

**Jonathan W. Kimball**  
*Professor of Electrical and Computer Engineering*  
*Interim Director of Center for Research in Energy and Environment*  
*Curriculum Vitae*

**Education**

*University of Illinois at Urbana-Champaign, 2004-07*

PhD, Electrical and Computer Engineering, 2007

Dissertation: *Digital Control Techniques for Switching Power Converters*

Committee: P.T. Krein (chair), P.L. Chapman, P.W. Sauer, G. Dullerud

*University of Illinois at Urbana-Champaign, 1994-96*

MS, Electrical Engineering, 1996

Thesis: *Applications of nonlinear control techniques in low voltage dc-dc converters*

Advisor: Philip T. Krein

*Carnegie Mellon University, 1991-94*

BS, Electrical and Computer Engineering, with University Honors, 1994

**Work Experience**

*Missouri University of Science and Technology, Rolla, MO*

**Assistant Professor** of Electrical and Computer Engineering, 2008-2014

**Associate Professor with Tenure**, 2014-2018

**Dean's Scholar**, AY'16 through AY'17

**Professor**, effective September 2018

**Interim Director of Center for Research in Energy and the Environment**, effective September 2019

Research interests include microgrids, energy harvesting, multi-phase dc-dc converters, and switched-capacitor converters. Teaching interests include electromechanics and power electronics.

*SmartSpark Energy Systems, Inc., Champaign, IL*

Co-Founder and **Vice President of Engineering**, 2004-2007, **Senior Engineer**, 2007-2008

Managed a design team of six engineers that developed battery management and solar power products

*University of Illinois at Urbana-Champaign*

*Grainger Center for Electric Machinery and Electromechanics*

**Research Engineer** (2003-2006), **Senior Research Engineer** (2006-2007)

**Visiting Lecturer** for five semesters

Managed laboratories (teaching and research), assisted graduate students in developing experimental systems, and performed independent research. Taught undergraduate classes.

*Baldor Electric, Inc., Fort Smith, AR*

**Senior Design Engineer, 1998-2003**

Designed industrial motor control products ranging 1-150 hp, 230/460/575 V. Also participated in a switched-reluctance drive project and other drive projects ranging up to 450 hp.

*Motorola Semiconductor Products Sector, Phoenix, AZ*

**Systems Design Engineer, Hybrid Power Module Group, 1996-1998**

Led design teams for standard and custom IGBT modules (up to 100 A/1200 V).

**Awards**

**Research Catalyst Award**, Missouri S&T College of Engineering and Computing, May 2019.

This was a college-level award recognizing mentorship of junior faculty and leadership on multi-PI grants.

**Faculty Research Award**, Missouri University of Science and Technology, December 2018.

This is a campus level award given annually to recognize faculty members who have demonstrated excellence in research and scholarship. Eight awards were given for FY18.

Outstanding Teaching Award, December 2016 (for AY'15), a campus-level award given to 41 instructors; December 2018 (for AY'17).

**Dean's Scholar**, awarded Fall 2016 for AY'16 and AY'17. Six awards were given for this inaugural class of assistant and associate professors who excel in research, teaching, and service.

Outstanding Reviewer, IEEE Transactions on Power Electronics, March 2016.

**Faculty Excellence Award**, Missouri University of Science and Technology, February 2015.

This is a campus level award given annually to recognize sustained excellence in teaching, research, and service. Five awards were given for FY14.

**Missouri Academic Advising Association (MACADA) Outstanding Academic Advisor**,

Faculty Role, September 2014. This is a state level award given annually to one individual whose primary responsibility is teaching and who spend a portion of their time providing academic advising services to students.

**Scholarly Publications**

***Theses***

J. W. Kimball, "Digital control techniques for switching power converters," Ph.D. Dissertation, University of Illinois at Urbana-Champaign, Urbana, IL, 2007.

J. W. Kimball, "Applications of nonlinear control techniques in low voltage dc-dc converters," M.S. Thesis, University of Illinois at Urbana-Champaign, Urbana, IL, 1996.

***Theses Advised***

S.H. Kankanala, "Modeling And Control Of Cascaded Bridgeless Multilevel Rectifier Under Unbalanced Load Conditions," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2020.

- K.J.P. Veeramraju, "Design and development of power processing units for applications in electrically-propelled satellite systems," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2020.
- V. Roy Chowdhury, "Smart control architecture for microgrid application," Ph.D. Dissertation, Missouri University of Science and Technology, Rolla, MO, 2019.
- W. St. Pierre, "Practical Dwell Times for Switched System Stability with Smart Grid Application," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2018.
- P. Patel, "Modeling and Control of Three-Phase Grid-Connected PV Inverters In the Presence of Grid Faults," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2018.
- J. A. Mueller, "Analysis of DC microgrids as stochastic hybrid systems," Ph.D. Dissertation, Missouri University of Science and Technology, Rolla, MO, 2018.
- P. Jain, "Battery optimization in microgrids using Markov decision process integrated with load and solar forecasting," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2018.
- B. Zhou, "Lyapunov stability analysis of switched microgrid systems," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2018.
- J. Mohammad, "Construction and Validation of TL-IPM Generator," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2016.
- W. Zhang, "DC-DC Converter Based Photovoltaic Simulator with a Double Current Mode Controller," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2016.
- P. Nandy, "Hidden Markov Model Based Non-Intrusive Load Monitoring Using Active and Reactive Power Consumption," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2016.
- T. Paul, "Application of Unified Invariants for Cyber Physical Systems in Smart Grids," Ph.D. Dissertation, Missouri University of Science and Technology, Rolla, MO, 2015.
- Md. Rasheduzzaman, "Small Signal Modeling and Analysis of Microgrid Systems," Ph.D. Dissertation, Missouri University of Science and Technology, Rolla, MO, 2015.
- S. H. Alalwani, "Optimal Techno-Economic Sizing of Wind/Solar/Battery Hybrid Microgrid System Using the Forever Power Method," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2015.
- J. A. Mueller, "Small-Signal Modeling of Grid-Supporting Inverters in Droop Controlled Microgrids," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2014.
- L. K. Müller, "Hard-Switched Switched Capacitor Converter Design," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2014.
- L. D. Watson, "Inverter design and analysis using multiple reference frame theory", Ph.D. Dissertation, Missouri University of Science and Technology, Rolla, MO, 2013.
- S. H. Jafari, "New Sensorless, Efficient Optimized and Stabilized V/f Control for PMSM Machines," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2013. Co-advised with Keith Corzine.

