Markus A. Downey, PhD

mdowney@fiu.edu

Education

Michigan State University, East Lansing, MI Aug 2012 to Dec 2016

- PhD Chemical Engineering
- Dissertation: Toughening Of Carbon Fiber-Reinforced Epoxy Polymer Composites Via Copolymers And Graphene Nano-Platelets

University of Rhode Island, Kingston, RI Sep 2002 to May 2004

- M.S. Chemical Engineering
- Thesis: A Nanocomposite Intermediate Coating to Improve the Fatigue Life of High Temperature Ceramic Coatings

University of Rhode Island, Kingston, RI Sep 1997 to May 2002

- B.S. Chemical Engineering
- B.A. German

Academic Experience

Florida International University **Miami, Florida**
Department of Mechanical and Materials Engineering Aug 2024 to Present
Graduate Program Co-Director

Florida International University **Miami, Florida**
Department of Mechanical and Materials Engineering Aug 2023 to Present
Assistant Teaching Professor

Florida International University **Miami, Florida**
Department of Mechanical and Materials Engineering Sep 2020 to May 2023
Visiting Assistant Teaching Professor

Michigan State University **East Lansing, Michigan**
Composite Materials and Structures Center Jan 2017 to May 2017
Research Associate

Michigan State University **East Lansing, Michigan**
Department of Chemical Engineering and Material Science Jan 2013 to Dec 2016
Composite Materials and Structures Center
Graduate Research Assistant

Non-Academic Experience

The Continuous Improvement Institute **Sunrise, Florida**
Six Sigma Black Belt Sep 2022 to Present

www.linkedin.com/pub/markus-downey/10/898/3a
www.researchgate.net/profile/Markus_Downey

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Magic Leap Inc. — **Plantation, Florida**
Senior Material Scientist — June 2017 to June 2020

Emitec Inc. — **Rochester Hills, Michigan**
Applications Engineer — Jan 2007 to June 2012

Emitec GmbH — **Lohmar, Germany**
Research Engineer — March 2005 to Dec 2006

Teaching Experience

Instructor – Analysis of Engineering Systems, EGM 3311, Florida International University
Spring 2021 to Present

Instructor – Materials in Engineering, EGN 3365, Florida International University
Spring 2024

Instructor – Introduction to Engineering, EGS 1006, Florida International University
Spring 2024

Instructor – Heat Transfer, EML 4140, Florida International University
Summer 2021 to Present (Online)
Spring 2023 & Fall 2024 (In-Person)

Instructor – Mechanics and Material Science, EMA 3706, Florida International University
Fall 2022

Co-Instructor – Ethics and Design Project Organization, EML 4551, Florida International University
Fall 2020 to Spring 2021 & Spring 2023 to Present

Co-Instructor – Senior Design Project, EML 4905, Florida International University
Spring 2021 to Present

Instructor – Special Topics, EML 4930, Florida International University
Spring 2023

Service

- Large Cat (Lion) Interpreter, Naples Zoo (June 2024 to Present)
- Sawgrass Toastmasters Vice President of Education (July 2023 to Present)
- Sawgrass Toastmasters Club Secretary (July 2022 to June 2023)
- Toastmasters Area Director, Area 53, Division E, District 48 (July 2020 to July 2021)

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- Magic Leap Toastmasters Club President (July 2019 to June 2020)

Certifications

- Certification in College Teaching – Engineering, Michigan State University — May 2017
- Six Sigma Green Belt, The Continuous Improvement Institute — March 2018
- Six Sigma Black Belt, The Continuous Improvement Institute — Dec 2019

