

U.C. Foundation Associate Professor, Electrical Engineering, UTC

College of Engineering & Computer Science

735 Vine Street, Chattanooga, TN 37403

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RESEARCH INTEREST

- Power & Energy**
 - Power Electronics & Drives; Power System; and Sustainable Energy.
- Controls**
 - Motion Drives and Control; Robotics; Application of Intelligent Controls.
- Automotive**
 - Diesel engine and after-treatment (emission) controls development.
 - Virtual sensors development for engine and after-treatment systems.

EDUCATION

- May 2006: Ph.D.** in Electrical Engineering; Howard University, Washington DC. Major in advance/intelligent controls application.
- May 2003: M.Eng.** degree in Electrical Engineering from Howard University, Washington DC. This degree was a major in power system application and controls.
- July 1999: B.Sc.** degree in Electrical & Electronic Engineering; Graduated with first class honors from Kwame Nkrumah University of Science and Technology(KNUST), Kumasi, Ghana.

PROFESSIONAL REGISTRATION

- Registered Professional Engineer (PE) in the State of Tennessee, 2013.

PROFESSIONAL EXPERIENCE

ACADEMIC

Associate Professor, Tenured

Aug '10 – Present

The University of Tennessee at Chattanooga, Tennessee USA

- Teach Electrical engineering courses and labs
 - Courses taught includes: Circuits I (ENEE 2700), Circuits II (ENEE 2720), Analog Electronics and Lab (ENEE 3720 & 3720L), Power Electronics and Lab (ENEE 4600 & 4600L), Power Electronics and Drives (ENEE 5610), Instrumentation -includes LabVIEW and PLC (ENEE 4800), Linear Controls and Drives Lab (ENEE 4790), Fundamentals of Engineering and Professionalism (ENEE 4900), Artificial Neural Networks (Graduate) and Fuzzy Logic and Intelligent Controls Applications (Graduate).
- Developed new labs for power electronics, control & drives and upgraded the PLC lab.

Research Assistant,

Spr '03 – Spr '06

Howard University, Washington DC

Developed and implemented real-time control algorithms for industrial applications using advance digital control, adaptive control techniques and intelligent control for alternative energy systems, drives, automation and power networks. Hardware implementation of most of these control techniques were illustrated using industrial standard rapid prototyping tools like dSPACE systems.

Teaching Assistant,

Fall '04 – Spr '06

Howard University, Washington DC

Developed and wrote experimental procedures and guidelines for the interdisciplinary undergraduate system dynamics and control laboratory to enhance quality of instruction at the university. Taught the following lab sessions, *linear controls lab*, *energy conversion lab*, and *introduction to electrical engineering lab*. Graded lab reports, mid-term and final exam papers.

INDUSTRIAL

Senior Controls Engineer,

July '06 – June '10

Cummins Inc., Columbus Indiana, USA

Some Responsibilities: (i) Develop and implement real-time control algorithms and strategies for diesel automotive applications to meet specific control objectives utilizing classical, advanced and intelligent control techniques. (ii) Implemented and validated real-time diagnostic and control algorithms on various diesel engines platforms using rapid controls prototyping systems. (iii) Developed electronic hardware and software controls for waste heat recovery systems and electric hybrid-diesel power systems.

Internship Experience,

Summer 1998

Benso Oil Palm Plantation, Unilever, Ghana.

Major task included redesigning the one-line power diagram of the main factory while a minor assignment involved the design and implementation of control circuits for the protection of factory motors. A final project was to conduct and estimate the monthly power consumption for all small businesses around the factory housing units for billing purposes, which were then operating without any billing. Projected increase in profit averaged 10% annually if implemented. Attended a one week workshop training on "*Improving Energy efficiency and minimizing of energy wastage in industries*".

COMPUTER SKILLS:

- Skilled with Microsoft Office Applications, Windows and UNIX Operating System.
- Skilled with Mathematical, Design and Electronic Simulation Tools: P-Spice Schematics, Simulink, MATLAB, LABVIEW and PSIM.
- Skilled with Information Technology Applications: Web-Page Publishing, FrontPage, and HTML

SERVICE

- Faculty advisor for the IEEE UTC Student branch chapter 2013 – Current.
- IEEE – IAS officer of the Industrial Automation and Controls Committee (IACC) since 2009 to present (secretary, vice-chair and **currently chair** of the IACC technical committee).
- **Associate Editor** and reviewer for IEEE Industrial Application Society (IAS) –IEEE, 2009 – Current.
- Faculty coordinator for the EE department undergraduate curriculum program development and also in charge of the EE department website development/maintenance.
- Created a new EE department ABET course folder assessment form in the summer of 2014 to replace the old assessment form. The new form has since been modified about thrice to its current final form.

