CASEY M. ALLEN

Marquette University, Department of Mechanical Engineering
casey.allen@marquette.edu – 414-288-2160 – 1637 W. Wisconsin Ave, Milwaukee, WI 53233
www.eng.mu.edu/firelab

PROFESSIONAL EXPERIENCE

2019 – Present	**Marquette University, Associate Professor** Department of Mechanical Engineering	Milwaukee, WI
2012 – 2019	**Marquette University, Assistant Professor** Department of Mechanical Engineering	Milwaukee, WI
2007 – 2012	**Michigan State University, Graduate Research Assistant** Department of Mechanical Engineering	East Lansing, MI
2004 – 2007	**Accenture LLC, Business & Technology Consultant**	Chicago, IL

ACADEMIC CREDENTIALS

2012 **MICHIGAN STATE UNIVERSITY –** East Lansing, MI
PH.D., Mechanical Engineering
Dissertation: Advanced Rapid Compression Machine Test Methods and Surrogate Fuel Modeling for Bio-Derived Jet and Diesel Fuel Autoignition
Advisor: Dr. Tonghun Lee

2004 **UNIVERSITY OF IOWA –** Iowa City, IA
B.S.E., Chemical Engineering

AWARDS & HONORS (SINCE 2008)

2017 Ralph R. Teetor Educational Award (Society of Automotive Engineers)
2017 Outstanding Teacher Award, Department of Mechanical Engineering (Marquette University)
2014 Bernard Lewis Fellowship (awarded by the Combustion Institute to outstanding young researchers)
2012 Michael J. Wallace Endowed Scholarship
2011 Dissertation Completion Fellowship
2009 Colucci Graduate Fellowship for Achievement in Energy Research
2008 MSU Graduate Fellowship

TEACHING ACTIVITIES

INSTRUCTIONAL EXPERIENCE

Thermodynamics I (MEEN 3310)
Fall 2012

Internal Combustion Engines (MEEN 4310/5310)
Spring 2013

Thermodynamics II (MEEN 3340)
Fall 2013, Fall 2014, Fall 2015, Fall 2016, Fall 2017 (2-3 sections in each term)

Combustion: Thermochemistry, Kinetics & Applications (MEEN 4310/5310)
Spring 2014, Spring 2015, Spring 2016, Spring 2017, Spring 2018, Spring 2019

Advanced Topics in Combustion Kinetics (MEEN 6931)
Spring 2014

Combustion Chemistry and Mechanisms (MEEN 6370)
Spring 2015, Spring 2017

Convective Heat and Mass Transfer (MEEN 6350)
Spring 2019

CURRICULUM DEVELOPMENT

MEEN 4310/5310: Combustion: Thermochemistry, Kinetics & Applications
Developed an undergraduate/graduate level course on introductory combustion topics. Content includes first-law and second-law analysis of reacting systems, chemical kinetics and mechanism analysis for combustion, integration of chemical mechanisms with physical reactor models, and the application of these topics to engine modeling. Course emphasizes practical application of physical/chemical laws in MATLAB programs.

- **Flipped Content (2017):** Developed online lecture content for MEEN 4310/5310 (62 videos + 30 online activities) to enable more face-to-face applications practice during classtime.

MEEN 6370: Combustion Chemistry & Mechanisms
Developed a graduate level course relevant to the study of chemical kinetics and sensitivity/uncertainty analysis of kinetic mechanisms. Content includes theoretical techniques for calculating elementary reaction rate coefficients and their pressure dependencies (transition state theory, Lindemann theory, Hinshelwood theory, QRRK theory for unimolecular and bimolecular chemical activation reactions) and global uncertainty/sensitivity analysis techniques for factor fixing and factor prioritization in kinetic models.