- A. R. Kashyap, "Direct-Drive Permanent Magnet Synchronous Generator Design for Hydrokinetic Energy Extraction," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2013.
- A. Balakrishnan, "Quantization Noise Analysis of a Closed-Loop PWM Controller That Includes  $\Sigma$ - $\Delta$  Modulation," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2013.
- M. M. Alabbass, "Parallel-Connected Solar Arrays," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2013.
- F. Alfaris, "Stochastic model for solar sensor array data," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2012.
- J. A. Zhao, "A Digitally Implemented Practical Photovoltaic Simulator with a Double Current Mode Controller," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2012.
- T. Paul, "Unified Knowledge Model for Stability Analysis in Cyber Physical Systems," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2012.
- H. Zhou, "Maximum Power Point Tracking Control of Hydrokinetic Turbine and Low-Speed High Thrust Permanent Magnet Generator Design," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2012.
- A. Saad, "Laboratory Implementations of PMSM Drive in Hybrid Electric Vehicles Applications," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2012.
- N. A. McFowland, "Forward Converter for Solar Power Applications," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2012.
- Z. S. Johnson, "Module-Level Power Converters for Parallel Connected Photovoltaic Arrays," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2012.
- H. Qin, "Dual Active Bridge Converters in Solid State Transformers," Ph.D. Dissertation, Missouri University of Science and Technology, Rolla, MO, 2011.
- B. A. Yount, "Managing a solar sensor array project: Analyzing insolation & motivation," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2011. Co-advised with Scott Grasman.
- N. Nagarajan, "Development of a graphical user interface for the study of parallel-connected solar arrays," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2011.
- J. M. Henry, "Modeling the practical performance of switched-capacitor converters and a method for automating state-space model generation," M.S. Thesis, Missouri University of Science and Technology, Rolla, MO, 2010.
- M. M. Baggu, "Advanced control techniques for doubly fed induction generator-based wind turbine converters to improve low voltage ride-through during system imbalances," Ph.D. Dissertation, Missouri University of Science and Technology, Rolla, MO, 2009. Co-advised with Badrul Chowdhury.

**Journal Papers** († denotes student or postdoctoral advisee)

1. V. R. Chowdhury† and **J. Kimball**, "Robust Control Scheme for a Three Phase Grid-tied Inverter with LCL Filter during Sensor Failures," *IEEE Transactions on Industrial Electronics*, pp. 1–1, 2020, doi: 10.1109/TIE.2020.3013515.
2. V. R. Chowdhury† and **J. W. Kimball**, "Virtual charge-based synchronisation and feedback linearisation-based current control of a three-phase grid-connected inverter without grid voltage sensors," *IET Power Electronics*, vol. 13, no. 15, pp. 3496–3504, 2020, doi: 10.1049/iet-pel.2020.0145.
3. M. Dabbaghjamanesh, A. Moeini†, **J. W. Kimball**, and J. Zhang, "Using Gated Recurrent Units for Selective Harmonic Current Mitigation-PWM in Grid-Tied Cascaded H-Bridge Converters," *IEEE Transactions on Industry Applications*, pp. 1–1, 2020, doi: 10.1109/TIA.2020.3003563. (in press)
4. A. Moeini†, M. Dabbaghjamanesh, **J. W. Kimball**, and J. Zhang, "Artificial Neural Networks for Asymmetric Selective Harmonic Current Mitigation-PWM in Active Power Filters to Meet Power Quality Standards," *IEEE Transactions on Industry Applications*, pp. 1–1, 2020, doi: 10.1109/TIA.2020.3007596. (in press)
5. V. R. Chowdhury† and **J. W. Kimball**, "Control of a Three-Phase Grid-Connected Inverter Under Non-Ideal Grid Conditions with Online Parameter Update," *IEEE Transactions on Energy Conversion*, vol. 34, no. 3, pp. 1613-1622, Sept. 2019.
6. Md. Rasheduzzaman and **J. W. Kimball**, "Modeling and Tuning of an Improved Delayed-Signal-Cancellation PLL for Microgrid Application," *IEEE Transactions on Energy Conversion*, vol. 34, no. 2, pp. 712–721, Jun. 2019.
7. J. A. Mueller† and **J. W. Kimball**, "Modeling Dual Active Bridge Converters in DC Distribution Systems," *IEEE Transactions on Power Electronics*, vol. 34, no. 6, pp. 5867–5879, Jun. 2019.
8. J. A. Mueller†, D. C. Wunsch, and **J. W. Kimball**, "Forecast-Informed Energy Storage Utilization in Local Area Power Systems," *IEEE Transactions on Sustainable Energy*, vol. 10, no. 4, pp. 1740-1751, Oct. 2019.
9. J. A. Mueller† and **J. W. Kimball**, "An Improved Generalized Average Model of DC-DC Dual Active Bridge Converters," *IEEE Transactions on Power Electronics*, vol. 33, no. 11, pp. 9975-9988, Nov. 2018.
10. J. A. Mueller† and **J. W. Kimball**, "Accurate Energy Use Estimation for Nonintrusive Load Monitoring in Systems of Known Devices," *IEEE Transactions on Smart Grid*, vol. 9, no. 4, pp. 2797–2808, July 2018.
11. W. Zhang† and **J. W. Kimball**, "DC-DC Converter Based Photovoltaic Simulator with a Double Current Mode Controller," *IEEE Transactions on Power Electronics*, vol. 33, no. 7, pp. 5860–5868, July 2018.
12. M. G. Fikru, G. Gelles, A.-M. Ichim, **J. W. Kimball**, J. D. Smith, and M. J. Zawodniok, "An Economic Model for Residential Energy Consumption, Generation, Storage and Reliance on Cleaner Energy," *Renewable Energy*, vol. 118, pp. 429–438, Apr. 2018.
13. J. A. Mueller† and **J. Kimball**, "An Efficient Method of Determining Operating Points of Droop-Controlled Microgrids," *IEEE Transactions on Energy Conversion*, vol. 32, no. 4, pp. 1432–1446, Dec. 2017.

