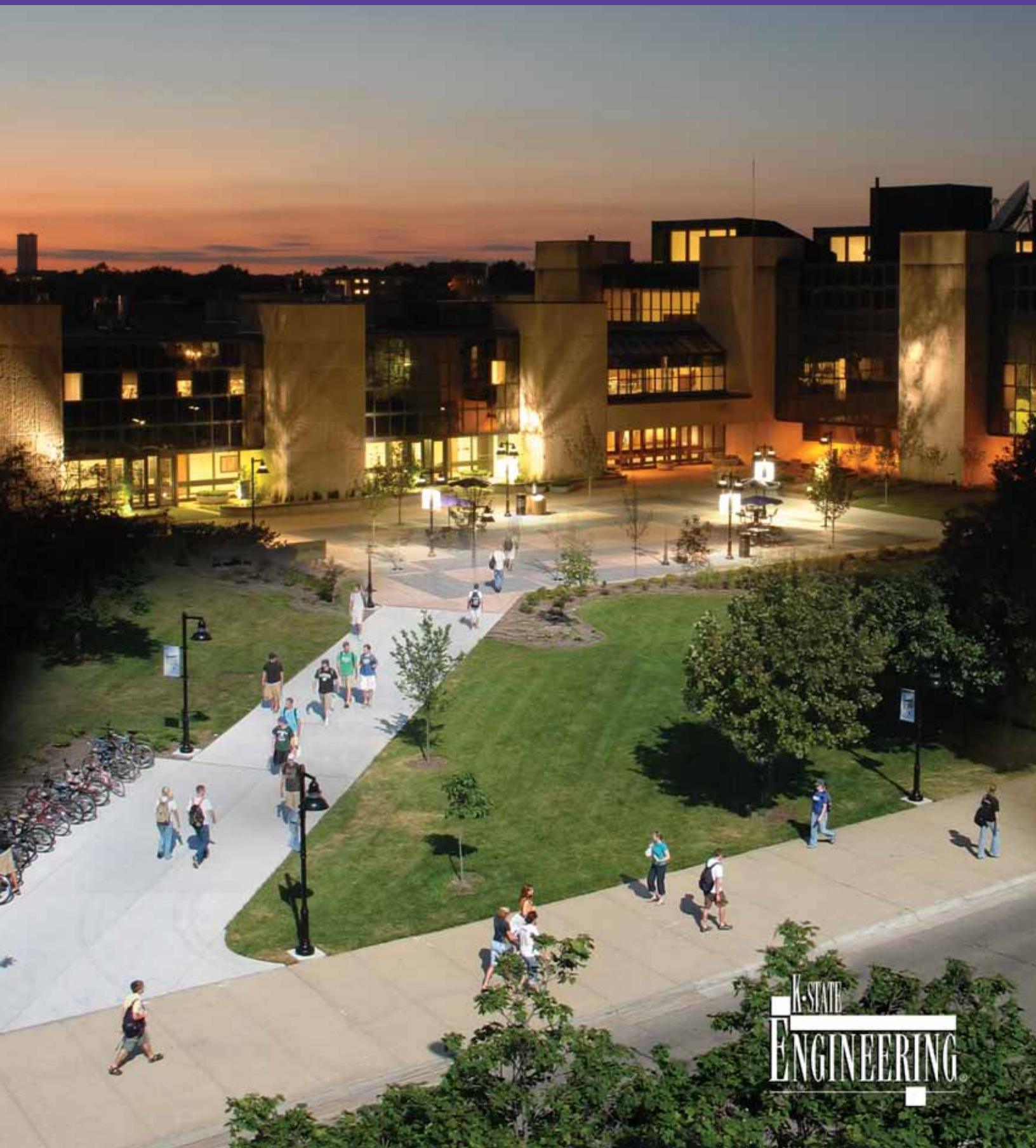
Annual Report 2008

Electrical and Computer Engineering

KANSAS STATE UNIVERSITY



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Message from the Department Head

The department of electrical and computer engineering at Kansas State University reached its 109th year since electrical engineering began at K-State in 1899. The faculty continues to conduct quality research while maintaining excellence in undergraduate education. Funding for our research programs continues to grow, with an approximate increase of 20% in 2008 over the previous year. Our faculty remains effective in producing quality publications that exhibit their research results while contributing to the body of knowledge in their respective fields.