SERVICE (continued)

- Current and active member of the Engineering-Computer Science College Curriculum Committee.
- Current and active member of the university-wide Departmental Honors Committee for the past two academic years.
- An active member of the university-wide Classroom Technology Committee for two academic years (2011 – 2013).
- Mentored the TVA/JC-Penney High school Robotic teams in the area of LabVIEW programming and the use of electrical sensors in their robot; went to the regional competition in Knoxville with the teams in 2012, 2013 and 2014.

BOOK CHAPTER:

- “Multilayer Fuzzy Controller for Control of Power Networks,” Chapter 17, *Advanced Fuzzy Logic Technologies in Industrial Applications*, Edited by Ying Bai, Hanqi Zhuang and Dali Wang. Springer, 2006.

SELECTED PUBLICATIONS:

1. R. Sowah, M. A. Acquah, A. R. Ofoli, G. A. Mills and K. M. Koumadi, “**Rotational Energy Harvesting To Prolong Flight Duration Of Quadcopters**”, IEEE Industry Applications Conference Record, Addison, TX, USA, Oct. 18-22, 2015.
2. D. L McPherson and A. R. Ofoli, “**BasketBallBot: Teaching Intelligent and Fuzzy Controls to Highschoolers using LabView, MATLAB, and Arduino**”, 2015 IEEE SoutheastCon, April 9-12, in Fort Lauderdale, FL.
3. R. Sowah, A. R. Ofoli, S. Krakani, and S. Fiawoo, “**Hardware Module Design of a Real-time Multi-Sensor Fire Detection and Notification System using Fuzzy Logic**”, IEEE Industry Applications Conference Record, Vancouver, BC, Canada, Oct. 5-10, 2014.
4. R. Sowah, A. R. Ofoli, S. Krakani, and S. Fiawoo, “**A Web-based Communication Module Design of a Real-time Multi-Sensor Fire Detection and Notification System**”, IEEE Industry Applications Conference Record, Vancouver, BC, Canada, Oct. 5-10, 2014.
5. A. R. Ofoli “**Experimental Demonstration of ammonia storage and slip modeling with control for an SCR aftertreatment system**,” *IEEE Transaction on Industry Applications*, vol. 50, Issue 4, pp. 2342-2348, Jul.-Aug. 2014.
6. N. Sisworahardjo, A. R. Ofoli, S. Craven, and A. Eltom, “**State-of-the-Art Laboratories for Training the Modern Power Workforce**”, IEEE PES General Meeting, 21 - 25 July 2013, Vancouver, BC, Canada.
7. A. R. Ofoli, A. Khaled and B. Patel, “**A Robust Adaptive-Fuzzy Controller for Different System Applications**” IEEE Industry Applications Conference Record, Orlando, FL, Oct. 6-10, 2013.
8. N. Boakye-Boateng, A. R. Ofoli, “**Real-Time Simulation of a Doubly-Fed Induction Generator Based Wind Power System on eMEGASim® Digital Simulator**” IEEE Industry Applications Conference Record, Orlando, FL, Oct. 6-10, 2013.
9. A. Rubaii, A. R. Ofoli, “**Teaching Power Electronics Converter Experiments That Integrates Fuzzy Logic Approach**,” ASEE Annual Conference, Vancouver, BC, Canada, June 26-29, 2011.

PUBLICATIONS (continued)

