

Annual Report 2010

Electrical and Computer Engineering

KANSAS STATE UNIVERSITY • COLLEGE OF ENGINEERING





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MESSAGE FROM THE DEPARTMENT HEAD

The Department of Electrical and Computer Engineering at Kansas State University reached its 111th year since electrical engineering began at K-State in 1899. The faculty continue to conduct very quality research while also maintaining our excellence in undergraduate education. Funding for our research programs continues to grow, with an approximate increase of 35% in 2010 over the previous year. Our faculty also remain effective in producing quality publications that exhibit their research results and contribute to the body of knowledge in their respective fields.

We have highlighted two different aspects of communications research and associated courses in this report. The wireless hardware projects led by Dr. William Kuhn have produced outstanding achievements in low power transceiver design for applications in space and other applications with power constraints. Research sponsors and collaborators include NASA, Sandia National Labs, Honeywell FM&T, and Peregrine Semiconductor. Graduates out of both groups have been highly sought after in both industry and academia. The WiCom group led by Dr. Bala Natarajan has conducted fundamental research on wireless communications and sensor networks. His team has led to some core technologies that are now incorporated in mobile communication standards, and their achievements in strategic deployment of sensors in a network are also noteworthy. The WiCom group receives funding from sponsors such as the from Department of Energy, Department of Defense, National Science Foundation, and the State of Kansas.

There are many other strengths in ECE that are evident within this report and from highlights in previous years. This includes the areas of biological computing, biomedical instrumentation and systems, complex networks, epidemic modeling, high speed computing architectures, power



distribution systems, renewable energy, and smart grid. The faculty continue to grow in their roles on larger collaborative projects that are both multidisciplinary and multi-institutional.

Finally, I would like to briefly mention some of the recognition our faculty and students have received in the past year. Professor James DeVault received the Commerce Bank Outstanding Undergraduate Teaching Award, while Dr. Steve Warren was part of a large NASA project to measure the physiological characteristics of humans during low-gravity missions. Graduate student

Sakshi Pahwa's research on distributed generation, islanding, and cascading failures was selected as the winner in the State of Kansas Graduate Research Summit. Dr. Ruth Douglas Miller received DOE grants to develop a Small-Wind Turbine Test Center at Colby, KS as well as a project to develop and analyze wind energy resources at a regional site. Dr. Noel Schulz also served as the president-elect of the IEEE Power & Energy Society

I hope you enjoy this snapshot of the research activities in our department for 2010. While it cannot capture all of the activities that are currently ongoing, additional information on our program can be found at our website, www.ece.ksu.edu. Please feel free to contact us if you would like to explore areas of collaboration or other common interests.

A handwritten signature in black ink that reads "Don Gruenbacher". The signature is fluid and cursive, with a large, stylized "D" and "G".

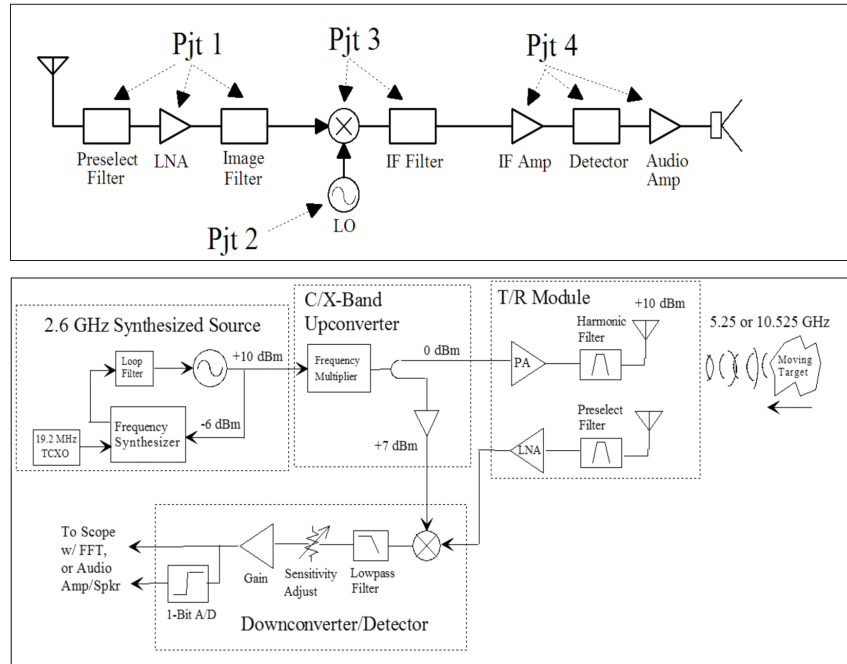
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Research and education in wireless hardware design

Underpinning the wireless products we enjoy today is a vast array of research and development in radio hardware design conducted over the last century. For more than 30 years, KSU's ECE department has provided students with outstanding laboratory experiences in the technologies involved. In addition to courses in the required

technologies for future wireless products. In particular, the senior/graduate-level digital radio hardware design course (ECE 765) was created for just this reason. Originally developed through a National Science Foundation Career Award, the course begins with the basics of digital wireless systems and proceeds to the study of RF integrated circuit design and system-level performance issues. A central feature of the course is a class project in which students work in teams/companies to produce an integrated circuit design/product. For example, during the fall 2010 semester, the class project was the design of a fully-integrated 2.4 GHz digital radio transceiver for use in future lunar or outer-planetary exploration.

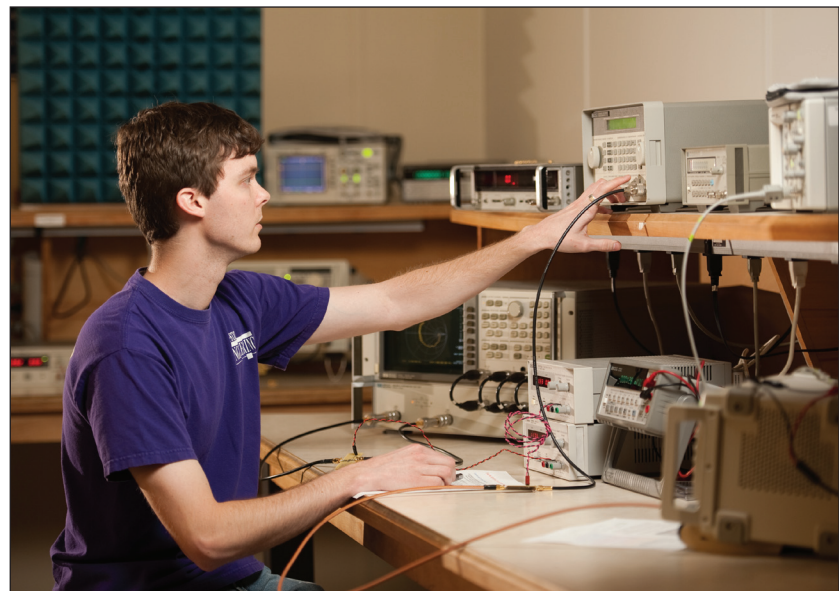
The design was done in Peregrine Semiconductor's latest 0.25um "GC" silicon-on-sapphire process and leveraged the departments existing "Mars Radio" transceiver design at 400 MHz as a foundation (www.ece.ksu.edu/research/mars). To accomplish this rather large task, stu-



Block diagrams of 662/764 radios/radars

mathematical theory (ECE 512 – Linear Systems Theory, ECE 557 – Electromagnetics, and ECE 660 – Communications Systems I), the department now offers three laboratory-oriented courses covering this “physical layer” of wireless systems: ECE 662 – Design of Communication Circuits, ECE 764 – Design of Microwave Circuits and ECE 765 – Digital Radio Hardware Design. In these courses, students design, build and test FM broadcast-band transmitters and receivers, antennas and radars operating at up to 10 GHz, and RF integrated circuits like those at the core of cell phone and wireless devices.

In conjunction with this course-level training, many participants join our communications research laboratory as seniors or graduate students where they research new tech-



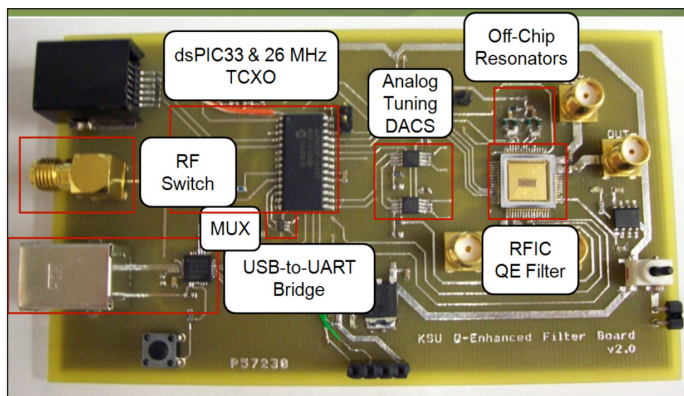
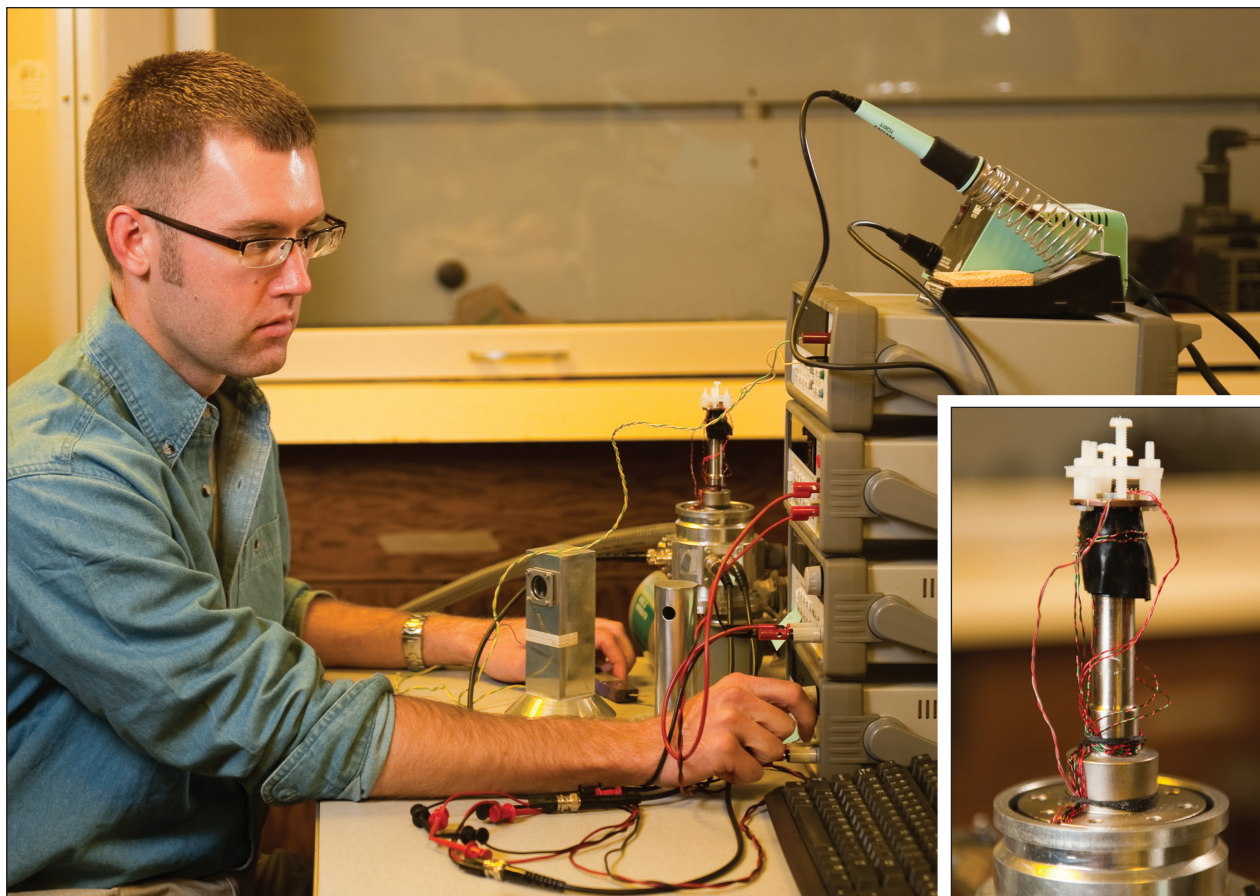
dents worked in teams using modern electronic design automation tools including those donated to the department by Agilent Technologies and Cadence Design Systems.