Our traditional strengths in communications/signal processing and power systems remain strong, receiving strong external support from both federal and corporate sponsors. Dr. Bill Kuhn has played a key role in developing new low-power transceiver technologies for NASA and the Jet Propulsion Lab that will be available for use on future missions. Dr. Bala Natarajan is working with Sandia National Laboratories to develop improved GPS receiver tracking loops for high-dynamic applications. Dr. Chris Lewis is working on multi-spectral imaging applications for NASA, while Dr. Caterina Scoglio and I have a grant with NSF/GENI to help build a test bed with other universities in the region for promoting future innovations in networking. In the power systems area, Drs. Anil Pahwa and Sanjoy Das have been studying the impact of environmental factors on the reliability in distribution systems. Dr. Ruth Douglas Miller has developed a highly successful DOE- funded program to integrate small wind turbines into K-12 educational facilities throughout the state.

I am also very excited about the two areas highlighted in this report that we believe are already highly successful and will gain even greater momentum in the coming years. Dr. Steve Warren's work in the design of medical components for both animal and human applications has provided significant capabilities that can have a large impact in home health care as well as bioag security. Dr. Scoglio's development of epidemic models is also providing some very fundamental results in this highly collaborative effort with her colleagues from multiple colleges. Both of these efforts hold much promise for the biosecurity excellence field at K-State and the related growth expected in this region.

Two highlights of 2008 involve corporate involvement in our program. GE Aviation has opened a University Development Center in Manhattan that will utilize computer engineering students to help test the embedded system aspects of the avionics systems produced by GE. Another development is the establishment of an Electrical Power Affiliates Program, sponsored by power utilities and engineering firms, to promote power engineering in the department and college. The program provides funds for undergraduate and graduate students to work on research projects in the power systems area.

I hope you enjoy this snapshot of the research activities in our department for 2008. While it cannot capture all that is currently going on, additional information on our program can be found at our website at www.ece.ksu.edu. Please feel free to contact us if you would like to explore areas of collaboration or other common interests.

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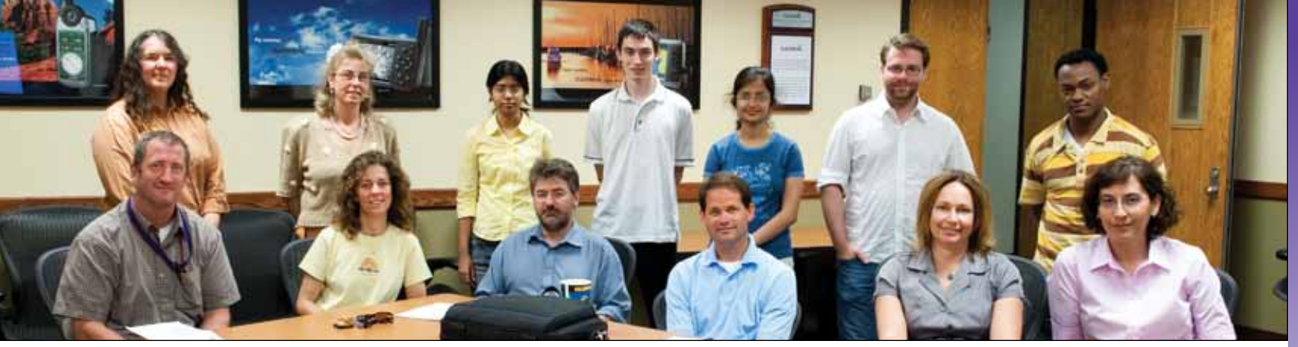


