

## **CURRICULUM VITAE**

### **ALI EMADI**

#### **PRESENT APPOINTMENT**

Harris Perlstein Endowed Chair Professor and Director,  
Electric Power and Power Electronics Center and Grainger Laboratories  
Electrical and Computer Engineering Department  
Illinois Institute of Technology  
3301 S. Dearborn Street  
Chicago, IL 60616, USA  
Phone: +1-312-567-8940  
Fax: +1-312-567-8976  
E-mail: [emadi@iit.edu](mailto:emadi@iit.edu)  
URL: <http://hybrid.iit.edu>

#### **UNIVERSITY SPIN-OFF START-UP COMPANY**

Founder, President, and CTO,  
Hybrid Electric Vehicle Technologies, Inc. (HEVT<sup>1</sup>)  
3424 South State Street, Suite 1A9-1  
Chicago, IL 60616, USA  
Phone: +1-312-235-3602  
Fax: +1-312-235-3603  
E-mail: [emadi@hevt.com](mailto:emadi@hevt.com)  
URL: <http://hevt.com>

#### **HOME ADDRESS**

1841 S. Calumet Ave., Suite 1404  
Chicago, IL 60616, USA  
Phone: +1-312-929-3689  
Cell: +1-312-593-5497

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<sup>1</sup> HEVT is an Illinois Institute of Technology spin-off company.

## SHORT BIOGRAPHY



Ali Emadi (IEEE S'98-M'00-SM'03) received the B.S. (1995) and M.S. (1997) degrees in electrical engineering with highest distinction from Sharif University of Technology, Tehran, Iran. He also received his Ph.D. degree (2000) in electrical engineering from Texas A&M University, College Station, TX. He is currently the Harris Perlstein Endowed Chair Professor of Engineering and the Director of the Electric Power and Power Electronics Center and Grainger Laboratories at Illinois Institute of Technology (IIT) in Chicago, where he has established research and teaching facilities as well as courses in power electronics, motor drives, and vehicular power systems. In addition, Dr. Emadi is the Founder, President, and CTO of Hybrid Electric Vehicle Technologies, Inc. (HEVT) – a university spin-off company of IIT.

Dr. Emadi is the recipient of numerous awards and recognitions. He has been named a Chicago Matters Global Visionary in 2009. He was named the Eta Kappa Nu Outstanding Young Electrical Engineer of the Year 2003 (single international award) by virtue of his outstanding contributions to hybrid electric vehicles by the Electrical Engineering Honor Society. He also received the 2005 Richard M. Bass Outstanding Young Power Electronics Engineer Award from the IEEE Power Electronics Society. In 2005, he was selected as the Best Professor of the Year by the students at IIT. Dr. Emadi is the recipient of the 2002 University Excellence in Teaching Award from IIT as well as the 2004 Sigma Xi/IIT Award for Excellence in University Research. He directed a team of students to design and build a novel motor drive, which won the First Place Overall Award of the 2003 IEEE/DOE/DOD International Future Energy Challenge for Motor Competition.

Dr. Emadi is the principal author/co-author of over 250 journal and conference papers as well as several books including *Vehicular Electric Power Systems: Land, Sea, Air, and Space Vehicles* (Marcel Dekker, 2003), *Energy Efficient Electric Motors* (Marcel Dekker, 2004), *Uninterruptible Power Supplies and Active Filters* (CRC Press, 2004), *Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design* (CRC Press, 2004), and *Integrated Power Electronic Converters and Digital Control* (CRC Press, 2009). Dr. Emadi is also the editor of the *Handbook of Automotive Power Electronics and Motor Drives* (Marcel Dekker, 2005).

Dr. Emadi was the founding General Chair of the 1<sup>st</sup> IEEE Vehicle Power and Propulsion Conference (VPPC'05), which was co-located under his chairmanship with the Society of Automotive Engineers (SAE) International Future Transportation Technology Conference. He is currently the Chair of the IEEE Vehicle Power and Propulsion Steering Committee, Chair of the Technical Committee on Transportation Power Electronics of the IEEE Power Electronics Society, and Chair of the Power Electronics Technical Committee of the IEEE Industrial Electronics Society. He has also served as the Chair of the 2007 IEEE International Future Energy Challenge.

Dr. Emadi is the Editor (North America) of the International Journal of Electric and Hybrid Vehicles. He has been the Guest Editor-in-Chief of the Special Issue on Automotive Power Electronics and Motor Drives, *IEEE Transactions on Power Electronics*. He has also been the Guest Editor of the Special Section on Hybrid Electric and Fuel Cell Vehicles, *IEEE Transactions on Vehicular Technology* and Guest Editor of the Special Section on Automotive Electronics and Electrical Drives, *IEEE Transactions on Industrial Electronics*. He has served as an Associate Editor of the *IEEE Transactions on Vehicular Technology*, *IEEE Transactions on Power Electronics*, and *IEEE Transactions on Industrial Electronics*.

## **EDUCATION**

- Ph.D. (highest distinction), Electrical Engineering, specializing in Power Electronics and Motor Drives, Texas A&M University, College Station, Texas, Aug. 2000.  
Dissertation Title: Modeling, Analysis, and Stability Assessment of Multi-Converter Power Electronic Systems  
Dissertation Advisor: Prof. Mark Ehsani
- M.S. (highest distinction), Electrical Engineering, specializing in Power Electronics, Sharif University of Technology, Tehran, Iran, April 1997.  
Thesis Title: Modeling and Control of Power Electronic Converters using Generalized State Space Averaging Method  
Thesis Advisor: Prof. Javad Mahdavi
- B.S. (highest distinction), Electrical Engineering, Sharif University of Technology, Tehran, Iran, July 1995.  
Thesis Title: Harmonic Forecasting in Electric Power Systems using Artificial Neural Networks  
Thesis Advisor: Prof. Ali M. Ranjbar

## **RESEARCH AND TEACHING INTERESTS**

- Power electronics and motor drives
- Advanced electric drive vehicles: electric, hybrid, and plug-in hybrid electric vehicles
- Transportation energy conversion and vehicular power and propulsion systems
- Renewable and efficient energy systems
- Energy and sustainability

## EXPERIENCE

- 2000-present: Electrical and Computer Engineering Department, Illinois Institute of Technology
  - 2009-present: Harris Perlstein Endowed Chair Professor in Engineering
  - 2006-present: Full Professor
  - 2005-2006: Associate Professor
  - 2000-2005: Assistant Professor
- 2002-present: Electric Power and Power Electronics Center, Illinois Institute of Technology
  - 2005-present: Director
  - 2002-2005: Assistant Director
- 2000-present: Director, Grainger Power Electronics and Motor Drives Laboratory, Illinois Institute of Technology.
- 2003-present: Founding Director and Chairman of the Board, Industry/Multi-university Consortium on Advanced Automotive Systems (IMCAAS).
- 2005-present: Founder, President, and Chief Technology Officer, Hybrid Electric Vehicle Technologies, Inc. (an Illinois Institute of Technology spin-off company).
- 2005-present: Founder and Chief Technology Officer, DigitalDrive Tech, Inc. (an Illinois Institute of Technology spin-off company).
- 1998-2000: Research Assistant, Advanced Vehicle Systems Research Program, Electrical Engineering Department, Texas A&M University.
- 1996-1997: Lecturer and Power Electronics Lab Manager, Sharif University of Technology.
- 1995-1997: Founder, President, and CEO, Samin Pazhoohesh Engineering Co., Tehran, Iran.
- 1994-1995: Project Engineer, Electrical Power Research Center, Tehran, Iran.

## HONORS AND AWARDS

### Research

- 2008 NSF \$500k Alan T. Waterman Award Nomination, for pioneering contribution in the field of automotive power electronics and motor drives for advanced automobiles, primarily hybrid electric vehicles, which accelerates the shift to environmentally friendlier transportation systems, 2007.
- 2005 Richard M. Bass Outstanding Young Power Electronics Engineer Award (single award), IEEE Power Electronics Society, 2005.
- 2005 IEEE Vehicular Technology Society's Paper of the Year Award in Automotive Electronics (single award) for the paper titled "Comparative assessment of hybrid electric and fuel cell vehicles based on comprehensive well-to-wheels efficiency analysis" published in *IEEE Transactions on Vehicular Technology*, vol. 54, no. 3, May 2005.
- 2004 IEEE Vehicular Technology Society's Paper of the Year Award in Automotive Electronics (single award) for the paper titled "Hybrid electric sport utility vehicles" published in *IEEE Transactions on Vehicular Technology*, vol. 53, no. 5, September 2004.
- 2004 Sigma Xi/IIT Award for Excellence in University Research (single award), Illinois Institute of Technology, 2004.
- 2003 Eta Kappa Nu Outstanding Young Electrical Engineer of the Year (single award) for outstanding contributions to hybrid electric vehicles, Eta Kappa Nu Association, the Electrical Engineering Honor Society, 2003.
- 2003 Best Paper Presentation Award, IEEE 29<sup>th</sup> Industrial Electronics Conference, Roanoke, VA, Nov. 2003.
- 2002 Overall Excellence in Research Award (single award), Office of the President, Illinois Institute of Technology, 2002.
- 2001 Best Paper Presentation Award, IEEE 27<sup>th</sup> Industrial Electronics Conference, Denver, Colorado, Nov. 2001.
- 2000 Electric Power and Power Electronics Institute Fellowship, Department of Electrical Engineering, Texas A&M University, 2000.

### Teaching

- 2006 First Place Award for the Interprofessional Project titled "Hybrid Electric School Bus," Illinois Institute of Technology, Dec. 2006.
- 2005 Best Professor of the Year Award (single award voted by students), IEEE Student Branch, Illinois Institute of Technology.

- Honorable Mention from the Power Sources Manufacturing Association (PSMA) – The Multi-National Power Electronics Association for the Grainger Power Electronics Initiatives at Illinois Institute of Technology, 2003.
- 2002 University Excellence in Teaching Award (single award), Illinois Institute of Technology.
- 2002 Recognition Award for Exceptional Team Performance of the Interprofessional Project titled “Hybrid Electric Vehicles,” Illinois Institute of Technology, Dec. 2002.

### **Professional**

- 2009 Named as a Chicago Matters Global Visionary for helping to make Chicago a center for hybrid technology research, development, and application. In its 19<sup>th</sup> year, Chicago Matters is a public-information series broadcast on WBEZ 91.5 FM Chicago Public Radio and WTTW Channel 11, 2009.
- 2007 Guest Editor, *IEEE Transactions on Industrial Electronics*, Special Section on Automotive Electronics and Electrical Drives, 2007.
- 2006 Guest Editor-in-Chief, *IEEE Transactions on Power Electronics*, Special Issue on Automotive Power Electronics and Motor Drives, vol. 21, no. 3, May 2006.
- 2005 Guest Editor, *IEEE Transactions on Vehicular Technology*, Special Section on Hybrid Electric and Fuel Cell Vehicles, vol. 54, no. 3, May 2005.
- 2003 First Place Overall Award, 2003 IEEE/DOE/DOD International Future Energy Challenge for Motor Competition.
- 1995 Ranked 1<sup>st</sup> in the entire B.S. Program of Sharif University of Technology, Dec. 1995.

## PUBLICATIONS AND PRESENTATIONS: SUMMARY

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Conference Papers .....	158
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## BOOKS

- [1] **A. Emadi**, *Advanced Electric Drive Vehicles*, to be published in 2010.
- [2] **A. Emadi** and M. Krishnamurthy, *Electric Motor Drives*, to be published in 2010.
- [3] **A. Emadi**, A. Khaligh, Z. Nie, Y.-J. Lee, *Integrated Power Electronic Converters and Digital Control*, Boca Raton, FL: CRC Press, ISBN: 978-1-4398-0069-0, May 2009.
- [4] **A. Emadi**, *Handbook of Automotive Power Electronics and Motor Drives*, New York, NY: Marcel Dekker, ISBN: 0-8247-2361-9, May 2005.
- [5] M. Ehsani, Y. Gao, S. E. Gay, and **A. Emadi**, *Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design*, Boca Raton, FL: CRC Press, ISBN: 0-8493-3154-4, Dec. 2004.
- [6] **A. Emadi**, A. Nasiri, and S. B. Bekiarov, *Uninterruptible Power Supplies and Active Filters*, Boca Raton, FL: CRC Press, ISBN: 0-8493-3035-1, Oct. 2004.
- [7] **A. Emadi**, *Energy-Efficient Electric Motors: Selection and Applications*, New York, NY: Marcel Dekker, ISBN: 0-8247-5735-1, Sept. 2004.
- [8] **A. Emadi**, M. Ehsani, and J. M. Miller, *Vehicular Electric Power Systems: Land, Sea, Air, and Space Vehicles*, New York, NY: Marcel Dekker, ISBN: 0-8247-4751-8, Dec. 2003.

