

# Curriculum Vitae

## Rickey Alfred Caldwell, Jr

### Education

**Ph.D. Mechanical Engineering,**  
Michigan State University, East Lansing, MI

*Dissertation:* Applications of Complex Modal Decomposition Methods to Dispersive Media  
*Advisor:* Dr. Brian Feeny

**Master of Science Mechanical Engineering,**  
Michigan State University, East Lansing, MI

*Specialization:* Vibrations and Dynamics  
*Thesis:* Experimental Application of Modal Decomposition Methods to a Nonuniform Beam  
*Advisor:* Dr. Brian Feeny

**Bachelor of Science Mechanical Engineering,**  
Michigan State University, East Lansing, MI

### Employment History

**Merrimack College, North Andover, Massachusetts. – September 2016 – current. Assistant Professor of Mechanical Engineering.**

Created and taught two new courses; Introduction to Robotics, and Technical Computing with MATLAB and CAD. Built and develop a research laboratory for engineering systems which focuses on dynamics and robotics research. Founding advisor for the Robotics club. Conducted robotics outreach programs in K-12 enrichment programs.

**The MITRE Corporation, Center for National Security, National Security Engineering Center, Bedford, Massachusetts. Nov 2014 – September 2016. Senior Mechanical Engineer.** Support the acquisition, design, and analysis of various complex systems for DOD, DHS, and the US Armed Forces. Created and perform test plan for an instrumented transit drop test. Simulated within ANSYS vertical drop, edge drop, rail impact, and road mobility environments of a Deployable Air Traffic Control system. Designed **isolation** system for and performed dynamic analysis of tractor pulled Ground Penetration Radar system. Derived the governing equations, state variable model, and control model of an aircraft arresting gear system. Design, test, built, and operated scaled testbed of a Ford class aircraft carrier. Mentored MIT Hyperloop student design team, assisted in fabrication of parts, dynamic analysis, of the Hyperloop Pod.

**Merrimack College, College of Engineering, Department of Mechanical Engineering, North Andover, Massachusetts, Fall 2015. Adjunct Professor, MEN 5012 Introduction to Robotics and Instrumentation.**

Taught graduate/senior level elective. Used Parallax Board of Education to teach basic linear circuits, controls, programming, and sensing.

**Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland. May 2012 – November 2014. Analyst**

Worked in the dynamics' section of the Air and Missile Defense Department (AMDD). Researched and applied pseudo-inverse error bounds to Dynamic Smart Filter (DSF). Performed output only modal analysis and system identification of aerospace structures, first principle modeling and simulations of systems and vibration/shock isolators. FEM anchoring. Develop DAQ application in Labview for the DSF. Created Matlab code to interpolate mean wave height, significant wave height and wave period, to compute the sea state at any lat/long coordinates. Volunteered as a mentor for APL's College Preparatory Program (CPP).

**Michigan State University, East Lansing, Michigan, August 2007 – November 2014. Research Assistant**

Conducted research, designed, setup, and ran experiments in output-only modal decomposition methods and experimental modal analysis using proper orthogonal decomposition (POD), reduced-order mass weighted proper orthogonal decomposition (RMPOD), smooth orthogonal decomposition (SOD), state variable modal decomposition (SVMD) and complex orthogonal decomposition (COD). Worked in various engineering youth outreach programs.

**Diversity Programs Office, Michigan State University, College of Engineering, August 2007 – Current, Graduate Coordinator of the Guided Learning Center (GLC)**

Assisted in the recruitment and retention of traditionally underrepresented minorities in the College of Engineering. Managed a staff of graduate and undergraduate students; responsibilities included hiring, promotion, training, and disciplinary actions of the GLC staff. Provide free tutoring services for students of the College of Engineering. Assist in the logistics of hosting corporate representatives. Created and ran a retention program for "at risk students" and increased those students GPA and average of 0.744 points over the prior term's GPA.

**Michigan State University, Honor's College, Gifted and Talent Education Program, Math Science and Technology (MST) Summer 2011 – Summer 2015, Instructor**

Taught two sections of an engineering course designed to expose talented 6<sup>th</sup>-9<sup>th</sup> graders to education topics and experiences beyond what they would be exposed to in their normal curriculum. I developed an Engineering curriculum which covered mechatronics, mechanical engineering, electrical engineering, computer science, engineering design, civil engineering and manufacturing based in experiential engineering education.

**Cengage Learning, August 2012 – January 2014, Technical Reviewer for Engineering Textbook Thermodynamics for Engineers, 1st Edition by Merle Potter and Kenneth A. Kroos**

Assisted in the pedagogical development of an engineering textbook. Reviewed textbook, solved all example, homework, and FE exam problems to check for errors and clarity. Reviewed and proofed the solution manual.