14. L. Müller† and **J. W. Kimball**, “High gain dc-dc converter based on the Cockroft-Walton multiplier,” *IEEE Transactions on Power Electronics*, vol. 31, pp. 6405-6415, Sept. 2016.
15. J. A. Mueller†, M. Rasheduzzaman†, and **J. W. Kimball**, “A Model Modification Process for Grid-Connected Inverters Used in Islanded Microgrids,” *IEEE Transactions on Energy Conversion*, vol. 31, pp. 240-250, March 2016.
16. Md. Rasheduzzaman†, J. A. Mueller†, **J. W. Kimball**, “Reduced order small-signal model of microgrid systems,” *IEEE Transactions on Sustainable Energy*, vol. 6, no. 4, pp. 1292–1305, Oct. 2015.
17. M. M. Baggu†, B. H. Chowdhury, **J. W. Kimball**, “Comparison of Advanced Control Techniques for Grid Side Converter of Doubly-Fed Induction Generator Back-to-Back Converters to Improve Power Quality Performance during Unbalanced Voltage Dips,” *IEEE Journal on Emerging and Selected Topics in Power Electronics*, vol. 3, pp. 516-524, June 2015.
18. Md. Rasheduzzaman†, J. A. Mueller†, **J. W. Kimball**, “An accurate small-signal model of inverter-dominated islanded microgrids using  $dq$  reference frame,” *IEEE Journal on Emerging and Selected Topics in Power Electronics*, vol. 2, pp. 1070-1080, Dec. 2014.
19. L. Müller†, **J. W. Kimball**, “Effects of stray inductance on hard-switched switched capacitor converters,” *IEEE Transactions on Power Electronics*, vol. 29, pp. 6276-6280, Dec. 2014.
20. L. Müller†, **J. W. Kimball**, “A dynamic model of switched-capacitor power converters,” *IEEE Transactions on Power Electronics*, vol. 29, pp. 1862-1869, April 2014.
21. H. Qin†, **J. W. Kimball**, “Closed-loop control of dc-dc dual active bridge converters driving single-phase inverters,” *IEEE Transactions on Power Electronics*, vol. 29, pp. 1006-1017, Feb. 2014.
22. T. Paul†, **J. W. Kimball**, M. Zawodniok, T. P. Roth, B. McMillin, S. Chellappan, “Unified invariants for cyber-physical switched system stability,” *IEEE Transactions on Smart Grid*, vol. 5, pp. 112-120, Jan. 2014.
23. H. Qin†, **J. W. Kimball**, “Solid state transformer architecture using ac-ac dual active bridge converter,” *IEEE Transactions on Industrial Electronics*, vol. 60, pp. 3720-3730, Sept. 2013.
24. J. M. Henry†, **J. W. Kimball**, “Switched-Capacitor Converter State Model Generator,” *IEEE Transactions on Power Electronics*, vol. 27, pp. 2415-2425, May 2012.
25. A. M. Bazzi, **J. W. Kimball**, K. Kepley, P. T. Krein, “IGBT and diode loss estimation under hysteresis switching,” *IEEE Transactions on Power Electronics*, vol. 27, pp. 1044-1048, March 2012.
26. H. Qin†, **J. W. Kimball**, “Generalized Average Modeling of Dual Active Bridge DC-DC Converter,” *IEEE Transactions on Power Electronics*, vol. 27, pp. 2078-2084, April 2012.
27. **J.W. Kimball**, M. Zawodniok, “Reducing Common-Mode Voltage in Three-Phase Sine-Triangle PWM with Interleaved Carriers,” *IEEE Transactions on Power Electronics*, vol. 26, pp. 2229-2236, August 2011.

28. J.M. Henry†, **J.W. Kimball**, “Practical performance analysis of complex switched-capacitor converters,” *IEEE Transactions on Power Electronics*, vol. 26, pp. 127-136, January 2011.
29. **J. W. Kimball**, B. T. Kuhn, R. S. Balog, “System design approach for unattended solar energy harvesting supply,” *IEEE Transactions on Power Electronics*, vol. 24, pp. 952-962, April 2009.
30. **J. W. Kimball**, P.T. Krein, “Singular perturbation theory for dc-dc converters and application to PFC converters,” *IEEE Transactions on Power Electronics*, vol. 23, pp. 2970-2981, November 2008.
31. **J.W. Kimball**, P.T. Krein, “Discrete-time ripple correlation control for maximum power point tracking,” *IEEE Transactions on Power Electronics*, vol. 23, pp. 2353-2362, September 2008.
32. **J.W. Kimball**, J.T. Mossoba, P.T. Krein, “A stabilizing, high-performance controller for input series-output parallel converters,” *IEEE Transactions on Power Electronics*, vol. 23, pp. 1416-1427, May 2008.
33. **J.W. Kimball**, P.T. Krein, Y. Chen, “Hysteresis and delta modulation control of converters using sensorless current mode,” *IEEE Transactions on Power Electronics*, vol. 21, pp. 1154-1158, July 2006.
34. T. Esumi, **J.W. Kimball**, P.T. Krein, P.L. Chapman, P. Midya, “Dynamic maximum power point tracking of photovoltaic arrays using ripple correlation control,” *IEEE Transactions on Power Electronics*, vol. 21, pp. 1282-1291, September 2006.
35. **J.W. Kimball**, P.T. Krein, K.R. Cahill, “Modeling of capacitor impedance in switching converters,” *IEEE Power Electronics Letters*, vol. 3, pp. 136-140, December 2005.
36. R.S. Balog, Z. Sorchini, **J.W. Kimball**, P.L. Chapman, P.T. Krein, “Modern laboratory based education for power electronics and electric machines,” *IEEE Transactions on Power Systems*, vol. 20, pp. 538-547, May 2005.
37. **J.W. Kimball**, T.L. Flowers, P.L. Chapman, “Low-input-voltage, low-power boost converter design issues,” *IEEE Power Electronics Letters*, vol. 2, pp. 96-99, September 2004.

