

# ***Mark H. McKinney, Ph.D.***

## ***CURRICULUM VITAE***

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### **EDUCATION**

#### **Ph.D. in Electrical Engineering**

*University of South Carolina, December 1999*

*Dissertation Topic*

*Polymer Current Limiters for Low-voltage Power Distribution Systems*

#### **Master of Engineering in Electrical Engineering**

*University of South Carolina, December 1995*

#### **Bachelor of Science in Electrical Engineering**

*University of South Carolina, December 1993*

### **EXPERIENCE**

**Professor of Electrical Engineering** - September 2015 - Present

**Associate Professor of Electrical Engineering** - September 2003 – September 2015

**Assistant Professor of Electrical Engineering** - September 1997 – September 2003

*Department of Electrical and Computer Engineering, The Citadel*

Responsible for development, coordination, and instruction of both lecture and laboratory courses in all aspects of undergraduate electrical engineering education. Experience in teaching nearly 60% of the courses offered. Advise students at all levels. Serve as member and chair of various departmental and college-wide committees.

**Research Engineer** - May 2013 – Present

*Duke Energy eGRID, Clemson University SCE&G Energy Innovation Center*

Research engineer working on the initial design and implementation of a 15MVA, four-quadrant grid simulator. Responsible for the initial design of the communication and data acquisition systems for the hardware-in-the-loop grid simulator.

**Researcher** - May 2012 – December 2012

*Department of Electrical Engineering, The University of South Carolina (Joint Project)*

Researcher investigating the feasibility of scaling a power-converter DC protection system to levels sufficient for a medium voltage shipboard power distribution system.

**Engineer** - September 2007 – March 2014

*Space and Naval Warfare Center, Atlantic, North Charleston, South Carolina*

Part time engineer in the advanced technology branch. Responsible for analysis and assessment of emerging technologies for use by emergency responders.

**Consulting Engineer** - May 2000 – May 2003

*KryoTech, West Columbia, South Carolina*

Responsible for software design and hardware integration of sub-degree temperature control algorithm utilizing LabVIEW for use in vapor-phase refrigeration of microprocessors.

## **Doctoral Research - December 1995 – August 1999**

*Department of Electrical Engineering, The University of South Carolina*

Principle researcher for Polymer Current Limiter Project. Worked with Westinghouse and the Naval Surface Warfare Center to model and develop high power polymer current limiting technology. Developed electro-thermal models of PCL devices and molded-case circuit-breakers using ACSL (Advanced Continuous Simulation Language) for electrical and thermal analysis of devices under dynamic self-heating conditions and to study interactions of PCL devices with low-voltage circuit-breakers.

## **ADDITIONAL RESEARCH EXPERIENCE**

### **LabVIEW Integration with The Virtual TestBed**

Researched feasibility of integrating LabVIEW virtual instruments and models into the Virtual TestBed Platform.

### **Commercial Feasibility Testing of Miniature BOSS Switches**

Primary research assistant. Conducted literature review of existing work. Designed and produced masks for testing of GaAs switches. Set up and performed experiments to gather data on existing devices.

### **Electron Beam Generation Utilizing Pseudospark Discharge**

Primary research assistant. Designed and built pseudospark electron beam generation device. Set up and performed experiments to study physical characteristics of pseudospark discharges.

## **COURSES TAUGHT:**

*\* indicates principle instructor for class*

- ELEC 104 – Introduction to Engineering I\*
- ELEC 105 – Introduction to Engineering II\*
- ELEC 106 – Introduction to Electrical Engineering \*
- ELEC 201 – Electric Circuits I\*
- ELEC 202 – Electric Circuits II\*
- ELEC 204 – Electric Circuits Laboratory
- ELEC 206 – Computer Applications for Electrical Engineers
- ELEC 301 – Linear Systems Laboratory
- ELEC 302 – Electromechanical Energy Conversion Laboratory
- ELEC 306 – Electronics I\*
- ELEC 308 – Elements of Electrical Engineering for non-majors\*
- ELEC 311 – Digital Logic and Circuits
- ELEC 313 – Electronics Laboratory\*
- ELEC 401 – Electronics II\*
- ELEC 401a – Power Electronics\*
- ELEC 403 – Electric Power Systems\*
- ELEC 405 – Instrumentation and Measurements\*

- ELEC 415 – Instrumentation and Measurements Laboratory\*
- ELEC 416 – Communications Engineering\*
- ELEC 421 – Electrical Engineering Design I\*
- ELEC 422 – Electrical Engineering Design II\*