As another example of combining research and education in ECE 765, prior-year students worked on technologies for variable band-pass filters – an enabling hardware technology for future cognitive radio products which must adapt to many different radio standards. Through the course project and related support from research sponsors, a series of students researched automatic tuning algorithms, associated IC designs and underlying high-quality-factor inductors spawning theses, conference and journal publications, and demonstration hardware such as that pictured below. The filter response plots demonstrate the technique of narrowing the bandwidth of a filter through active circuits and has been shown to operate reliably over a range of temperatures from 25C to over 85C.

For wireless products of interest to NASA and related agencies, the department is also looking at performance of RF integrated circuits at extremely low temperatures. For example, it is characterizing the Peregrine Semiconductors GC process to tempera-

tures of 50 Kelvin and below as a precursor to being able to design circuits that operate at liquid nitrogen temperatures, or which can work on the moons of Jupiter or Saturn without the need for power-consuming “warm boxes” typically used to house electronics in today’s space probes.

Through all of these activities, the ECE department is working to maintain our strong tradition in radio hardware design education and scholarship, and keep our graduates at the forefront of new developments.



Filter board and demonstration



Wireless communication and information

Living in an untethered world where information access and exchange is ubiquitous, new applications and enabling technologies are fast emerging, stretching the boundaries of human imagination. This technological revolution has been fueled by research and development efforts across research institutions around the world and K-State is playing a critical role in this future. The WiCom group at Kansas State University, started in 2002 under the leadership of Dr. Bala Natarajan, has been engaged in state-of-the-art theoretical and applied research across a broad range of applications. Consistent research support from Department of Energy, Department of Defense, National Science Foundation, state of Kansas and industry partners has helped the group grow and advance research and development.

While core expertise of the group lies in statistical signal processing, stochastic modeling, optimization and control theory, the scope of their research is expansive. Over the past decade, researchers from the group have made significant contributions to the areas of wireless communication systems, sensor networks and signal/image processing systems. For example, Dr. Natarajan's early work on carrier interferometry OFDM- and DFT-based coding in CDMA systems is now part of mobile technology standard — 3GPP Release 10 uplink specifications. A subset of recent research contributions across multiple areas are highlighted in this article.

Wireless communication systems can support higher data rates when using multiple antennas at the transmitter and receiver, and current channel state information is available at the transmitter. Recently, the WiCom group has focused on single-user and multi-user MIMO (multiple input multiple output) precoding strategies to improve capacity and performance of multi-antenna systems. Specifically, they have made fundamental contributions to the areas of limited feedback precoding and space time coding in MIMO systems. The idea behind limited feedback precoding is to send quantized channel information from the receiver to the transmitter to improve capacity. While precoding based on Grassmanian manifolds and other structured approaches have been proposed for limited feedback systems, the group has developed a new online trellis-search-based

polyphase precoding strategy that (1) outperforms existing limited precoding methods in terms of ergodic capacity, (2) uses fewer number of feedback bits for a given performance constraint, (3) adapts to channel state changes and (4) has complexity



that does not scale exponentially with MIMO dimensions.

Dr. Natarajan and his former graduate student Justin Dyer have a related patent currently pending approval. The MIMO precoding work was inspired by their earlier groundbreaking patented work on a trellis-based algorithm for custom designing spreading sequences*. This work was featured in multiple news venues and enables the design of complex spreading sequences with custom correlation properties for code division multiple access (CDMA)-based wireless systems. The core technology can also be used to design pulse compression codes for multi-beam radars for military applications. Other current active projects relate to cooperative MIMO, cognitive radio networks and application of residue number system (RNS) arithmetic in the design of (1) frequency hopping patterns (2) pilot pattern design for channel estimation and (3) space time coding in MIMO systems.

With advances in embedded processing, sensor-based detection, monitoring and tracking networks are becoming more common. Researchers in the WiCom group have been advancing the state of the art in distributed detection, estimation and energy-aware information processing, and fusion in sensor networks. For any sensor network-based automated surveillance operation to be

successful, it is critical to have sensing resources strategically positioned to observe, interpret, react and maybe even predict events. In many practical scenarios, it is also expected that different zones within a surveillance area may have different probabilities of event detection (or false alarm) requirements. The operational objective in such surveillance systems is to optimize resources (number of sensors and the associated cost) and their deployment while guaranteeing a certain assured level of detection/false alarm performance. If employing data or decision fusion across sensors to help in a surveillance effort is known in advance, how can sensors be optimally deployed to satisfy end user performance requirements?

To address this question, WiCom group researchers have developed a novel approach for strategic sensor deployment based on optimal control theory principles. For the first time, unlike many heuristic approaches investigated earlier, the proposed approach provides a rigorous framework for sensor deployment. A control theoretic self-heal-



ing algorithm to deal with lost sensors in the detection network has also been developed. Currently, the group is working towards designing energy-aware cooperative estimation/tracking algorithms. The emphasis is on understanding how policies related to estimation load sharing among participating sensors impact the rate and power of transmissions. The goal is to quantify the tradeoff between lifetime of the network and the quality of estimates under different energy management policies.

In addition to fundamental research in wireless communication systems and sensor networks, students in the WiCom group are also engaged in applied research in smart grids, complex networks, and biomedical and image processing systems. These research efforts are in collaboration with a num-

ber of other faculty members within ECE: Drs. Pahwa, Miller, Das and Schulz (power systems); Dr. Scoglio (complex networks); Dr. Day (image processing); and Dr. Warren (biomedical systems). As many interesting challenges lie along boundaries of disciplines, these collaborative efforts have resulted in insights and solutions that are creating new design paradigms in the corresponding domains.

The success of WiCom research is a testament to the quality of graduate students who have been part of the group over the years. Twenty graduate students, six Ph.D. and 14 M.S., have graduated from the WiCom group. In addition to nearly 100 peer-reviewed journal and conference publications in the past nine years, and student paper awards in prestigious conferences, the WiCom group has also been home to an NSF graduate fellowship winner. The group currently has five Ph.D., three M.S. students and two undergraduate students engaged in a wide spectrum of research.

For more details on active research projects, related publications and graduate students, visit <http://www.ece.ksu.edu/wicom>.



* J.S.Dyer and B.Natarajan, Multiple Access Code Generation, U.S. Patent No. 7,587,660, issued September 8, 2009.

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Don Gruenbacher

- • • • • Ph.D., Electrical Engineering, Kansas State University, 1994
- M.S., Electrical Engineering, Kansas State University, 1991
- B.S., Electrical Engineering, Kansas State University, 1989
- Research: Communication networks, digital design, HDL synthesis and modeling, error-control coding, intrusion detection
- Teaching: Networking, digital design, stochastic processes



Satish Chandra

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- Research: Multimedia coding and communication over networks, multimedia watermarking and security, biomedical signal and image processing
- Teaching: Electric circuits and control, multimedia compression, computer design, discrete-time and computer-control systems, digital image processing



Sanjoy Das

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- Research: Multi-agent system, machine learning, neural networks, evolutionary computation, quantum computing, game theory, modeling and optimization
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- Teaching: Digital computer design, computer interfacing, digital filtering, digital signal processing, computer engineering methods, digital image processing



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- Research: Instrumentation, embedded systems, road smoothness testing
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Stephen A. Dyer

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- M.S., Electrical Engineering, Kansas State University, 1974
- B.S., Physics, Kansas State University, 1973
- Research: Instrumentation and measurement, numerical methods, communication theory, audio and electroacoustics, history of engineering
- Teaching: Electronics, linear systems, audio engineering, rapid design

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Will Hageman

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- M.S., Electrical Engineering, Kansas State University, 2002
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- B.S., Physics, Kansas State University, 1999
- Research: Solid-state lasers, fiber lasers, nonlinear optics, optical system design, thermo-optical modeling
- Teaching: Optoelectronics, lasers, electronics design lab, applied optics



William B. Kuhn

- • • • • Ph.D., Electrical Engineering, Virginia Polytechnic Institute and State University, 1996
- M.S., Electrical Engineering, Georgia Institute of Technology, 1982
- B.S., Electrical Engineering, Virginia Polytechnic Institute and State University, 1979
- Research: Analog/digital/RF circuit design, integrated circuit development, RF device technologies, wireless telecommunications systems design and implementations with emphasis on physical layer, renewable energy technology
- Teaching: Intro to electrical engineering, electronics, design of communication circuits, microwaves and antennas, IC design, digital radio hardware design



Ruth Douglas Miller

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- Teaching: Introduction to electrical engineer, electronics engineering lab, electronics, electromagnetic theory, introduction to biomedical engineering, wind engineering, bioinstrumentation lab



Medhat M. Morcos

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- B.Sc., Electrical Engineering, Cairo University, Cairo, Egypt, 1966
- B.Sc., Military Science, Military Academy, Egypt, 1966
- Research: Power electronics, power systems, electric machines, high-voltage engineering, gaseous dielectrics, engineering education
- Teaching: Power electronics, control systems, energy conversion, power quality



Bala Natarajan

- • • • • Ph.D., Electrical Engineering, Colorado State University, 2002
- B.E., Electrical and Electronics Engineering, BITS Pilani, 1997
- Research: Estimation and detection/decision theory, communication systems and theory, wireless communications, optimization theory, sensor signal processing and networks
- Teaching: Communication systems, wireless communications estimation and detection theory, information theory



Anil Pahwa

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- M.S., Electrical Engineering, University of Maine at Orono, 1979
- B.E., Electrical Engineering, Birla Institute of Technology and Science - Pilani, 1975
- Research: Power distribution system automation, reliability, analysis and design; intelligent computational methods for power systems
- Teaching: Power system analysis, design, protection; distribution system design and planning