10. A. Khaled, A. R. Ofoli and M. Castro, “**An Incremental Sliding Mode Controller (ISMC) for Chattering Reduction**,” IEEE Industry Applications Conference Record, Orlando, FL, Oct. 9-13, 2011.
11. A. Rubaai, M. J. Castro-Sitiriche, and A. R. Ofoli, “**Design and Implementation of Parallel Fuzzy PID Controller for High-Performance Brushless Motor Drives: An Integrated Environment for Rapid Control Prototyping**”. *IEEE Transaction on Industry Applications*, vol. 44, Issue 4, pp. 1090-1098, Jul.-Aug. 2008.
12. A. Rubaai, A. R. Ofoli, and D. Cobbinah, “**DSP-Based Real-Time Implementation of a Hybrid $H \infty$ Adaptive Fuzzy Tracking Controller for Servo-Motor Drives**”. *IEEE Transaction on Industry Applications*, vol. 43, Issue 2, pp. 476-484, March-April 2007.
13. A. R. Ofoli and A. Rubaai, “**Real-Time Implementation of a Fuzzy Logic Controller for Switch-Mode Power-Stage DC-DC Converters**”. *IEEE Transaction on Industry Applications*, vol. 42, Issue 6, pp. 1367-1374, Nov.-Dec. 2006.
14. Ahmed Rubaai, A. R. Ofoli, L. Burge III and M. Garuba, “**Hardware implementation of an adaptive network-based fuzzy controller for DC-DC converters**”. *IEEE Transaction on Industry Applications*, vol. 41, Issue 6, pp. 1557-1565, Nov.-Dec. 2005.
15. Ahmed Rubaai, and A. R. Ofoli, “**Multi-Layer Fuzzy Controller for Control of Power Networks**”. *IEEE Transaction on Industry Applications*, vol. 40, Issue 6, pp. 1521-1528, Nov.-Dec. 2004.
16. A. Rubaai, and A. R. Ofoli, “**Design and Analysis of Nonlinear Digital Controllers-Based Two-level Hierarchy for Electric Utility Industry**,” *IEEE Transaction on Industry Applications*, vol. 39, pp. 395-407, March/April 2003.

WORKSHOPS AND SEMINARS

- Seminar (8hrs), “Transformer Diagnostics”, University of Tennessee at Chattanooga (UTC), Oct 3rd 2013.
- Seminar (1hr), “EPB's Demand Response”, University of Tennessee at Chattanooga (UTC), April 10, 2013.
- NSF/ONR/DOE Workshop on Electric Energy Systems Curriculum hosted at Napa, California from Feb. 07 - Feb. 10, 2013. (Presented two posters)
- DOE-Sponsored Nationwide Consortium of Universities to Revitalize Electric Power Engineering Education by State-of-the-Art Laboratories at UMN in August 2012.
- Two faculty development seminars by Dr. Rockquomore organized by the Office of Equity & Diversity on (September 29, 2011 at The University of Tennessee at Chattanooga (UTC)):
 - (i) “*Tenure & Time Management: How to Manage Your Time so You Can Publish Prolifically AND Have a Life Beyond the Ivory Tower*” and
 - (ii) “*Every Semester Needs a Plan: How to Create a Strategic Plan For Your Research and Writing & The Secret to Actually Doing It!*”
- ONR-NSF sponsored Faculty Development Workshop in Electric Energy Systems for U.S. faculty interested in teaching Electric Energy Systems courses. June 6 – 12, 2010.
- Seminar (8hrs), “Smart Grid - IEC 61850”, University of Tennessee at Chattanooga (UTC), Nov. 2nd 2010.

CONFERENCES ATTENDED

- IAS Annual Conference meeting in Vancouver, BC, Canada. October 5-9, 2014.
- IAS Annual Conference meeting in Orlando, FL. October 6-10, 2013.
- IEEE Region 3 Annual conference (SoutheastCon 2013), Jacksonville, FL. April 4-7, 2013.
- IAS Annual Conference meeting in Las Vegas, NV from October 6-11, 2012.
- IAS Annual Conference meeting in Houston, TX from October 3-6, 2011.
- ASEE Annual Conference, Vancouver, BC, Canada. June 26-29, 2011.
- IAS Annual Conference meeting in Houston, TX from October 3-6, 2010.