## BOOK CHAPTERS

- [1] J. Cao, M. Krishnamurthy, and **A. Emadi**, "Battery electronics for electric and hybrid electric vehicles," *The Industrial Electronics Handbook*, CRC Press/IEEE Press, to be published in 2009.



- [2] M. Krishnamurthy, J. Cao, and **A. Emadi**, "Electrical loads in automotive systems," *The Industrial Electronics Handbook*, CRC Press/IEEE Press, to be published in 2009.
- [3] A. E. Amac and **A. Emadi**, "Uninterruptible power supplies," *McGraw-Hill Encyclopedia of Science and Technology*, 10<sup>th</sup> Edition, McGraw-Hill, 2007.
- [4] A. E. Amac and **A. Emadi**, "Uninterruptible power supplies," *The Electrical Engineering Handbook*, 3<sup>rd</sup> Edition, CRC Press, 2005.
- [5] M. Ehsani and **A. Emadi**, "Multi-converter vehicular power electronic systems: definition, dynamics, and applications," *Jubilee Power Electrical Engineering*, EdP Sciences, France, 2002.
- [6] **A. Emadi** and M. Ehsani, Chapter 21, "More electric vehicles: 21.1 aircraft and 21.2 terrestrial vehicles," *CRC Handbook of Power Electronics*, CRC Press, Nov. 2001.
- [7] J. Mahdavi, A. Agah, and **A. Emadi**, Chapter 2.2, "Choppers: one-quadrant, two-quadrant, and four-quadrant," *CRC Handbook of Power Electronics*, CRC Press, Nov. 2001.

## REFEREED JOURNAL PAPERS

- [1] A. M. Rahimi and **A. Emadi**, "Discontinuous conduction mode DC/DC converters feeding constant power loads," to be published in *IEEE Transactions on Industrial Electronics*.
- [2] Y.-J. Lee, A. Khaligh, and **A. Emadi**, "Advanced integrated bi-directional AC/DC and DC/DC converter for plug-in hybrid electric vehicles," to be published in *IEEE Transactions on Vehicular Technology*.
- [3] F. J. Perez-Pinal, I. Cervantes, and **A. Emadi**, "Stability of electric differential for traction applications," to be published in *IEEE Transactions on Vehicular Technology*.
- [4] S. M. Lukic, A. Bhandwale, and **A. Emadi**, "Novel digital control of conventional electric motor drives for home appliances," to be published in *International Journal of Power Electronics*.
- [5] A. Sathyan, N. Milivojevic, Y.-J. Lee, M. Krishnamurthy, and **A. Emadi**, "An FPGA based novel digital PWM control scheme for BLDC motor drives," *IEEE Transactions on Industrial Electronics*, vol. 56, no. 8, pp. 3040-3049, Aug. 2009.
- [6] A. M. Rahimi and **A. Emadi**, "An analytical investigation of DC/DC power electronic converters with constant power loads in vehicular power systems," *IEEE Transactions on Vehicular Technology*, vol. 58, no. 6, pp. 2689-2702, July 2009.
- [7] Y.-J. Lee, A. Khaligh, A. Chakraborty, and **A. Emadi**, "Digital combination of buck and boost converters to control a positive buck-boost converter and



- improve the output transients,” *IEEE Transactions on Power Electronics*, vol. 24, no. 5, pp. 1267-1279, May 2009.
- [8] A. M. Rahimi and **A. Emadi**, “Active damping in DC/DC power electronic converters: a novel method to overcome the problems of constant power loads,” *IEEE Transactions on Industrial Electronics*, vol. 56, no. 5, pp. 1428-1439, May 2009.
- [9] Y.-J. Lee, A. Khaligh, and **A. Emadi**, “A compensation technique for smooth transitions in noninverting buck-boost converter,” *IEEE Transactions on Power Electronics*, vol. 24, no. 4, pp. 1002-1015, April 2009.
- [10] S. M. Lukic and **A. Emadi**, “Charging ahead: The development of adequate energy storage systems in electric, hybrid electric, and plug-in hybrid electric vehicles,” *IEEE Industrial Electronics Magazine*, Dec. 2008.
- [11] S. M. Lukic, P. Mulhall, and **A. Emadi**, “Energy autonomous solar/battery auto rickshaw,” *Journal of Asian Electric Vehicles*, vol. 6, no. 2, Dec. 2008.
- [12] A. Esfandiari, M. Parniani, **A. Emadi**, and H. Mokhtari, “Application of the unified power quality conditioner for mitigating electric arc furnace disturbances,” *International Journal of Power and Energy Systems*, vol. 28, no. 4, Dec. 2008.
- [13] **A. Emadi**, Y. J. Lee, and K. Rajashekara, “Power electronics and motor drives in electric, hybrid electric, and plug-in hybrid electric vehicles,” *IEEE Transactions on Industrial Electronics*, vol. 55, no. 6, pp. 2237-2245, June 2008.
- [14] S. M. Lukic, J. Cao, R. C. Bansal, F. Rodriguez, and **A. Emadi**, “Energy storage systems for automotive applications,” *IEEE Transactions on Industrial Electronics*, vol. 55, no. 6, pp. 2258-2267, June 2008.
- [15] **A. Emadi** and K. Rajashekara, “Guest editorial special section on automotive power electronics and electrical drives,” *IEEE Transactions on Industrial Electronics*, vol. 55, no. 6, pp. 2235-2236, June 2008.
- [16] A. Khaligh and **A. Emadi**, “Mixed DCM/CCM pulse adjustment with constant power loads,” *IEEE Transactions on Aerospace and Electronic Systems*, vol. 44, no. 2, pp. 766-782, April 2008.
- [17] A. Khaligh, A. M. Rahimi, and **A. Emadi**, “Modified pulse adjustment technique to control DC/DC converters driving variable contact power loads,” *IEEE Transactions on Industrial Electronics*, vol. 55, no. 3, pp. 1133-1146, March 2008.
- [18] A. Nasiri, Z. Nie, S. Bekiarov, and **A. Emadi**, “An on-line UPS system with power factor correction and electric isolation using BIFRED converter,” *IEEE Transactions on Industrial Electronics*, vol. 55, no. 2, pp. 722-730, Feb. 2008.
- [19] A. Khaligh, A. M. Rahimi, Y. J. Lee, J. Cao, **A. Emadi**, S. D. Andrews, C. Robinson, and C. Finnerty, “Digital control of an isolated active hybrid fuel cell/Li-ion battery power supply,” *IEEE Transactions on Vehicular Technology*, vol. 56, no. 6, pp. 3709-3721, Nov. 2007.

- [20] F. Rodriguez and **A. Emadi**, "A novel digital control technique for brush-less DC motor drives," *IEEE Transactions on Industrial Electronics*, vol. 54, no. 5, pp. 2365-2373, Oct. 2007.
- [21] S. S. Williamson, **A. Emadi**, and K. Rajashekara, "Comprehensive efficiency modeling of electric traction motor drives for hybrid electric vehicle propulsion applications," *IEEE Transactions on Vehicular Technology*, vol. 56, no. 4, pp. 1561-1572, July 2007.
- [22] A. Khaligh, A. M. Rahimi, and **A. Emadi**, "Negative impedance stabilizing pulse adjustment control technique for DC/DC converters operating in discontinuous conduction mode and driving constant power loads," *IEEE Transactions on Vehicular Technology*, vol. 56, no. 4, pp. 2005-2016, July 2007.
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- [25] A. Antoniou, J. Komyathy, J. Bench, and **A. Emadi**, "Modeling and simulation of various hybrid electric configurations of the high-mobility multipurpose wheeled vehicle (HMMWV)," *IEEE Transactions on Vehicular Technology*, vol. 56, no. 2, pp. 459-465, March 2007.
- [26] **A. Emadi**, Y. P. Patel, and B. Fahimi, "Thyristor-based resonant current controlled switched reluctance generator for distributed generation," *Journal of Electrical Engineering and Technology*, March 2007.
- [27] **A. Emadi**, A. Khaligh, C. Rivetta, and G. A. Williamson, "Constant power loads and negative impedance instability in automotive systems: definition, modeling, stability, and control of power electronic converters and motor drives," *IEEE Transactions on Vehicular Technology*, vol. 55, no. 4, pp. 1112-1125, July 2006.
- [28] **A. Emadi** and J. Shen, "Guest editorial special issue on automotive power electronics and motor drives," *IEEE Transactions on Power Electronics*, vol. 21, no. 3, pp. 565-566, May 2006.
- [29] **A. Emadi**, S. S. Williamson, and A. Khaligh, "Power electronics intensive solutions for advanced electric, hybrid electric, and fuel cell vehicular power systems," *IEEE Transactions on Power Electronics*, vol. 21, no. 3, pp. 567-577, May 2006.
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- [31] M. Krishnamurthy, C. S. Edrington, **A. Emadi**, P. Asadi, M. Ehsani, and B. Fahimi, "Making the case for applications of switched reluctance motor

- technology in automotive products,” *IEEE Transactions on Power Electronics*, vol. 21, no. 3, pp. 659-675, May 2006.
- [32] A. Khaligh and **A. Emadi**, “Stabilizing control of DC/DC buck converters with constant power loads in continuous conduction and discontinuous conduction modes using digital power alignment technique,” *Journal of Electrical Engineering and Technology*, pp. 63-72, March 2006.
- [33] C. Rivetta, **A. Emadi**, G. A. Williamson, R. Jayabalan, and B. Fahimi, “Analysis and control of a buck DC-DC converter operating with constant power load in sea and undersea vehicles,” *IEEE Transactions on Industry Applications*, vol. 42, no. 2, pp. 559-572, March/April 2006.
- [34] S. S. Williamson, **A. Emadi**, and A. Dewan, “Effects of varying driving schedules on the drive train efficiency and performance characteristics of a parallel diesel-hybrid bus,” *Society of Automotive Engineers (SAE) Journal*, Paper No. 2005-01-3477, 2005; and, in *Proc. SAE 2005 Future Transportation Technology Conference*, Chicago, IL, Sept. 2005.
- [35] A. Khaligh, **A. Emadi**, G. A. Williamson, and C. Rivetta, “Constant power load characteristics in multi-converter automotive power electronic intensive systems,” *Society of Automotive Engineers (SAE) Journal*, Paper No. 2005-01-3451, 2005; and, in *Proc. SAE 2005 Future Transportation Technology Conference*, Chicago, IL, Sept. 2005.
- [36] J. Park, B. Raju, and **A. Emadi**, “Effects of an ultra-capacitor and battery energy storage system in a hybrid electric vehicle,” *Society of Automotive Engineers (SAE) Journal*, Paper No. 2005-01-3452, 2005; and, in *Proc. SAE 2005 Future Transportation Technology Conference*, Chicago, IL, Sept. 2005.
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- [39] **A. Emadi** and K. Rajashekara, “Guest editorial special section on hybrid electric and fuel cell vehicles,” *IEEE Transactions on Vehicular Technology*, vol. 54, no. 3, pp. 761-762, May 2005.
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- [52] **A. Emadi** and T. M. Jacobius, "Interprofessional projects in advanced automotive power systems: an integrated education and research multidisciplinary approach," *IEEE Transactions on Education*, vol. 47, no. 3, pp. 356-360, Aug. 2004.
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- [103] M. Ferdowsi and **A. Emadi**, "Pulse regulation control technique for flyback converter," in *Proc. 19<sup>th</sup> Annual IEEE Applied Power Electronics Conference*, Anaheim, CA, Feb. 2004.
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- [105] A. A. Aboulnaga, P. C. Desai, F. Rodriguez, T. R. Cooke, and **A. Emadi**, "A novel, low-cost, high-performance single-phase adjustable-speed motor drive using PM brush-less DC machine: IIT's design for 2003 Future Energy Challenge," in *Proc. 19<sup>th</sup> Annual IEEE Applied Power Electronics Conference*, Anaheim, CA, Feb. 2004.
- [106] Y. P. Patel and **A. Emadi**, "Thyristor-based resonant current controlled switched reluctance generator for distributed generation," in *Proc. 35<sup>th</sup> North American Power Symposium*, Rolla, MO, Oct. 2003.
- [107] S. Kaboli, M. R. Zolghadri, S. Haghbin, and **A. Emadi**, "Torque ripple minimization in DTC of induction motor based on optimized flux value determination," in *Proc. IEEE 29<sup>th</sup> Industrial Electronics Conference*, Roanoke, VA, Nov. 2003 (This paper received Best Session Paper Presentation Award).
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- [110] Z. Nie, S. B. Bekiarov and **A. Emadi**, "An on-line UPS system with power factor correction and electric isolation using BIFRED converter," in *Proc. IEEE 29<sup>th</sup> Industrial Electronics Conference*, Roanoke, VA, Nov. 2003.
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- [112] V. Dawood and **A. Emadi**, "Performance and fuel economy comparative analysis of conventional, hybrid, and fuel cell heavy-duty transit buses," in *Proc. IEEE 2003 Vehicular Technology Conference*, Orlando, FL, Oct. 2003.
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- converter,” in *Proc. IEEE 2003 International Telecommunications Energy Conference*, Yokohama, Japan, Oct. 2003.
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- [115] A. Nasiri, S. B. Bekiarov, and **A. Emadi**, “Reduced parts three-phase series-parallel UPS system with active filter capabilities,” in *Proc. IEEE 38<sup>th</sup> Industry Application Society Annual Meeting*, Salt Lake City, UT, Oct. 2003.
- [116] A. Nasiri and **A. Emadi**, “Different topologies for single-phase unified power quality conditioners,” in *Proc. IEEE 38<sup>th</sup> Industry Application Society Annual Meeting*, Salt Lake City, UT, Oct. 2003.
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- [119] S. M. Lukic and **A. Emadi**, “Modeling of electric machines for automotive applications using efficiency maps,” in *Proc. 2003 Electrical Manufacturing and Coil Winding Expo*, Indianapolis, IN, Sept. 2003.
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- [121] S. B. Bekiarov and **A. Emadi**, “A new on-line single-phase to three-phase UPS topology with reduced number of switches,” in *Proc. IEEE 34<sup>th</sup> Power Electronics Specialist Conference*, Acapulco, Mexico, June 2003.
- [122] M. Telefus, A. Shteynberg, M. Ferdowsi, and **A. Emadi**, “Pulse Train™, a novel digital control method, applied to a discontinuous conduction mode flyback converter,” in *Proc. IEEE 34<sup>th</sup> Power Electronics Specialist Conference*, Acapulco, Mexico, June 2003.
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- [124] S. S. Williamson and **A. Emadi**, “Power electronics intensive electrical power systems for spacecraft applications,” in *Proc. 2003 IEEE Electro/Information Technology Conference*, Indianapolis, IN, June 2003.