### **Conference Papers**

1. V. R. Chowdhury† and **J. W. Kimball**, “Operation of a Three-Phase Standalone Inverter With Online Parameter Update By Instantaneous Charge Transfer Estimation,” in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, Oct. 2020, pp. 2563–2568, doi: 10.1109/ECCE44975.2020.9236095.
2. A. Moeini†, M. Dabbaghjamanesh, and **J. W. Kimball**, “Q-Learning-Based Smart Selective Harmonic Current Mitigation-PWM (S2HCM-PWM) for Grid-Connected Converters,” in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, Oct. 2020, pp. 5068–5075, doi: 10.1109/ECCE44975.2020.9236369.
3. A. Moeini†, S. H. Kankanala†, and **J. W. Kimball**, “DC Link Voltage Balancing of the Active Front-End for the Extreme Fast Charging Stations,” in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, Oct. 2020, pp. 2945–2952, doi: 10.1109/ECCE44975.2020.9236377.

4. V. R. Chowdhury† and **J. W. Kimball**, “Negative Virtual Capacitance to Eliminate Resonance Oscillations in a Three-Phase Inverter with LCL Filter,” in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, Oct. 2020, pp. 4520–4525, doi: 10.1109/ECCE44975.2020.9235656.
5. V. R. Chowdhury†, K. J. Prasad Veeramraju†, J. Li, J. Park, R. Landers, and **J. W. Kimball**, “Battery Degradation Modeling and Optimal Usage in a Microgrid Using Markov Decision Process,” in *2019 North American Power Symposium (NAPS)*, Oct. 2019, pp. 1–6, doi: 10.1109/NAPS46351.2019.9000375.
6. K. J. P. Veeramraju† and **J. W. Kimball**, “An Improved Method for the Practical Determination of Core and Copper Losses in High Frequency Switchmode Transformers,” in *2019 North American Power Symposium (NAPS)*, Oct. 2019, pp. 1–5, doi: 10.1109/NAPS46351.2019.9000251.
7. K. J. P. Veeramraju† and **J. W. Kimball**, “An Improved Power Processing Unit for Multi-Mode Monopropellant Electrospray Thrusters for Satellite Propulsion Systems,” in *Proc. 2019 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2019, pp. 1302–1309.
8. V. R. Chowdhury† and **J. W. Kimball**, “Grid Voltage Estimation and Feedback Linearization based Control of a Three phase Grid Connected Inverter under Unbalanced Grid Conditions with LCL Filter,” in *Proc. 2019 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2019, pp. 2979–2984.
9. S. Mukherjee, P. Shamsi, M. Ferdowsi, and **J. Kimball**, “Indirect Grid Current Control of LCL Filter based Grid-Connected Converter,” in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 3024–3031.
10. V. R. Chowdhury† and **J. W. Kimball**, “Voltage Sensorless Control of a Three-phase Grid Connected Inverter with LCL filter based on Passivity under Non-ideal Grid Voltage Conditions,” in *2019 IEEE Power and Energy Conference at Illinois (PECI)*, 2019, pp. 1–8.
11. V. R. Chowdhury† and **J. W. Kimball**, “Adaptive Feedback Linearization Based Control of a Three-Phase Grid Connected Inverter under Non-Ideal Grid Voltage Condition,” in *2019 IEEE Power and Energy Conference at Illinois (PECI)*, 2019, pp. 1–5.
12. M. Rasheduzzaman, P. Fajri, **J. W. Kimball**, and A. A. S. Khan, “Voltage Mode Control of Single-Phase Boost Inverter in  $dq$  Reference Frame,” in *IECON 2018 - 44th Annual Conference of the IEEE Industrial Electronics Society*, 2018, pp. 1574–1579.
13. J. A. Mueller† and **J. W. Kimball**, “Analysis of Soft-Switching Performance for a DC-DC Dual Active Bridge Converter with Randomly Varying Loads,” in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 4246–4253.
14. S. Mukherjee, V. R. Chowdhury†, and **J. Kimball**, “Control of a three phase boost rectifier under unbalanced grid conditions without grid voltage sensors,” in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 1521–1527.
15. V. R. Chowdhury†, S. Mukherjee, and **J. Kimball**, “A Voltage Sensorless Control of a Three Phase Grid Connected Inverter Based on Lyapunov Energy Function Under Unbalanced Grid Voltage Condition,” in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 4884–4888.