INSTRUCTIONAL SUPPORT & ADVISING

E-Lead Faculty Participant
2016 - Present

Team Advisor, SAE Baja Team
2013 - 2018

Senior Design Advising
Baja Vehicle Frame Optimization *(SAE Baja Team), 2014 – 2015*
Modeling Engine Hunting *(Briggs and Stratton), 2015 – 2016*
Gearbox Optimization *(SAE Baja Team), 2015 – 2016*
Simulink-Based Engine Control *(Briggs and Stratton), 2016 – 2017*
Baja Vehicle Data Acquisition System *(SAE Baja Team), 2017 – 2018*

FE Review
Thermodynamics (1 lecture)*: Spring 2013*
Heat Transfer (2 lectures)*: Fall 2014, Spring 2015, Fall 2015, Spring 2016, Fall 2016, Spring 2017, Fall 2017, Spring 2018*

GRADUATE STUDENT SUPERVISION

John Neuman	Master of Science	Graduated: 5/2015
David Wilson	Master of Science	Graduated: 5/2016
	Doctor of Philosophy	Graduated: 5/2019
Jack Rehn	Master of Science	Graduated: 8/2017
Jenna Ezzell	Master of Science	Graduated: 8/2017
Mark Carioscio	Master of Science	Graduated: 5/2018
Ashley Hatzenbihler	Master of Science	Graduated: 8/2019
Dylan Lehmier	Master of Science	Graduated: 5/2019
David Roulo	Master of Science	Graduated: 8/2019

RESEARCH ACTIVITIES

PUBLICATIONS (REFEREED JOURNALS)

Publications Currently Under Development

Iso-octane Consumption during Cool Flame Oxidation in a Rapid Compression Machine
In Preparation
D. Roulo, J. Neuman, A. Hatzenbihler, C. Allen

Speciated Transient Gasoline Engine Emissions Under Optimally-Controlled Speed-Load Trajectories
In Preparation
D. Lehmier, J. Rehn, B. Herzberg, D. Wilson, C. Allen

Published at Marquette University

1 **Exploration of the Hysteresis Effects in Speciated Emissions during Transient Gasoline Engine Combustion**
Energy & Fuels, Vol. 33, pp. 5620-5631 (2019)
D. Wilson, D. Lehmier, C. Allen

2 **On the Influence of Initial Conditions and Facility Effects on Rapid Compression Machine Data**
Fuel, Vol. 245, pp. 368-383 (2019)
J. Ezzell, D. Wilson, C. Allen

3 **Experimental Validation of an Unscented Kalman Filter for Estimating Transient Engine Exhaust Composition with Fourier Transform Infrared Spectroscopy**
Energy & Fuels, Vol. 32, pp. 11899-11912 (2018)
D. Wilson, C. Allen

4 **A Bayesian Estimation Model for Transient Engine Exhaust Characterization using Fourier Transform Infrared Spectroscopy**
Energy & Fuels, Vol. 31, pp. 11156-11168 (2017)
D. Wilson, C. Allen

5 **A Comparison of Sensitivity Metrics for Two-Stage Ignition Behavior in Rapid Compression Machines**
Fuel, Vol. 208, pp. 305-313 (2017)
D. Wilson, C. Allen

6 **Application of a Multi-Zone Model for the Prediction of Species Concenrations in Rapid Compression Machine Experiments**
Combustion and Flame, Vol. 171, pp. 185-197 (2016)
D. Wilson, C. Allen

7 **Conventional and Bio-Derived Jet Fuel Surrogate Modeling in Low Temperature and Lean Combustion**
Energy & Fuels, Vol. 29, pp. 4597-4607 (2015)
A. Oldani, D. Valco, K. Min, J. Edwards, C-B. Kweon, C. Allen, T. Lee

8 **Autoignition Characteristics of JP-5 and HRJ-5 using Conventional Jet Fuel Surrogates**
Energy & Fuels, Vol. 27, pp. 7790-7799 (2013)
C. Allen, D. Valco, E. Toulson, J.H. Yoo, T. Lee

9 **Characterization of the Effect of Fatty Ester Composition on the Ignition Behavior of Biodiesel Fuel Sprays**
Fuel, Vol. 111, pp. 659-669 (2013)
C. Allen, E. Toulson, D. Tepe, H. Schock, D. Miller, T. Lee

10 **Ignition Behavior and Surrogate Modeling of JP-8 and of Camelina and Tallow Hydrotreated Renewable Jet Fuels at Low Temperatures**
Combustion and Flame, Vol. 160, pp. 232-239 (2013)
C. Allen, D. Valco, E. Toulson, T. Edwards, T. Lee