- [125] A. Shrinath and **A. Emadi**, "On the suitability of electronic control units for automotive power systems," in *Proc. 2003 IEEE Electro/Information Technology Conference*, Indianapolis, IN, June 2003.
- [126] A. E. Amac, A. Nasiri, and **A. Emadi**, "A comparative study of single-phase active filters for improving power quality," in *Proc. 2003 IEEE Electro/Information Technology Conference*, Indianapolis, IN, June 2003.
- [127] F. Aras, R. Suerkan, A. E. Amac, and **A. Emadi**, "Determination of excitation capacitance for isolated induction generator using low cost electronic controller," in *Proc. 2003 IEEE Electro/Information Technology Conference*, Indianapolis, IN, June 2003.
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- [129] Y. P. Patel and **A. Emadi**, "Suitability of switched reluctance machines in distributed generation systems," in *Proc. 2003 IASTED International Conference on Power and Energy Systems*, Palm Springs, CA, Feb. 2003.
- [130] S. M. Lukic and **A. Emadi**, "Advantages of hybrid electric vehicles with parallel drivetrain configurations," in *Proc. 2002 Electrical Manufacturing and Coil Winding Expo*, Cincinnati, OH, Oct. 2002.
- [131] A. A. Abounaga and **A. Emadi**, "High performance linear brushless DC motor drives for automotive applications," in *Proc. 2002 Electrical Manufacturing and Coil Winding Expo*, Cincinnati, OH, Oct. 2002.
- [132] S. S. Williamson and **A. Emadi**, "Fuel cell applications in the automotive industry," in *Proc. 2002 Electrical Manufacturing and Coil Winding Expo*, Cincinnati, OH, Oct. 2002.
- [133] R. Oza and **A. Emadi**, "Feasibility and applicability of computer methods/tools for analyzing advanced power electronic systems," in *Proc. 2002 International Power Electronics Technology Conference*, Rosemont, IL, Oct. 2002.
- [134] A. A. Abounaga, **A. Emadi**, J. Mahdavi, and M. Telefus, "Integrated magnetic structures for DC/DC converters: Modeling, analysis, design, and applications," in *Proc. 2002 International Power Electronics Technology Conference*, Rosemont, IL, Oct. 2002.
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- [137] A. A. Abounaga, M. M. Atout, and **A. Emadi**, "Analysis and design of forced commutation circuit for by-pass Thyristor-based AC-DC converters," in *Proc. IEEE 28<sup>th</sup> Industrial Electronics Conference*, Sevilla, Spain, Nov. 2002.
- [138] **A. Emadi** and A. Abur, "Real time state estimation of multi-converter DC power electronic systems using generalized state space averaging method," in *Proc. IEEE 33<sup>rd</sup> Power Electronics Specialist Conference*, Cairns, Queensland, Australia, June 2002.
- [139] B. Fahimi and **A. Emadi**, "Robust position sensorless control of switched reluctance motor drives over the entire speed range," in *Proc. IEEE 33<sup>rd</sup> 2002 Power Electronics Specialist Conference*, Cairns, Queensland, Australia, June 2002.
- [140] A. A. Abounaga, A. R. Amin, M. M. Atout, and **A. Emadi**, "GTO by-pass thyristor based method for improving performance of single-phase AC/DC bridge converters," in *Proc. IEEE 33<sup>rd</sup> 2002 Power Electronics Specialist Conference*, Cairns, Queensland, Australia, June 2002.
- [141] S. M. Lukic and **A. Emadi**, "Performance analysis of automotive power systems: effects of power electronic intensive loads and electrically-assisted propulsion systems," in *Proc. 2002 IEEE Vehicular Technology Conference*, Vancouver, BC, Canada, Sept. 2002.
- [142] S. Onoda, S. M. Lukic, A. Nasiri, and **A. Emadi**, "A PSIM-based modeling tool for conventional, electric, and hybrid electric vehicle studies," in *Proc. 2002 IEEE Vehicular Technology Conference*, Vancouver, BC, Canada, Sept. 2002.
- [143] S. B. Bekiarov and **A. Emadi**, "Uninterruptible power supplies: classification, operation, dynamics, and control," in *Proc. 17<sup>th</sup> Annual IEEE Applied Power Electronics Conference*, Dallas, TX, March 2002.
- [144] **A. Emadi**, "A new negative impedance stabilizing control technique for switching power supplies with constant power loads," in *Proc. 2001 International Conference on Power Electronics*, Seoul, Korea, Oct. 2001.
- [145] S. S. Williamson and **A. Emadi**, "Power electronic converters for fuel cell applications," in *Proc. 2001 International Conference on Power Electronics*, Seoul, Korea, Oct. 2001.
- [146] L. Safavian, S. Filizadeh, and **A. Emadi**, "Lyapunov-based fuzzy control scheme for switched reluctance motor drives," in *Proc. 2001 International Conference on Power Electronics*, Seoul, Korea, Oct. 2001.
- [147] **A. Emadi**, "Modeling of power electronic loads in AC distribution systems using the generalized state space averaging method," in *Proc. IEEE 27<sup>th</sup> Industrial Electronics Conference*, Denver, CO, Nov./Dec. 2001.
- [148] **A. Emadi**, "Modeling and analysis of multi-converter DC power electronic systems using the generalized state space averaging method," in *Proc. IEEE 27<sup>th</sup> Industrial Electronics Conference*, Denver, CO, Nov./Dec. 2001 (This paper received Best Paper Presentation Award).



- [149] **A. Emadi** and M. Ehsani, "Dynamics and control of multi-converter DC power electronic systems," in *Proc. IEEE 32<sup>nd</sup> Power Electronics Specialist Conference*, Vancouver, BC, Canada, June 2001.
- [150] **A. Emadi** and M. Ehsani, "Multi-converter power electronic systems: Definition and applications," in *Proc. IEEE 32<sup>nd</sup> Power Electronics Specialist Conference*, Vancouver, BC, Canada, June 2001.
- [151] **A. Emadi**, "Feasibility of power electronic converters for low-voltage (42V) SRM drives in mildly hybrid electric traction systems," in *Proc. IEEE 2001 International Electric Machines and Drives Conference*, Cambridge, MA, June 2001.
- [152] (Invited) M. Ehsani and **A. Emadi**, "Multi-converter vehicular power electronic systems: definition, dynamics, and applications," *Power Electrical Engineering Jubile*, University of Paris VI, Paris, France, Dec. 2000.
- [153] **A. Emadi** and M. Ehsani, "Negative Impedance Stabilizing Controls for PWM DC/DC Converters using Feedback Linearization Techniques," in *Proc. 35<sup>th</sup> Intersociety Energy Conversion Engineering Conference*, Las Vegas, NV, July 2000.
- [154] **A. Emadi**, M. Ehsani, and J. M. Miller, "Advanced silicon rich automotive electrical power systems," in *Proc. 18<sup>th</sup> Digital Avionics Systems Conference*, St. Louis, MO, Oct. 1999.
- [155] (Invited) J. M. Miller, **A. Emadi**, A. V. Rajarathnam, and M. Ehsani, "Current status and future trends in more electric car power systems," in *Proc. IEEE 1999 Vehicular Technology Conference*, Houston, TX, May 1999.
- [156] J. Mahdavi, **A. Emadi**, and H. A. Toliyat, "Application of state space averaging method to sliding mode control of PWM DC/DC converters," in *Proc. IEEE 1997 Industry Application Society Annual Meeting*, New Orleans, LA, Oct. 1997.
- [157] J. Mahdavi and **A. Emadi**, "Analysis of power electronic converters using the developed state space averaging method," in *Proc. IEEE 22<sup>nd</sup> Annual International Conference on Industrial Electronics*, Taiwan, Aug. 1996.
- [158] J. Mahdavi and **A. Emadi**, "Sliding mode control of PWM Cuk converter," in *Proc. IEE Sixth International Conference on Power Electronics and Variable Speed Drives*, Nottingham, United Kingdom, Sept. 1996.

## KEYNOTE SPEECHES, SEMINARS, TUTORIALS, AND SHORT COURSES

- [1] (Invited) **A. Emadi**, "Transportation 2.0 (Electrified) / Power System 2.0 (Smart Grid)," Keynote speech to be given at the *Mobilis 2009 International*, Montbeliard, France, Nov. 2009.
- [2] (Invited) **A. Emadi**, "Plug-in hybrid electric vehicles and vehicle-to-grid (V2G) integration," Half-day tutorial to be presented at the *2009 IEEE PES/IAS*

- International Conference on Sustainable Alternative Energy*, Valencia, Spain, Sept. 2009.
- [3] **A. Emadi**, "Plug-in hybrid electric vehicles: transportation 2.0," Half-day tutorial to be presented at the *2009 IEEE Vehicle Power and Propulsion Conference (VPPC'09)*, Dearborn, MI, Sept. 2009.
- [4] (Invited) **A. Emadi**, "Transportation 2.0: advanced electric drive vehicles," Energy Policy and Future Transportation Panel speech to be given at the *2009 IEEE Vehicle Power and Propulsion Conference (VPPC'09)*, Dearborn, MI, Sept. 2009.
- [5] (Invited) **A. Emadi**, "Plug-in hybrid electric vehicles," Invited speech given at the *Université des Sciences et Technologies de Lille*, Lille, France, Jan. 2009.
- [6] (Invited) **A. Emadi**, "Saving the planet, one plug-in hybrid vehicle at a time," Invited speech given at the *MHPEA 2008 PD Conference*, Winnipeg, Manitoba, Canada, Nov. 2008.
- [7] **A. Emadi**, "Hybrid and plug-in hybrid electric vehicles," Half-day tutorial presented at the *34th Annual Conference of the IEEE Industrial Electronics Society (IECON'08)*, Orlando, Florida, Nov. 2008.
- [8] (Invited) **A. Emadi**, "Plug-in hybrid electric vehicles: sustainable solution for transportation," Keynote speech given at the *2008 IEEE Vehicle Power and Propulsion Conference (VPPC'08)*, Harbin, China, Sept. 2008.
- [9] (Invited) **A. Emadi**, "Plug-in hybrid electric vehicles: sustainable solution," Invited seminar given at the *University of Manitoba*, Winnipeg, Manitoba, Canada, April 2008.
- [10] (Invited) **A. Emadi**, "Plug-in hybrid electric vehicles: sustainable solution," Invited presentation given at the *2008 Midwest Energy Solutions Conference*, Chicago, IL, Jan. 2008.
- [11] (Invited) **A. Emadi**, "Hybrid and plug-in hybrid electric vehicles: a lasting solution," Keynote speech given at the *Mobilis 2007*, Mulhouse, France, Dec. 2007.
- [12] (Invited) **A. Emadi**, "Plug-in hybrid electric vehicles: challenges and unprecedented opportunities into the future," Keynote speech given at the *2007 Plug-in Hybrid Electric Vehicle Conference (PHEV'07)*, Winnipeg, Manitoba, Canada, Nov. 2007.
- [13] S. M. Lukic, **A. Emadi**, and B. Fahimi, "Energy storage systems for electric, hybrid electric, and fuel cell vehicles," Half-day tutorial presented at the *33<sup>rd</sup> Annual Conference of the IEEE Industrial Electronics Society (IECON'07)*, Taipei, Taiwan, Nov. 2007.
- [14] (Invited) **A. Emadi**, "Hybrid and plug-in hybrid conversion," Keynote speech given at the *2007 IEEE Vehicle Power and Propulsion Conference (VPPC'07)*, Arlington, TX, Sept. 2007.