16. W. St. Pierre† and **J. W. Kimball**, “Minimum Dwell Times for the Stability of Switched Systems with Multiple Stable Operating Points,” in *Proc. American Control Conference (ACC)*, Milwaukee, WI, 2018, pp. 3798-3803.
17. B. P. Baddipadiga, S. Strathman†, M. Ferdowsi, and **J. W. Kimball**, "A high-voltage-gain DC-DC converter for powering a multi-mode monopropellant-electrospray propulsion system in satellites," in *Proc. IEEE Applied Power Electronics Conf.*, 2018, pp. 1561–1565.
18. P. Jain†, J. A. Mueller†, R. Landers, J. Park, and **J. W. Kimball**, “Battery Optimization in Microgrids using Markov Decision Process Integrated with Load and Solar forecasting,” in *Proc. IEEE Intl. Symp. Power Electronics for Distributed Generation Systems*, Charlotte, NC, 2018, pp. 1–6.
19. G. Mpenbele† and **J. W. Kimball**, “A Matrix Representation of a Markov Jump Linear System Applied to a Standalone Microgrid,” in *Proc. IEEE Intl. Symp. Power Electronics for Distributed Generation*, Charlotte, NC, 2018, pp. 1–8.
20. J. A. Mueller†, D. C. Wunsch, and **J. W. Kimball**, "Active Stabilization of Line-regulating Converters with Constant Power Loads," in *Proceedings of the North American Power Symposium*, Wheeling, WV, 2017, pp. 1–6.
21. G. Mpenbele† and **J. Kimball**, "Analysis of a standalone microgrid stability using generic Markov jump linear systems," in *2017 IEEE Power and Energy Conference at Illinois (PECI)*, 2017, pp. 1–8.
22. J. A. Mueller† and **J. W. Kimball**, "Generalized Average Modeling of DC Subsystem in Solid State Transformers," in *Proceedings of the IEEE Energy Conversion Congress and Exposition*, Cincinnati, OH, 2017, pp. 1659–1666.
23. J. A. Mueller† and **J. W. Kimball**, “Model-based Determination of Closed-Loop Input Impedance for Dual Active Bridge Converters,” in *Proceedings of the IEEE Applied Power Electronics Conference and Exposition*, 2017, pp. 1039-1046.
24. M. Rasheduzzaman, S. Khorbotly, and **J. W. Kimball**, “A modified SRF-PLL for phase and frequency measurement of single-phase systems,” in *2016 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2016, pp. 1–7.
25. L. Müller† and **J. W. Kimball**, “High frequency core coefficient for transformer size selection,” in *2016 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2016, pp. 1–6.
26. M. Fikru, G. Gelles, A.M. Ichim, **J. W. Kimball**, J. D. Smith, and M. J. Zawodniok, “An economic model for residential energy consumption, generation and reliance on solar energy,” extended abstract presented by Fikru at Missouri Valley Economic Association (MVEA) Conference, October 2016.
27. M. Fikru, G. Gelles, A.M. Ichim, **J. W. Kimball**, and J. D. Smith, “Economic analysis for residential solar photovoltaic systems in Missouri,” extended abstract presented by Ichim at Missouri Valley Economic Association (MVEA) Conference, October 2016.

28. J. A. Mueller† and **J. W. Kimball**, “An Accurate Method of Energy Use Prediction for Systems with Known Consumption,” in *Proceedings of the 3rd International Workshop on Non-Intrusive Load Monitoring*, Vancouver, Canada, 2016.
29. W. Zhang† and **J. W. Kimball**, "DC-DC Converter Based Photovoltaic Simulator with a Double Current Mode Controller," in *Proceedings of the Power & Energy Conference at Illinois*, 2016.
30. L. Müller†, M. Mohammed†, and **J. W. Kimball**, “Using the Arduino Uno to teach digital control of power electronics,” in *Proceedings of the IEEE Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2015.
31. S. Alalwani†, **J. W. Kimball**, “Optimal sizing of a wind/solar/battery hybrid microgrid system using the ForeverPower method,” in *Proceedings of the IEEE Green Technologies Conference*, 2015, pp. 29-35.
32. T. Paul†, H. Ravindra, M. Steurer, **J. W. Kimball**, “Voltage stability preserving invariants for smart grids,” in *Proc. Power and Energy Conference at Illinois (PECI)*, 2015, pp. 1-6.
33. A. Alzahrani†, **J. W. Kimball**, C. Dagli, “Predicting solar irradiance using time series neural networks,” presented at Complex Adaptive Systems, 2014. Published in *Procedia Computer Science*, vol. 36, pp. 623-628, Nov. 2014.
34. F. Alfaris†, A. Alzahrani†, **J. W. Kimball**, “Stochastic model for PV sensor array data,” in *Proc. Intl. Conf. Renewable Energy Research and Application (ICRERA)*, 2014, pp. 798-803.
35. L. Müller†, **J. W. Kimball**, “Dual-input high gain dc-dc converter based on the Cockroft-Walton Multiplier,” in *Proc. Energy Conversion Congress and Exposition (ECCE)*, 2014, pp. 5360-5367.
36. A. Choudhari, H. Ramaprasad, S. Chellappan, B. McMillin, **J. Kimball**, M. Zawodniok, “Adaptive Scheduling with Explicit Congestion Notification in a Cyber-Physical Smart Grid System,” in *Proc. 40th Euromicro Conference on Software Engineering and Advanced Applications*, 2014, pp. 309-317.
37. J. A. Mueller†, A. Sankara, **J. W. Kimball**, B. McMillin, “Hidden Markov models for nonintrusive appliance load monitoring,” in *Proc. North American Power Symposium*, 2014, pp. 1-6.
38. M. Rasheduzzaman†, T. Paul†, J. W. Kimball, “Markov jump linear system analysis of microgrid stability,” in *Proc. American Control Conference*, 2014, pp. 5062-5066.
39. M. Rasheduzzaman†, J. Mueller†, **J. W. Kimball**, “Small-signal modeling of a three-phase isolated inverter with both voltage and frequency droop control,” in *Proc. Applied Power Electronics Conference (APEC)*, 2014, pp. 1008-1015.
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41. **J. W. Kimball**, “Performance analysis of generalized algebraic switched capacitor converters,” in *Proc. Energy Conversion Congress and Exposition (ECCE)*, 2013, pp. 1808-1813.

