Abdullah Al Amin, Ph.D.

Assistant Professor, Department of Mechanical and Aerospace Engineering, University of Dayton
Principal Investigator, Smart Manufacturing Advancement and Logistics Technology Lab, SMALT Lab
Dayton, OH aamin1@udayton.edu +1 857 231 0198 smalt.dev neoceph Scholar alamin-research

Research Interests

- **Additive Manufacturing**
  - Laser Powder Bed Fusion Process Modeling
  - AM Part Qualification via Non-Destructive Evaluation
- **Superconducting Magnet Design**
  - Magnetic Resonance Imaging (MRI) Magnets
  - Tokamak Fusion Magnets
  - Magnetic Sensing Devices
- **Energy & Materials**
  - Metal Matrix Composites, Fusion Energy, Superconducting Wires
  - Solar Cells
  - Battery Technologies
- **Computational Science**
  - Multiphysics and Multiscale Modeling
  - High Performance Computing
  - Scientific Machine Learning
  - Atomistic, molecular, and continuum modeling

Education

Ph.D. **Case Western Reserve University**, Mechanical Engineering — 2018
Thesis: *Multiscale Multiphysics Thermo-Mechanical Modeling of an MgB_2 Based Conduction Cooled MRI Magnet System*
Adviser: Prof. Michael Martens and Prof. Ozan Akkus

M.S. **The University of Akron**, Mechanical Engineering — 2014
Thesis: *High throughput particle separation using differential Fermat spiral microchannel with variable channel width*
Adviser: Prof. Jiang Zhe

B.S. **Bangladesh University of Engineering and Technology**, Mechanical Engineering — 2009
Thesis: *Design, Improvement, Modification & Fabrication of Mechanisms and Control Systems of Robots for ABU ROBOCON*
Adviser: Prof. Maglub Al Nur

Appointments

Assistant Professor, Mechanical and Aerospace Engineering, University of Dayton — Dayton, OH, Aug 2023 - Present

Postdoctoral Fellow, Mechanical Engineering, Northwestern University — Evanston, IL, Feb 2021 - Jul 2023
Adviser: Prof. Wing Kam Liu
Project: Development of an FVM based high fidelity multiphysics laser powder

bed fusion solver.

Research Engineer, Research Engineer, Bridgestone Americas Technical Center — Akron, OH — Jan 2018 - Jan 2021

Projects:

- Development of a hybrid analytical-FEA tire analysis framework for cornering and braking
- Composite polymer material modeling

Graduate Research Assistant, Case Western Reserve University — Cleveland, OH — Aug 2013 - Dec 2017

Projects: Development of a multiscale multiphysics model of a full body 1.5 T MRI main magnet

Graduate Research Assistant, The University of Akron — Akron, OH — Aug 2010 - Jul 2013

Projects:

- Characterization of a high temperature, high vacuum soft microgripper
- Development of a high throughput microparticle separation device

Teaching Experience

Assistant Professor, Mechanical and Aerospace Engineering — Dayton, OH — Aug 2023 - Present

University of Dayton

Courses Taught:

- MEE 427 - Mechanical Design I (Undergraduate)
- MEE 490/590 - Advanced Manufacturing (Senior Undergraduate/Graduate)

Assistant Director, Predictive Science and Engineering Design (PSE&D) — Evanston, IL — Sep 2022 - Jun 2023

Northwestern University

A Northwestern University fellowship program where fellows are selected from a pool of applicants and trained with concurrent state-of-the-art computational modeling techniques through three quarters (Fall, Winter, Spring) of courses.

Guest Lecturer, Northwestern University — Akron, OH — Jan 2018 - Jan 2021

Courses Taught:

- Mechanistic Data Science
- Advanced FEM II: Materials and reduced order models

Graduate Teaching Assistant, Case Western Reserve University — Cleveland, OH — Aug 2013 - Dec 2017

Courses Assisted and Taught:

- Musculoskeletal Biomechanics
- Mechanical Engineering Measurements Laboratory
- Senior Design Project

Graduate Teaching Assistant, The University of Akron — Akron, OH — Aug 2010 - Jul 2013

Courses Taught:

- Mechanical Engineering Drawing
- Tools for Mechanical Engineering Lab

Lecturer, Green University of Bangladesh — Dhaka, Bangladesh — Jun 2010 - Aug 2010

Courses Taught:

- Introduction to Mechanical Engineering

- Machine Ergonomics
- Mechanical Engineering Drawing

Lecturer, College of Aviation Technology, Bangladesh — Dhaka, Bangladesh
Courses Taught: — Feb 2010 - May 2010
- Introduction to Mechanical Engineering

Adjunct Lecturer, Green University of Bangladesh — Dhaka, Bangladesh
Courses Taught: — Oct 2009 - May 2010
- Mechanical Engineering Drawing

Journal Articles

[J1] Sultana, Nishat; Amin, Abdullah A.; Payton, Eric J.; Kim, Woo Kyun. Prediction of Raman Signatures, Electronic Structure, and Ion Transport Mechanisms in Nb2C and Nb2CO2 MXenes for Li/Na-ion Batteries: An *Ab Initio* Study. *Journal of Physics and Chemistry of Solids* 209 (Feb. 2026), p. 113218.

[J2] Amin, Abdullah Al; Li, Yangfan; Lu, Ye; Xie, Xiaoyu; Gan, Zhengtao; Mojumder, Satyajit; Wagner, Gregory J.; Liu, Wing Kam. Physics Guided Heat Source for Quantitative Prediction of IN718 Laser Additive Manufacturing Processes. *npj Comp Mat* 10.1 (Feb. 2024), p. 37.

[J3] Li, Yangfan; Mojumder, Satyajit; Lu, Ye; Amin, Abdullah Al; Guo, Jiachen; Xie, Xiaoyu; Chen, Wei; Wagner, Gregory J.; Cao, Jian; Liu, Wing Kam. Statistical Parameterized Physics-Based Machine Learning Digital Shadow Models for Laser Powder Bed Fusion Process. *Additive Manufacturing* 87 (May 2024), p. 104214.

[J4] Mojumder, Satyajit; Gan, Zhengtao; Li, Yangfan; Amin, Abdullah Al; Liu, Wing Kam. Linking Process Parameters with Lack-of-Fusion Porosity for Laser Powder Bed Fusion Metal Additive Manufacturing. *Additive Manufacturing* 68 (Apr. 2023), p. 103500.

[J5] Huang, Hannah; Mojumder, Satyajit; Suarez, Derick; Amin, Abdullah Al; Fleming, Mark; Liu, Wing Kam. Knowledge Database Creation for Design of Polymer Matrix Composite. *Computational Materials Science* 214 (Nov. 2022), p. 111703.

[J6] Lu, Ye; Li, Hengyang; Saha, Sourav; Mojumder, Satyajit; Al Amin, Abdullah; Suarez, Derick; Liu, Yingjian; Qian, Dong; Kam Liu, Wing. Reduced Order Machine Learning Finite Element Methods: Concept, Implementation, and Future Applications. *Computer Modeling in Engineering & Sciences* 129.3 (2021), pp. 1351–1371.

[J7] Islam, Mahmudul; Thakur, Md Shajedul Hoque; Mojumder, Satyajit; Al Amin, Abdullah; Islam, Md Mahbubul. Mechanical and Vibrational Characteristics of Functionally Graded Cu–Ni Nanowire: A Molecular Dynamics Study. *Composites Part B: Engineering* 198 (Oct. 2020), p. 108212.

[J8] Poole, Charles; Al Amin, Abdullah; Baig, Tanvir; Martens, Michael. Mechanical Analysis of an MgB2 1.5 T MRI Main Magnet Protected Using Coupling Loss Induced Quench. *Cryogenics* 100 (June 2019), pp. 18–27.

[J9] Sultana, Nishat; Al Amin, Abdullah; Metin, Dani Z.; Gaston, Nicola. Unveiling the Structures and Electronic Properties of CH3NH3PbI3 Interfaces with TiO2, ZnO, and SnO2: A First-Principles Study. *J Mater Sci* 54.21 (Nov. 2019), pp. 13594–13608.

[J10] Amin, Abdullah Al; Sabri, Laith; Poole, Charles; Baig, Tanvir; Deissler, Robert J.; Rindfleisch, Matthew; Doll, David; Tomsic, Michael; Akkus, Ozan; Martens, Michael. Computational Homogenization of the Elastic and Thermal Properties of Superconducting Composite MgB2 Wire. *Comp. Struct.* 188 (Mar. 2018), pp. 313–329.