K-State EPICENTER:
Modeling the future of epidemic research

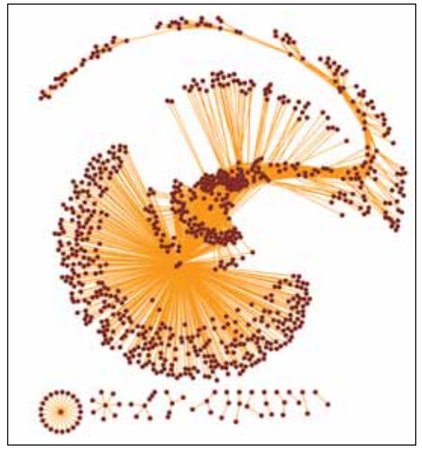
Kansas State University's EPICENTER—Center for Complex Network Approach to Epidemiological, Biological, and Sociological Modeling and Simulation—is directed by Dr. Caterina Scoglio, assoc. professor of electrical and computer engineering, and Dr. Morgan Scott, professor of epidemiology. EPICENTER provides those in multidisciplinary research with resources to build, simulate, and analyze mathematical models to determine the spread of phenomena in complex networks.

A main goal of EPICENTER is to provide policy makers with real-time, flexible modeling tools to curtail epidemiological outbreaks, whether such an outbreak occurs in humans, animals, plants, or computers. Given the heightened attention to protecting the United States from threats, such modeling may well be essential to mitigating the sociological and economic effects of a potentially out-of-control epidemic, effects such as human death, herd disposal, crop destruction, or the inability to communicate over the Internet. Whether the threat is famine, war, terrorism, or epidemic disease, the goal of EPICENTER researchers is to design efficient, realistic simulations for real-time implementation using models, algorithms, and software for network simulation and topology analysis.

The lynch pin of EPICENTER is its multidisciplinary approach to complex networks; for example, faculty hail from agriculture, veterinary science, biology, medicine, social sciences, and engineering. Additionally, EPICENTER research is enhanced by the contributions of dedicated student researchers. Highlights of several key projects that together demonstrate the versatility of this approach follow.

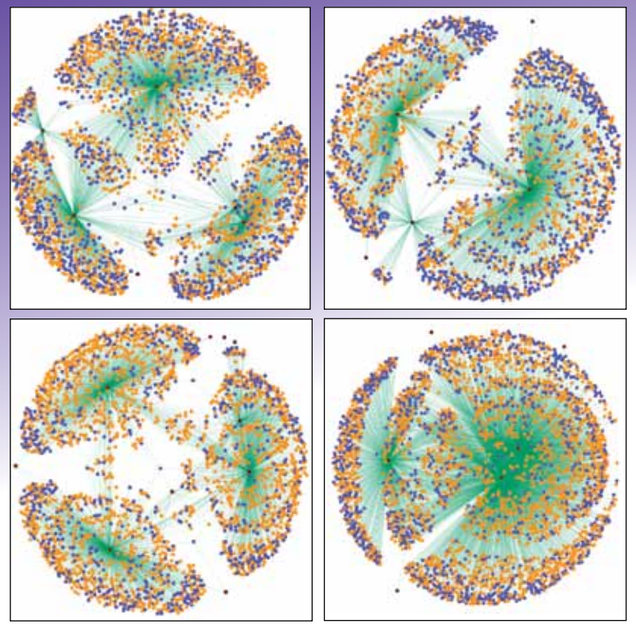
Complex network approach to epidemic spreading in rural regions

This research develops optimized guidelines for administrators to establish procedures and allocate resources to help mitigate the effects of the spread of infectious diseases in rural regions whether by malicious attack or natural causes. Dedicated projects assess the particular contact network of rural regions and develop a simulation tool with multiple compartments running on the contact network. For example, Dr. Scoglio, Dr. Todd Easton, assoc. professor of industrial and manufacturing systems engineering, and Dr. Walter Schumm, professor of family studies and human services, are researching strategies that will work specifically in rural areas to deal with disease outbreaks.



"We found that person-to-person contact is most important," Easton said. "Having a population with two times as many interpersonal contacts is more dangerous than a disease that is twice as virulent. This shows that the government's ability to limit travel during an epidemic is very important."

Scoglio also points out that research confirms it would be equally important to vaccinate people who don't have many contacts themselves but who are a common link between two people with many connections.



Quality of care and network properties of outpatient health care delivery

As healthcare systems become more complex, there has been little or no work describing the topology of the complex network of patient care within these systems. In collaboration with Dr. Michael Parchman, professor with the Veterans Health Administration (VA), the largest integrated health care delivery system in the U.S., this study intends to explore the topology of networks of patient-provider relationships derived from VA records. The purpose of this study is to examine the feasibility of using the network topology to determine the quality of care provided to patients in the network.