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44. A. Vinod, A. Kashyap†, A. Banerjee, and **J. Kimball**, “Augmenting energy extraction from vortex induced vibration using strips of roughness/thickness combinations,” in *Proc. 1<sup>st</sup> Marine Energy Technology Symposium*, 2013, pp. 1-10.
45. R. Ahmadi, A. Kashyap†, A. Berrueta Irigoyen†, A. Rayachoti†, C. Wright†, and **J. W. Kimball**, “Selective source power converter for improved photovoltaic power utilization,” in *Proc. Power and Energy Conference at Illinois (PECI)*, 2013, pp. 247-252.
46. A. Kashyap†, **J. W. Kimball**, “Input voltage control of SEPIC for maximum power point tracking,” in *Proc. Power and Energy Conference at Illinois (PECI)*, 2013, pp. 30-35.
47. Z. Johnson†, N. McFowland†, L. Müller†, K. Peterson†, J. Jensby†, and **J. W. Kimball**, “High-gain dc-dc conversion for parallel photovoltaic arrays,” in *Proc. IEEE Applied Power Electronics Conference (APEC)*, 2013, pp. 2871-2875.
48. H. Qin†, **J. W. Kimball**, “Closed-loop control of dc-dc dual active bridge converters driving single-phase inverters,” in *Proc. IEEE Energy Conversion Congress and Exposition (ECCE)*, 2012, pp. 173-179.
49. T. El-mezyani, R. Wilson, J. Leonard, C. Edrington, S. Srivastava, M. Khazraei, H. Qin†, **J. Kimball**, M. Ferdowsi, “Evaluation of nonlinearity and complexity in SSTs systems,” in *Proc. IEEE International Systems Conference (SysCon)*, 2012.
50. L. D. Watson†, **J. W. Kimball**, S. Atcitty, “Linear single phase inverter model for battery energy storage system evaluation and controller design,” in *Proc. IEEE Applied Power Electronics Conference*, 2012, pp. 1861-1867.
51. J. Zhao†, **J. W. Kimball**, “A digitally implemented photovoltaic simulator with a double current mode controller,” in *Proc. IEEE Applied Power Electronics Conference*, 2012, pp. 53-58.
52. T. Paul†, **J. W. Kimball**, M. Zawodniok, T. P. Roth, B. McMillin, “Invariants as a unified knowledge model for cyber-physical systems,” in *Proc. IEEE International Conference on Service Oriented Computing and Applications (SOCA’11)*, December 2011.
53. V. Lobo, A. Banerjee, N. Mainsah†, **J. Kimball**, “Hydrokinetic energy harvesting system from vortex induced vibrations of submerged bodies,” in *Proc. ASME Joint Conference on Environmental Sustainability and Fuel Cells*, 2011, paper ES-FuelCell2011-54353.

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66. **J.W. Kimball**, J. Henry†, "Compatibility between GFCI breakers and household adjustable speed drives," in *Proceedings of the Energy Conversion Congress and Exposition (ECCE)*, 2009, pp. 517-520.
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- inverters,” in *Proceedings of the IEEE Applied Power Electronics Conference (APEC)*, 2009, pp. 637-641.
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73. **J.W. Kimball**, "An efficient discontinuous-mode model of a switch pole," in *Proceedings of the IEEE Computers in Power Electronics Workshop (COMPEL)*<sup>†</sup>, 2006, pp. 260-263.
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75. **J.W. Kimball**, M. Amrhein, "Machine design considerations for the Future Energy Challenge," in *Proceedings of the Electrical Manufacturing Conference*<sup>†</sup>, 2005, pp. 448-453.
76. **J.W. Kimball**, J.T. Mossoba, P.T. Krein, "Control technique for series input-parallel output converter topologies," in *Record of the IEEE Power Electronics Specialists Conference (PESC)*, 2005, pp. 1441-1445.
77. **J.W. Kimball**, "Modeling controlled switches and diodes for electro-thermal simulation," in *Record of the IEEE Power Electronics Specialists Conference (PESC)*, 2005, pp. 2175-2179.
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79. **J.W. Kimball**, P.T. Krein, "Analysis and design of switched capacitor converters," in *Proceedings of the IEEE Applied Power Electronics Conference (APEC)*, 2005, pp. 1473-1477.
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83. P.T. Krein, **J.W. Kimball**, "Series-parallel approaches and clamp methods for extreme dynamic response with advanced digital loads," in *Proceedings of the IEEE Workshop on Computers in Power Electronics (COMPEL)*<sup>†</sup>, 2004, pp. 85-88.
84. **J.W. Kimball**, T.L. Flowers, P.L. Chapman, "Issues with low-input-voltage boost converter design," in *Record of the IEEE Power Electronics Specialists Conference (PESC)*, 2004, pp. 2152-2156.
85. **J. Kimball**, P.T. Krein, "Real-time optimization of dead time for motor control inverters," in *Record of the IEEE Power Electronics Specialists Conference (PESC)*, 1997, pp. 597-600.
86. **J. Kimball**, P.T. Krein, "Continuous-time optimization of gate timing for synchronous rectification," in *Proceedings of the Midwest Symposium on Circuits and Systems*, 1996, pp. 1015-1018.
87. P. Midya, P.T. Krein, R.J. Turnbull, R. Reppa, **J. Kimball**, "Dynamic maximum power point tracker for photovoltaic applications," in *Record of the IEEE Power Electronics Specialists Conference (PESC)*, 1996, pp. 1710-1716.

### ***Technical Magazine Articles***

1. R.S. Balog, J.W. Kimball, "Printed circuit board design for power electronics," *IEEE Power Electronics Society Newsletter*, pp. 10-12, Fourth Quarter 2006.
2. J.W. Kimball, P.L. Chapman, "Power converters for micro fuel cells," *Power Electronics Technology*, vol. 30, pp. 48-54, Oct. 2004.
3. J.W. Kimball, P.L. Chapman, "Power converters for micro fuel cells," *FUEL CELL*, vol. 4, pp. 30-33, Oct./Nov. 2004.
4. J. Kimball, B. Kuhn, "Battery equalization to extend useful operating life of rechargeable battery packs," *Battery Power Products and Technology*, vol. 8, pp. 19-21, Sept. 2004.

### ***Patents***

1. P. L. Chapman, B. T. Kuhn, R. S. Balog, **J. W. Kimball**, P. T. Krein, A. Gray, and T. Esram, "Apparatus and method for controlling DC-AC power conversion," U.S. Patent No. 9,806,628, October 31, 2017.
2. P. L. Chapman, B. T. Kuhn, R. S. Balog, **J. W. Kimball**, P. T. Krein, and A. Gray, "Apparatus for converting direct current to alternating current using multiple converters," U.S. Patent No. 9,722,504, August 1, 2017.