11 **Application of a Novel Charge Preparation Approach to Testing the Autoignition Characteristics of JP-8 and Camelina Hydroprocessed Renewable Jet Fuel**
Combustion and Flame, Vol. 159, pp. 2780-2788 (2012)
C. Allen, E. Toulson, T. Edwards, T. Lee

Published at Michigan State University

12 **Ignition Characteristics of Diesel and Canola Biodiesel Sprays in the Low-Temperature Combustion Regime**
Energy & Fuels, Vol. 25, pp. 2896-2908 (2011)
C. Allen, E. Toulson, D. Hung, H. Schock, D. Miller, T. Lee

13 **Modeling the Autoignition of Fuel Blends with a Multi-step Model**
Energy & Fuels, Vol. 25, pp. 632-639 (2011)
E. Toulson, C. Allen, D. Miller, J. McFarlane, H. Schock, T. Lee

14 **An Aerosol Rapid Compression Machine for Studying Energetic-Nanoparticle-Enhanced Combustion of Liquid Fuels**
Proceedings of the Combustion Institute, Vol. 33, pp. 3367-3374 (2010)
C. Allen, G. Mittal, C.-J. Sung, E. Toulson, T. Lee

15 **Optimization of a Multi-step Model for the Auto-Ignition of Dimethyl Ether in a Rapid Compression Machine**
Energy & Fuels, Vol. 24, pp. 3510-3516 (2010)
E. Toulson, C. Allen, D. Miller, H. Schock, T. Lee

16 **Modeling the Auto-Ignition of Oxygenated Fuels using a Multi-step Model**
Energy & Fuels, Vol. 24, pp. 888-896 (2010)
E. Toulson, C. Allen, D. Miller, T. Lee

CONFERENCE PROCEEDINGS

Published at Marquette University

1 **Comprehensive Emissions from a Spark-Ignited Gasoline Engine Under Transient Load Profiles**
11th U.S. National Combustion Meeting, 3/26/19
D. Wilson, C. Allen

2 **A New Measurement Model for an Unscented Kalman Filter for Effective Rise Time Reduction of Fourier Transform Infrared Spectroscopy Measurements**
Spring Technical Meeting, Central States Section of the Combustion Institute, 5/21/18
D. Wilson, C. Allen

3 **A Comprehensive Characterization of Spark Ignited Exhaust Emissions during Transient Load Cycles**
Spring Technical Meeting, Central States Section of the Combustion Institute, 5/21/18
D. Lehmier, C. Allen

4 **A Bayesian Processing Model for High Speed Transient Engine Exhaust Characterization**
10th U.S. National Combustion Meeting, 4/24/17
D. Wilson, C. Allen

5 **Fast Joint PDF Evaluation using Calibrated Multi-Step Kinetic Models**
9th U.S. National Combustion Meeting, 5/18/15
C. Allen

6 **Conventional and Bio-Derived Jet Fuel Surrogate Modeling in Low Temperature and Lean Combustion Regimes**
9th U.S. National Combustion Meeting, 5/18/15
A. Oldani, D. Valco, C. Allen, K. Min, T. Edwards, T. Lee

7 **Autoignition Behavior of Synthetic Alternative Jet Fuels: An Examination of Chemical Composition Effects on Ignition Delays at Low to Intermediate Temperatures**
Proceedings of the Combustion Institute, Vol. 35, pp. 2983-2991 (2015)
D. Valco, G. Gentz, C. Allen, M. Colket, T. Edwards, S. Gowdagiri, M. Oehlschlaeger, E. Toulson, T. Lee

8 **The Effects of Non-Uniform Boundary Temperatures on Ignition Delay Time Measurements from Heated Rapid Compression Machine Experiments**
53rd AIAA Aerospace Sciences Meeting & Exhibit (as part of SciTech 20145, 1/5/15
J. Neuman, C. Allen

9 **The Influence of Non-Uniform Initial Conditions on Temperature Field Development in Rapid Compression Machine Experiments**
52nd AIAA Aerospace Sciences Meeting & Exhibit (as part of SciTech 2014), 1/13/14
J. Neuman, C. Allen

Published at Michigan State University

10 **Autoignition Behavior of Petroleum-Based and Hydroprocessed Renewable Jet Fuel Blends in a Rapid Compression Machine**
51st AIAA Aerospace Sciences Meeting & Exhibit, 1/7/13
D. Valco, C. Allen, E. Toulson, T. Lee