Senior Design Teams Mentored

1. Eco-Swift: Solar-Powered Beach Cleaning Robot for Sustainable Debris Removal – Fall 2024 to Present
2. Moving, Mobile Sunshade – Fall 2024 to Present
3. ASME e Human Powered Vehicle Challenge – Fall 2024 to Present
4. FSAE Vehicle: CFD Aerodynamic design and body manufacturing, Team 1 – Fall 2024 to Present
5. FSAE Vehicle: CFD Aerodynamic design and body manufacturing, Team 2 – Fall 2024 to Present
6. Interactive Map for FIU Engineering Center – Spring 2024 & Fall 2024
7. Concentrated Solar Collector – Spring 2024 & Fall 2024
8. Embedded Sensor in 3D Printed Parts – Spring 2024 & Fall 2024
9. Extruder for Recycled 3D Printer Filament – Spring 2024 & Fall 2024
10. Trash Can Robot – Spring 2024 & Fall 2024
11. Open Source FSAE Active Rear Wing – Fall 2023 & Spring 2024
12. Intelligent Waste Sorting – Fall 2023 & Spring 2024
13. Automated Materials Handling – Fall 2023 & Spring 2024
14. Waste Heat Recovery from Data Centers – Fall 2023 & Spring 2024
15. Morphing Wing – Fall 2023
16. Automated Line Leveling for Land Elevation – Fall 2023
17. Mobile Sunshade - Spring 2023 & Fall 2023
18. Car Cooling Device – Spring 2023 & Fall 2023
19. Passive Flow Splitting Module for Microfluidics – Spring 2023 & Fall 2023
20. Formula SAE Carbon Fiber Wing – Spring 2023 & Fall 2023
21. Formula SAE Carbon Fiber Suspension – Spring 2023 & Fall 2023
22. Optimization of Microfluidic Chip for Studies on Nano Plastic Exposure – Spring 2023 & Fall 2023
23. Automated Urban Garden – Fall 2022
24. Filtering Pharmaceuticals – Fall 2022
25. Off Grid Cooling – Fall 2022
26. Passive Flow Splitting Module for Microfluidics – Fall 2022
27. Skateboard Design – Fall 2022
28. 2022 SAE Aero Design Regular Class Competition – Fall 2021 & Spring 2022
29. Mechanical and Magnetic Properties of Ceramic Ferrites – Fall 2021 & Spring 2022
30. Lobster Trap Recovery System – Fall 2021 & Spring 2022
31. NASA Human Exploration Rover Challenge Team A – Fall 2021 & Spring 2022
32. NASA Human Exploration Rover Challenge Team B – Fall 2021 & Spring 2022
33. 2021 FIU Engineering Resources – Fall 2021 & Spring 2022
34. 3D Printed Heat Exchanger – Spring 2022

35. Pitting Machine for Ackee Fruit – Spring 2021 & Fall 2021
36. Replacement for Indexing Sprinkler Valve – Spring 2021 & Fall 2021
37. 2025 Unmanned Vertical Lift for Medical Equipment Distribution – Spring 2021 & Fall 2021
38. Diver Assistance Propulsion System – Spring 2021 & Fall 2021
39. Modeling/Simulation of Thermoset Cure - Cyanate Esters – Spring 2021 & Fall 2021
40. Robotic Arm for Pipe Crawler Robot – Fall 2020 & Spring 2021
41. Development of AI enabled Battery Management System (BMS) – Fall 2020 & Spring 2021
42. Improving Thermoset Composite Part Generation – Fall 2020 & Spring 2021
43. The Slush Gusher – Fall 2020 & Spring 2021
44. NASA Human Exploration Rover Challenge – Fall 2020 & Spring 2021
45. Modular Delivery Cargo Vehicle System – Fall 2020 & Spring 2021
46. Design of A/C heat exchanger for Residential Water Heater – Spring 2021

Special Topics Students

- Joshua Fernandez - "Different Types of Composites and Their Usage in Automotive Applications" - Spring 2023
- Josele Menendez - "Composite Materials In Aerospace Applications" - Spring 2023

Publications

1. "Toughening of Carbon Fiber-Reinforced Epoxy Polymer Composites Utilizing Fiber Surface Treatment and Sizing", **Markus A. Downey**, Lawrence T. Drzal, Composites Part A, JCOMA_4419, Volume 90, p. 687-698, September 2016
2. "Toughening of Aromatic Epoxy via Aliphatic Epoxy Copolymers", **Markus A. Downey**, Lawrence T. Drzal, Polymer, Polymer, Volume 55, No. 26, p. 6658-6663, December 2014
3. "Microstructural characterization of pipe bomb fragments" Otto Gregory, **Markus A. Downey**, et. al., Materials Characterization, Volume 61, Issue 3, p. 347- 354, December 2009
4. "Increasing Durability of Flame-Sprayed Strain Gauges", Gregory, Otto J., **Downey, Markus A.**, Wnuk, Steve, NASA Tech Briefs, May 2007