- [15] **A. Emadi**, “Automotive power electronics and motor drives: current status and future trends,” Half-day tutorial presented at the *IEEE 38<sup>th</sup> Power Electronics Specialist Conference (PESC’07)*, Orlando, FL, June 2007.
- [16] (Invited) **A. Emadi**, “Electrical machines and drives for civilian and military vehicle applications,” Week-long course presented at the Energy Institute, Tubitak Marmara Research Center, Turkey, May 7-11, 2007.
- [17] **A. Emadi**, “Automotive power electronics and motor drives: applications in hybrid electric and fuel cell vehicles,” Half-day tutorial presented at the *32<sup>nd</sup> Annual Conference of the IEEE Industrial Electronics Society (IECON’06)*, Paris, France, Nov. 2006.
- [18] (Invited) **A. Emadi**, “Advanced automobiles: current status and future trends,” presented at Human Resources Development Institute, Chungnam, Korea, July 2005.
- [19] (Invited) **A. Emadi**, “Power electronics, motor drives, and vehicular applications,” Week-long course presented at Korea University of Technology and Education, Chungnam, Korea, July 25-29, 2005.
- [20] (Invited) **A. Emadi**, “Automotive power electronics and motor drives: unprecedented opportunities into the future,” presented at the Electrical Engineering Department, Sharif University of Technology, Tehran, Iran, June 2005.
- [21] (Invited) **A. Emadi**, “Modern automotive systems: power electronic and motor drive opportunities and challenges,” Half-day tutorial presented at the *2005 IEEE International Electric Machines and Drives Conference (IEMDC’07)*, San Antonio, TX, May 2005.
- [22] **A. Emadi**, “A novel switched reluctance machine for propulsion applications and a novel true digital control technique for automotive motor drives,” presented at Ford Motor Company SRL, Dearborn, MI, April 2005.
- [23] (Invited) **A. Emadi**, “Current status and future trends in automotive industry,” presented at the Department of Biological, Chemical, and Physical Sciences – Physics Colloquium, Illinois Institute of Technology, March 2005.
- [24] F. Rodriguez and **A. Emadi**, “Digital control of electric motor drives and hardware-in-the-loop concept using the dSPACE rapid prototyping and real-time interface system,” Half-day short course presented at the *U.S. Army Vetronics Institute Annual Workshop*, Warren, MI, Jan. 2005.
- [25] (Invited) **A. Emadi**, “Power electronics in conventional, hybrid electric, and fuel cell vehicles,” Half-day short course presented at the *Power Electronics Technology Conference*, Chicago, IL, Nov. 2004.
- [26] A. Chakraborty and **A. Emadi**, “Nano power electronics,” presented at the *IIT-Argonne National Lab Nanoscience Workshop*, Chicago, IL, Aug. 2004.

- [27] S. S. Irudayaraj and **A. Emadi**, "Micro and nano scale electric machines," presented at the *IIT-Argonne National Lab Nanoscience Workshop*, Chicago, IL, Aug. 2004.
- [28] (Invited) **A. Emadi** and S. S. Williamson, "Automotive electrical power systems," Week-long course presented at Korea University of Technology and Education, Chungnam, Korea, Aug. 9-13, 2004.
- [29] **A. Emadi**, R. Oza, and S. M. Lukic, "Design issues in switched-mode DC power supplies: DC output with synchronous rectification," Tutorial presented at the *IEEE 35<sup>th</sup> Power Electronics Specialist Conference (PESC'04)*, Aachen, Germany, June 2004.
- [30] (Invited) **A. Emadi**, "Integrated education, research, business, and leadership: power electronics and motor drives experience at IIT," presented at the *2004 Teaching Workshop*, Armour College of Engineering, Illinois Institute of Technology, Jan. 2004.
- [31] (Invited) **A. Emadi**, "Fuel cell vehicles vs. hybrid electric vehicles: facts and fictions," presented at ECE Distinguished Speaker Seminar, Illinois Institute of Technology, Oct. 2003.
- [32] M. Ehsani and **A. Emadi**, "Vehicular power electronics: automotive and aerospace applications of power electronic converters and motor drives," Tutorial presented at the *18<sup>th</sup> Annual IEEE Applied Power Electronics Conference (APEC'03)*, Miami Beach, FL, Feb. 2003.
- [33] (Invited) **A. Emadi**, "Power electronic and motor drive applications of magnetic materials," keynote speech given at the *21<sup>st</sup> Annual Conference on Properties and Applications of Magnetic Materials*, Chicago, IL, May 2002.
- [34] **A. Emadi** and S. S. Williamson, "Structures, operations, and applications of fuel cells and their power electronics interface," Tutorial presented at *IEEE 33<sup>d</sup> Power Electronics Specialist Conference*, Cairns, Queensland, Australia, June 2002.
- [35] M. Ehsani and **A. Emadi**, "Vehicular power systems: architectures, dynamics, control, and stability assessment," Full-day short course presented at the *U.S. Army Vetronics Institute Annual Workshop*, Warren, MI, Jan. 2002.
- [36] M. Ehsani and **A. Emadi**, "Automotive electrical power systems: current status and future trends," Tutorial presented at the *2000 IEEE Vehicular Technology Conference*, Boston, MA, Sept. 2000.

**PATENTS AND PATENTS PENDING**

- [1] J. Cao and **A. Emadi**, *Battery/Ultra-Capacitor Hybrid Energy Storage System for Electric, Hybrid Electric, and Plug-in Hybrid Electric Vehicles*, IIT-254, April 2009, pending.
- [2] A. Khaligh, Y. J. Lee, and **A. Emadi**, *Digital Control of Power Electronic Converters*, IIT-248, May 2008, pending.
- [3] F. Rodriguez and **A. Emadi**, *Integrated Electric Motor Differential for Hybrid Electric Vehicles*, IIT-243, Serial No. 12/217,221, July 2008, pending.
- [4] F. Rodriguez, S. M. Lukic, and **A. Emadi**, *Adaptive Control Strategy and Method for Optimizing Hybrid Electric Vehicles*, IIT-244, Serial No. 12/025,376, February 2008, pending.
- [5] F. Rodriguez, S. M. Lukic, S. G. Wirasingha, and **A. Emadi**, *Hybrid Electric Conversion Kit for Rear-Wheel Drive, All-Wheel Drive, and Four-Wheel Drive Vehicles*, IIT-237, Serial No. 12/031,172, February 2008, pending.
- [6] Y. J. Lee and **A. Emadi**, *Integrated Bi-Directional Converter for Plug-in Hybrid Electric Vehicles*, IIT-234, Serial No. 11/975,530, October 2007, pending.
- [7] S. M. Lukic and **A. Emadi**, *Power Management for Multi-Module Energy Storage Systems in Electric, Hybrid Electric, and Fuel Cell Vehicles*, IIT-233, Serial No. 11/977,118, October 2007, pending.
- [8] F. Rodriguez, S. M. Lukic, and **A. Emadi**, *Digital Control of Motor Drives*, IIT-240, Serial No. 60/934,765, June 2007, pending.
- [9] P. C. Desai and **A. Emadi**, *Switched Reluctance Machine*, US 7,230,360, June 12, 2007.
- [10] **A. Emadi**, F. Rodriguez, and P. C. Desai, *Digital Control of Motor Drives*, US 7,193,385, March 20, 2007.
- [11] R. Jayabalan and **A. Emadi**, *Combustion Engine Acceleration Support using an Integrated Starter/Alternator*, US 7,024,859, April 11, 2006.

**FUNDING: SUMMARY**

Pending Proposals .....	\$17,437,970
Research and Industrial Funding.....	\$2,893,300
Average/Year (2000-2009) .....	\$321,478
Current Research Funding – Ongoing Projects .....	\$1,753,790
Funding – Electric Power and Power Electronics Center .....	\$6,500,000
Average/Year (2000-2009) .....	\$722,222

**PENDING PROPOSALS**

- [1] A. Emadi (PI), A. Khaligh, and M. Krishnamurthy, “Hybrid locomotive electrical system configurations with ultra-capacitor, battery, and hybrid ultra-capacitor/battery energy storage systems,” Electro-Motive Diesel (EMD), 7/1/2009-6/30/2010, \$250,000.
- [2] A. Emadi (PI), M. Krishnamurthy, and A. Khaligh, “Novel switched reluctance machines with higher rotor poles than stator poles,” National Science Foundation (NSF), 8/1/2009-7/31/2012, \$473,254.
- [3] A. Emadi (PI), M. Shahidehpour, H. Arastoopour, J. Yagoobi, and F. Ruiz, “Drivelectric: A multi-university education, training, outreach, and public awareness program for advanced electric drive vehicles,” National Energy and Technology Laboratory (NETL) / Department of Energy (DOE), 9/1/2009-8/31/2012, \$13,877,027.
- [4] M. Krishnamurthy (PI), A. Emadi (Co-PI), and A. Khaligh (Co-PI), “A laboratory-based undergraduate course development in energy harvesting and hybrid electric vehicle technology,” National Science Foundation (NSF), 9/1/2009-8/31/2010, \$187,716.
- [5] H. Arastoopour (PI), A. Emadi (Co-PI), J. S. Kallend (Co-PI), N. R. Khalili (Co-PI), and N. Sabbaghi (Co-PI), “Innovative sustainability engineering program at Illinois Institute of Technology (ISEEiT),” National Science Foundation (NSF), 9/1/2009-8/31/2010, \$149,973.
- [6] A. Emadi, “Concept Paper: Development of an innovative hybrid-electric powertrain for general aviation,” Advanced Research Projects Agency-Energy (ARPA-E) / Department of Energy (DOE), 1/1/2010-12/31/2011, \$2,500,000.
- [7] A. Emadi (PI), H. Arastoopour, A. Khaligh, M. Krishnamurthy, and V. Weil, “PIRE: Partnerships for international research and education in hybrid electric and plug-in hybrid electric vehicles,” National Science Foundation (NSF), 1/1/2010-12/31/2014, preliminary proposal.

- [8] A. Emadi (PI), M. Shahidehpour, H. Arastoopour, F. Ruiz, and P. Land, "IGERT: Transportation/Power System 2.0 – plug-in hybrid electric vehicles and integration with renewable energies through perfect power and smart grid," National Science Foundation (NSF), 6/1/2010-5/31/2015, preliminary proposal.