11 **Optical Diagnostic Comparisons of Pump Diesel with Bio-derived Diesel Blends**
SAE 2012 World Congress, 4/24/11
C. Squibb, H. Schock, C. Allen, T. Lee, M. Poort, K. Crayne

12 **An Experimental Investigation of the Autoignition Characteristics of Camelina-Based Hydroprocessed Renewable Jet Fuel**
49th AIAA Aerospace Sciences Meeting & Exhibit, 1/6/11
C. Allen, E. Toulson, T. Lee

13 **Energetic-Nanoparticle-Enhanced JP-8 Combustion in an Aerosol Rapid Compression Machine**
6th U.S. National Combustion Meeting, 5/20/09
C. Allen, T. Lee

14 **Energetically-Enhanced Combustion of Liquid Fuels in a Rapid Compression Machine**
47th AIAA Aerospace Sciences Meeting & Exhibit, 1/5/09
C. Allen, T. Lee

INVITED TALKS

1 **"Good Enough" Rapid Compression Machine Experiments**
Lindbergh Lecture Series, Univ. of Wisconsin-Madison, Madison, Wisconsin, 11/20/14

2 **Advanced Test Methods and Diagnostics for Characterizing the Autoignition Chemistry of Non-Volatile Fuels**
Naval Research Laboratory, Washington, D.C., 12/6/11

3 **Advanced Test Methods and Diagnostics for Characterizing the Autoignition Chemistry of Non-Volatile Fuels**
Argonne National Laboratory, Chicago, Illinois, 11/15/11

FUNDED RESEARCH GRANTS

2017 **Optimal Conditions for Measuring Ignition Quality in Non-Engine Tests**
CFR Engines Inc.
Budget: $465,487
Project Timeline: 10/2017 – 10/2021

2016 **Model-Based Fuel Blend Optimization for Paslode Cordless Nailers**
Illinois Tool Works, Construction Products
Budget: $130,592
Project Timeline: 8/2016 – 7/2018

2015 **An Engine Test Stand for Rapid Fuel Blend Optimization**
Marquette University, College of Engineering
Budget: $10,750

2014 **Gas-Chromatography-Mass Spectrometry for Energy Research**
Marquette University, College of Engineering
Budget: $92,000

2013 **High-Fidelity *iso*-Octane Ignition Kinetics – New Rigor for an Unresolved Problem**
American Chemical Society, Petroleum Research Fund
Budget: $100,000
Project Timeline: 8/2013 – 7/2015

2012 **Optical Diagnostics for Combustion Characterization of Compression Autoignition Engines**
Michael J. Wallace Endowment
Budget: $10,000/year
Project Timeline: Renewable until 2018

2012 **A Computationally-Efficient Droplet Evaporation Model for Multi-Component Bio-Based Fuel Blends**
Marquette University
Budget: $10,150
Project Timeline: 5/2013 – 12/2013

Academic Service

Departmental Service

Secretary to the Faculty	2015, 2016, 2017
Assessment Committee	2013, 2014, 2015, 2016
Graduate Committee	2012, 2013, 2017, 2018
Faculty Search Committee	2013, 2015, 2017, 2018
Executive Committee	2017, 2018

Conference Organization

2013 – 2014	Section Organizer, Alternative and Advanced Fuels, SAE World Congress & Exhibition
2014 – 2015	Section Organizer, Alternative and Advanced Fuels, SAE World Congress & Exhibition
2015 – 2016	Section Organizer, Alternative and Advanced Fuels, SAE World Congress & Exhibition
2016 – 2017	Lead Organizer, Alternative and Advanced Fuels, SAE World Congress Experience
2017 – 2018	Section Organizer, Alternative and Advanced Fuels, SAE World Congress & Exhibition
2018	Session Chair, Alternative Fuels and Emissions I, CSSCI 2018 Spring Technical Meeting

Journal Reviewer (for the following periodicals)

Applied Energy
Energy & Fuels
Fuel
International Journal of Heat and Mass Transfer
Journal of Renewable and Sustainable Energy
Optics Letters
Proceedings of the Combustion Institute (International Symposium)
Society of Automotive Engineers (World Congress, Int'l Powertrain, Fuels & Lubricants Meeting)