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Andrew Rys

- • • • • Ph.D., Electrical Engineering, Texas Tech University, 1983
- M.S./B.S., Electronics Engineering, Technical University of Wroclaw, Poland, 1978
- Research: Solid-state electronics, design and processing of integrated circuits, characterization of III-V and wide band-gap II_N semiconductors, design of light detectors and sources
- Teaching: Introduction to electrical engineering, electronics, optoelectronics, integrated circuit design, IC devices and processes, solid-state devices



Noel N. Schulz

- • • • • Ph.D., Electrical Engineering, University of Minnesota, 1995, Minor: Computer Science
- Research: Application of computers, including intelligent systems, to solve problems
- Teaching: Power systems, energy conversion, application of computer programs to power engineering, application of intelligent systems to engineering problems, fundamentals of electrical circuits and technical communications in engineering



Caterina M. Scoglio

- • • • • Dr. Eng., Electronics Engineering, "Sapienza" University of Rome, 1987
- Research: Network science, computational epidemiology, complex networks, modeling and control of epidemics, dynamic networks
- Teaching: Network science, computer networks, circuit theory, epidemic models



David L. Soldan

- • • • • Ph.D., Engineering, Kansas State University, 1980
- M.S., Electrical Engineering, Kansas State University, 1976
- B.S., Electrical Engineering, Kansas State University, 1969
- Research: Engineering education and accreditation, curriculum development, economic models for universities, first-year experiences
- Teaching: Introductory logic design, digital systems design, computer architecture



Shelli Starrett

- • • • • Ph.D., Electrical Power Engineering, Iowa State University, 1994
- M.S., Electrical Power Engineering, University of Missouri - Rolla, 1990
- B.S., Electrical Engineering, University of Missouri - Rolla, 1988
- Research interests: Power system stability and control, voltage stability, applications of artificial intelligence to power systems, wide-area analysis, measurements and control, nonlinear simulations, innovations in engineering education, learning communities
- Teaching: Energy conversion, power devices, power laboratory, power system protection, power seminar, advanced systems theory



Steve Warren

- • • • • Ph.D., Electrical Engineering, The University of Texas at Austin, 1994
- M.S., Electrical Engineering, Kansas State University, 1991
- B.S., Electrical Engineering, Kansas State University, 1989
- Research: Biomedicine, home care, light-based biomedical instrumentation, student learning, telemedicine, numerical analysis and simulation
- Teaching: Circuit theory, linear systems, introduction to biomedical engineering, computer graphics, theory and techniques of bioinstrumentation, bioinstrumentation design laboratory, computer engineering methods for analysis, simulation and design

Agents, Algorithms and Artificial Intelligence Group

<http://www.ece.ksu.edu/~sdas/bic/bic.htm>

The AAA research group (formerly BIC) at K-State is involved in theoretical and applied research in machine learning, algorithm analysis, multiagent systems, game theory, multi-objective optimization and soft computing techniques for prediction, structure discovery, and other applications in terrestrial and shipboard power systems, smart grid and computational genomics. The group has received external funding from the National Science Foundation, Department of Defense and the U. S. Department of Agriculture in the areas of gene network modeling, shipboard systems and power distribution systems.

Communication Circuits Laboratory

<http://www.eece.ksu.edu/crl/ccl/>

The Communications Circuits Laboratory (CCL) conducts coordinated teaching and research in analog and radio frequency (RF) design. Within the teaching area, students design, build and test complete radios and radar systems at VHF through microwave frequencies. This gives our graduates practical, hands-on experience necessary for this field of engineering. Our research efforts have been primarily focused on design of transceivers in integrated circuit form, with special emphasis on the modeling and application of high-Q spiral inductors and performance of semiconductor processes. Students and faculty connected with the CCL have experience with standard bulk-CMOS, silicon-on-insulator (soi) and silicon-on-sapphire (SOS), and GaAs integrated circuit processes. Designs are created with tools from both Agilent and Cadence and are tested at the board and chip levels with industry-caliber measurement equipment and probing stations. Examples of research and development work is our Mars microtransceiver recently developed in collaboration with NASA's jet propulsion laboratory. This three-year project resulted in a complete RFIC chipset for future missions to the planet Mars. Please see <http://www.eece.ksu.edu/research/mars/> for additional information.

The Kansas Wind Applications Center

The Kansas Wind Applications Center missions are to educate electrical engineers on the basics of wind energy, and to be a source of information on wind energy for the people of Kansas who want to harvest wind power for the benefit of themselves, their children and the state. Research projects include the following:

- siting of small wind turbines, including means of assessing surface roughness and turbulence;

- networking of distributed generation sources for reliability, especially in islanded conditions; and
- development of curricula for use in K-12 and informal educational settings, such as 4-H, focusing on topics of energy and sustainability.

The WAC also runs the Wind for Schools program in which small wind turbines are installed at K-12 schools throughout Kansas for educational purposes. Undergraduate students assist with school selection, communications and siting. The WAC coordinates a variety of industry donors to accomplish the installations with minimal costs to the schools and enhanced cooperation with electric utilities. Through 2009, seven turbines had been installed at Kansas schools. The Wind Applications Center is funded by the Department of Energy under its Wind Powering America program.

Kansas State Epicenter

http://www.ece.ksu.edu/epicenter_wiki

Kansas State University's EPICENTER – Center for Complex Network Approach to Epidemiological, Biological, and Sociological Modeling and Simulation - is directed by Dr. Caterina Scoglio, associate professor of electrical and computer engineering, and Dr. Morgan Scott, professor of epidemiology in veterinary medicine. One of the main goals of EPICENTER is to provide policymakers with real-time, flexible modeling tools to curtail epidemiological outbreaks, whether it occurs in humans, animals, plants or computers. The most important aspect is use of a complex networks approach for the analysis of problems relating to multiple disciplines such as agriculture, veterinary science, biology, medicine, social sciences and engineering.

Highlights of the key areas under K-State EPICENTER are as follows:

- Network-based modeling for epidemics. These projects are concerned with the study and implementation of mathematical models of epidemic spreading in a realistic environment with individual-based models and meta-population models. Work on models for specific contagious diseases such as foot and mouth disease and Rift Valley fever are in progress.
- Agent-based epidemiological simulator for rural communities. The aim of this project is to design agent-based simulation software for a set of representative infectious diseases in a rural community to detect the conditions under which an epidemic would spread or die out, as well as to determine the direction and

speed if it spreads. These results will be used to derive and analyze optimized policies and guidelines for containment and prevention of infectious diseases.

- Modeling of interconnections among human behavior and epidemic spreading. Human behaviors play a crucial role in how an epidemic spreads in a social society. Despite extensive studies on how human beings perceive a disease and the behavior they show in response, not many results have been reported on how human behavior would actually affect the epidemic spread. The goal in this study is to provide interconnected models for epidemic spread and individual behaviors, followed by simulation and analysis of the models.
- Network partitioning for mitigation of epidemics. One of the considered mitigation strategies to control and reduce epidemic spreading is quarantine. When contacts are represented by a network, quarantine can be determined using network partitioning algorithms. We are developing network partitioning algorithms, designed to be a simple, efficient method to partition a network into possible quarantine sections. Our algorithm, called Bloom, grows partitions and then allows the individuals to decide which partition they feel most comfortable in. We have implemented the first algorithm and done some initial testing on classical clustering graphs.

Sunflower Networking Group (SNG)

http://www.eece.ksu.edu/sunflower_wiki

Our goals are to conduct theoretical research in emerging areas, as well as to apply optimal networking solutions through simulations, to current and future realistic problems. General areas of interest include network science, network robustness, networking protocols, architecture, modeling and analysis, security and network metrics.

Three main topics of focus are as follows:

- Characterization and control of complex networks. Projects based on this topic are concerned with the study of multiple statistical metrics and performance indices for complex networks. Specific projects under this category include quantifying the robustness of complex networks with respect to epidemic spreading using SIS and SIR models and mitigation strategies using optimal control, analysis of cascading failures in power grid networks with mitigation strategies including use of distributed sources and islanding, efficient techniques for modularity and cluster detection in complex networks, and study of weighted networks.

- GpENI—enabling network innovation at K-State. The Great Plains Environment for Network Innovation (GpENI) is a regional network between the University of Kansas (KU), Kansas State University (K-State), University of Nebraska – Lincoln (UNL), and University of Missouri – Kansas City, within the Great Plains Network. Global Environment for Network Innovation (GENI) is a global, programmable testbed which provides experimenters the ability to deploy innovative ideas in real-time. SNG administers the core GpENI testbed, an aggregate of GENI that realizes programability at all seven layers of the protocol stack through PlanetLab, VINI and DCN (dynamic circuit network). Furthermore, SNG has enabled K-State to become the 13th openflow campus among other schools including Georgia Institute of Technology, Stanford and Rutgers. This opportunity allows researchers at K-State, and also researchers around the world, the opportunity to conduct network research in domains such as security, mobility, energy management, access control and traffic management.
- Peer-to-Peer networks. Peer-to-Peer (P2P) networking is a distributed application architecture which generates more than 50% traffic in the current Internet. Different from traditional client-server architecture, each peer is both a service consumer and a service provider in P2P networks. P2P technologies can be used to improve system performance, scalability and robustness; therefore they are popular in file-sharing, video streaming, web caching, etc. The goal of this project is to design architectures and protocols to enhance the efficiency of P2P systems.

Medical Component Design Laboratory (MCDL)

Steve Warren directs the KSU ECE Medical Component Design Laboratory (MCDL), housed in Rathbone Hall. The primary mission of the MCDL is to support work in interoperable component design for medical systems: plug-and-play hardware/software elements that can be assembled rapidly to create care systems matched to patient needs. Interoperability standards, wireless devices, wearable sensors, and light-based devices play important roles in this research, which targets physiologic monitoring for humans and animals. Quality of life issues (e.g., successful aging and technology applications for the disabled) are important drivers for the pervasive care environments addressed by these projects. This laboratory also plays an important role in engineering



education via the delivery of research products into the classroom and grant-sponsored research that focuses on how students learn and how students transfer and retain knowledge over multiple semesters. Primary collaborators in 2010 included Heartspring (Wichita, Kan.), East Carolina University, the KSU Department of Computing & Information Sciences, the KSU Department of Anatomy & Physiology, the KSU Electronics Design Laboratory, the KSU Mathematics Department, the KSU Physics Department, the KSU Kinesiology Department, the U.S. Food and Drug Administration, and the University of Pennsylvania. Project funding was received from the National Science Foundation (CCLI/TUES, CNS, CRI, & REESE), NASA and the KSU Targeted Excellence program

Influence of Environmental Factors on Outages in Electricity Distribution Systems

Environmental factors such as lightning, wind, tree, and squirrels cause a majority of outages in distribution systems. Their effects follow random processes with higher probability of outages under worse conditions. Understanding effects of environmental variables is important for utilities to increase reliability of electricity distribution systems. The National Science Foundation is providing funding to Dr. Anil Pahwa and Dr. Sanjoy

Das to investigate these effects. Due to the complex nature of interaction of these factors with distribution systems, modeling becomes difficult. In this project, we are investigating regression, neural networks, wavelet decomposition and Bayesian models to study effects of environmental variables on distribution systems. For example, to study the influence of lightning and wind, we have used non-linear regression models with maximum daily wind gust and sum of lightning strokes in a day as inputs and outages as outputs. Applying these models to five years of data (2005-2009) obtained for service territories of Manhattan, Lawrence and Topeka show that the model with linear relationship for lightning and quadratic relationship for wind to outages gives the best performance. Future research will focus on exponential regression models, neural networks and Bayesian models.