## RESEARCH AND INDUSTRIAL FUNDING

- [1] A. Emadi (PI) and A. Khaligh, "REU Supplement GOALI: Novel integration of AC/DC charger and DC/DC converter for plug-in hybrid electric vehicles," National Science Foundation (NSF), 8/1/2009-7/31/2010, \$12,000.
- [2] A. Emadi (PI) and A. Khaligh, "REU Site: Summer engineering research experience in hybrid electric and plug-in hybrid electric vehicles," National Science Foundation (NSF), 5/1/2009-4/30/2012, \$352,032.
- [3] A. Khaligh (PI) and A. Emadi (Co-PI), "GOALI: Novel integration of AC/DC charger and DC/DC converter for plug-in hybrid electric vehicles," National Science Foundation (NSF), 8/1/2008-7/31/2011, \$359,350.
- [4] A. Emadi, "Hybrid electric conversion kit (HECK)," DRS Test & Energy Management, Inc. / U.S. ARMY Tank Automotive Research Development and Engineering Center (TARDEC), 6/1/2008-10/31/2009, \$580,408.
- [5] A. Emadi, "Formula Hybrid Racing," Wanger Institute for Sustainable Energy Research (WISER), Illinois Institute of Technology, 9/1/2008-5/31/2010, \$100,000.
- [6] A. Emadi, "Solar/battery smart hybrid auto rickshaw three-wheeler," Atul and Kaplana Thakkar, MD, 9/1/2006-8/31/2011, \$350,000.
- [7] A. Emadi, "Iron-less permanent-magnet electric machine," Mag-Drive, LLC, IL, 9/1/2007-5/31/2008, \$45,818.
- [8] A. Emadi, "Formula Hybrid Racing," Armour College of Engineering, Illinois Institute of Technology, 9/1/2007-5/31/2008, \$30,000.
- [9] A. Emadi, "Predictive emission analysis for plug-in hybrid electric school bus," Advanced Energy, Raleigh, NC, 6/4/2007-5/18/2008, \$38,670.
- [10] A. Emadi, "Efficiency and loss models for key electronic components for a hybrid electric vehicle's electrical propulsion systems," National Renewable Energy Laboratory (NREL) / Department of Energy (DOE), 7/1/2006-12/31/2007, \$31,743.
- [11] A. Emadi, "Integrated bi-directional converter for plug-in hybrid electric vehicles," Hybrid Electric Vehicle Technologies, Inc., IL, 8/1/2007-5/31/2008, \$25,000.
- [12] A. Emadi, "Permanent magnet electric motor drive," Abacat, Inc., IL, 1/1/2007-12/31/2007, \$45,000.
- [13] A. Emadi, "Li-ion electronic battery management system for hybrid electric vehicles," InvenTek, Inc., IL, 6/1/2006-12/31/2006, \$28,000.

- [14] A. Emadi, "50W power electronic system for a hybrid fuel cell/Li-ion battery power supply," NanoDynamics, Inc., NY, 3/1/2006-5/31/2006, \$21,834.
- [15] A. Emadi, "Ford Escape plug-in hybrid electric vehicle AC/DC charger," All Cell Technologies, LLC, IL, 1/1/2006-12/31/2006, \$25,000.
- [16] A. Emadi, "42V DC/DC converter for an automotive engine application," Intronics, Inc., MA, 6/15/2005-9/14/2006, \$30,000.
- [17] A. Emadi, "Active AC/DC rectifier for heavy-duty alternators," C. E. Niehoff & Co., IL, 5/10/2005-12/9/2005, \$30,600.
- [18] A. Emadi, "Positive buck-boost converter and controller," Hipac Semiconductor, Inc., CA, 12/13/2004-3/13/2005, \$10,000.
- [19] A. Emadi, "Hybrid electric vehicular conversion – TATA 1512 heavy-duty buses," Hybridtronics, Inc., IL, 1/1/2005-5/31/2006, \$78,927.
- [20] A. Emadi (PI), M. Shahidehpour, H. Gao, H. Salehfar, and R. W. Wies, "Collaborative research: a novel approach in improving power electronics and electric drives courses, curriculum, and laboratories: multi-university implementation," National Science Foundation (NSF), 7/15/2003-7/14/2004, \$400,000.
- [21] A. Emadi, "Suitability of Firefly lead-acid battery for hybrid electric vehicles," Firefly Energy Inc., IL, 8/18/2003-8/17/2004, \$29,580.
- [22] A. Emadi, "Simulation and feasibility study of a hybrid electric drivetrain for Hindustan Motors taxi vehicles," Rajiv Motors, India, 5/15/2003-12/31/2003, \$20,000.
- [23] A. Emadi, "A novel three-phase AC/DC PWM rectifier with high power factor and low harmonic distortion for BLDC motor drives in advanced aircraft power systems with wild frequency," MPC Products Corporation, IL, 1/1/2003-7/1/2004, \$56,187.
- [24] A. Emadi, "Three-phase AC/DC rectifier with power factor correction and fault-tolerant power systems," Technology Dynamics Inc., NJ, 1/1/2003-5/31/2003, \$21,000.
- [25] A. Emadi, "Electromechanical clutch system," Tobechei Automotive Ltd., UK, 9/1/2002-12/31/2003, \$55,932.
- [26] A. Emadi, "Electric motors and electronic drivers," Bodine Electric Company, IL, 05/2003, \$14,000.
- [27] A. Emadi, "2kW single-phase switched reluctance motor drive power module for vacuum cleaners," LG Electronics, South Korea, 5/1/2002-10/31/2002, \$20,786.
- [28] A. Emadi, "Novel low-voltage current-intensive electrical power systems for lightly hybridized electric vehicles with parallel drivetrains," Educational and Research Initiative Fund (ERIF), Illinois Institute of Technology, 1/1/2002-12/31/2002, \$10,000.

- [29] A. Emadi, "Low-THD, high performance single-phase DC/AC inverter for army vehicles," C. E. Niehoff & Co., IL, 11/21/2001-12/31/2003, \$38,800.
- [30] A. Emadi, "Feasibility study of improving iWatt switch-mode power supply converters/controllers and developing novel schemes," iWatt Corporation, CA, 11/12/2001-3/11/2002, \$27,633.
- [31] A. Emadi, "Suitability of PSIM in modeling and simulation of automotive power systems," Powersim, Inc., MA, 10/9/2001-4/8/2002, \$5,000.

## **FUNDING – ELECTRIC POWER & POWER ELECTRONICS CENTER**

- [1] Endowment for the Grainger Laboratories and Grainger Scholarships, The Grainger Foundation, IL, 2007, \$5,000,000.
- [2] Grainger Special Electric Machines Laboratory, Advanced Power Engineering Laboratory, and Scholarships, The Grainger Foundation, IL, 2004, \$500,000.
- [3] Grainger Power Electronics and Motor Drives Laboratory Development, The Grainger Foundation, IL, 2000, \$500,000 + \$500,000 matching fund from IIT.



**2000-2009 GRADUATE STUDENTS: SUMMARY**

Ph.D. Students Graduated .....	15
With Tenure-Track Faculty Positions in Academia .....	5
Current Ph.D. Students .....	8
Visiting Scholars and Post-Docs .....	14
M.S. Theses Students Graduated .....	16
Current M.S. Theses Students .....	4

**PH.D. STUDENTS GRADUATED**

- [1] Stoyan B. Bekiarov (currently at C. E. Niehoff and Co.), *Reduced-Parts Uninterruptible Power Supplies*, Ph.D. Dissertation, Illinois Institute of Technology, graduated May 2004.
- [2] Mehdi Ferdowsi (currently at Missouri University of Science and Technology as a tenure-track faculty member), *Advanced Digital Controls for Integrated Power Electronic Converters*, Ph.D. Dissertation, Illinois Institute of Technology, graduated June 2004.
- [3] Adel Nasiri (currently at the University of Wisconsin-Milwaukee as a tenure-track faculty member), *Series-Parallel Active Filter/Uninterruptible Power Supply Systems: Configurations, Modeling, and Digital Control*, Ph.D. Dissertation, Illinois Institute of Technology, graduated June 2004.
- [4] Aly A. Aboulnaga (currently at Phillips), *Generalized Theory of Magnetic Integration for Power Electronic Converters*, Ph.D. Dissertation, Illinois Institute of Technology, graduated June 2004.
- [5] Zhong Nie (currently at Inductoheat, Inc.), *Integrated Switched-Mode Power Supplies*, Ph.D. Dissertation, Illinois Institute of Technology, graduated May 2005.
- [6] Claudio H. Rivetta (currently at Stanford University, as a senior research associate), *Nonlinear Analysis and Control of DC/DC Power Converters Feeding Downstream Power Converters*, Ph.D. Dissertation, Illinois Institute of Technology, graduated July 2005 (Co-Advisor with Dr. Geoffrey Williamson).
- [7] Sheldon S. Williamson (currently at Concordia University, Canada, as a tenure-track faculty member), *Efficiency Modeling and Analysis of Power Electronic Converters and Electric Motor Drives for Parallel Hybrid Electric and Fuel Cell Vehicles*, Ph.D. Dissertation, Illinois Institute of Technology, graduated May 2006.
- [8] Alireza Khaligh (currently at Illinois Institute of Technology as a tenure-track faculty member), *Digital Control of DC/DC Converters Loaded by Constant*

- Power Loads in Vehicular Systems*, Ph.D. Dissertation, Illinois Institute of Technology, graduated May 2006.
- [9] Fernando Rodriguez (currently at Illinois Institute of Technology as a senior research associate), *Advanced Digital Control Techniques for Brush-Less DC Motor Drives*, Ph.D. Dissertation, Illinois Institute of Technology, graduated December 2006.
- [10] Arindam Chakraborty (currently at Sylvania/Siemens), *Digital Combination of DC/DC Converters: A Novel Theory Applied to Positive Buck-Boost Converters*, Ph.D. Dissertation, Illinois Institute of Technology, graduated February 2007.
- [11] Srdjan M. Lukic (currently at North Carolina State University as a tenure-track faculty member), *Advanced Digital Control Techniques for Switched Reluctance Motor Drives*, Ph.D. Dissertation, Illinois Institute of Technology, graduated November 2007.
- [12] Anand Sathyan (currently at Chrysler), *Digital PWM Control of Brush-Less DC Motor Drives*, Ph.D. Dissertation, Illinois Institute of Technology, graduated November 2008.
- [13] Amir M. Rahimi (currently at International Rectifier), *Addressing Negative Impedance Instability Problem of Constant Power Loads: Comprehensive View Encompassing Entire System from the Load to the Source*, Ph.D. Dissertation, Illinois Institute of Technology, graduated December 2008.
- [14] Young-Joo Lee (currently at Whirlpool), *Integrated Bi-Directional AC/DC and DC/DC Converter for Plug-in Hybrid Electric Vehicles*, Ph.D. Dissertation, Illinois Institute of Technology, graduated May 2009.
- [15] Piyush C. Desai (currently at Woodward MPC), *The Novel Concept of Switched Reluctance Machines with Higher Number of Rotor Poles*, Ph.D. Dissertation, Illinois Institute of Technology, graduated May 2009.

## **CURRENT PH.D. STUDENTS**

- [1] Jian Cao, Ph.D. Candidate, Dissertation Topic: Battery/Ultra-Capacitor Hybrid Energy Storage System for Electric, Hybrid Electric and Plug-in Hybrid Electric Vehicles, Qualifying Exam: passed in Fall 2008, Comprehensive Exam: passed in Spring 2009, Graduation Date: May 2010 (expected).
- [2] Sanjaka G. Wirasingha, Ph.D. Candidate, Dissertation Topic: System Level Analysis of Plug-in Hybrid Electric Vehicles: Electrification, Energy Efficiency, and Control Strategy, Qualifying Exam: passed in Fall 2007, Comprehensive Exam: Aug. 2009 (expected), Graduation Date: May 2010 (expected).
- [3] Nikola Milivojevic, Ph.D. Candidate, Dissertation Topic: Digital Control of PM Brush-Less DC Machines in Generating and Regenerative Modes, Qualifying Exam: passed in Spring 2008, Comprehensive Exam: Aug. 2009 (expected), Graduation Date: May 2010 (expected).