### **PEER REVIEWED PUBLICATIONS**

- M. McKinney, D. Millare, "Parasitic Modeling and Evaluation of SiC MOSFETs for Evolving Power Systems," *2018 IEEE Electronic Power Grid (eGrid)*, Charleston, SC, 2018.
- J. Leonard, R. Hadidi, J. C. Fox, T. Salem, B. Gislason and M. H. McKinney, "Evaluating Megawatt-Scale Smart Solar Inverters: A Commissioned 2.5-MW dc Supply for Testing Grid-Tie Inverters," in *IEEE Industry Applications Magazine*, vol. 24, no. 5, pp. 52-61, Sept.-Oct. 2018.
- D. Millare, R. Hadidi, M. H. McKinney, J. Leonard and J. C. Fox, "Calculations for Asymmetrical Fault Synthesis for Evaluating Ride-Through of Grid Connected Solar Inverters," *2018 9th IEEE International Symposium on Power Electronics for Distributed Generation Systems (PEDG)*, Charlotte, NC, 2018, pp. 1-5.
- N. LaFlair, M. H. McKinney and R. Hadidi, "Arc flash risk assessment for a megawatt scale medium voltage research and testing facility," *2017 North American Power Symposium (NAPS)*, Morgantown, WV, 2017, pp. 1-5.
- J. Leonard, T. Salem, R. Hadidi, B. Gislason, J. C. Fox and M. H. McKinney, "Design and commissioning of 2.5 MW DC supply for evaluating megawatt scale smart solar inverters," *2016 IEEE Industry Applications Society Annual Meeting*, Portland, OR, 2016, pp. 1-5.
- M. H. McKinney, J. C. Fox, E. R. Collins, K. Bulgakov and T. E. Salem, "Design, Development, and Commissioning of a Multimegawatt Test Facility for Renewable Energy Research," in *IEEE Transactions on Industry Applications*, vol. 52, no. 1, pp. 11-17, Jan.-Feb. 2016.
- J. Leonard, J.C. Fox, R. Hadidi, B. Gislason, M.H. McKinney, "Experimental PWM Method Validation of a 9-level 4.16 kV Series Connected H-bridge Grid Simulator," *Power and Energy Conference at Illinois (PECI), 2016 IEEE*, Champaign, IL, 2016.
- M. H. McKinney, J. C. Fox and B. Gislason, "Design and validation of a communication and control system for a 20MVA hardware-in-the-loop renewable energy test facility," *Innovative Smart Grid Technologies Conference (ISGT), 2015 IEEE Power & Energy Society*, Washington, DC, 2015, pp. 1-5.
- M. H. McKinney, J. C. Fox, B. Gislason and T. Salem, "Controller Hardware-In-the-Loop validation of a magnetic core saturation algorithm for fault ride-through evaluations," *Power Electronics, Electrical Drives, Automation and Motion (SPEEDAM), 2014 International Symposium on*, Ischia, 2014, pp. 290-294.

- J. C. Fox, M. McKinney, E. R. Collins, K. Bulgakov and T. Salem, "A multi-megawatt test facility for renewable energy research," *Industry Applications Society Annual Meeting, 2014 IEEE*, Vancouver, BC, 2014, pp. 1-5.
- Mark McKinney, "The eGRID Controller – Design and Benchmarking" *2<sup>nd</sup> Annual International Workshop on Grid Simulator Testing of Energy Systems and Wind Turbine Powertrains*, N. Charleston, SC, Sept. 17–18, 2014.
- M.H. McKinney and R. Hayne, "Interdisciplinary laboratory projects integrating LabVIEW with VHDL models implemented in FPGA hardware" *2010 ASEE National Convention*, Louisville, KY, June 2010.
- M.H. McKinney, "Using PSpice Behavior Modeling to Teach Communications Topics" *2006 Frontiers in Education*, San Diego, CA, October 2006.
- M.H. McKinney and R. Barsanti, "Sparking Interest in Middle and High School Students Using a Robotics Competition" *Proceedings of the 2006 Southeastern ASEE Conference*, Tuscaloosa, AL, April 2006.
- M.H. McKinney and C. Wall, "Control of a Laboratory-Based Thermal Management System" *Proceedings of the 2003 ASME International Electronic Packaging Technical Conference*, Maui, HI, July 6-11, 2003.
- M.H. McKinney, "LabVIEW in the Undergraduate EE Classroom - The Rebirth of the Measurements Lab" *Proceedings of the 2003 Southeastern ASEE Conference*, Macon, GA, April 2003.
- M.H. McKinney, "LabVIEW in the Electronics Lab," *2001 Southeastern ASEE Conference*, Charleston, SC, April 2001.
- M.H. McKinney, C. W. Brice, and R. A. Dougal, "Polymer Current Limiters for Low-Voltage Power Distribution Systems," *1997 Industrial and Commercial Power Systems Technical Conference*, Philadelphia, PA, May 1997.
- F.E. Peterkin, K.H. Schoenbach, R. Block, R.A. Dougal, M. McKinney, "Studies of Breakdown in Photoconductive Power Switches," *Conference Record of the 21st Power Modulator Symposium*, Costa Mesa, California, June 1994.