Community Wind

Wind generation has received significant attention over the past decade, but most of the focus has been on large wind farms. The focus of this project, supported by the U.S. Department of Energy, is to investigate the feasibility of owning a wind generator by electricity distribution co-operative. Dr. Anil Pahwa and a graduate student are using the hourly load data of a co-operative in western Kansas and weather data for this research.

Sanjoy Das

- D. Kundu, K. Suresh, S. Ghosh, Sw Das, B.K. Panigrahi, S. Das, "Multi-objective optimization with artificial weed colonies," Information Sciences, 2010, doi:10.1016/j.ins.2010.09.026 (ISI Web of Knowledge 2009 Impact Factor: 3.291).
- B. K. Pa V. R. Pandi, S. Das and Sw. Das, "Multiobjective fuzzy dominance-based bacterial foraging algorithm to solve economic emission dispatch problem," Energy, Vol. 35, No.12, pp. 4761-4770, 2010. (ISI Web of Knowledge 2009 Impact Factor: 2.952).
- M. R. Lohokare, S. S. Pattnaik, S. Devi, B. K. Panigrahi, S. Das, J. G. Joshi, "Extrapolated Biogeography- Based Optimization for Global Numerical Optimization and Patch Antenna Design," International Journal of Applied Evolutionary Computation, Special Issue on Applications of Bioinspired Computing to Control and Forecasting, Vol. 1, No. 3, pp. pp. 1 – 26, 2010.
- O. Odeh, A. Featherstone, S. Das, "Predicting Credit Default: Comparative Results from an Artificial Neural Network, Logistic Regression and Adaptive Neuro-Fuzzy Inference System," International Research Journal of Finance and Economics, Vol. 42, pp. 7 – 18, 2010.
- S. Pal, S. Bose, S. Das, S. Scoglio, B. Natarajan, N. Schulz, "Shipboard power system reconfiguration using reinforcement learning," pp. 1-7, Proceedings, North American Power Symposium, 2010.
- S. Bose, S. Pal, B. Natarajan, S. Scoglio, S. Das, N. Schulz, "Analysis of optimized reconfiguration of power system for electric ships," pp. 1-7, Proceedings, North American Power Symposium, 2010.
- M. Gui, A. Pahwa, S. Das, "Classification of input and output variables for a Bayesian model to analyze animal-related outages in overhead distribution systems," IEEE 11th International Conference on Probabilistic Methods Applied to Power Systems (PMAPS), Singapore, pp. 469 – 474, 2010.
- S. Ghosh, Sw. Das, S. Das, "On the asymptotic convergence of differential evolution in continuous spaces: a control theoretic approach," pp. 2073-2074, ACM Genetic & Evolutionary Computing Conference, (Late Breaking Papers), 2010.
- A. Ghosh, A. Chowdhury, R. Giri, Sw Das, S. Das, "A fitness-based adaptation scheme for control parameters in differential evolution," pp. 2075-2076, ACM Genetic & Evolutionary Computing Conference, (Late Breaking Papers), 2010.
- S. Roy Choudhury, S. Das, C. Scoglio, Sw. Das, B. K. Panigrahi, S. S. Pattnaik, "Mitigation Strategies in Epidemics: Evolutionary

Optimization Using a Hierarchy of Objective Functions," Proceedings, ACM Genetic & Evolutionary Computing Conference, pp. 1325-1326, 2010

Stephen A. Dyer

- S. A. Dyer and J. S. Dyer, "Least-Squares Fitting of Data by Rational Functions: Levy's Method (Part 2)," IEEE Instrumentation & Measurement Magazine, vol. 13, no. 2, pp. 38-42, Apr. 2010.

Don Gruenbacher

- D. Soldan, W.P. Osborne, and D. Gruenbacher, "Modeling the Economic Cost of Inadequate Teaching and Mentoring," Proceedings of the 40th ASEE/IEEE Frontiers in Education Conference, Arlington, VA.
- Y. Li, D. Gruenbacher, "Analysis of P2P File Sharing Network's Credit System for Fairness Management," IEEE NOMS, April 2010.
- J. Sterbenz, D. Medhi, B. Ramamurthy, C. Scoglio, D. Hutchison, B. Plattner, T. Anjali, A. Scott, C. Buffington, G. Monaco, D. Gruenbacher, R. McMullen, J. Rohrer, P. Angu, H. Qian, N. Tare, "The Great Plains Environment for Network Innovation (GpENI): A Programmable Testbed for Future Internet Architecture Research," ICST TridentCom, May 2.

William Hageman

- William Hageman, Ying Chen, Xiangru Wang, Lanlan Gao, Gyu Ug Kim, Martin Richardson, and Michael Bass, "Scalable side-pumped, gain-guided index-antiguidded fiber laser," J. Opt. Soc. Am. B 27, 2451-2459 (2010) – (PUBLISHED DEC 2010) Impact Factor - 2.087.
- W. B. Hageman, Y. Chen, M. Bass, V. Sudesh, T. McComb, M. Richardson, and G. Kim, "Diode Side Pumping of a Gain-Guided, Index Anti-Guided Large Mode Area Neodymium Fiber Laser," in Advanced Solid-State Photonics, OSA Technical Digest Series (CD) (Optical Society of America, 2010), paper AMB5. – (REFEREED CONFERENCE).

William Kuhn

- William B. Kuhn and Adam P. Boutz, "Measuring and Reporting High Quality Factors of Inductors Using Vector Network Analyzers," IEEE Transactions on Microwave Theory and Techniques, IEEE Transactions on Microwave Theory and Techniques, pp. 1046 – 1055, April 2010.

Ruth Douglas Miller

- S. Kubler, M. Youssef, R.D. Miller, C. Scoglio, "Wind data transfer program for Skystream wind turbines," Windpower 2010: American Wind Energy Association Annual Conference,

Dallas, TX, May 2010.

- A.A. Jose, A. Pahwa, R.D. Miller. "Intelligent Dispatch of Small Wind and Solar Generators," IEEE Power Engineering Society Transmission and Distribution Annual Meeting, New Orleans, LA, April 2010.

Medhat M. Morcos

- F. Misoc, J. Lookadoo, M.M. Morcos, "Effect of DC-DC converter topologies and operation on the electrical performance of fuel cells," Electric Power Components and Systems, Vol. 38, pp. 851-861, 2010.
- J.C. Gomez and M.M. Morcos, "A new methodology for coordination of over-current protection systems with embedded distributed generation," Electric Power Components and Systems, Vol. 38, pp. 615-619, 2010.

Bala Natarajan

- S. Warren and B. Natarajan, "Wireless Communication Technologies for Wearable systems," in Wearable Monitoring Systems, Springer Publications, Dec 2010.
- A. Ababnah and B. Natarajan, "Optimal Control-Based Sensor Deployment Incorporating Data Fusion," IEEE Transactions on Aerospace and Electronic Systems, October 2010.
- A. Ababnah and B. Natarajan, "Optimal Control-Based Strategy for Sensor Deployment," IEEE Transactions on Systems, Man and Cybernetics, Part A: Systems and Humans (in press)
- D. Zhu and B. Natarajan, "Residue Number System Arithmetic Inspired Hopping Pilot Pattern Design," IEEE Transactions on Vehicular Technology, vol. 59, no. 7, Sep 2010, pp. 3679-3683.
- R. Krishnan, B. Natarajan and S. Warren, "Two-Stage Approach for Detection and Reduction of Motion Artifacts in Photoplethysmographic Data," IEEE Transactions on Biomedical Engineering, vol. 57, no. 8, August 2010, pp. 1867-1876.
- D. Zhu and B. Natarajan, "Limited Feedback-Based Unitary Precoder Design in Rician MIMO Channel via Trellis Exploration Algorithm," Proceedings of IEEE Global Telecommunications Conference, GLOBECOM 2010, Miami, FL, December 2010. (Acceptance rate – 33%)
- A. Ababnah and B. Natarajan, "LQR Formulation of Sensor Deployment for Decision Fusion-Based Detection," Proceedings of IEEE Global Telecommunications Conference, GLOBECOM 2010, Miami, FL, December 2010. (Acceptance rate – 33%)
- R. Krishnan and B. Natarajan, "On the Achievability in Cooperative Amplify and Forward Wireless Relay Network," Proceedings of IEEE

Global Telecommunications Conference, GLOBECOM 2010, Miami, FL, December 2010. (Acceptance rate – 33%)

- A. Ababnah and B. Natarajan, "Control theoretic sensor deployment for data fusion-based detection," Proceedings of 6th IEEE/ACM International conference on Distributed Computing in Sensor systems, Lecture Notes in Computer Science, vol. 6131. Springer, Santa Barbara, CA, 2010, pp. 92–101. (Acceptance Rate – 36.8%)
- D. Zhu and B. Natarajan, "Residue number system arithmetic-inspired hopping pilot pattern design for cellular downlink OFDMA," Proceedings of 9th annual Wireless Telecommunications Symposium (WTS), Tampa, FL, April 2010. (Acceptance Rate – 50%)
- L. Akter and B. Natarajan, "Modeling Fairness in Resource Allocation for Secondary Users in a Competitive Cognitive Radio Network," Proceedings of 9th annual Wireless Telecommunications Symposium (WTS), Tampa, FL, pp. 1-6, April 2010. (Acceptance Rate – 50%)
- S. Bose, S. Pal, B. Natarajan, C. Scoglio, S. Das, and N. Schulz, "Analysis of Power System Reconfiguration of Electric Ships," North American Power Systems Symposium (NAPS 2010), Arlington, TX, September 2010.
- S. Pal, S. Bose, S. Das, B. Natarajan, C. Scoglio, and N. Schulz, "Power System Reconfiguration of Electric Ships Using Reinforcement Learning," North American Power Systems Symposium (NAPS 2010), Arlington, TX, September 2010.

Anil Pahwa

- H. Caswell, V. Forte, J. Fraser, A. Pahwa, T. Short, M. Thatcher, V. Werner, "Weather Normalization of Reliability Indices," IEEE Transactions on Power Delivery, Volume 26, no. 2, 2011, pp. 1273-1279.
- M. Gui, A. Pahwa, and S. Das, "Bayesian Network Model with Monte Carlo Simulations for Analysis of Animal-Related Outages in Overhead Distribution Systems," IEEE Transactions on Power System, 2011.
- Anita A. Jose and A. Pahwa, "Economic Evaluation of Small Wind Generation Ownership under Different Electricity Pricing Scenarios," North American Power Symposium, Arlington, TX, Sept. 2010.
- A. Tamimi, A. Pahwa, S. Starrett, and N. Williams, "Maximizing Wind Penetration Using Voltage Stability- Based Methods for Sizing and Locating New Wind Farms in Power System," IEEE Power and Energy Society General Meeting, Minneapolis, MN, July 2010.
- M. Gui, A. Pahwa, and S. Das, "Classification of Input and Output Variables for a Bayesian Model to Analyze Animal-Related Outages in Overhead Distribution Systems," International

Conference on Probabilistic Methods Applied to Power Systems, Singapore, June 2010.