**Massachusetts Institute of Technology's Lincoln Laboratory, Lexington Massachusetts, June 2009 – August 2009, Summer Research Program, Intern Engineer**

Used Abaqus to create CAD and FEM models for modal analysis of aerospace structures. Reviewed and added to existing Labview code of PI controller of ground based thermal vacuum testing chamber for duty cycle testing of satellite electronics. Performed other miscellaneous assignments requested.

**Engineering Animation Inc, Southfield Michigan, January 2000 – October 2001  
Project Engineer**

**Clients worked for: Ford, Visteon, Troy Design, Atoma Latches, General Motors**

Investigated assembly variation between the Fan Shroud, Inlet Tank, and Outlet Tanks of the Radiator, using VSA-3D integrated with I-Deas. Discovered nominal build issues, including interference conditions which prevented assembly. Recommended changes to GD&T and geometry to reduce variation.

Predicted interference between the RH Off Engine Bracket and the RH Engine Isolator Mount. Recommended changes to the Bracket or Mount to correct interference. Suggested additional investigations for chassis components to reduced further assembly variation.

Investigated the assembly variation between the Catalytic Converter and the Muffler, using VSA-3D integrated with I-Deas. Resulting recommendation produced a 9% variation reduction in the X direction, 31% reduction in the Y direction, and an 8% reduction in the Z direction

Investigated and determined the cause of an audible rear differential backlash.

**Volvo Heavy Truck, Greensboro North Carolina, December 1995 – August 1996  
Cooperative Education Engineer**

Calculated cycles to failure histograms in Wiebul Smith for Test vehicle components. Used Visual Basic to create a GUI damage estimation program. Created monitoring modules in Labview for the Chassis Dynamometer and Wind Tunnel. Designed test rig to simulate a 20 g collision, and designed a noise barrier for a Shock absorber test rig.

**Engineering Pedagogy Experience**

**Michigan State University, Diversity Programs Office, Michigan Louis Stokes Alliance for Minority Participation (MI-LSAMP), Engineering and Science Summer Academy (ESSA)**

**Chautauqua Short Course, California State University Dominguez Hills, May 2011  
“Enhancing Student Success Through A Model: Introduction to Engineering Course”**

Completed a short course designed to increase students success in college. Course focused on community building, student professional development, academic success strategies, personal development, and orientation to the university. Learned pedagogical approaches for working with students.

**Diversity Programs Office, Michigan State University, College of Engineering  
Summer Undergraduate Research Academy (SURA) (May 2010 – August 2010)**

Managed the daily operations of an undergraduate summer research program. Paired students with faculty research mentors. Created cultural programs for students, planned weekly activities and a research symposium.

**Diversity Programs Office, Michigan State University, College of Engineering  
Program Manager Detroit Area Pre-College Engineering Program (DAPCEP) (June 2008-  
August 2008) Academic Intensive Summer Residential Program (AISRP)**

Managed the daily operations of 4 week high school summer residential program with 45 students. Hired the instructing staff, develop the curriculum for the math, CADD, and fitness courses. Taught the fitness and math courses. Develop CADD course. Managed a staff of 12 people.

**Diversity Programs Office, Michigan State University, College of Engineering  
Informational Technology and Experiences for Students and Teacher (ITEST)**

Managed the daily operations of a NSF funded 4 week summer residential program for 64- 8th graders. Hired the instruction staff and developed the curriculum for the math and CADD courses. Taught a fitness and math course for the program. Managed a staff of 14 people.

## **Service and Outreach**

**5AM Martial Arts** – Taught life skills via martial arts to incoming freshmen for ESA, ESSA, MAGIC, and other DPO and OSS TRIO programs

**Success Habits** – created and ran a 20 hour evening program to help struggling engineering students learn and developed successful habits to excel as an engineering student

**MST@MSU** – Taught gifted 6-10 graders, mechanical engineering class, and created and taught engineering curriculum.

**Steering Committee Member –MI-LSAMP (Michigan Louis Stokes Alliance for Minority Participation)**

**Design Day** – Escorted local area school kids during design day, took photos.

**HSEI lectures** – Assisted with classroom instruction

**ASME TCVS, Subcommittee for Industrial Application** – Friend of the committee, work towards increasing private sector involvement at IDETC

### **Michigan State University, College of Engineering Hearing Board**

**Mother Theresa National Service Day** – Took College of Engineering students to Detroit to board-up abandon houses.

**College Fairs** – Worked several booths for the College of Engineering at Detroit area college fairs.

**Leader Encouraging Academic Development (LEAD) MSU**– Mentor

## **College Prep Program JHU/APL – Mentor**

**Miscellaneous** – Conducted various presentations and motivation talks for programs like COE ROSES Program, CVM Bridge Program, and DPO Scholar Program. Hosted, meet and greets with several prospective graduate students for the SLOAN program and the ME Department, and judged various undergraduate research events

## **STEM Student Research Judging**

Emerging Researchers National Conference in STEM, Washington DC, February 2016

AIAA Region 1 Conference, Online Student Paper Competition, Worcester MA, Worcester Polytechnic Institute, April 2016