- [4] Igor Stamenkovic, Ph.D. Candidate, Dissertation Topic: Iron-Less Axial-Radial Flux Permanent-Magnet Electric Machines, Qualifying Exam: passed in Spring 2008, Comprehensive Exam: Aug. 2009 (expected), Graduation Date: May 2010 (expected).
- [5] Yusuf Gurkaynak, Ph.D. Candidate (co-advised with Prof. Alireza Khaligh), Dissertation Topic: Adaptive Control Strategy for Hybrid Electric Vehicles, Qualifying Exam: passed in Fall 2008, Comprehensive Exam: Fall 2009 (expected), Graduation Date: July 2010 (expected).
- [6] Berker Bilgin, Ph.D. Student (co-advised with Prof. Mahesh Krishnamurthy), Dissertation Topic: Switched Reluctance Machine for Propulsion Systems, Qualifying Exam: Spring 2010 (expected), Comprehensive Exam: Fall 2010 (expected), Graduation Date: Dec. 2011 (expected).
- [7] Baiming Shao, Ph.D. Student, Dissertation Topic: Digital Control of Electric Motor Drives and Propulsion Systems, Qualifying Exam: Spring 2010 (expected), Comprehensive Exam: Fall 2010 (expected), Graduation Date: Dec. 2011 (expected).
- [8] Seshadri S. Raghavan, Ph.D. Student, Dissertation Topic: Hybrid Electric Locomotives, Qualifying Exam: Fall 2010 (expected), Comprehensive Exam: Fall 2011 (expected), Graduation Date: July 2012 (expected).

## **VISITING SCHOLARS AND POST-DOCS**

- [1] Dr. Fernando Rodriguez, Jan. 2007-present, Senior Research Associate.
- [2] Mr. Ernest Montllo Casabayo, Sept. 2008-Jan. 2009, Visiting Scholar from the Universidad Politecnica de Catalunya in Barcelona, Spain, Research Topic: Bi-Directional Battery Charger.
- [3] Mr. Jagadanand Gangadharan, July 2008-Sept. 2008, Visiting Scholar from the National Institute of Technology, Calicut, India, Research Topic: Fault Detection in Electric Motor Drives using Current Signature Analysis.
- [4] Mr. Erik Schaltz, Feb. 2008-April 2008, Visiting Scholar from Aalborg University, Denmark, Research Topic: Fuel Cell Hybrid Electric Vehicles.
- [5] Dr. Nigel Schofield, Oct. 2007-Feb. 2008, Visiting Professor from the University of Manchester, United Kingdom, Research Topic: Electric Propulsion Systems.
- [6] Dr. Srdjan M. Lukic, Nov. 2007-March 2008, Post-Doctoral Research Associate.
- [7] Prof. Francisco J. Perez-Pinal, Sept. 2006-May 2007, Fulbright Scholar from the Universidad Autonoma de San Luis Potosi, Mexico, Research Topic: Dual Motor Control for Electric Propulsion Systems.
- [8] Prof. Natarajan Kumaresan, April-May 2007, Visiting Professor from National Institute of Technology, India, Research Topic: Converters for Renewable Energy Systems.

- [9] Prof. Abdolreza Rahmati, Sept. 2004-May 2005, Visiting Professor from Iran University of Science and Technology, Iran, Research Topic: Digital Control and Power Management in Power Electronics.
- [10] Prof. Mohan V. Aware, June 2004, Visiting Professor from Visvesvaraya National Institute of Technology, India, Research Topic: SMES for Protection of Distributed Critical Loads.
- [11] Prof. Meral Altinay, April 2004-March 2005, Visiting Scholar from Kocaeli University, Turkey, Research Topic: Modeling and Control of PWM Rectifiers.
- [12] Prof. Xiaohua Jiang, March 2004-July 2004, Visiting Professor from Zhongshan University, China, Research Topic: Digital Control of Advanced Motor Drives and Hybrid Electric Vehicles.
- [13] Prof. Ayse Ergun Amac, July 2002-July 2005, Visiting Scholar from Kocaeli University, Turkey, Research Topic: Active Power Filters and Uninterruptible Power Supplies.
- [14] Prof. Sung-Chul Oh, Sept. 2002-Sept. 2003, Visiting Professor from Korea University of Technology and Education, Korea, Research Topic: Modeling of Power Trains for Hybrid Electric Vehicles.

## **M.S. THESES STUDENTS GRADUATED**

- [1] Sheldon S. Williamson, *Power Electronic Converters for Fuel Cell Applications*, M.S. Thesis, Illinois Institute of Technology, graduated July 2002.
- [2] Ritesh Oza, *Synchronous Rectification for Integrated High-Quality Rectifier-Regulators*, M.S. Thesis, Illinois Institute of Technology, graduated May 2003.
- [3] Yogesh P. Patel, *Thyristor-Based Resonant Current Controlled Switched Reluctance Generator for Distributed Generation*, M.S. Thesis, Illinois Institute of Technology, graduated May 2003.
- [4] Ranjit Jayabalan, *Acceleration Support by Integrated Starter/Alternator for Automotive Applications*, M.S. Thesis, Illinois Institute of Technology, graduated May 2003.
- [5] Shigeru Onoda, *PSIM-Based Modeling of Automotive Power Systems: Conventional, Electric, and Hybrid Electric Vehicles*, M.S. Thesis, Illinois Institute of Technology, graduated July 2003.
- [6] Venkata S. Rimmalapudi, *Modeling and Analysis of Hybrid Power Electronic Based Distributed Generation Systems*, M.S. Thesis, Illinois Institute of Technology, graduated Dec. 2003.
- [7] Srdjan M. Lukic, *Low-Voltage (42V) Electrical Power Systems for Hybrid Electric Vehicles*, M.S. Thesis, Illinois Institute of Technology, graduated May 2004.

- [8] Madan M. Jalla, *Modeling of Multi-Converter More Electric Ship Power Systems using the Generalized State Space Averaging Method*, M.S. Thesis, Illinois Institute of Technology, graduated May 2004.
- [9] Fernando Rodriguez, *Conduction-Angle Digital Control of Brush-Less DC Motor Drives for Electric Power Steering Applications*, M.S. Thesis, Illinois Institute of Technology, graduated May 2004.
- [10] Piyush C. Desai, *Novel Digital Control of Brush-Less DC Motor Drives*, M.S. Thesis, Illinois Institute of Technology, graduated May 2004.
- [11] Sujay S. Irudayaraj, *Micro-Machines: Classification, Analysis, and Design*, M.S. Thesis, Illinois Institute of Technology, graduated July 2005.
- [12] Sanjaka G. Wirasingha, *Hybrid Electric Conversion of Heavy-Duty Transit Buses*, M.S. Thesis, Illinois Institute of Technology, graduated May 2006.
- [13] Abhijeet A. Bhandwale, *Digital Control of Electric Motor Drives for Home Appliances*, M.S. Thesis, Illinois Institute of Technology, graduated December 2006.
- [14] Jian Cao, *Efficiency and Loss Models for Key Electronic Components of Hybrid and Plug-in Hybrid Electric Vehicles' Electrical Propulsion Systems*, M.S. Thesis, Illinois Institute of Technology, graduated July 2007.
- [15] Ji Wu, *Plug-in Hybrid Electric Vehicles: Test, Simulation, and Analysis in Support of a Standardized Test Procedure*, M.S. Thesis, Illinois Institute of Technology, graduated September 2007.
- [16] Sadia Sadiq, *Performance Analysis of Plug-in Hybrid Electric School Buses*, M.S. Thesis, Illinois Institute of Technology, graduated November 2008.

## **CURRENT M.S. THESES STUDENTS**

- [1] Antonis I. Antoniou, M.S. Student, Thesis Topic: Adaptive Control Strategy for Hybrid Electric Vehicles, Graduation Date: July 2009 (expected).
- [2] Priscilla Mulhall, M.S. Student, Thesis Topic: Solar/Battery Electric Auto Rickshaw Three-Wheeler, Graduation Date: Dec. 2009 (expected).
- [3] Jonathan Sibley, M.S. Student, Thesis Topic: Electric Differential for Hybrid Electric Vehicles, Graduation Date: Dec. 2009 (expected).
- [4] Garrett Nielson, M.S. Student, Thesis Topic: Hybrid Electric Vehicles and Energy Storage Systems, Graduation Date: Dec. 2009 (expected).

## **COURSE/LABORATORY DEVELOPMENTS AND INITIATIONS AT IIT**

Prof. Emadi has developed a comprehensive power electronics program at IIT from the grounds up. This program is among the best programs in the country and has two undergraduate and four graduate courses as well as two short courses and one interprofessional project course. For further information, please visit <http://power.iit.edu/> and <http://hybrid.iit.edu/>.

### **Two New Undergraduate Courses and Laboratories**

*ECE 411: Power Electronics (4 Credits)*—The purpose of this course in power electronics is to give an overview of the major aspects of switching power conversion circuits. The laboratory developed for this course consists of 14 experiments and one major design experience. A new 98-page laboratory manual has also been written.

*ECE 412: Electric Motor Drives (4 Credits)*—The purpose of this course is to present the principles of electric motor drives. The laboratory developed for this course consists of 14 experiments and one major design experience. A new 119-page laboratory manual has also been written.

### **Four New Graduate Courses**

*ECE 549: Motion Control Systems Dynamics (3 Credits)*—Fundamentals of motion control systems and control techniques for high precision motion control are studied.

*ECE 550: Power Electronic Dynamics and Control (3 Credits)*—Modeling, dynamics, control, and stability of power electronic converters/systems are comprehensively studied.

*ECE 551: Advanced Power Electronics (3 Credits)*—The purpose of this course is to present the fundamental principles of power electronics, including converters such as AC/DC rectifiers and DC/AC inverters.

*ECE 552: Adjustable Speed Drives (3 Credits)*—This course presents fundamental principles of adjustable speed drive (ASD) systems including machine structures and driver topologies.

### **A New Multi-Disciplinary Project Course: IPRO 326**

IIT's IPRO (Interprofessional Project) program engages multidisciplinary teams of students in semester-long undergraduate projects based on real-world topics. Prof. Emadi has developed a new IPRO (IPRO 326) titled "Hybrid Electric Vehicles: Simulation, Design, and Implementation." He has offered this IPRO eight times as an extra course load from 2002 through 2007.



## **Two New Short Courses**

*ECE 752: Industrial Applications of Power Electronics and Motor Drives (2 credits)*—This course addresses practical topologies of different types of power electronic converters and electric motor drives.

*ECE 764: Vehicular Power Systems (2 credits)*—This course covers conventional and advanced electrical power systems of land, sea, air, and space vehicles.

## **A New Certificate Program in Power Electronics**

In this certificate program introduced in 2001, students receive professional preparation in the areas of power electronic converters, industrial electronics, switching power supplies, electric motor drives, and renewable energy systems.

## **Laboratory Development and Initiation**

Based on a generous gift of \$500,000 from the Grainger Foundation which was matched under IIT's Capitol Campaign, Dr. Emadi has established two new undergraduate teaching laboratories: the Grainger Power Electronics Laboratory and the Grainger Electric Motor Drives Laboratory. Dr. Emadi designed all laboratory experiments and ordered custom designed laboratory test-setups from two companies in Europe. He has installed and tested all the equipment.

Facilities in these laboratories include specialized experimental teaching setups for undergraduate power electronics and motor drives programs. The laboratory is one of the best-equipped and most advanced for undergraduate teaching purposes in the nation. The two labs are models for other universities in the United States.

## CLASSROOM PERFORMANCE AND COURSE EVALUATIONS

The table below contains the student and course evaluations for Dr. Emadi. All these courses are newly developed courses at IIT by Dr. Emadi.