- T. Hong, A. Pahwa, P. Wang, M. Gui, and S. Hsiang, "Cost of temperature history data uncertainties in short-term electric load forecasting," International Conference on Probabilistic Methods Applied to Power Systems, Singapore, June 2010, pp. 212-217.
- T.-W. Ko and A. Pahwa, "Investigating Small Renewable Energy Light Sources to Meet the Needs of Off-Grid People," Proceedings of International Conference on Power Systems Operation and Planning, Abuja, Nigeria, Jan. 2010.
- A. Esmaily, A. Pahwa, J. G. Thompson, and D. Watts, "Challenges and Opportunities for Strengthening Higher Education in Afghanistan," Paper No. AC2010-2345, ASEE Annual Conference, Louisville, Kentucky, June 2010.
- A. Pahwa, W. Kuhn, C. Lewis, R. D. Miller, A. Rys, "Sustainability in ECE Curriculum," NSF Awardees Conference, Reston, VA, Feb 2010.
- A. Pahwa, W. Kuhn, C. Lewis, R. D. Miller, A. Rys, "Sustainability in ECE Curriculum," K-State Sustainability Symposium, Jan 2010.
- S.S. Venkata, S. Roy, A. Pahwa, G. L. Clark and E. C. Boardman, "Smart Distribution Grid: Status, Goals, Vision and Pathway for Success," 2010 NSF/ECEDHA Energy and Power Educational Programs Development Workshop, Washington, DC, November 1, 2010. (Invited)
- Padmavathy Kankanala (Advisors: A. Pahwa and S. Das), "Regression Models for Outages Due to Wind and Lightning on Overhead Distribution Feeders," Student Paper Contest, IEEE Power and Energy Society General Meeting, Minneapolis, MN, July 2010.
- Subedi (Advisors: A. Pahwa and S. Das), "Trouble Call Analysis Supported by Intelligent Techniques," Student Paper Contest, IEEE Power and Energy Society General Meeting, Minneapolis, MN, July 2010.
- Anita A. Jose (Advisor: A. Pahwa), "Economic Evaluation of Small Wind Generation Ownership under Different Electricity Pricing Scenarios," Student Paper Contest, IEEE Power and Energy Society General Meeting, Minneapolis, MN, July 2010.
- A. A. Jose (Advisor: A. Pahwa), "Economic Evaluation of Small Wind Generation Ownership under Different Electricity Pricing Scenarios," Student Paper Contest, IEEE Power and Energy Society T&D Conference and Exposition, New Orleans, LA, April 2010.
- Anita A. Jose (Advisor: A. Pahwa), "Residential Load-Curtailment Schemes in the Presence of Wind Generation and Storage," K-State Research Forum, March 2010.
- A. Pahwa, Editor and Chairman, "Smart Distribution Systems Tutorial," IEEE Power and

Energy Society General Meeting, Minneapolis, MN, July 2010.

- G. Karady and A. Pahwa, "Phasor Analysis, Power Definitions, Single-Phase and Three-Phase Circuits," Power System Educational Track, IEEE/PES T&D Conference and Exposition, New Orleans, April 2010.

Noel N. Schulz

- Soumya K. Srivastava, Anurag K. Srivastava, Adrienne R. Minerick and Noel N. Schulz, "Recruitment and Retention of International Graduate Students in U.S. Universities," International Journal of Engineering Education, Vol. 26, No. 6, pp. 1561-1574, 2010.
- Qiuli Yu, Noel N. Schulz and Anurag K. Srivastava, "Multi-Agent-Based Reconfiguration of AC-DC Shipboard Distribution Power System," Integrated Computer-Aided Engineering, 17 (2010) pp. 347-357.
- Jignesh M. Solanki, Sarika Khushalani Solanki and Noel Schulz, "Multi-Agent-Based Reconfiguration for Restoration of Distribution Systems with Distributed Generators," Integrated Computer-Aided Engineering, 17 (2010), pp. 331-346
- Minglan Lin, Anurag K Srivastava and Noel Schulz, "Voltage Stability Assessment of AC/DC Systems," Proceedings of the IEEE PES T&D Conference and Exposition, New Orleans, LA, April 19-22, 2010.
- Venkata Pendurthi, Noel Schulz and Anurag K Srivastava, "Dealing with Errors in the Measurements for the Reconfiguration of Distribution Power Systems," Proceedings of the IEEE PES T&D conference and exposition, New Orleans, LA, April 19-22, 2010.
- Sayak Bose, Siddharth Pal, Caterina Scoglio, Bala Natarajan, Sanjoy Das and Noel N. Schulz, "Analysis of Optimized Reconfiguration of Power Systems for Electric Ships," Proceedings of the North American Power Symposium, University of Texas-Arlington, September, 2010.
- Siddharth Pal, Sayak Bose, Sanjoy Das, Caterina Scoglio, Bala Natarajan and Noel Schulz, "Shipboard Power System Reconfiguration Using Reinforcement Learning," Proceedings of the North American Power Symposium, University of Texas-Arlington, September, 2010.

Caterina M. Scoglio

- R. Gehring, P. Schumm, M. Youssef, C. Scoglio, "A Network-Based Approach for Resistance Transmission in Bacterial Populations," Journal of Theoretical Biology (impact factor 2.454), Elsevier, Vol. 262, Issue 1, 7 Jan. 2010, Pages 97-106.
- P. Schumm, C. Scoglio, D. van der Merwe, "A Novel Network-Based Model for Dermal Absorption," Journal of Theoretical Biology (impact factor 2.454), Elsevier, Vol. 262, Issue 3, 7 Feb. 2010, Pages 471-477.

- C. Scoglio, C. Bruni, G. Koch, S. Suttrave, "Estimation of Traffic Flows from Aggregate Measurements," *Mathematical and Computer Modeling* (impact factor 1.032), Elsevier, 2010, Volume 52, pp. 837-853, 2010.
- C. Scoglio, W. Schumm, P. Schumm, T. Easton, S. Chowdhury, A. Sydney, M. Youssef, "Efficient Mitigation Strategies for Epidemics in Rural Regions," *PLoS ONE* 5(7): e11569. doi:10.1371/journal.pone.0011569, (impact factor 4.351), 2010.
- M. Youssef, B.Y. Choi, C. Scoglio, E. K. Park, "Dynamic Hybrid Topology Design for Integrated Traffic Support in WDM Mesh Networks," *International Journal of Computer Networks*, Volume 2, Issue 2, pp. 115-131, 2010.
- A. Sydney, C. Scoglio, M. Youssef, P. Schumm, "Characterizing the Robustness of Complex Networks," *Int. J. Internet Technology and Secured Transactions*, Volume 2, Nos 3/4, pp. 291-320, 2010, 2010.
- C. Scoglio, P. Schumm, W. Schumm, "Detecting Key Locations in Rural Communities to Reach Critical Individuals for Epidemic Spreading," 2010 Conference on Modeling for Public Health Action, December 9-10 Atlanta, GA, USA.
- S. Pahwa, A. Hodges, C. Scoglio, S. Wood, "Topological Analysis of the Power Grid and Mitigation Strategies against Cascading Failures," 4th Annual IEEE International Systems Conference, April 5-8, 2010, San Diego, CA, USA.
- S. Roy Chowdhury, C. Scoglio, W. Hsu, "Simulative Modeling to Control the Foot and Mouth Disease Epidemic," *Procedia Computer Science*, Vol. 1, 2010, pp. 2261-2270, (acceptance rate 30%), May 31- June 2, 2010, Amsterdam, The Netherlands.

David L. Soldan

- "Modeling the Economic Cost of Inadequate Teaching and Mentoring," with W. P. Osborne and D. Gruenbacher, *Proceedings of the 40th ASEE/IEEE Frontiers in Education Conference*, Arlington, Virginia, October 2010. (Refereed, 50% acceptance rate)
- Chair, "Department-Level Reforms Panel Session," 2010 ECEDHA Annual Conference and ECExpo, Clearwater Beach, Florida, March 12-16, 2010.

Shelli Starrett

- Ala A. Tamimi, Anil Pahwa, Shelli Starrett. "Methods for Determining Optimal Sizes of Multiple Wind Farms to Increase Wind Penetration in Power Systems Using Voltage-Stability Margins." *Proceedings of IEEE Power and Energy Society General Meeting* 2010.
- Ala A. Tamimi, Anil Pahwa, Shelli Starrett. "Method for Assessing System Impact of Increasing Wind Farm Sizes Above Their Maximum Voltage Stability Limits." Submitted to 2011 IEEE PES General Meeting, July 26 -July 29, 2011.
- Starrett, S.K., Shelli K. Starrett, Travis Heier and Yunsheng Su. 2010. "Impact of Filled in Data on Santa Clara River Annual Peak Flows." *EWRI World Environmental and Water Resources Congress*. Providence, RI.
- Starrett, Steven K., Starrett, Shelli K., Heier, T., Su, Y., Banduraga, M. and D. Tuan. 2010. Filling in Missing Peakflow Data Using Artificial Neural Networks. *ARPJ. of Engineering and Applied Sciences* Vol. 5, No. 1.

Steve Warren

- Warren, Steve and Balasubramaniam Natarajan – Chapter 3: *Wireless Communication Technologies for Wearable Systems*, pp. 51–80. Bonfiglio, Annalisa and Danilo De Rossi, Editors. *Wearable Monitoring Systems*, © 2010, First Edition, December 2, 2010, Springer, New York, ISBN-10: 1441973834, ISBN-13: 978-1441973832.
- Warren, Steve and Jianchu Yao. "Work in Progress: Updates to a Mobile Circuits-and-Signals Learning Kit that Incorporates a USB Data Acquisition Unit," *Frontiers in Education* 2010, Marriott Crystal Gateway, Arlington, VA, October 27–30, 2010, pp. S2H-1–S2H-2.
- Yao, Jianchu, Loren Limberis, and Steve Warren. "Work in Progress: A Ubiquitous Laboratory Model to Enhance Hands-On Learning in Electronics Courses Offered by Two Universities with Dissimilar Curricula," *Frontiers in Education* 2010, Marriott Crystal Gateway, Arlington, VA, October 27–30, 2010, pp. F3C-1–F3C-2.
- Diederich, Sam. "The Road to Space Goes through Manhattan, Thanks to NASA Grant," *KSU Collegian*, Vol. 116, No. 10, September 3, 2010.
- Torline, Jennifer. "Researchers Explore Physiological Effects of Space Travel with NASA Grant," *KSU Press Release*, August 23, 2010.
- Li, Kejia and Steve Warren. "A High-Performance Wireless Reflectance Pulse Oximeter for Photo-Plethysmogram Acquisition and Analysis in the Classroom," 2010 Annual Conference and Exposition, American Society for Engineering Education, Louisville, KY, June 20–23, 2010.
- Warren, Steve and Jianchu Yao. "Portable Cyber-Laboratories for Electrical Engineering Education," 2010 Annual Conference and Exposition, American Society for Engineering Education, Louisville, KY, June 20–23, 2010.
- Rebello, N.Sanjay, Elizabeth Gire, Dong-Hai Nguyen, Dean A. Zollman, Andrew G. Bennett, and Steve Warren. "Investigating Students' Transfer of Problem-Solving Skills in Physics Across Multiple Representations," 2010 NSF REESE PI Meeting, Ritz-Carlton, Pentagon City, Washington, D.C., March 11–12, 2010.
- Bennett, Andrew G., Todd Moore, Xuan Hien Hguyen, N.Sanjay Rebello, Dean Zollman, and Steve Warren. "Investigating Students' Conceptual Understanding and Transfer in Mathematics," 2010 NSF REESE PI Meeting, Ritz-Carlton, Pentagon City, Washington, D.C., March 11–12, 2010.
- Krishnan, Rajet, Balasubramaniam Natarajan, and Steve Warren. "Two-Stage Approach for Detection and Reduction of Motion Artifacts in Photoplethysmographic Data," *IEEE Transactions on Biomedical Engineering*, Vol. 57, No. 8, February 13, 2010, pp. 1867–1876.