Conference Proceedings

1. "Optimized Fiber-Reinforced Polymer Composites for High-Performance Applications: Toughening of Aromatic Epoxy Polymers via Aliphatic Epoxy Copolymers", **Markus A. Downey**, Lawrence Drzal, American Society for Composites, September 2015
2. "Toughening of Aromatic Epoxy Polymers via Aliphatic Epoxy Monomer Addition: Optimized Fiber-Reinforced Polymer Composites for Lightweighting", **Markus A. Downey**, Lawrence Drzal, Society of Plastics Engineers Automotive Composites Conference & Exhibition, September 2015
3. "Advanced Aftertreatment System Development for Locomotive Applications", Paul Park, **Markus A. Downey**, Claus Bruestle, 21st Aachen Colloquium Automobile and Engine Technology 2012, October 2012
4. "Advanced Aftertreatment System Development for Locomotive Applications", Paul Park, **Markus A. Downey**, Claus Bruestle, David Youngen, ASME 2012 Internal Combustion Engine Division Fall Technical Conference, September 2012

5. "Aftertreatment in a Pre-Turbo Position: Size and Fuel Consumption Advantage for Tier 4 Large-Bore Diesel Engines", **Markus A. Downey**, Claus Bruestle, Mark Subramaniam, Aaron Birckett, Dr. Dean Tomazic, 20. Aachen Colloquium Automobile and Engine Technology 2011, October 2011
6. "Advanced Metal Substrate Technology for Large Engine Exhaust Gas Aftertreatment Systems", **Markus A. Downey**, Ulrich Pfahl, ASME 2011 Internal Combustion Engine Division Fall Technical Conference, October 2011, ICEF2011-60096
7. "Pre-Turbo Aftertreatment Position for Large Bore Diesel Engines – Compact & Cost-Effective Aftertreatment with a Fuel Consumption Advantage", Mark Subramaniam, Christopher Hayes, Dr. Dean Tomazic, **Markus A. Downey**, Claus Bruestle, SAE World Congress, April 2011, 11PFL-0699; also published in SAE Journal of Engines, June 2011, Vol. 4, No.1, p. 106-116
8. "Large Engine Aftertreatment in a Pre-Turbo Position: A Path To Compact and Cost-Effective Emissions Reduction", **Markus A. Downey**, Claus Bruestle, Mark Subramaniam, Christopher Hayes, Dr. Dean Tomazic, ASME 2010 Internal Combustion Engine Division Fall Technical Conference, September 2010, ICEF2010-35086
9. "Structured Foil Catalyst Substrates: A Road Map to Highly Effective, Compact Aftertreatment Systems", Klaus Mueller-Haas, **Markus A. Downey**, Talus Park, Robert Diewald, Rod Radovanovic, SAE Powertrain and Fluids Conference 2007, October 2007, SAE 2007-01-4038
10. "An Intermediate TCE Nanocomposite Coating for Thermal Barrier Coatings." Gregory, Otto J., **Markus A. Downey**, Steve Wnuk and Vince Wnuk, Materials Research Society Symposium, Vol.791, December 2003. p.99-104.
11. "Improved Thermal Barrier Coatings using Intermediate TCE Nanocomposites" Otto J. Gregory, **Markus A. Downey**, Timothy H. Starr, Steve Wnuk, Vince Wnuk, MPIF Conference Proceedings, September 2003, p 150-157
12. "Improved Bond Coats for Thermal Spray Instrumentation", Otto J. Gregory, **Markus A. Downey**, Timothy H. Starr, Steve Wnuk, Vince Wnuk, 49th International Instrumentation Symposium Proceedings, May 2003

Presentations

1. "Optimized Fiber-Reinforced Polymer Composites for High-Performance Applications: Toughening of Aromatic Epoxy Polymers via Aliphatic Epoxy Copolymers", **Markus A. Downey**, Lawrence Drzal, American Society for Composites, East Lansing Michigan, September 2015
2. "Toughening of Aromatic Epoxy Polymers via Aliphatic Epoxy Monomer Addition: Optimized Fiber-Reinforced Polymer Composites for Lightweighting", **Markus A. Downey**, Lawrence Drzal, Society of Plastics Engineers Automotive Composites Conference & Exhibition, Novi Michigan, September 2015
3. "Toughened Epoxy/Carbon Fiber Composites for Aerospace and Lightweighting Applications", **Markus A. Downey**, Lawrence Drzal, 12th Michigan State University Chemical Engineering and Material Science Research Forum, East Lansing, May 2015
4. "Development And Practical Experience Of A 2010 Compliant Heavy Duty Diesel Engine And Aftertreatment System", Dr. Brad Adelman, Ed Derybowski, Victor Miranda, Matt Tyo, Jan Kramer, Claus Bruestle, **Markus A. Downey**, 1st Aachen Colloquium China "Automobile and Engine Technology", Presentation Only, November 2011, Beijing China
5. "Advanced Metal Substrate Technology for Locomotive Exhaust Gas Aftertreatment Systems", **Markus A. Downey**, Claus Bruestle, Rail Road Environmental Conference 2011, Presentation Only, October 2011