Academic Year	Semester	Course	Enrollment	Instructor Score	Department Average	College Average	Course Score	Number of Respondents
2000/2001	Fall 2000	Laboratory (ECE 411 and ECE 412) Development						
	Spring 2001	ECE 411	6	4.67/5	4.10/5	4.18/5	4.50/5	6/6
2001/2002	Fall 2001	ECE 551	28	4.62/5	4.09/5	4.16/5	4.42/5	26/28
	Spring 2002	ECE 412	25	4.92/5	4.19/5	4.16/5	4.50/5	24/25
		ECE 764	15	5.00/5	4.19/5	4.16/5	5.00/5	10/15
		I PRO 326	11	4.82/5	4.19/5	4.16/5	4.82/5	11/11
2002/2003	Fall 2002	ECE 411	36	4.72/5	4.08/5	4.11/5	4.64/5	25/36
		ECE 552	26	4.83/5	4.08/5	4.11/5	4.48/5	18/26
		I PRO 326	13	4.58/5	4.08/5	4.11/5	4.58/5	12/13
	Spring 2003	ECE 550	32	4.50/5	3.94/5	NA	4.31/5	26/32
		I PRO 326	11	4.90/5	3.94/5	NA	4.60/5	10/11
	Summer 2003	ECE 412	12	NA	NA	NA	NA	NA
		ECE 764	12	NA	NA	NA	NA	NA
2003/2004	Fall 2003	ECE 411	33	4.61/5	4.00/5	4.04/5	4.55/5	23/33
		ECE 551	26	4.55/5	4.00/5	4.04/5	4.30/5	22/26
		I PRO 326	16	4.60/5	4.00/5	4.04/5	4.10/5	10/16
	Spring 2004	ECE 412	35	4.55/5	3.99/5	4.09/5	4.22/5	31/35
	Summer 2004	ECE 411	16	NA	NA	NA	NA	NA
		ECE 764	14	NA	NA	NA	NA	NA
2004/2005	Fall 2004	ECE 411	40	4.44/5	3.98/5	NA	4.28/5	25/40
		I PRO 326	11	4.20/5	3.98/5	NA	2.60/5	5/11
	Spring 2005	ECE 412	26	4.20/5	3.91/5	NA	4.40/5	10/26
		ECE 550	23	4.46/5	3.91/5	NA	4.23/5	13/23
		ECE 764	28	NA	3.91/5	NA	NA	NA
		I PRO 326	11	4.67/5	3.91/5	NA	4.67/5	3/11
2005/2006	Fall 2005	ECE 411	38	4.69/5	NA	NA	4.44/5	16/38
	Spring 2006	ECE 412	31	NA	NA	NA	NA	11/31
		ECE 764	43	4.64/5	NA	NA	4.18	NA
2006/2007	Fall 2006	ECE 411	33	4.30/5	NA	NA	4.20/5	10/33
		ECE 551	23	4.65/5	NA	NA	4.50/5	14/23
		ECE 752	61	NA	NA	NA	NA	NA
	Spring 2007	ECE 550	19	4.62/5	NA	NA	4.62/5	13/19
		ECE 764	41	NA	NA	NA	NA	NA
		<b>Average</b>	<b>763</b>	<b>4.62/5</b>	<b>NA</b>	<b>NA</b>	<b>4.40/5</b>	<b>374/568</b>

## GRADUATE RESEARCH AND SPECIAL PROJECTS

- [1] Spring 2002: ECE 597-134 (2 Credits), Carl Lebsack, Short Distance Wireless Power Transmission for Biomedical Implants.
- [2] Spring 2002: ECE 597-134 (2 credits), Sachin A. Borse, Electrical Power System of Sea and Undersea Vehicles.
- [3] Spring 2002: ECE 597-134 (3 credits), Kai-Chung Fung, Voltage Reducer Circuit for a Solenoid in a Hydraulic Valve.
- [4] Spring 2002: ECE 597-134 (3 credits), Reno Varghese, Implementing PWM Switching Schemes for 1-Phase DC/AC Inverters using TI TMS320LF2407 DSP.
- [5] Spring and Fall 2002: ECE 597-134 (4 credits), Chee C. Chong, Solid-State Solenoid Driver.
- [6] Fall 2002: ECE 597-134 (2 credits), Kirankumar G. Prajapati, Design Procedure of 24/16 Switched Reluctance Motor and Drive.
- [7] Fall 2002: ECE 597-134 (2 credits), Naveen K. Janapareddy, Amortization Study of Adjustable Speed Drives.
- [8] Fall 2002: ECE 597-134 (3 credits), Sureel Bhurat, DSP Control Implementation for a BLDC Motor Drive.
- [9] Fall 2002: ECE 597-134 (3 credits), Shaik Fiyaz Ahmmed, Electric Vehicles.
- [10] Spring 2003: ECE 597-134 (4 credits), Arjun Shrinath, Electronic Control Units for Automotive Applications.
- [11] Spring 2003: ECE 597-134 (2 credits), Vamshee R. Bhupathi Raju, Fuel Cell Based Vehicles.
- [12] Spring 2003: ECE 597-134 (2 credits), Salim S. Shaikh, Lithium-Ion Batteries for HEV Applications.
- [13] Fall 2003: ECE 597-134 (2 credits), David Cossigny, Small Electric Vehicles.
- [14] Fall 2003: ECE 597-134 (2 credits), David F. Claahsen, Electrical and Mechanical Specifications of 2WD Jeep Liberty with Manual Transmission and 2.4L Power Tech DOHC I-4 Engine.
- [15] Fall 2003: ECE 597-134 (4 credits), Timothy R. Cooke, Suitability of Brush-Less DC (BLDC) Motor Drives for Propulsion Applications.
- [16] Spring 2004: ECE 597-134 (2 credits), Srdjan M. Lukic, Digital Control of Switched Reluctance Motor Drives.
- [17] Spring 2004: ECE 597-134 (2 credits), Hyeon Chul Park, Micro Linear Motors.
- [18] Spring 2004: ECE 597-134 (3 credits), Margee Shah, Advanced Power Electronic Converters for Piezoelectric Motor Drives.
- [19] Spring 2004: ECE 597-134 (3 credits), David F. Claahsen, Nano Electro-Mechanical Systems (NEMS).

- [20] Spring 2004: ECE 597-134 (1 credit), Aman Gupta, Technical Specifications of Small Indian Vehicular Systems.
- [21] Spring 2004: ECE 597-134 (2 credits), Sridharan Gopal, Wireless Power Electronic Based Power Transmission.
- [22] Spring 2004: ECE 597-134 (2 credits), Aruna Thiyagarajan, Small Electric Motors.
- [23] Spring and Summer 2004: ECE 597-134 (3 credits), Vikram D. Immanuel, Biomechanical Energy Conversion.
- [24] Spring and Fall 2004: ECE 597-134 (3 credits), Krishna M. Panganamala, Micor Electro-Mechanical Systems (MEMS).
- [25] Fall 2004: ECE 597-134 (2 credits), Edward G. Polzin, Design and Simulation of a 2-Quadrant 250W Power Supply/Inverter (Battery Charger and Discharger).
- [26] Fall 2004: ECE 597-134 (1 credit), Naveen K. Janapareddy, DARPA Grand Challenge: Vehicular Review.
- [27] Fall 2004 and Spring 2005: ECE 597-134 (4 credits), Brianna M. Swenson, Suitability of Permanent Magnet Brushless DC Motor Drives for Automotive Propulsion Applications.
- [28] Spring 2005: ECE 597-134 (1 credit), Gurudatta D. Shamain, The Overall System (Electrical and Mechanical) of a Quad Runner ATV.
- [29] Spring 2006: ECE 597-134 (2 credits), Hector M. Gonzalez, Motors, Batteries, and Motor Control for Power Tools.
- [30] Spring 2006: ECE 597-134 (2 credits), Matthew F. Rodriguez, Implementation of a Novel BLDC Motor Drive Digital Control Using Micro-Controllers.
- [31] Fall 2006: ECE 597-134 (4 credits), Jeffrey R. Szekely, Hybrid Electric Go-Kart.
- [32] Fall 2006: ECE 597-134 (3 credits), Peter E. Sveum, System Components/Requirements for a Plug-in Hybrid Electric Vehicle Retrofit.
- [33] Fall 2006 and Spring 2007: ECE 597-134 (3 credits), Anantharaman Thasarathan, Energy Autonomous Auto Rickshaw – System Analysis.
- [34] Spring 2007: ECE 597-134 (4 credits), Ahmed M. Koran, Digital Control of Electric Motor Drives.
- [35] Spring 2007: ECE 597-134 (3 credits), Danny C. Leitao, High Performance Electric Drives.
- [36] Spring and Summer 2007: ECE 597-134 (3 credits), Patrick Alizon, Multi-Module Energy Storage Systems.
- [37] Summer 2007: ECE 597-134 (3 credits), Sairam V. Nimmagadda, Electric Rickshaw Design and Implementation.
- [38] Fall 2007: ECE 597-134 (2 credits), Baiming Shao, ACE Formula Hybrid.

- [39] Fall 2007: ECE 597-134 (2 credits), Cheng Sun, Simulation Analysis of All-Electric Auto-Rickshaw.
- [40] Fall 2007: ECE 597-134 (2 credits), Cong Zheng, Battery Technologies for All-Electric Auto-Rickshaw.
- [41] Fall 2008: ECE 597-134 (2 credits), Ernest Montllo Casabayo, AC/DC Charger with Power Factor Correction.
- [42] Spring 2009: ECE 597-134 (3 credits), Srinidhi N. Kaushik, WISER Formula Hybrid.
- [43] Summer 2009: ECE 597-134 (2 credits), Baiming Shao, High-Power Propulsion Dyno.

## **UNDERGRADUATE RESEARCH AND SPECIAL POBLEMS**

- [1] Spring 2001: ECE 497-134 (1 credit), Thomas Grzesik, Applications of Power Electronics in Power Systems.
- [2] Fall 2001: ECE 497-134 (3 credits), Peter R. Zurawski, Implementation of a 3-phase IGBT-Based DC/AC Inverter.
- [3] Fall 2001: ECE 491-134 (3 credits), Melissa Chee, 42V Systems in Hybrid Electric and More Electric Vehicles.
- [4] Fall 2001: ECE 491-134 (3 credits), Srdjan M. Lukic, Effects of Drivetrain Hybridization on Fuel Economy and Dynamic Performances of Parallel Hybrid Electric Vehicles.
- [5] Spring 2002: ECE 497-134 (2 credits), Srdjan M. Lukic, Vehicular Power Systems.
- [6] Spring 2002: ECE 491-134 (3 credits), Basem Fahmy, Classification of Advanced Electric Motor Drives.
- [7] Spring 2002: ECE 497-134 (3 credits), Birute Jurjonas, Transcutaneous Energy and Information Transfer System for the Streamliner LVAD.
- [8] Summer 2002: ECE 491-134 (3 credits), Hani Bodak, Modeling of Electrical Loads in Automotive Power Systems using ADVISOR and SIMPLORER.
- [9] Summer 2002: ECE 491-134 (3 credits), Valliy Dawood, Electrical Power Systems for Heavy Duty Vehicles.
- [10] Summer 2002: ECE 491-134 (3 credits), Erwin Uy, Steer-by-Wire Systems for Automotive Applications.
- [11] Fall 2002: ECE 491-134 (3 credits), Rajat P. Bijur, Electric Dragsters.
- [12] Fall 2002: ECE 491-134 (3 credits), Fernando Rodriguez, Electrically-Assisted Power Steering Systems.

- [13] Fall 2002: ECE 497-134 (3 credits), Anthony A. Villagomez, 2003 International Future Energy Challenge Preparation Paper.
- [14] Spring 2003: ECE 491-134 (1 credit), Andrew Baisden, An ADVISOR Based Model of a Battery and an Ultra-Capacitor Energy Source for Hybrid Electric Vehicles.
- [15] Spring 2003: ECE 491-134 (3 credits), Marina Kramskaya, Single-Phase PWM AC/DC Rectifiers.
- [16] Spring 2003: ECE 491-134 (3 credits), Brian D. McGuire, Linear Power Supplies vs. Switching Power Supplies.
- [17] Spring 2003: ECE 491-134 (3 credits), James C. Schroeder, Hybrid Electric Aircraft.
- [18] Spring 2003: ECE 491-134 (3 credits), Jeffrey R. Szekely, Electric Car Conversion.
- [19] Spring and Fall 2003: ECE 491-134 (3 credits), Ima U. Ufot, All Electric Combat Vehicles.
- [20] Fall 2003: ECE 491-134 (2 credits), Salman Memon, Electrical System of Segway Human Transporter.
- [21] Spring 2004: ECE 497-134 (3 credits), Ariel C. Gonzales, Development and Testing of Power Electronic Test Boards for BLDC Motor Drives.
- [22] Spring 2004: ECE 497-134 (3 credits), Allan M. Howard, Implementation of a Hybrid Electric Motor Bike.
- [23] Spring 2004: ECE 497-134 (3 credits), Darnez Gresham, Power Electronics at Micro and Nano Scales.
- [24] Spring 2004: ECE 491-134 (3 credits), Tiana A. Washington, Mechatronic Systems: Application of Power Electronics and Electric Motor Drives.
- [25] Spring 2004: ECE 491-134 (3 credits), Betsy M. Raju, Power Electronics in Nanotechnology.
- [26] Summer 2004: ECE 491-134 (3 credits), Delali Dogbey, Practical Design of an Adjustable Speed Motor Drive for an Electric Pump Application.
- [27] Fall 2004: ECE 497-134 (3 credits), Sanjaka G. Wirasingha, Experimental Implementation of a Hybrid Electric Bicycle.
- [28] Spring 2005: ECE 491-134 (3 credits), Mayank Bhatia, Hybrid Electric Large Sport Utility and Military Vehicles.
- [29] Fall 2005: ECE 497-134 (3 credits), Jeffrey L. Parks, Design and Implementation of Hybrid Electric Model Cars.
- [30] Spring 2006: ECE 491-134 (3 credits), Antonis I. Antoniou, Series Hybrid vs. Parallel Hybrid HMMWVs.
- [31] Spring 2006: ECE 491-134 (3 credits), Sadia Sadiq, Plug-in Hybrid Electric Vehicles.