AIAA Region 1 Conference, Research Presentations, Worcester MA, Worcester Polytechnic Institute, April 2016

## **Organizations**

**American Association of Blacks in Energy** – President Emeritus (2009), Michigan State University Chapter

**Alliance for Graduate Education and the Professoriate** – AGEP Fellow (2010)

**National Society of Black Engineers** – President Emeritus (2010), Michigan State University Chapter

**National Society of Professional Engineers** – Member

**Order of the Engineer**

## **Publications**

### **Journals**

Characterizing Wave Behavior in a Beam Experiment by Using Complex Orthogonal Decomposition, Rickey A. Caldwell Jr. and Brian F. Feeny, Journal of Vibration and Acoustics 138(4):041007-041007-7. doi:10.1115/1.4033268.

Output-Only Modal Identification of a Nonuniform Beam by Using Decomposition Methods, Rickey A. Caldwell Jr. and Brian F. Feeny, Journal of Vibration and Acoustics, 136(4), DOI: 10.1115/1.4027243

### **Peer Reviewed Conferences** (presenter bolded)

Smooth Orthogonal Decomposition Applied to Traveling Waves in Elastic Media, **Rickey A. Caldwell Jr.**, Brian F. Feeny, SEM IMAC, February 2016, Orlando, FL.

Wave Dispersion Extraction In Discrete Mass Chain Using Complex Orthogonal Decomposition, **Rickey A. Caldwell Jr.**, Smruti R. Panigrahi, Brian F. Feeny, SEM IMAC, February 2016, Orlando FL

Modal Parameter Identification and Finite Element Model Correlation of a Missile Launcher Structure, **Ronald N. Couch**, Elliott J. Radcliffe, Brian J. Olson, Rickey A. Caldwell Jr. Brian F. Feeny. SEM IMAC February 2015, Orlando, FL.

Modal Analysis and Inverse Force Identification for High-fidelity Dynamic Thrust Measurements of Guided Interceptor Missile Divert and Attitude Control Systems, Ronald N. Couch, Elliott J. Radcliffe, **Brian J. Olson**, Rickey A. Caldwell Jr. Brian F. Feeny. SEM IMAC February 2015, Orlando, FL.

An Inverse Force Identification Methodology for High-fidelity Dynamic Thrust Measurements of Guided Interceptor Missile Divert and Attitude Control Systems, **Brian J. Olson**, Elliott J. Radcliffe, Ryan J. Monroe, Brendan J. Vidmar, Rickey A. Caldwell Jr. USNCTAM June 2014, Michigan State University, East Lansing, MI

Modal Parameter Identification of a Missile Launcher Structure for Finite Element Model Correlation Using Proper Orthogonal Decomposition Techniques. **Ronald N. Couch**, Elliott J. Radcliffe, Brian J. Olson, Rickey A. Caldwell Jr. Brian F Feeny. USNCTAM June 2014, Michigan State University, East Lansing, MI

Complex Modal Analysis of Waves in an Elastic Beam, **Rickey A. Caldwell Jr** and Brian F. Feeny, USNCTAM June 2014, Michigan State University, East Lansing, MI

Output Only Modal Analysis of a Nonuniform Beam Experiment by Using Decomposition Methods. Rickey A. Caldwell Jr and **Brian F. Feeny**. ASME 2011 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference August 2011, Washington DC

Reduced Mass-Weighted Proper Decomposition of an Experimental Non-Uniform Beam **Rickey A. Caldwell Jr.** and Brian F. Feeny  
2010 Inverse Problems Symposium, Michigan State University, East Lansing, MI

## **Conferences**

Dispersion Relationship Using Complex Decomposition Methods. **Rickey A. Caldwell Jr.** and Brian F. Feeny, 2015 Inverse Problems Symposium, Michigan State University, East Lansing, MI

Increasing Retention of Underrepresented Minority Students in Engineering: The Diversity Programs Office - Scholars Program (DPO-SP), Claudia E. Vergara, **Theodore D Caldwell**, Jon Sticklen, Rickey A. Caldwell Jr., Kyle P. Foster, Tonisha B. Lane, Lisa R. Henry, ASEE 2014, Indianapolis, IN

What Happens After a Summer Bridge Program: The DPO Scholars Program, Theodore Demetrius Caldwell, Kyle P. Foster, **Tonisha Brandy Lane**, Rickey Alfred Caldwell, Claudia Elena Vergara, and Jon Sticklen. ASEE 2011, Vancouver BC, AC 2011-1790.

## **Honors and Awards**

**Navy Enterprise Intern Program, NUWC, Newport, Rhode Island**

Accepted into the NERIP 2009

**National Society of Black Engineers**

Academic Pyramid of Excellence (2009)

**Alliance for Graduate Education and the Professoriate**

AGEP Fellow 2010