Sanjoy Das

- Co-PI (with C. Weinig-PI, J. N. Maloof, C. Robertson McClung, S. M. Welch), "Agroecological annotation of gene function and computational analysis of gene networks," National Science Foundation, (\$5,652,782), 5 years.
- Co-PI (with A. Pahwa-PI), "Influence of Lighting, Wind, Trees, and Squirrels on Reliability of Power Distribution Systems," National Science Foundation, (\$289,747), 3 years.
- Co-PI (with N. Schulz-PI, B. Natarajan, C. Scoglio-Co-PIs), "Advanced Computational and Sensor Network Methods for MVDC Shipboard Power Systems," DoD EPSCoR ONR, (\$569,380), January 2010 – December, 2012.
- Co-PI (with A. Pahwa -PI), "Trouble Call Analysis Supported by Intelligent Techniques, Power Affiliates Program," (\$17,800), 2009-2010.
- PI, Development of ECE 840 as a Distance Education Course, K-State DCE, (\$5,000).
- Funded Senior Investigator (with M. Welch, W. H. Hsu, J. L. Roe), "Molecular Evolutionary Ecology of Developmental Signaling Pathways in Complex Environments," NSF FIBR 0425759, funded senior investigator (co-PIs R. Amasino-U. of Wisconsin), M. Purugganan-NCSU, S. Welch-KSU) (sub-team amount: \$1,405,614), September 1, 2004 – August 31, 2009, extended to 2010.

Dwight Day

- Co-PI, "Process to Automatically Rate Severity and Extent of D-Cracking of Concrete Pavement from Lin-Scan Images," KSU RE-0560-01, Kansas Department of Transportation, (\$75,000), April 2010.

Don Gruenbacher

- Co-PI (with D. Soldan -PI, and N. Schulz), "From Defense to Degree: Accelerating Engineering Degree Opportunities for Military Veterans," National Science Foundation, (\$146,000), August 2010 – July 2012.
- Co-PI (with D. Soldan, and W. P. Osborne-SIU-Carbondale), "Modeling the Economic Cost of Inadequate Teaching and Mentoring," NSF IEECI program, (\$148,390), January 1 to June 30, 2010. Subcontract \$50,000 to SIU-C.
- Co-PI (with J. Sterbenz-KU, C. Scoglio, G. Monaco-KSU, B. Ramamurthy-UNL, and D. Medhi -UMKC), "GpENI: The Great Plains Environment for Network Innovation," NSF—GENI (Global Environment for Network Innovation), (\$462,000), September 2009 – August 2011.
- Co-PI (with C. Lewis, R. Miller, B. Natarajan, A. Pahwa, C. Scoglio), "Kansas Wind Energy Consortium," (\$713,625), August 1, 2010 – June 31, 2010.
- Co-PI (with R. Miller, C. Lewis, A. Pahwa, C. Scoglio, B. Natarajan), "Wind Energy and Sustainable Energy Solutions," U.S. Department

of Energy (though Wichita State University), (\$216,978), December 1, 2010 – December 1, 2012.

William Kuhn

- PI, "Phase V Research and Development at Kansas State University," Sandia National Laboratory, (\$85,095), December 2010 – September 2011.
- PI, "Research in RFIC Design and LTCC Filter Implementations," Honeywell, KCP, (\$70,468), Phase II FY 2011, November 2010 – October 2011.
- PI, "Design and Measurement Techniques for High-Quality Factor Filters and Passive Components," Honeywell, KCP, (\$51,968), December 2010 – September 2011.
- PI, "Noise Measurements in Silicon-on-Sapphire IC Processes," Peregrine Semiconductor, (\$6,839), September 2010 – December 2010.
- Co-PI (with A. Rys), "Extreme Environment Electronics in Silicon on Sapphire," UES, (\$50,000), December 2010 – March 2012.
- PI, "RFIC Development in Peregrine SOS Phase IV," Sandia National Laboratory, (\$116,928), October 2009 – September 2010.
- PI, "Research in RFIC Design and LTCC Filter Implementations," Honeywell, KCP, (\$96,586), Phase I FY2010, October 2009 – September 2010.
- PI, "Electrical Testing and Characterization of Thin Film Capacitors on Low-Temperature, Co-Fired Ceramic (LTCC)," Honeywell KCP, (\$9,755), November 2009 – September 2010.
- PI, "Microtransceiver Development and Support," Ball Aerospace, (\$22,395), November 2009 – March 2010.
- Co-PI (with A. Pahwa, A. Rys, R. Miller, C. Lewis), "Winds of Change in ECE: Infusing Sustainability into the Program," NSF EEC-IEECI, (\$316,338), September 1, 2009 – February 2011.

Ruth Douglas Miller

- Co-PI (with A. Pahwa, A. Rys, B. Kuhn, C. Lewis), "Winds of Change in ECE: Infusing Sustainability into the Program," NSF EEC-IEECI, (\$316,338), September 1, 2009 – February 11, 2011.
- Co-PI (with C. Scoglio, C. Lewis, A. Pahwa, D. Gruenbacher, and B. Natarajan), "Kansas Wind Energy Consortium," U.S. Department of Energy, (\$713,625), September 1, 2009 – August 30, 2011.
- PI, "High Plains Small Wind Testing Center," U.S. Department of Energy/NREL, with Colby Community College and Midwest Energy Inc. support, (\$280,392), 3 years.
- Senior Personnel (with C. Scoglio under David Carter, Engineering Extension) "Resourceful Kansas: A Sustainable Energy and Economic Development Blueprint," U.S. Department of Energy (Recovery Act.), KSU subcontract to Riley County, (\$512,318), 3 years.

Bala Natarajan

- PI (with N. Schulz -Co-PI), "Intelligent Power Management in All Electric and Hybrid Electric Combat Vehicles," US Marine Corps and M2 Technologies, (\$100,000), August 2010 – August 2011.
- PI, "Urban Operations Lab, Automated Surveillance and Control Using Smart Robots," U.S. Marine Corps and M2 Technologies, (\$40,000), August 2010 – August 2011.
- Co-PI (with D. Gruenbacher, R. Miller, A. Pahwa, C. Scoglio, and W. Hageman), "Process to Automatically Rate Severity and Extent of D-Cracking of Concrete Pavement from Line-Scan Images," Kansas Department of Transportation, (\$75,000), May 2010 – December 2011.
- Co-PI (with D. Gruenbacher, R. Miller, A. Pahwa, C. Scoglio, and W. Hageman), "Wind Energy and Sustainable Energy Solutions," U.S. Department of Energy, sub award through Wichita State University, (\$216,978), July 2010 – May 2011.
- PI, "Automated Surveillance and Control Using Smart Robots," U.S. Marine Corps - Urban Operations Environmental Laboratory, (\$33,090), October 2009 – 2010.
- PI, "Analysis of MIMO Precoder Design Based on the Viterbi Algorithm," K-State Research Foundation, (\$15,000), January 2009 – May 2010.
- Co-PI (with N. Schulz -PI), S. Das, C. Scoglio-Co-PIs), "Advanced Computational and Sensor Network Methods for MVDC Shipboard Power Systems," DoD EPSCoR ONR, (\$569,380), January 2010 – December, 2012.
- Co-PI (with D. Gruenbacher -PI, A. Pahwa, C. Lewis, C. Scoglio, R. Miller), "Kansas Wind Energy Consortium," U.S. Department of Energy, (\$713,625), September 2009 – August 2011.
- Co-PI (with D. Gruenbacher-PI), "Enhancing IT Infrastructure Monitoring via Advanced Baseline Event Detection and Prediction Techniques," eG Innovations, (\$161,497), August 2008- July 2010.

Anil Pahwa

- PI (with Sanjoy Das), "Influence of Lightning, Wind, Trees, and Squirrels on Reliability of Power Distribution Systems," National Science Foundation, (\$92,833 for Year 1 funded) \$287,403, September 2009 – August 2012.
- PI (with W. Kuhn, C. Lewis, R. D. Miller, A. Rys), "Winds of Change in ECE: Infusing Sustainability into the Program," National Science Foundation, \$149,907, September 2009 – January 2011.
- Co-PI (with Don Gruenbacher -PI, Noel Schulz, Caterina Scoglio, Ruth Miller), "Kansas Wind Energy Consortium," DOE, \$892,032, September 2009 – August 2011.
- Department Coordinator, "Partnership of Kabul University and Kansas State University to Strengthen the Faculty of Engineering," World Bank/Ministry of Higher Education in Afghanistan, \$3,186,826, May 2007- April 2010.
- PI, "Intelligent Dispatch of Small Wind and Solar Generators," K-State Engineering Power Affiliates Program, \$17,800, June 2009 – May 2010.
- PI (with S. Das), "Trouble Call Analysis Supported by Intelligent Techniques," K-State Engineering Power Affiliates Program, \$17,480, June 2009 – May 2010.
- PI, "Travel Support for Students to Attend the IEEE PES GM 2009," K-State Engineering Power Affiliates Program, \$3,000, 2009.
- Senior Personnel (with K. Hohn (PI), Larry Erickson, Jennifer Anthony, Mary Rezac, Ken Klabunde), REU Site: Earth, Wind, and Fire: Sustainable Energy for the 21st Century," NSF REU, Senior Personnel, \$269,445, 2009-2012.