- [32] Spring 2006: ECE 497-134 (3 credits), Robert L. Todd, Design and Implementation of a Bi-Directional DC/DC Converter.
- [33] Fall 2006: ECE 491-134 (3 credits), Pradeep Shenoy, Drive Train Analysis and Design of Formula Hybrid Electric Vehicle.
- [34] Spring 2007: ECE 497-134 (2 credits), Joel S. Fenner, Energy Autonomous Auto Rickshaw – Implementation.
- [35] Spring 2007: ECE 497-134 (1 credit), Eric M. Hope, Design of Power Electronic Circuitry for a Brush-Less DC Motor Drive.
- [36] Spring 2007: ECE 491-134 (3 credits), Priscilla K. Mulhall, Electrical Sensors: Theory and Application in Motor Control.
- [37] Fall 2007: ECE 497-134 (3 credits), Gil-Su Choi, All-Electric Auto-Rickshaw: Implementation.
- [38] Fall 2007: ECE 497-134 (1 credit), Saurabh S. Jain, A Solar Powered battery Recharging Station for Auto-Rickshaws in India.
- [39] Fall 2007: ECE 497-134 (3 credits), Dong Hwan Kim, Assessment of Hybridization Options for Converting a Conventional Single Piston Dune Buggy into a Gas/Electric Hybrid.
- [40] Fall 2007: ECE 497-134 (3 credits), Jihyung Kim, Assessment of Hybridization Options for Converting a Conventional Single Piston Dune Buggy into a Gas/Electric Hybrid.
- [41] Fall 2007: ECE 497-134 (3 credits), Opeyemi O. Babatola, ACE Formula Hybrid Modeling and Simulations.
- [42] Fall 2007 and Spring 2008: ECE 497-134 (3 credits), McLain M. Hubbard, ACE Formula Hybrid.
- [43] Fall 2007 and Spring 2008: ECE 497-134 (3 credits), Joseph P. Krause, ACE Formula Hybrid.
- [44] Fall 2007 and Spring 2008: ECE 497-134 (3 credits), Giuseppe B. Marrari, ACE Formula Hybrid.
- [45] Fall 2007 and Spring 2008: ECE 497-134 (3 credits), Daniel R. Mathus, ACE Formula Hybrid.
- [46] Fall 2007 and Spring 2008: ECE 497-134 (3 credits), Garrett T. Nielson, ACE Formula Hybrid.
- [47] Fall 2007 and Spring 2008: ECE 497-134 (3 credits), David E. Parry, ACE Formula Hybrid.
- [48] Fall 2007 and Spring 2008: ECE 497-134 (3 credits), Donald F. Ruffatto, ACE Formula Hybrid.
- [49] Fall 2007 and Spring 2008: ECE 497-134 (3 credits), Jonathan M. Sibley, ACE Formula Hybrid.
- [50] Spring 2008: ECE 497-134 (2 credits), Eric M. Hope, ACE Formula Hybrid.

- [51] Spring 2008: ECE 497-134 (3 credits), Rohan Mathews, Brush-Less DC Motor Drive with FPGA Control Unit.
- [52] Spring 2008, ECE 497-134 (1 credit), Henrietta R. Tsosie, An Efficient Iron-Less Permanent Magnet Electric Machine Design.
- [53] Fall 2008, ECE 491-134 (3 credits), Suni Smith, Plug-in Hybrid Electric Micro Air Vehicle.
- [54] Fall 2008: ECE 497-134 (1 credit), Chia-Hao Tu, WISER Formula Hybrid.
- [55] Fall 2008: ECE 497-134 (2 credits), John T. McCluskey, WISER Formula Hybrid.
- [56] Fall 2008 and Spring 2009: ECE 497-134 (3 credits), Konrad M. Kawa, WISER Formula Hybrid.
- [57] Fall 2008 and Spring 2009: ECE 497-134 (3 credits), Erik S. Mead, WISER Formula Hybrid.
- [58] Fall 2008 and Spring 2009: ECE 497-134 (3 credits), Ryan M. Ruidera, WISER Formula Hybrid.
- [59] Fall 2008 and Spring 2009: ECE 497-134 (3 credits), Eric Schamber, WISER Formula Hybrid.
- [60] Fall 2008 and Spring 2009: ECE 497-134 (3 credits), Anthony M. Castaneda, WISER Formula Hybrid.
- [61] Spring 2009: ECE 497-134 (1 credit), Woochan Kim, WISER Formula Hybrid.
- [62] Spring 2009: ECE 497-134 (1 credit), Jonathan A. Kobayashi, WISER Formula Hybrid.

## **SERVICE TO THE DEPARTMENT (ILLINOIS INSTITUTE OF TECHNOLOGY)**

- 2005-present: Chair, Department Executive Planning Committee.
- 2006-present: Chair, Academic Dishonesty Committee.
- 2006-2008: Chair, Power/Electronics Faculty Recruitment Committee.
- 2006: General Chair, IIT's Magnetic Conference – 25<sup>th</sup> Annual Conference on Properties and Applications of Magnetic Materials (PAMM'06), Chicago, IL, May 2006.
- 2005-present: Coordinator of the Power and Control Systems Group and Director of the Electric Power and Power Electronic Center.
- 2002-2005: Assistant Director, Electric Power and Power Electronic Center.
- 2005: Member, ECE Department Chair Search Committee.
- Organizer and Advisor, IIT's Student Team in 2004 Energy Efficiency Challenge.

- Organizer and Advisor, IIT's Student Team in 2003 IEEE/DOE/DOD International Future Energy Challenge.
- Fall 2002 and Spring 2003: Organizer, ECE Distinguished Speaker Seminars.
- 2002-2005: Interprofessional Projects (IPRO) Coordinator.
- 2002-2005: Member, Advisory Board Task Force.
- 2001-present: Student Recruitment, Presenting Power Electronics and Motor Drives Laboratories to undergraduate students and applicants, Camras scholarship candidates, high school students as well as their parents.
- 2000-present: Coordinator, Grainger Undergraduate/Graduate Scholarships.

### **SERVICE TO THE UNIVERSITY (ILLINOIS INSTITUTE OF TECHNOLOGY)**

- March 2009: Presentation titled "Leading the energy economy: Transportation 2.0," presented to the Institutional Advancement Department, IIT.
- 2008-present: Chair, University Academic Affairs Committee, University Faculty Council.
- 2008-present: Member, Career Management Center Advisory Board.
- 2008-present: Member, University Library Committee.
- 2006-present: Member, University Faculty Council.
- 2008: Chair, ECE AUCOPT (Academic Unit Committee on Promotion and Tenure).
- 2008: Substitute Representative of ECE, CAMCOPT (Campus Committee on Promotion and Tenure).
- Member, 2008/2009 Teaching Award Committee, Armour College of Engineering.
- Member, 2007/2008 University Provost Search Committee.
- Member, Faculty Advisory Committee of the 2007 University Presidential Search.
- 2007: Member, University Excellence in Teaching Award Committee and University Research Award Committee.
- 2005-2007: Representative of the ECE Department, University Research Council.
- Advisor, WISER Hawk Formula Hybrid Team including 100+ IIT Students.
- Co-Advisor, Society of Automotive Engineers (SAE) at IIT.
- Founder, Hybrid Electric Vehicle Team at IIT.
- April 2005: Presentation titled "Power electronics, motor drives, and automotive power systems program at IIT," presented to the Institutional Advancement Department, IIT.

- March 2005: Presentation titled “Interprofessional projects: integrated education, research, teamwork, and leadership,” presented to the Board of Trustees, IIT.
- Spring, Summer, and Fall 2005: Member, IPRO Project Proposals Review Panel.
- 2004-2005: Member, University Interprofessional Studies Committee.
- 2003-2008: Member, Armour College of Engineering Research and Education Planning Committee.
- 2003: Member, University Excellence in Teaching and Bauer Family Undergraduate Teaching Awards Committee.

## **ADVANCEMENT OF THE PROFESSION AND RECOGNITION AS A PROFESSIONAL**

- General Chair, 2011 IEEE Vehicle Power and Propulsion Conference (VPPC’11), Chicago, IL, Sept. 2011.
- Board Member (Section Editor for Electric, Hybrid, Plug-in Hybrid, and Fuel Cell Vehicles), 10 Volume Encyclopedia of Sustainable Science and Technology, Springer, 2011.
- Track Chair of Electric Machines and Drives, 2010 IEEE International Symposium on Industrial Electronics (ISIE’10), Bari, Italy, July 2010.
- 2008-present: Series Editor in Energy, Sustainability, Power Electronics, and Electric Machines, Taylor & Francis/CRC Press.
- 2007-present: Chair, IEEE Vehicle Power and Propulsion Steering Committee.
- 2005-2007: Vice-Chair, IEEE Vehicle Power and Propulsion Steering Committee.
- 2007-present: Chair, Power Electronics Technical Committee, IEEE Industrial Electronics Society.
- 2005-2007: Chair, Vehicular Power Electronics and Drives Technical Sub-Committee, and Member, Power Electronics Technical Committee (PETC), IEEE Industrial Electronics Society.
- 2007-present: Chair, Technical Committee on Transportation Power Electronics, IEEE Power Electronics Society.
- 2006-present: Editor (North America), International Journal of Electric and Hybrid Vehicles.
- 2005-present: Chair, Transportation Electronics Fellowship Committee, IEEE Vehicular Technology Society.
- 2003-present: Member, Technical Committee on Transportation Power Electronics, IEEE Power Electronics Society.

- Chair, Power Electronics Track, 34<sup>th</sup> Annual Conference of the IEEE Industrial Electronics Society (IECON'08), Orlando, FL, Nov. 2008.
- Program Chair, 2007 IEEE Vehicle Power and Propulsion Conference (VPPC'07), Arlington, TX, Sept. 2007.
- Track Chair, Power Electronic Automotive Applications, 38<sup>th</sup> IEEE Power Electronics Specialist Conference, Orlando, FL, June 2007.
- Track Co-Chair of Electric Machines and Drives, IEEE 32<sup>nd</sup> Industrial Electronics Conference, Paris, France, Nov. 2006.
- 2006-2007: Chair, IEEE International Future Energy Challenge.
- Founding General Chair, 1<sup>st</sup> IEEE Vehicle Power and Propulsion Conference (VPPC'05), Chicago, IL, Sept. 2005.
- General Chair, 2005 SAE International Future Transportation Technology Conference (FTT'05), Chicago, IL, Sept. 2005 (IEEE-VPPC'05 and SAE-FTT'05 were co-located on the campus of IIT under the leadership of Dr. Emadi).
- Track Chair of Automotive Applications, 36<sup>th</sup> IEEE Power Electronics Specialist Conference, Recife, Brazil, June 2005.
- Publications Chair, 36<sup>th</sup> IEEE Power Electronics Specialist Conference as well as 2005 IEEE Power Electronics Education Workshop, Recife, Brazil, June 2005.
- Track Co-Chair of Motors and Drives, IEEE 31<sup>st</sup> Industrial Electronics Conference, Raleigh, NC, Nov. 2005.
- Coordinator, 2005 IEEE/DOE/DOD International Future Energy Challenge.
- 2005-2007: Guest Editor, *IEEE Transactions on Industrial Electronics*, Special Section on Automotive Electronics and Electrical Drives, 2007.
- 2004-2006: Guest Editor-in-Chief, *IEEE Transactions on Power Electronics*, Special Issue on Automotive Power Electronics and Motor Drives, vol. 21, no. 3, May 2006.
- 2004-2005: Guest Editor, *IEEE Transactions on Vehicular Technology*, Special Section on Hybrid Electric and Fuel Cell Vehicles, vol. 54, no. 3, May 2005.
- 2004-2007: Associate Editor, *IEEE Transactions on Vehicular Technology*.
- 2004-2007: Associate Editor, *IEEE Transactions on Industrial Electronics*.
- 2003-2007: Associate Editor, *IEEE Transactions on Power Electronics*.
- 2003-2005: Member, Organizing Committee, IEEE Workshop on Power Electronics in Transportation (WPET).
- 2002-2005: Member, Editorial Board of the Journal of Electric Power Components and Systems.