The networks we are examining are bipartite graphs with nodes being either patients or providers. The graphs at left are taken from four VA hospital clinics over the course of a single year, each with different providers and patients. A connection exists between a patient and a provider if a patient has had an appointment with that provider at any point during the four years. Because a patient often sees the same provider multiple times, the edges in the graphs are weighted by the number of recurring appointments between the patient and the provider. Patients are marked "Chronic" if they have been diagnosed with diabetes or hypertension.

Network models for soybean rust epidemics: adapting to aerially-dispersed pathogens

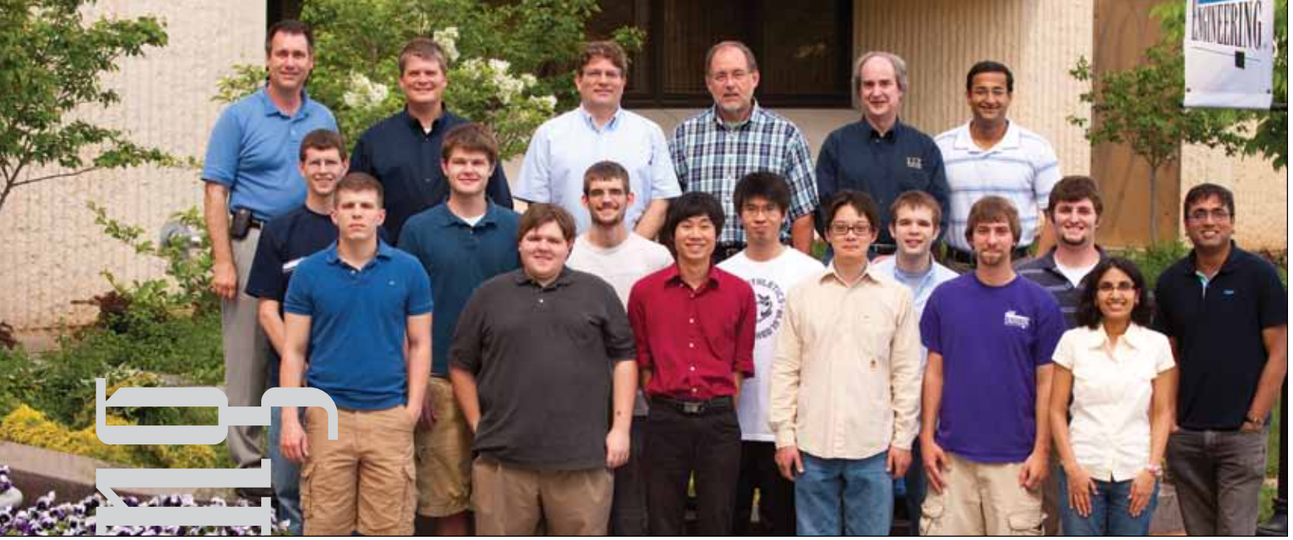
"Collaboration with Professor Caterina Scoglio as part of EPICENTER has helped our group move forward in implementing novel modeling approaches that advance plant disease epidemiology," said Dr. Karen Garrett, assoc. professor of plant pathology. Modeling large-scale plant disease epidemics calls for network model adaptation; for example, information about soybean rust is available typically from sentinel plots that function to represent a larger area such as a county. Also, since many plant pathogens are capable of long-distance aerial dispersal, distant nodes may be connected with a small but non-zero probability. Currently, research focus is on developing network models to forecast soybean rust in the U.S. using sentinel plot data for model construction and validation.

Predicting rabies exposure risk with spatially explicit, dynamic contact networks

In exploring the ecology of disease, research efforts of those like Dr. Samantha Wisely, asst. professor of biology, concentrate on testing hypotheses of how ecological patterns of urbanization shape the epizootiological processes of rabies for predicting health risk and determining the effect of disease-intervention methods. Specifically, Dr. Wisely said she and her colleagues "… use an integrated approach combining epidemiology and host ecology. Collaborating with EPICENTER has allowed us to model how these aspects of disease emergence work synergistically to create epizootics on the landscape." EPICENTER's contribution to this collaboration is dynamic contact network modeling.

