

# 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 

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## Research Interests

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### • 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

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**Ph.D. Case Western Reserve University**, Mechanical Engineering

2018

Thesis: Multiscale Multiphysics Thermo-Mechanical Modeling of an MgB<sub>2</sub> 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

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**Assistant Professor**, Mechanical and Aerospace Engineering, University of Dayton

Dayton, OH

Aug 2023 - Present

**Postdoctoral Fellow**, Mechanical Engineering, Northwestern University

Evanston, IL

Adviser: Prof. Wing Kam Liu

Feb 2021 - Jul 2023

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

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

Aug 2013 - Dec 2017

**Graduate Research Assistant**, The University of Akron

Akron, OH

Projects:

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

## Teaching Experience

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**Assistant Professor**, Mechanical and Aerospace Engineering

Dayton, OH

University of Dayton

Aug 2023 - Present

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

Northwestern University

Sep 2022 - Jun 2023

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

Courses Taught:

Jan 2018 - Jan 2021

- Mechanistic Data Science

- Advanced FEM II: Materials and reduced order models

**Graduate Teaching Assistant**, Case Western Reserve University

Cleveland, OH

Courses Assisted and Taught:

Aug 2013 - Dec 2017

- Musculoskeletal Biomechanics

- Mechanical Engineering Measurements Laboratory

- Senior Design Project

**Graduate Teaching Assistant**, The University of Akron

Akron, OH

Courses Taught:

Aug 2010 - Jul 2013

- Mechanical Engineering Drawing

- Tools for Mechanical Engineering Lab

**Lecturer**, Green University of Bangladesh

Dhaka, Bangladesh

Courses Taught:

Jun 2010 - Aug 2010

- Introduction to Mechanical Engineering

- Machine Ergonomics
- Mechanical Engineering Drawing

**Lecturer**, College of Aviation Technology, Bangladesh

Dhaka, Bangladesh  
Feb 2010 - May 2010

Courses Taught:

- Introduction to Mechanical Engineering

**Adjunct Lecturer**, Green University of Bangladesh

Dhaka, Bangladesh  
Oct 2009 - May 2010

Courses Taught:

- Mechanical Engineering Drawing

## Journal Articles

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- [J1] Sultana, Nishat; Amin, Abdullah A.; Payton, Eric J.; Kim, Woo Kyun. [Prediction of Raman Signatures, Electronic Structure, and Ion Transport Mechanisms in Nb<sub>2</sub>C and Nb<sub>2</sub>CO<sub>2</sub> 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 Mabbubul. [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 MgB<sub>2</sub> 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 CH<sub>3</sub>NH<sub>3</sub>PbI<sub>3</sub> Interfaces with TiO<sub>2</sub>, ZnO, and SnO<sub>2</sub>: 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 MgB<sub>2</sub> 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 MgB<sub>2</sub> 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 MgB<sub>2</sub> 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<sub>2</sub> 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 MgB<sub>2</sub> 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 MgB<sub>2</sub> 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 Microgripping Using Ionic Liquids for High Temperature and Vacuum Applications](#). *J. Micromech. Microeng.* 21.12 (Dec. 2011), p. 125025.

## Conference Proceedings

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- [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 MgB<sub>2</sub> 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 MgB<sub>2</sub> 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 MgB<sub>2</sub> 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<sub>2</sub> 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 MgB<sub>2</sub> Magnet Design". *ISMRM 23rd Annual Meeting & Exhibition*. May 2015.

## Projects

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### Multi-User Drawing Tool

- 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

[github.com/amin-abdullah/multi-user-drawing-tool](https://github.com/amin-abdullah/multi-user-drawing-tool)



### Synchronized Desktop Calendar

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

[github.com/amin-abdullah/synchronized-desktop-calendar](https://github.com/amin-abdullah/synchronized-desktop-calendar)



### Custom Operating System

2002

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

## **Technologies**

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

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