Andrew Rys

- PI (with C. Culbertson, J. Li, D. Higgins, S. Bossmann, J. Bai, and T. Sobering), "Novel Nanotechnologies and Microfluidic Component Development; Virus Capture/Detection Based on Nanotechnology and Microfluidic Components," CEEZAD - Center of Excellence for Emerging and Zoonotic Animal Diseases, Kansas State University, (\$30,000 – ECE department), 2010.
- PI (with R. Miller, A. Pahwa, B. Kuhn, and A. Rys), "Curriculum Development in Sustainable Electric Power Generation," U.S. Department of Energy, (\$65,000), August 15, 2010 – August 14, 2011.
- Co-PI (with A. Pahwa, R. Miller, B. Kuhn, C. Lewis), "Winds of Change in ECE: Infusing Sustainability into the Program," NSF EEC-IEECI, (\$316,338), September 1, 2009 – February 11, 2011.
- Co-PI (with B. Kuhn), "Extreme Environment Electronics in Silicon on Sapphire," UES, (\$50,000), December 2010 – March 2012.
- Co-PI (with M. Rys, and E. Russell), "A Review of KDOT Overhead Guide Sign Lighting Policy; Kansas Department of Transportation (K-TRAN)," (\$128,000), November 1, 2010 – June 30, 2012.

Noel N. Schulz

- Co-PI (with D. Soldan-PI, and D. Gruenbacher), "From Defense to Degree: Accelerating Engineering Degree Opportunities for Military Veterans," National Science Foundation, (\$146,000), August 2010 – July 2012.
- PI (with S. Das, B. Natarajan, C. Scoglio-Co-PIs), "Advanced Computational and Sensor Network Methods for MVDC Shipboard Power Systems," DoD EPSCoR ONR, (\$569,380), January 2010 – December, 2012.
- PI, "Electric Ship Research and Development Consortium," Mississippi State University for ONR ESRDC Project, (\$60,019), January 1, 2010 – December 31, 2010.
- Co-PI (with B. Natarajan-PI), "Power Management and Control in All Electric and Hybrid Electric Combat Vehicles," M2 through Expeditionary Capabilities Consortium, K-State, (\$100,000), August 2010 – September, 2011.

Caterina M. Scoglio

- Co-PI (with K. Garrett-PI), "Network analysis for forecasting the spatial progress of soybean rust epidemics and optimizing sentinel plot strategies," USDA NC RIPM, (\$99,987), 2010 – 2011.
- PI, "Mathematical and Simulative Models for Epidemics," K-State National Agricultural Biosecurity Center, (\$200,000), January 2010 – December 2010.
- Senior Personnel (with R. Miller under David Carter, Engineering Extension) "Resourceful Kansas: A Sustainable Energy and Economic Development Blueprint," U.S. Department of Energy (Recovery Act.), KSU subcontract to Riley County, (\$512,318), 3 years.
- Co-PI (with N. Schulz-PI, S. Das, B. Natarajan-Co-PIs), "Advanced Computational and Sensor Network Methods for MVDC Shipboard Power Systems," DoD EPSCoR ONR, (\$569,380), January 2010 – December, 2012.

David L. Soldan

- Co-PI (with D. Gruenbacher, W.P. Osborne), "Modeling the Economic Cost of Inadequate Teaching and Mentoring," \$148,390, submitted to NSF IEECI program. \$50,000 to SIU-C. Funded January 1 to December 31, 2009.
- PI, "Reconnecting Chemical Engineering Students with the Physical World," \$82,509, Larry Glasgow, PI, submitted to NSF CCLI Phase I program. \$82,509, Fifty percent each to ECE and ChE. Funded January 1, 2009 to December 31, 2010.
- PI, "Development of Computer Models for Stored-Product Insect Population Dynamics in Flour Mills," USDA Department of Agriculture, Grain Marketing and Production Research Center, \$24,185. August 2007 to June 2011.
- Co-PI (with N. Schulz, D. Gruenbacher), "From Defense to Degree: Accelerating Engineering Degree Opportunities for Military Veterans," \$205,953, submitted to NSF in December 2009.
- Co-PI (with T. Barstow, C. Ade, and C. Lewis), "Standardized 'Pre-flight' Exercise Tests to Predict Performance During Extravehicular Activities in a Lunar Environment," Step-2 proposal, Research and Technology Development to Support Crew Health and Performance in Space Exploration Missions, NASA, Johnson Space Center, Exploration Systems Mission Directorate, (\$1,192,194), July 1, 2010 – June 30, 2013.
- PI (with Jianchu Yao), "CCLI: Portable Cyber-Laboratories: Virtual Instruments and Affordable Prototyping Kits to Enhance Learning and Improve Access to Electrical Engineering Education," NSF DUE—0942425, National Science Foundation, Course Curriculum and Laboratory Improvement (CCLI) Program, (\$111,899 (KSU) + \$88,100 (ECU), total \$199,999), January 1, 2010 – December 31, 2011.

Shelli Starrett

- Co-PI (with S. Standon), "Loss of Load-Flow Solution in Voltage Collapse," KSU Power Affiliates Project, (\$24,000).

Steve Warren

- Co-PI (with J. Hatcliff, G. Singh, Robby, and V. Wallentine), "An Integrated Development and Certification Environment for a Medical Device Coordination Framework," NSF CNS-1065887, National Science Foundation, U.S. Food and Drug Administration, Scholars In Residence Program, (\$60,000), September 1, 2010 – August 31, 2011.
- PI (with J. Devore, B. Natarajan-Co-PIs), "Communication and Controls Development," Sandia National Laboratories, (\$122,724), October 28, 2008 – February 28, 2011.
- Co-PI (with J. Hatcliff and D. Andresen), "REU: CPS: Medium: Collaborative Research: Infrastructure and Technology Innovations for Medical Device Coordination," National Science Foundation, CNS Cyber-Physical Systems (CPS) Program, (\$12,000), September 15, 2009 – August 31, 2012.
- Co-PI (with J. Hatcliff, V. Wallentine, Robby, D. Andresen, and G. Singh), "Development of a Prototype Healthcare Intranet for Improved Health Outcomes," Massachusetts General Hospital through the National Institutes of Health NIBIB Quantum Program, (\$375,000), October 1, 2010 – September 30, 2014.
- Co-PI (with J. Hatcliff, D. Andresen, and Robby), "CPS: Medium: Collaborative Research: Infrastructure and Technology Innovations for Medical Device Coordination," NSF CNS – 0932289, National Science Foundation, CNS Cyber-Physical Systems (CPS) Program, (\$839,548), September 1, 2009 – August 31, 2012.
- Co-PI (with D. Zollman, S. Rebello, and A. Bennett), "Investigating Trajectories of Learning and Transfer of Problem-Solving Expertise from Mathematics to Physics to Engineering," National Science Foundation REESE Program, (\$999,841), July 1, 2008 – July 30, 2011.
- Co-PI (with G. Singh, D. Andresen, S. DeLoach, and B. Natarajan), "CRI: An Experimentation Platform for Developing Customized, Large-Scale Sensor Systems," National Science Foundation, CNS Division, Computing Research Infrastructure, (\$420,110. Reduced by NSF to \$200,000), April 1, 2006 – March 31, 2010.
- Co-PI (with G. Singh, D. McGregor, and J. Edgar), "Center for Sensors and Sensor Systems," Kansas State University, Targeted Excellence Program, (\$1,500,000), July 1, 2006 – June 30, 2010.

Sanjoy Das

- Associate Editor, International Journal of Power and Energy Conversion
- Advisory Board Member and Special Sessions Program Chair, International Conference on Swarm, Evolutionary and Memetic Computing (SEMCCO), IndiaIEEE Transactions on SMC(B), SMC(C), Information Sciences, Applied Soft Computing
- Member, College of Engineering Math Liaison, Diversity, and Academic Standards committees.

James E. DeVault

- 2010 Commerce Bank Undergraduate Teaching Award
- Member, Electrical and Computer Engineering Department Committee on Planning (DCOP)
- Senior Member, IEEE
- Member, ASEE

Stephen A. Dyer

- Fellow, IEEE
- Senior Past President, IEEE Instrumentation and Measurement Society (2010–2011)
- Chair, Awards Committee, IEEE Instrumentation and Measurement Society
- Co-Chair, Organization Committee, IEEE Instrumentation and Measurement Society
- Member, Long-Range Planning Committee, IEEE Instrumentation and Measurement Society
- Member, Nominations and Appointments Committee, IEEE Instrumentation and Measurement Society
- Member, Management Committee, IEEE Instrumentation and Measurement Society
- Member, Finance Committee, IEEE Instrumentation and Measurement Society



- Member, Fellows Identification Committee, IEEE Instrumentation and Measurement Society
- Member, Administrative Committee, IEEE Nanotechnology Council
- Member, Editorial Board, IEEE Instrumentation & Measurement Magazine
- Member, 2010 International Instrumentation and Measurement Technology Conference (I2MTC/2010) Technical Program Committee
- Member, 2011 International Instrumentation and Measurement Technology Conference (I2MTC/2011) Technical Program Committee
- Corresponding Member, IEEE Technical Activities Board (TAB) Strategic Planning Committee
- Referee, Ministero dell'Istruzione, dell'Università e della Ricerca, Direzione Generale della Ricerca
- Reviewer, IEEE TRANSACTIONS ON COMMUNICATIONS
- Reviewer, Thermochimica Acta
- Reviewer, IEEE Instrumentation & Measurement Magazine
- Invited speaker, "Ethics in Engineering," Rowan University
- Invited lecturer, "Second- and Third-Order Engineering Design," Rowan University
- Member, Executive Team, K-State Center for the Advancement of Entrepreneurship
- Presented 2009 IEEE Instrumentation and Measurement Society's Career Excellence Award,
- IEEE I&M awards ceremony, Austin, Texas, May 2010

Don Gruenbacher

- Co-Chair, Energy Track, Big 12 Engineering Consortium
- Reviewer, IEEE Vehicular Technology Conference

William Kuhn

- Chair, Course and Curriculum Committee.
- Member, Department Committee on Planning
- Advisor, Honors Program
- Advisor, Amateur Radio Club.
- Advisor, Electronics Club
- Advisor, Robotics Competition Club
- Senior Member, IEEE
- Life Member, Microwave Theory and Techniques Society

Ruth Douglas Miller

- Member, Kansas Wind Working Group.

Medhat M. Morcos

- Associate Editor, Electric Power Components and Systems.
- Member, Executive Committee of the North American Power Symposium.