3. P. L. Chapman, B. T. Kuhn, R. S. Balog, **J. W. Kimball**, P. T. Krein, A. Gray, and T. Eswam, "Apparatus and method for controlling DC-AC power conversion," U.S. Patent No. 9,225,256, Dec. 29, 2015.
4. P. L. Chapman, B. T. Kuhn, R. S. Balog, **J. W. Kimball**, P. T. Krein, A. Gray, "Apparatus for converting direct current to alternating current," U.S. Patent No. 9,093,919, July 28, 2015.
5. P. L. Chapman, B. T. Kuhn, R. S. Balog, **J. W. Kimball**, P. T. Krein, and A. Gray, "Apparatus for converting direct current to alternating current using a frequency converter," U.S. Patent No. 9,093,919, July 28, 2015.
6. K. Kepley and **J. W. Kimball**, "Bi-directional DC/DC converter and battery testing apparatus with converter," U.S. Patent No. 8,929,099, January 6, 2015.
7. P. L. Chapman, B. T. Kuhn, R. S. Balog, **J. W. Kimball**, P. T. Krein, A. Gray, T. Eswam, "Apparatus and method for controlling dc-ac power conversion," U.S. Patent No. 8,482,947, July 9, 2013.
8. **J.W. Kimball**, P.T. Krein, N.D. Benavides, "Modular system for unattended energy generation and storage," U.S. Patent No. 8,350,411, January 8, 2013.
9. P. L. Chapman, B. T. Kuhn, R. S. Balog, **J. W. Kimball**, P. T. Krein, A. Gray, "Apparatus for converting direct current to alternating current using an active filter to reduce double-frequency ripple power of bus waveform," U.S. Patent No. 8,279,642, October 2, 2012.
10. **J.W. Kimball**, P. T. Krein, N.D. Benavides, "Apparatus and method for controlling a power supply," U.S. Patent No. 7,982,434, July 19, 2011.
11. **J.W. Kimball** and P.T. Krein, "Ripple correlation control based on limited sampling," U.S. Patent No. 7,681,090, March 16, 2010.
12. **J.W. Kimball**, P.T. Krein, and N.D. Benavides, "Apparatus and method for controlling multiple power supplies," U.S. Patent No. 7,663,342, February 16, 2010.
13. **J.W. Kimball**, P.T. Krein, N.D. Benavides, "Modular System for Unattended Energy Generation and Storage," U.S. Patent 7,994,657, August 9, 2011.
14. P. Chapman, P.T. Krein, **J. Kimball**, T.L. Flowers, "Method and Apparatus for Starting Power Converters," U.S. Patent 7,078,883, July 18, 2006.

### **Invited Talks**

1. "Topics and Challenges in Utility Interactive Systems," University of Illinois at Urbana-Champaign, on October 8, 2018, power area graduate seminar series.
2. "Energy Storage is More than Batteries and Capacitors," IEEE Applied Power Electronics Conference and Exposition, industry session, March 30, 2017.
3. "Nonintrusive Load Monitoring with Applications to Microgrid Stability Analysis," Ohio State University, Columbus, OH, on March 11, 2016, power area graduate seminar series.
4. "Non-Intrusive Load Monitoring at the Solar Village," University of Pittsburgh, Pittsburgh, PA, on March 20, 2015, graduate seminar sponsored by Center for Energy and the Mascaro Center for Sustainable Innovation.

5. "Parallel Connected Solar Arrays," Iowa State University, Ames, IA, on October 11, 2011, power area graduate seminar series.

### **Research Grants**

1. "Enabling Extreme Fast Charging with Energy Storage," PI, Department of Energy, \$2,915,377 (20% shared credit), Oct. 2018-Oct. 2022.
2. "CPS: Medium: Collaborative Research: Trusted CPS from Untrusted Components," co-PI, National Science Foundation, \$962,695 (20% shared credit), Oct. 2018-Oct. 2021; PI: Bruce McMillin.
3. "Optimal Energy Scheduling in Microgrids with Photovoltaic (PV) Generation and Energy Storage Systems," co-PI, National Science Foundation, \$315,303 (25% shared credit), Sept. 2016-Aug. 2019; PI: Jonghyun Park.
4. "Multi-Mode MicroPropulsion CubeSat Technology Demonstration Mission," co-PI, Utah State University (part of the University Nanosatellite Program), \$55,000 (20% shared credit), Dec. 2015-Dec. 2016; PI: Joshua Rovey.
5. "Use of Multi-Mode Propulsion to Expand CubeSat Mission Capabilities," co-PI, National Air and Space Administration, \$199,911 (20% shared credit), 2016; PI: Joshua Rovey.
6. "Collaborative Research:Breakthrough:Secure Algorithms for Cyber-Physical Systems," PI, National Science Foundation, \$349,298 (50% shared credit), April 2015-March 2018, co-PI: Bruce McMillin; collaborator: Mo-Yuen Chow, North Carolina State University.
  - a. REU Supplement added May 2016 (\$16,000)
7. "The Solar Endowment," PI, Midwest Renewable Energy Association, subaward from Department of Energy, \$130,253 (50% shared credit), Jan. 2015-Dec. 2016, co-PI: Tony Arnold.
8. "Analysis of Practical Microgrid Stability in the Presence of Random Events," PI, National Science Foundation, \$307,057 (100% shared credit), Aug. 2014-July 2017.
9. "The MidAmerica Regional Microgrid Education and Training (MARMET) Consortium," co-PI, Department of Energy, \$4,299,856 (27% shared credit), Oct. 2013-Oct. 2018; PI: Mariesa Crow.
10. "REU Site: Technologies for Renewable Energy Generation and Management," PI, National Science Foundation, \$341,232 (40% shared credit), June 2012-May 2016; co-PIs: Curt Elmore, Mehdi Ferdowsi, Joel Burken, Stuart Baur.
11. "P3: Selective Source AC/DC Power Supply," PI, Environmental Protection Agency, \$14,430 (100% shared credit), Aug. 2011-Aug. 2012.
12. "Waves, Wind, and Scavengers: Next Generation Renewable Energy Systems for Naval Applications," co-PI, Office of Naval Research, \$1,962,000 (16% shared credit, \$313,920), Aug. 2010-Aug. 2014; PI: Rajiv Mishra (later K. Chandrashekhara).
13. "EISG: Module-Level Power Converters for Parallel-Connected Photovoltaic Arrays," PI, California Energy Commission, \$94,998 (100% shared credit), Jan. 2010-Dec. 2010.
14. "Advanced Electric Drive Vehicles – A Comprehensive Education, Training, and Outreach Program," key personnel, Department of Energy, \$4,914,999 (9% shared credit, \$442,350), Jan. 2010-Dec. 2013; PI: Mehdi Ferdowsi.
15. "Parallel-Connected Solar Arrays for Flexible Installation and Improved Output Power," PI, Leonard Wood Institute, \$233,629 (100% shared credit), Sept. 2009-Sept. 2010.

