President, IUT CAD Society** 2022-2023

- Organized engaging sessions on CAD, modeling and simulations.
- Arranged technical sessions on SOLIDWORKS, ANSYS, AutoCAD.
- Organized intra IUT CAD competition Traction 2.0

4. **Secretary at CAD and simulation, ANTS Ariel System** 2022-2023

- Designed and fabricated the vertical takeoff and landing gear of the UAV
- Designed the UAV carrying box for different Challenges.
- Designed and 3D printed different necessary components

5. **Mechanical Team Lead, RC Forklift, Industrial Project by Spectrum Engineering** 2022-2023

- Built a remote-control forklift for industrial application with the team.
- Designed the lead screw for all loading conditions

Awards and Achievements

- First Class with Honors Distinction in undergraduate studies 2023
- 1st Runner up, Team CADmium. 2023
  Thunder CAD (Inter-University CAD Competition) Mecha Fest, BUET-2023
- Award of Achievement, Team Anirban. IUT Award Ceremony-2023 2023
- Award of Achievement, Team CADmium. IUT Award Ceremony-2023 2023
- Champion, Team CADmium
  Techno CAD (Inter-University CAD Competition) Mind Spark, AUST-2022 2022
- Ranked 13th globally, International Rover Design Challenge (IRDC),2022 2022
- Recipient of Government Scholarship 2018
  National Board Examination (Higher Secondary School Certificate)
- Recipient of Government Scholarship 2016
  National Board Examination (Secondary School Certificate)

Volunteer Works

- Organized Cezeri Lab Annual Project Showcase 2025
- Organized Seminar on 'Road to Research Success -Pathways for Higher Degree Research', IAEC-IUT 2025
- Organized International Conference on Core Engineering and Technology (ICCET-24), IUT 2024
- Organized 1st IUT International Conference on Mechanical, Materials and Production Engineering (ICMMPE) 2023
- Judge, Traction 3.0, CAD competition organized by IUT CAD Society 2023
- Organized sessions on Outcome Based Education and Complex Engineering Metrics 2023
- Organized IUT Mechanical Fest, Mecceleration-2019 2019

Certificates

- Industrial Training 2021
  Bangladesh Power Development Board | LG Electronics Bangladesh | Eco Threads and Yarns | National Polymer
- Foundation Training on Quality Education, by Office of Accreditation and Quality Assurance, IUT 2023

References

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