#### **NON REFEREED PUBLICATIONS**

- J. Curtiss Fox, Mark McKinney, Benjamin Gislason, "Controlling a Hardware-in-the-loop Grid Simulator for the World's Most Powerful Renewable Energy Test Facility" National Instrument's Case Study and 2014 NI Week Keynote Presentation.
- "Portable Radar Systems Application Note," System Assessment and Validation for Emergency Responders (SAVER) Program, United States Department of Homeland Security Science and Technology Directorate, October 2011.
- "Night Vision Devices Market Survey Report," System Assessment and Validation for Emergency Responders (SAVER) Program, United States Department of Homeland Security Science and Technology Directorate, January 2011.

- “*Mobile Electric Generators for Emergency Response Application Note*,” System Assessment and Validation for Emergency Responders (SAVER) Program, United States Department of Homeland Security Science and Technology Directorate, August 2009.
- “*Portable Pumps for Flood Management Market Survey Report*,” System Assessment and Validation for Emergency Responders (SAVER) Program, United States Department of Homeland Security Science and Technology Directorate, October 2008.
- “*Counter-IED Technologies TechNote*,” System Assessment and Validation for Emergency Responders (SAVER) Program, United States Department of Homeland Security Science and Technology Directorate, July 2008.

### **GRANTS AND AWARDS**

- Citadel School of Engineering Presentation of Research Grant, 2018 eGRID Conference
- Citadel Foundation Presentation of Research Grants, 2014, IAS Annual Conference
- Citadel Foundation Faculty Development Grant, 2010, ASEE National Conference
- Citadel Foundation Presentation of Research Grant 2006, IEEE FIE Conference
- NSF Grant: *Robotics as the Backbone for Integrated Grades 5-16 Learning to Enhance Undergraduate Electrical and Computer Engineering Programs*, November 2011, Co-PI with Dr. Tim Burg of Clemson University, unfunded.
- US Army STTR Topic A07-T015, Portable Fully-Automated Soil Property Measurement Probe: *Lightweight In-Situ Soil Analysis Device*, March 2007, Submitted with KaZak Composites and Ed Hajduk of The Citadel, unfunded.
- The Alcoa Foundation Proposal: *Engineering Opportunities for Rural South Carolina Students and Teachers*, December 2005, submitted with Timothy W. Mays and Kevin Bower of The Citadel, unfunded.
- Citadel Foundation Presentation of Research Grant 2003,
- Citadel Foundation Research Grant, 2002, Virtual TestBed Research
- Citadel Foundation Faculty Development Grant, 2002

### **SERVICE AND OUTREACH ACTIVITIES**

- *Tenure and Promotion Committee Chair, 2018/2019 academic year*  
Responsible for the organization of the process by which all faculty are granted tenure and promotion at The Citadel. Responsibilities include: updating college-wide T&P regulations, coordinating between faculty and administration, collecting and disseminating materials presented by faculty for T&P considerations, disseminating information to the faculty regarding T&P guidelines, and for collecting and compiling T&P decisions from the committee.
- *Electrical and Computer Engineering Scholarship Committee Chair, 2014-present*  
Responsible for the process awarding of nearly \$100,000 in scholarship monies to students majoring in electrical and computer engineering.
- *Citadel Leadership Day Facilitator, October 2015, 2016, 2017, 2018*  
Led a one-day seminar at Lifecycle Engineering for Citadel Seniors. Spent a day

working alongside the CEO and engineers from LifeCycle Engineering to discuss leadership topics with Citadel engineering seniors.