16. "Improved Photovoltaic Arrays with Local Switched-Capacitor Converters," PI, National Science Foundation, \$292,912 (100% shared credit), Sept. 2009-Aug. 2013.
17. "Future Renewable Electric Energy Delivery and Management (FREEDM) Systems Center," co-PI, National Science Foundation, \$3,164,040 awarded to date (14% shared credit prior to Aug. 2012, now 21%, totaling \$542,766), Sept. 2008-Aug. 2018; PI: Mariesa Crow.
18. "Switched-Capacitor Converters for Alternative Energy Applications," PI, University of Missouri System Research Board, \$32,200 (100% shared credit), Aug. 2008-July 2010.

### **Teaching Activities**

#### *Current Institution (Missouri S&T, since January 2008)*

- "Power Quality," Spring 2017. This is a senior/graduate level course that covers both system-level and device-level power quality concerns.
- "Electromechanics," Spring 2008, Fall 2008, Fall 2009, Fall 2010, Fall 2011 through Spring 2019, Spring 2020. This is a junior-level semi-required course for electrical engineering majors. There is an optional associated laboratory for which I am the coordinator. Course topics focus on electric machines, from basic physics through applications.
- "Senior Project I," Fall 2013, Spring 2015, Spring 2016. This is the first semester of a two-semester senior design sequence, for both electrical and computer engineers.
- "Senior Project II," Spring 2014, Fall 2016. This is the second semester of a two-semester senior design sequence, for both electrical and computer engineers.
- "Photovoltaic Systems," Spring 2014, Spring 2016, co-taught with C.-H. Wu. This is a senior/graduate level course on PV system design. I am 2/3 responsible.
- "Power Converter Modeling and Design," Spring 2009, Spring 2011, Spring 2013, Fall 2015, Fall 2017, Fall 2019. This is a new graduate-level course that I introduced. Course topics include all aspects of switching power converters, and their interrelationships.
- "Power Electronics," Spring 2010, Fall 2014. This is a senior-level/graduate-level elective. Course topics include the fundamentals of switching power conversion and dc-dc, dc-ac, and ac-dc converters.
- "Power Electronics Laboratory," Spring 2010. This is a non-required accompanying lab for Power Electronics.

#### *Previous Institution (University of Illinois at Urbana-Champaign)*

- "Power Circuits and Electromechanics," three semesters. This is a junior-level semi-required course for electrical engineering majors. Topics include three-phase circuits and electric machines.
- "Future Energy Challenge," two semesters. This was a new course developed around a student team that competed in an international competition. Students who chose this course received credit for senior design.

### **Licenses and Memberships**

Professional Engineer in the State of Illinois, license 062-057980, since 21 December 2004. Senior Member of IEEE, and of the Power Electronics Society, Industry Applications Society, and Industrial Electronics Society.

Member of Eta Kappa Nu, Tau Beta Pi, and Phi Kappa Phi national honor fraternities.

### **Service Activities**

#### *External*

- IEEE Applied Power Electronics Conference: Publications Chair, topic co-chair, and member of the organizing committee, 2009-2014 meetings. In 2014, placed on the succession plan: assistant program chair for 2015, program chair for 2016, general chair for 2017, steering committee chair for 2018, currently member of steering committee.
- Associate Editor, IEEE Journal of Emerging and Special Topics in Power Electronics (JESTPE), April 2019 to present.
- NCEES Fundamentals of Engineering Exam Development Committee, January 2019 to present.
- Member-At-Large of Administrative Committee of the Power Electronics Society of IEEE (2010-2012). Appointed member of nominating committee (March 2011-September 2012) and education chair (2011-2015).
- IEEE Energy Conversion Congress and Exposition: Publications Chair, 2012.
- Chairperson, Industry Applications Society Chapter of the St. Louis Section of IEEE, August 2012 to December 2015.
- Chairperson, Central Illinois Section of IEEE, 2006-2007.
- Reviewer for numerous journals and conferences.

#### *Campus/Department*

- ECE department Promotion & Tenure chair, November 2020 to present.
- Budgetary Affairs Committee, August 2020 to present.
- Intelligent Systems Center (ISC) director search committee chair, May 2020.
- Intellectual Property committee chair, October 2018 to present.
- University Tenure & Promotion Policy committee member, March 2020 to present.
- ECE department Wilkens Professorship faculty search committee member, January 2020.
- CS department faculty search committee member, September 2018 to March 2019.
- Sustainability Minor committee member, August 2016 to August 2018.
- “Mentoring Monday” mentor, Spring 2016 to 2018.
- Mars Rover Design Team: Technical advisor, May 2016 to present.
- Satellite Research Team: Technical advisor, February 2015 to present.
- Title IX Equity Resolution Process panelist pool member, April 2015 to present.
- ECE department teaching committee: Member, September 2015 to present.
- ECE department chair search committee member (2014).
- CEC associate dean of research search committee member (2018).
- ECE faculty search committee member: Electronics (2012), Power (2012), EMC (2015), Controls (2015). Faculty search committee chair: Power (2016).
- ECE department scholarship committee: Member, September 2011 to present.
- Solar Decathlon: Technical advisor, February 2010 to present.

- Vehicle Design Summit: Student team advisor, March 2008 to fall 2009.
- Freshman advising, January 2008 to present. PRO advising, spring 2009 to present.
- Judge, Undergraduate Research Conference, Missouri S&T, April 2008, April 2009, April 2010, April 2011, April 2012, April 2016, April 2019.
- GTA assessment, January 2008, January 2010, August 2010, August 2011, August 2012, August 2013, January 2015, January 2016, August 2016.
- Taught Electronics merit badge for Boy Scout Merit Badge University at Missouri S&T: January 2012, January 2013, January 2014, February 2015, February 2016.