[J11] Amin, Abdullah A.; Baig, Tanvir N.; Deissler, Robert J.; Sabri, Laith Abed; Doll, David; Tomsic, Michael; Akkus, Ozan; Martens, Michael A. Mechanical Analysis of MgB2 Based Full Body MRI Coils Under Different Winding Conditions. *IEEE Trans. Appl. Supercond.* 27.4 (June 2017), pp. 1–5.

[J12] Baig, Tanvir; Al Amin, Abdullah; Deissler, Robert J; Sabri, Laith; Poole, Charles; Brown, Robert W; Tomsic, Michael; Doll, David; Rindfleisch, Matthew; Peng, Xuan; Mendris, Robert; Akkus, Ozan; Sumption, Michael; Martens, Michael. Conceptual Designs of Conduction Cooled MgB2 Magnets for 1.5 and 3.0 T Full Body MRI Systems. *Supercond. Sci. Technol.* 30.4 (Mar. 2017), p. 043002.

[J13] Deissler, Robert J.; Baig, Tanvir; Poole, Charles; Amin, Abdullah; Doll, David; Tomsic, Michael; Martens, Michael. A Computational Study to Find an Optimal RRR Value for a 1.5-T Persistent-Mode Conduction-Cooled MgB 2 MRI Magnet From a Quench Protection Point of View. *IEEE Transactions on Applied Superconductivity* 27.4 (June 2017), pp. 1–6.

[J14] Amin, Abdullah Al; Baig, Tanvir; Deissler, Robert J; Yao, Zhen; Tomsic, Michael; Doll, David; Akkus, Ozan; Martens, Michael. A Multiscale and Multiphysics Model of Strain Development in a 1.5 T MRI Magnet Designed with 36 Filament Composite MgB2 Superconducting Wire. *Supercond. Sci. Tech.* 29.5 (May 2016), p. 055008.

[J15] Deissler, Robert J; Baig, Tanvir; Poole, Charles; Amin, Abdullah; Doll, David; Tomsic, Michael; Martens, Michael. Numerical Simulation of Quench Protection for a 1.5 T Persistent Mode MgB2 Conduction-Cooled MRI Magnet. *Supercond. Sci. Technol.* 30.2 (Dec. 2016), p. 025021.

[J16] Mojumder, Satyajit; Amin, Abdullah Al; Islam, Md Mahbubul. Mechanical Properties of Stanene under Uniaxial and Biaxial Loading: A Molecular Dynamics Study. *Journal of Applied Physics* 118.12 (Sept. 2015), p. 124305.

[J17] Amin, Abdullah Al; Jagtiani, Ashish; Vasudev, Abhay; Hu, Jun; Zhe, Jiang. Soft Micrograpping Using Ionic Liquids for High Temperature and Vacuum Applications. *J. Micromech. Microeng.* 21.12 (Dec. 2011), p. 125025.

Conference Proceedings

[C1] Amin, Abdullah Al; Tanner, Caleb; Rohmer, John. “Rapid Aero-Structural Design With Topological Optimization Of Tailored Fiber Placement Using Differentiable Programming”. *18th US Congress on Computational Mechanics*. Chicago, IL: USACM, July 2025.

[C2] Sultana, Nishat; Amin, Abdullah Al; Rathun, Rahul Singha; Guo, Jiachen; Liu, Wing Kam. “A Flexible and Parallelizable Python Framework for Additive Manufacturing Process Simulation”. *18th US Congress on Computational Mechanics*. Chicago, IL, July 2025.

[C3] Amin, Abdullah Al; Lowe, Robert; Sultana, Nishat. “High-Fidelity Melt Pool Prediction with a Physics-Guided Heat Source for Accelerated Laser Powder Bed Additive Manufacturing Simulations”. *DaytonCincinnati Aerospace Sciences Symposium*. Dayton, OH, Mar. 2024.

[C4] Amin, Abdullah Al; Lowe, Robert; Sultana, Robert; Liu, Wing Kam. “Physics-Guided Heat Source for Transient Laser Absorptance Prediction In Metal Additive Manufacturing”. *16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics*. Vancouver, British Columbia, Canada: Not presented due to CrowdStrike Computer Outage in 2024, July 2024.