- *Faculty Fellow for Service Learning, 2012*  
Developed and led a multi-day outreach activity to nearly 600 elementary school students from Richland County School District 2. Developed and organized several hands-on projects for the students to learn about electrical engineering. Helped organize a student-led version of the activities to meet the service learning objectives of The Citadel
- *Citadel Summer STEM Camp, Summer 2011 & Summer 2012*  
Developed and led a weeklong summer camp for middle school students. Introduced the engineering design process and programming techniques through the use of Lego robotics competitions.
- *Citadel Coordinator for National Engineers Week Activities, 1997 – Present*  
Initiated an annual Engineers Week Fair which occurs on The Citadel Campus every Saturday before Engineers Week. Developed two robotics competitions for middle and high school students. Organize and plan annual competitions in which 300-400 students participate.
- *Citadel Summer STEM Initiative, Summer 2008*  
Created an electrical engineering curriculum for middle and high school students participating in extracurricular engineering clubs across the state. Conducted a weeklong “teaching the teachers” workshop on teaching engineering design concepts to middle and high school students.
- *Sabbaticals Committee Chair, 2006/2007 academic year and 2007/2008 academic year*  
Responsible for collecting, distributing, and reviewing applications for sabbatical from Citadel faculty. Also responsible for organizing interviews with applicants.
- *Citadel Committee Membership: Faculty Council, Library Committee, Research Committee, Undergraduate Admissions Committee, Curriculum, Tenure and Promotion*  
Attend and participate in all meetings and participate on subcommittees as needed.
- Citadel representative to Charleston Engineers’ Joint Council, 2005-2008  
Helped to plan Annual Engineer of the Year banquet. Located and booked speaker for the 2007 banquet.
- Faculty Advisor for The Citadel Student Branch of IEEE, 1999-2008

#### AWARDS AND AFFILIATIONS

- *2016 J. Lawton and Emmah S. Ellis Electrical and Computer Engineering Teaching Award*
- National Instruments Engineering Impact Award Finalist, 2014
- *Lightning Bolt Award for Engineering Excellence* 2010, 2012, 2013, SPAWAR Systems Center, Atlantic
- *2010 C.A. Medberry Award for Dedication to Teaching*
- Senior Member of IEEE, Institute of Electrical and Electronics Engineers 2014
- Other Professional Memberships:
  - Phi Kappa Phi National Honors Society

- Tau Beta Pi
- ASEE – American Society for Engineering Education
- Eta Kappa Nu Engineering Honors Society
- Golden Key National Honors Society
- National Order of the Engineer
- 1st place, IEEE regional paper competition, February 1993 - “*Current Research on Pseudospark Discharge*”

### **PROFESSIONAL DEVELOPMENT ACTIVITIES**

- *2018 IEEE Electronic Power Grid (eGrid)*, Charleston, SC, November 12-14, 2018
- *2018 9th IEEE International Symposium on Power Electronics for Distributed Generation Systems (PEDG)*, Charlotte, NC, 2018
- *Innovative Smart Grid Technologies Conference (ISGT)*, 2015 IEEE Power & Energy Society, Washington, DC, 2015
- *2014 Industry Applications Society Annual Meeting*, Vancouver, BC, October 5-9, 2014
- *2<sup>nd</sup> Annual International Workshop on Grid Simulator Testing of Energy Systems and Wind Turbine Powertrains*, N. Charleston, SC, Sept. 17–18, 2014
- *The SCE&G Energy Innovation Center Grand Opening Technical Workshop*, N. Charleston, SC, November 20, 2013
- *NSF-ECEDHA Energy and Power Summer Program*, July 8-12, 2011
- *2010 ASEE National Conference*, Louisville, KY, June 20-23, 2010
- *Center for Reforming Undergraduate Education in Electric Energy Systems Faculty Workshop*, Minneapolis, MN, Jun 17-22, 2007
- *2007 IEEE SouthEastCon Conference*, Richmond, VA, March 22-25, 2006
- *2006 Frontiers in Education Conference*, San Diego, CA, October 2006
- *2006 IEEE SouthEastCon Conference*, Memphis, TN, March 30-April 3, 2006
- *2005 Frontiers in Education Conference*, Indianapolis, IN, October 2005
- *2005 IEEE SouthEastCon Conference*, Ft. Lauderdale, FL, April 7-10, 2005
- *2003 ASME International Electronic Packaging Technical Conference*, Maui, HI, July 6-11, 2003
- *2003 Southeastern Section of the ASEE Conference*, Macon, GA, April 2003
- *2002 National Instruments’ NIWeek*, Austin, TX, July 2002
- *2001 Southeastern Section of the ASEE Conference*, Charleston, SC, April 2001
- *2000 ASEE National Conference*, St. Louis, MO, June 18-21, 2000
- *1997 Industrial and Commercial Power Systems Technical Conference*, Philadelphia, PA, May 1997

**OTHER SKILLS**

Proficient in: LabVIEW, Spice, MathCAD, MAPLE, MATLAB, C++, ACSL (Fortran based simulation package), AutoCAD, TurboCAD.