Bala Natarajan

- Senior Member, IEEE (2008-current).
- Member, IEEE Communication Society (1998-current).
- Member, IEEE Vehicular Technology society (2002-current)
- Member, IEEE Technical Committee on Cognitive Networks (TCCN) (2006-current).
- Member, IEEE Technical Committee on Wireless Communications (2006 – current)
- Member, ASEE (2002-current).
- Member, HKN (2007 – current)
- Journal Reviewer, IEEE Communications Letters
- Journal Reviewer, IEEE Transactions on Communications
- Journal Reviewer, IEEE Transactions on Wireless Communications
- Journal Reviewer, IEEE Transactions on Vehicular Technology
- Journal Reviewer, IEEE Transactions on systems, man and cybernetics
- Session Chair, IEEE Globecom 2010, Miami
- Session Co-Chair, Wireless Telecommunications Symposium, Tampa, Fla., 2010
- Program Committee Member, IEEE Global Telecommunications Conference (GlobeCom) 2010
- Program Committee Member, IEEE International Conference on Communications (ICC) 2010
- Program Committee Member, IEEE Vehicular Technology Conference (VTC) 2010

Anil Pahwa

- Guest Editor, IEEE Transactions on Smart Grid
- Editor, IEEE Transactions on Power Systems
- Vice Chair and Technical Committee Paper Coordinator, Power and Energy Education Committee
- Member, Fellows Working Group, Power and Energy Education Committee
- Vice Chair and Technical Committee Paper Coordinator, Power System Planning and Implementation (PSPI) Committee
- Steering Committee, Power Systems Conference and Exposition
- Member, Technical Advisory Committee for International DistribuTECH Conference and Exposition
- Member, Editorial Board of Electric Power Components and Systems
- Member, Editorial Board of International Journal of Emerging Power Systems
- Session Chair, DistribuTECH Conference and Expo, Tampa, March 2010
- Session Chair, IEEE PES T&D Conference and Expo, New Orleans, April 2010
- Session Chair, PMAPS, Singapore, June 2010
- Session Chair, IEEE PES General Meeting, Minneapolis, July 2010
- WESP Making a Difference Award
- Faculty Advisor, HKN (up to August 2010) (Beta Kappa Chapter won 2009-10 HKN Outstanding Chapter Award)
- KSU Faculty Senator

Andrew Rys

- Member, IEEE Electron Device Society (EDS)
- Coordinator, ECE Graduate Program
- Member, Graduate ECE Course and Curriculum Committee
- Member, Physics – Engineering Liaison Committee

Noel N. Schulz

- Kansas State First Lady
- Development and university promotion activities through President's Office
- Chair, K-State Women of K-State Leadership Committee
- Advisory Board, Virginia Tech Department of Engineering Education
- Chair, ASEE Board of Directors and Professional Interest Council IV
- President-Elect, IEEE Power & Energy Society (PES) Governing Board and Executive Committee
- Board Member, Friends of McCain Auditorium and Friends of the Beach Museum
- Senior Member, IEEE
- Member, Society of Women Engineers
- Reviewer, IEEE PES Transactions and Conference Proceedings

Caterina M. Scoglio

- Associate Coordinator, DHS Center of Excellence for Emerging and Zoonotic Animal Diseases
- Chair, Technical Program Committee, IFIP Networking 2011, Valencia, Spain
- Member, Editorial board, Computer Network Elsevier journal
- Member, Editorial board, ISRN Communications journal, Hindawi Publishing Corporation

- Co-Organizer and Keynote Speaker, "Robustness of Complex Networks" Delft workshop, Nov. 2010
- Guest Editor, International Journal of Artificial Life Research, special issue "Modeling and mitigating the spread of disease"
- Member, Technical Program Committee for ITC2011
- Reviewer, Elsevier Journals and IEEE Transactions
- Invited Speaker, Bio-Defense Symposium organized by Hudson-Alpha Institute for Biotechnology, 2010

David L. Soldan

- Chair, ECE Assessment Committee
- Member, College Program Assessment Coordination Committee
- Member, College Assessment Review Committee
- Member, KSU Faculty Senate
- Member, Faculty Senate Committee on University Planning
- Trustee, KSU Amateur Radio Club
- Member, ABET Engineering Accreditation Commission (EAC)
- Member, EAC Executive Committee
- Chair, EAC Training Committee
- Member, ABET Accreditation Council Training Committee
- Support Facilitator, ABET Program Evaluator Candidate Training
- Co-Chair, Eta Kappa Nu, C. Holmes MacDonald Award Committee
- Member, Eta Kappa Nu, Outstanding ECE Student Award Committee
- Chair, ECEDHA ABET Workshop Committee
- Reviewer, National Science Foundation
- Reviewer, IEEE Transactions on Education

Shelli Starrett

- Chair, ECE Academic Standards and Advising Committee
- Reviewer, IEEE-Power and Energy Society publications

Steve Warren

- Member, Heartspring Board of Trustees, Wichita, Kan.
- Academic program consultant, East Carolina University, General Engineering Department
- National Instruments myDAQ Beta Program
- Member, K-State Olathe Innovation Campus Faculty Advisory Council
- Member, Kansas State University Goldwater Nominating Committee
- Member, Kansas State University Internal Review Board (Human Subjects Research)
- Director, KSU Student Chapter of the IEEE Engineering in Medicine and Biology Society
- IEEE 11073 Personal Health Devices Working Group
- Member, Institute of Electrical and Electronics Engineers
- Member, American Society for Engineering Education

UNDERGRADUATE STUDIES

The department of electrical and computer engineering offers B.S. degrees in both electrical engineering and computer engineering. Areas of specialization associated with each degree are as follows:

- Electrical engineering
 - bioengineering, communications and signal processing, digital electronics, integrated circuits and devices, power systems
- Computer engineering
 - architecture and design, embedded systems, multimedia and networking

Various opportunities exist for students to become involved in both organizational activities as well as undergraduate research. Student organizations and clubs within the department include Robotics, Engineering in Medicine and Biological Systems (EMBS), Amateur Radio, IEEE and Eta Kappa Nu (HKN). Many undergraduate students also actively participate in research projects, which include the following:

- Department of Energy-sponsored Wind for Schools program at K-State ECE utilizes many undergraduate students to help place small wind turbines at K-12 educational

facilities throughout the state. Undergraduate students assist with school selection, communications and siting.

- Industry-sponsored Electrical Power Affiliates Program supports multiple research projects which involve undergraduates in power-related research. Project titles supporting undergraduates include “Intelligent Dispatch of Small Wind and Solar Generators,” “Survey and Assessment of Different High-Performance and Low-Cost Control Strategies for Wind Turbines,” “Mapping Voltage Stability Vulnerabilities” and “Increasing the Robustness of the Power Grid through Distributed Solar and Wind Generation.”
- Various mathematical models in epidemic modeling and their corresponding software implementation were realized by an undergraduate research student in the EPICENTER group.
- An energy harvesting radio was developed for remote sensing applications.
- Undergraduates were involved in development of the K-State UHF micro-transceiver with frequency-hopping, spread-spectrum capabilities.



GRADUATE STUDIES

Graduate

Our graduate programs have an excellent base of students utilized in the various research activities listed. From local students raised in Kansas to our international students from countries such as Egypt, Poland, St. Lucia, China and India, our students are bright and hard working. They are often recognized for their accomplishments with national scholarships and best paper awards.

The department offers a master of science in electrical engineering and participates in the College of Engineering doctor of philosophy program. Several areas of specialization are available at the graduate level. At the master's level there are three options: thesis, report and coursework only. All require a minimum of 30 hours of credit. The Ph.D. program requires 60 hours beyond the master's, including original research of sufficient quality and importance to merit publication in a referred journal.

Research is conducted in many different areas of electrical and computer engineering including networking, communications theory and hard-

ware design, image processing, VLSI device and circuit development, power systems, embedded systems and medical device design. Opportunities for graduate research assistant appointments are available on a competitive basis to highly qualified students with good prior background in the specific technologies involved in externally funded grants. Opportunities for graduate teaching assistant positions are also available to students with good interpersonal as well as technical skills needed in interacting with the undergraduate student body.

The department is located in Rathbone Hall. This 100,000-square-foot facility has been designed to provide an excellent academic environment with numerous well-equipped instructional and research laboratories including the communications lab, signal processing lab, integrated systems lab, microcomputer lab, digital systems lab, networking lab, medical component design lab, energy systems lab and solid-state electronics lab. State-of-the-art software packages and corresponding computing facilities are available for students to



For additional information, please contact:

Graduate Program Coordinator
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Computer Engineering
2061 Rathbone Hall
Kansas State University
Manhattan, KS 66506-5204
Phone: (785) 532-5600

E-mail: grad@ece.ksu.edu
Web: <http://www.eece.ksu.edu/>

ADVISORY BOARD

ADVISORY



The purpose of the ECE Advisory Council shall be—

- To take a leadership role in encouraging department alumni and friends to provide service and financial support to the department.
- To provide a connection among ECE faculty, students, and the organizations represented by council members.
- To provide advice about ECE research and degree programs.

David Abrams

Sr. Vice President and Director of Power Delivery
Energy Division
Black & Veatch

Glen Fountain

Project Manager
The Johns Hopkins University Applied Physics
Laboratory

Joel Andrews, PhD

Design Engineering Team Leader
Garmin International

Mark Brown

Sr. Staff Architect
Embedded and Communications Group, Intel
Corp.

William N. Dowling, P.E.

Vice President of Energy Management and Supply
Midwest Energy, Inc.

Don Gemaehlih

Senior Technical Manager for Software
General Dynamics

Cal Gooden

Senior Program Controller, Networking and
Communications Systems Group
Freescale Semiconductor

Lief Koepsel

Director of Marketing
Cisco Systems

Ann Martin

Director of SW Engineering
Fusion – io

Jeff Meisel

LabVIEW Partner Program
Program Manager

Michelle Munson, PhD

CEO
Aspera, Inc.

Steve Owens

Executive Director - Distribution Operations
Westar Energy

Jesse Schriner

General Manager EPMO
Microsoft

Don Gruenbacher, Ph.D.

Associate Professor and Head
Dept. of Electrical and Computer Engineering
Kansas State University

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Devore, John J.	Professor	Rathbone 2071	785-532-4648	jdevore@ksu.edu
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Kuhn, William B.	Professor	Rathbone 2065	785-532-4649	wkuhn@ksu.edu
Miller, Ruth Douglas	Associate Professor	Rathbone 2080	785-532-4596	rdmiller@ksu.edu
Morcos, Medhat M.	Professor	Rathbone 2089	785-532-4678	morcos@ksu.edu
Natarajan, Bala	Associate Professor	Rathbone 2067	785-532-4597	bala@ksu.edu
Pahwa, Anil	Professor	Rathbone 2075	785-532-4654	pahwa@ksu.edu
Rys, Andrew	Professor	Rathbone 2081	785-532-4665	andrys@ksu.edu
Schulz, Noel	Professor	Rathbone 2077	785-532-4398	noels@ksu.edu
Scoglio, Caterina	Associate Professor	Rathbone 2069	785-532-4646	caterina@ksu.edu
Soldan, David L.	Professor	Rathbone 2090	785-532-5534	soldan@ksu.edu
Starrett, Shelli K.	Associate Professor	Rathbone 2091	785-532-4689	starret@ksu.edu
Warren, Steve	Associate Professor	Rathbone 2066	785-532-4644	swarren@ksu.edu

Notice of nondiscrimination

Kansas State University is committed to nondiscrimination on the basis of race, sex, national origin, disability, religion, age, sexual orientation, or other nonmerit reasons, in admissions, educational programs or activities and employment (including employment of disabled veterans and veterans of the Vietnam Era), as required by applicable laws and regulations. Responsibility for coordination of compliance efforts and receipt of inquiries concerning Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, and the Americans With Disabilities Act of 1990, has been delegated to Clyde Howard, Director of Affirmative Action, Kansas State University, 214 Anderson Hall, Manhattan, KS 66506-0124, (Phone) 785-532-6220; (TTY) 785-532-4807.

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