[C5] Amin, Abdullah Al; Mojumder, Satyajit; Li, Yangfan; Xie, Xiaoyu; Liu, Wing Kam. “Physics Augmented Stochastic Simulation (PASS) for Accelerated Computation of Laser Absorption in Powder Bed Fusion Additive Manufacturing”. *17th US Congress on Computational Mechanics*. Albuquerque, NM, July 2023.

[C6] Li, Yangfan; Lu, Ye; Amin, Abdullah Al. “A Stochastic Additive Manufacturing Simulation Method for Surface Roughness and Porosity Prediction”. *17th US Congress on Computational Mechanics*. Albuquerque, NM, July 2023.

[C7] Xie, Xiaoyu; Amin, Abdullah Al; Guo, Jiachen; Kizer, Nathan J; Mutswatiwa, Lovejoy; Katch, Lauren; Kube, Christopher; Liu, Wing Kam. "Real-Time Keyhole Porosity Detection in Metal Additive Manufacturing With In-Situ Ultrasound and X-Ray Imaging". *17th US Congress on Computational Mechanics*. Albuquerque, NM, July 2023.

[C8] Li, Hengyang; Amin, Abdullah Al; Lu, Ye; Liu, Wing Kam. "Advances and Applications of Mechanistic Machine Learning, Reduced-order and Data-driven Analyses". *16th US Congress on Computational Mechanics*. July 2021.

[C9] Mojumder, Satyajit; Huang, Hanna; Suarez, Derek; Amin, Abdullah Al; Liu, Wing Kam. "Mechanistic Data Science Approach for Reinforced Polymer Composites Design". *Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology*. San Diego, California, Sept. 2021.

[C10] Amin, Abdullah Al; Bhusal, Bhumi; Baig, Tanvir Noor; Deissler, Robert J.; Sabri, Laith; Akkus, Ozan; Martens, Michael. "A Comparative Study of Coil Winding Techniques of a Full Body 1.5 T MgB2 Based MRI Magnets". *ISMRM 25th Annual Meeting & Exhibition*. Hawaii, USA, Apr. 2017.

[C11] Amin, Abdullah Al; Baig, Tanvir Noor; Deissler, Robert J.; Sabri, Laith; Doll, David; Akkus, Ozan; Martens, Michael. "A Comparative Study of Coil Winding Techniques of a Full Body 1.5 T MgB2 Based MRI Magnets". *Applied Superconductivity Conference*. Superconductivity News Forum Contest Runner Up, SNF Contest for Best ASC 2016 Contributed Preprints – PART II, 2016. Denver, Colorado, Oct. 2016.

[C12] Amin, Abdullah Al; Bhusal, Bhumi; Baig, Tanvir Noor; Deissler, Robert J.; Sabri, Laith; Akkus, Ozan; Martens, Michael. "Variation in Strain Characteristics for Multiscale Multiphysics Models of a 1.5T Conduction Cooled MRI System Based on a 36 Filament MgB2 Composite Wire". *ISMRM 24th Annual Meeting & Exhibition*. Singapore City, Singapore, May 2016.

[C13] Deissler, Robert J.; Baig, Tanvir Noor; Poole, Charles Randall; Amin, Abdullah Al; Doll, David; Tomsic, Michael; Martens, Michael. "A Computational Study to Find an Optimal RRR Value for a 1.5 T Persistent-Mode Conduction-Cooled MgB_2 MRI Magnet from a Quench Protection Point of View". *Applied Superconductivity Conference*. Denver, Colorado, USA, Oct. 2016.

[C14] Amin, Abdullah Al; Baig, Tanvir; Yao, Zhen; Martens, Michael. "Stress and Strain Sensitivity Study of 1.5T Conduction Cooled MgB2 Magnet Design". *ISMRM 23rd Annual Meeting & Exhibition*. May 2015.

Projects

Multi-User Drawing Tool github.com/name/repo

- Developed an electronic classroom where multiple users can simultaneously view and draw on a "chalkboard" with each person's edits synchronized
- Tools Used: C++, MFC

Synchronized Desktop Calendar github.com/name/repo

- Developed a desktop calendar with globally shared and synchronized calendars, allowing users to schedule meetings with other users
- Tools Used: C#, .NET, SQL, XML

Custom Operating System 2002

- Built a UNIX-style OS with a scheduler, file system, text editor, and calculator
- Tools Used: C

Technologies

Languages: C++, C, Java, Objective-C, C#, SQL, JavaScript

Technologies: .NET, Microsoft SQL Server, XCode, Interface Builder