GRANT ACTIVITIES

- Charles Margraves (Principal), Jennifer Ellis (Co- Principal), Trevor Elliott (Co- Principal), Abdul Ofoli (Co-Principal), "Introduction to Sustainability: Using a Zero+ Energy Building as a Living Laboratory for Middle School Students (ITEST-Strategies)", Sponsored by National Science Foundation, \$1.1 million. Nov. 2014 (Pending).
- Farah Kandah (Principal), Joseph Kizza (Co-Principal), Jim Henry (Co-Principal), William Sutton (Co- Principal), Abdul Ofoli (Co- Principal), Bryan Ennis (Co- Principal), "IRNC: ENgage - Research and Education Development of Open Virtual Laboratories, Networked for the Global Community (R&E DOVLab)," Sponsored by National Science Foundation, \$2.1 million. Aug. 2014, (Pending).
- Abdul Ofoli (Principal), "Test system for wind power grid", Sponsored by Southeastern Center for Electrical Engineering Education (SCEEE), \$16000. April 2014. (Not funded).
- Bryan Ennis (Principal), Abdul Ofoli (Co-Principal), "ENGR 3280L and NI Academy Control Lab Project", Sponsored by UTC ThinkAchieve Grant of the Walker Center for Teaching and Learning, \$1,500.00 (Aug. – Dec, 2013).
- N. Sisworahardjo (Principal), Abdul Ofoli (Co-Principal), Aldo McLean (Co-Principal), "Post Disturbance Automatic Electric Distribution Network Reconfiguration" Sponsored by UTC Office of Partnerships & Sponsored Programs, \$10,000 (Aug. 2012 – July 2013).
- Abdul Ofoli (Principal), "Characterization and Management of Energy Storage System for Solar Power", Sponsored by National Science Foundation BRIGE, \$174,752. January 2012. (Not funded).
- Abdul Ofoli (Principal), "Equipment to upgrade Electrical Engineering Laboratories at UTC", Sponsored by TN Board of Architecture & Engineering Examiners (TBAAEE), \$20,120, (January 1, 2011 - June 30, 2011).
- Ahmed Eltom (Principal), Ed McMahon (Co-Principal), Stephen Craven (Co-Principal), Abdul Ofoli (Co-Principal), "Workforce Training for the Electric Power Sector (TEPS)" Sponsored by the department of energy (DOE), \$2.4 Million, (June 1, 2010 - July 12, 2014).

ACHIEVEMENTS

- Recipient of the 2013-2014 campus-wide SGA "*Outstanding Professor of the Year Award*" at the University of Tennessee at Chattanooga, April 2014.
- Recipient of the "*Teacher of the Year Award*" in the College of Engineering and Computer Science, April 2013.

ACHIEVEMENTS (continued)

- Recipient of the “*Outstanding Faculty Teacher of the Year Award*” in the EE Department in April 2011 and 2013.
- Recipient of the award: “*Keep the Stars Shining Performance Award*” UTC in 2012.
- Recipient of the “*Outstanding Faculty Researcher of the Year Award* in the EE Department in April 2012.
- Four patents received in the area of automotive engine controls for work at Cummins Inc.
- Recipient of the 2006 IEEE/IAS **Transaction Second Prize Paper Award**, September 2007.

PROFESSIONAL MEMBERSHIPS:

- IEEE, Senior Member
- IEEE Industrial Application Society (IAS)
- IEEE Education Society Membership
- IEEE Young Professionals
- IEEE Power & Energy Society Membership
- American Society for Engineering Education (ASEE)

PATENTS

□ **Patent Application 1800.2.44**

- EBU 8-02-12955 (Kunzler 1844), Controlling Ammonia Slip on an Ammonia Oxidation Catalyst (AMOX).

□ **Patent Application 1800.2.46**

- EBU 8-02-12957 (Kunzler 1846), Method of Determining the Amount of Ammonia and Isocyanic Acid in an SCR Catalyst.

□ **Patent Application 1800.2.47**

- EBU 8-02-12924 (Kunzler), Tracking NH₃ Storage for Improved Control of the Selective Catalytic Reduction (SCR) Process.
- EBU 8-02-12954 (Kunzler 1841), Estimating Ammonia Storage and Ammonia Slip on an SCR Catalyst.
- EBU 8-02-12960 (Kunzler 1847), NH₃ Storage Controls for Improved Control of Transient NO_x Emissions Using a Selective Catalytic Reduction (SCR) Process.

PROFESSIONAL SERVICE:

- **Associate Editor** for Industrial Application Society (IAS) –IEEE, 2009 – Current.
- **Chair** for Industrial Automation and Control Committee of IEEE-IAS, Jan. 2013- Dec. 2015.
- IEEE-IAS officer as **Technical Committee Paper Review Chair (TCPRC)** for Industrial Automation and Controls Committee (IACC), Jan. '11 – Dec. '13.
- **Vice-Chair** for Industrial Automation and Control Committee of IEEE-IAS, Jan. '11 – Dec. '12.
- **Secretary** for Industrial Automation and Control Committee of IEEE-IAS, Jan. '09 – Dec. '10.
- **Reviewer** for Industrial Application Society (IAS) –IEEE, 2008 - Current.