6. "Advanced Metal Substrate Technology for Large Engine Exhaust Gas Aftertreatment Systems", **Markus A. Downey**, Ulrich Pfahl, ASME 2011 Internal Combustion Engine Division Fall Technical Conference, October 2011, ICEF2011-60096
7. "Locomotive Aftertreatment systems for EPA Tier4 Legislation and the Benefits of Metal Substrate Technology to Meet this Challenge", **Markus A. Downey**, Claus Bruestle, Rail Road Environmental Conference 2010, Presentation Only, October 2010
8. "Large Engine Aftertreatment in a Pre-Turbo Position: A Path To Compact and Cost-Effective Emissions Reduction", **Markus A. Downey**, Claus Bruestle, Mark Subramaniam, Christopher Hayes, Dr. Dean Tomazic, ASME 2010 Internal Combustion Engine Division Fall Technical Conference, September 2010, ICEF2010-35086
9. "SCR and PM-METALIT for Passenger Cars and Heavy Duty Truck Applications: SCRi System", **Markus A. Downey**, Near Zero Emission Vehicle Technology Conference, Presentation Only, October 2009
10. "Structured Foil Catalyst Substrates: A Road Map to Highly Effective, Compact Aftertreatment Systems", Klaus Mueller-Haas, **Markus A. Downey**, Talus Park, Robert Diewald, Rod Radovanovic, SAE Powertrain and Fluids Conference 2007, October 2007, SAE 2007-01-4038
11. "An Intermediate TCE Nanocomposite Coating for Thermal Barrier Coatings." Gregory, Otto J., **Markus A. Downey**, Steve Wnuk and Vince Wnuk, Materials Research Society Symposium, Vol.791, December 2003. p.99-104.
12. "Improved Bond Coats for Thermal Spray Instrumentation", Otto J. Gregory, **Markus A. Downey**, Timothy H. Starr, Steve Wnuk, Vince Wnuk, 49th International Instrumentation Symposium Proceedings, May 2003

Posters

1. "Optimized Fiber-Reinforced Polymer Composites for Lightweighting: Toughening of Aromatic Epoxy Polymers via Aliphatic Epoxy Copolymers", 2015 Annual University of Michigan-Michigan State Univeristy Blue-Green Seminar, September 2015
2. "Optimized Fiber-Reinforced Polymer Composites for Lightweighting: Toughening of Aromatic Epoxy Polymers via Aliphatic Epoxy Copolymers", Society of Plastics Engineers Automotive Composites Conference, September 2014
3. "Toughening of Aromatic Epoxy Polymers for Fiber Reinforced Composite Matrices via Aliphatic Epoxy Copolymers", 2014 Michigan State University Engineering Graduate Research Symposium, May 2014

Patents

1. "Composite Used For Thermal Spray Instrumentation And Method For Making The Same", Gregory, Otto J., **Downey, Markus A.**, U.S. Patent Number 8048534 B2, November 1st 2011
2. "Thermal barrier coatings using intermediate TCE nanocomposites", Gregory, Otto J., **Downey, Markus A.**, Wnuk, Steve, Wnuk, Vincent, U.S. Patent Application Number 20100098961, April 22nd, 2010

Fellowships / Scholarships

1. 2014/2015 Future Academic Scholars in Teaching (FAST) Fellowship
2. 2014/2015 Society of Plastics Engineers Automotive Composites Conference Michigan Scholarship

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Awards

1. Outstanding Research Poster Award, 3rd Place, 2015 Annual University of Michigan-Michigan State Univeristy Blue-Green Seminar
2. ChEMS Graduate Student Service Award 2015
3. MSUFCU Research Translation Award, 2014 Michigan State University Engineering Graduate Research Symposium
4. Excellence in Research Award, 2014 Michigan State University Chemical Engineering and Material Science Research Forum

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www.researchgate.net/profile/Markus_Downey