Conclusion

While each discipline has its own research objectives and perspective, their collective endeavors unite in pursuit of the study of epidemics, a major research feature of the forthcoming National Biological and Agricultural Facility (NBAF) at Kansas State. EPICENTER's adaptive mathematical modeling tools enable these various disciplines and researchers to expedite their projects and professional goals. For a complete list of all the research participants and projects, consult the EPICENTER wiki at www.ece.ksu.edu/epicenter_wiki.



Wearable, Wireless Technologies for Health Monitoring

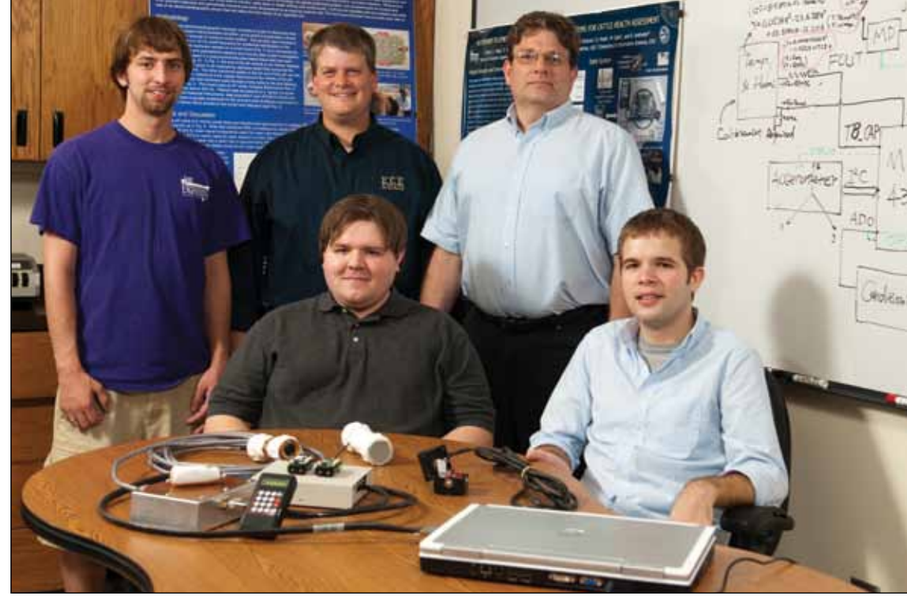
Telemedicine is a technology-rich alternative to a face-to-face patient/physician consultation that often employs video-conferencing links, electronic patient records, and medical instruments used by patients without care provider assistance. Since the mid-1990s, telemedicine technology has been increasingly viewed as a means to lower health care costs while increasing care quality and therefore quality of life. Health monitoring and assessment tools that can either be worn by an individual or exist in their local environment play an important role in this decentralized health care model. With the advent of robust wireless standards, handheld consumer electronics, and a pervasive Internet presence, an inexpensive and high-impact telemedicine model is now realistic. This health care delivery approach has the potential to replace the model of increasing rural patient migration toward nursing homes and assisted-living facilities with a model that employs intelligent medical devices and distributed cyber-infrastructures that promote independent living and successful aging at home.

Focus areas. To this end, research in the K-State Electrical and Computer Engineering (ECE) Department has focused on technologies that promote ambulatory health monitoring. The K-State Medical Component Design Laboratory (MCDL), directed by Dr. Steve Warren, assoc. professor of ECE, has served as a hub for that activity, supporting projects in the following areas:

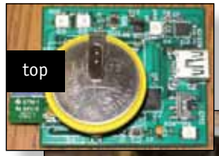
- **Ambulatory health-monitoring devices** for humans and animals (wearable or embedded in the local environment), light-based sensors, signal-processing algorithms, wireless connectivity, and supporting information infrastructures.
- **Interoperability standards and plug-and-play component models** that allow sensor collections matched to patient needs to be assembled rapidly.
- **Technology to engage students** in the learning process and to track knowledge retention.

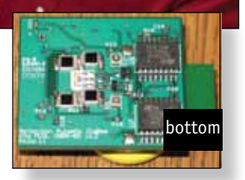
These research efforts are integrated with educational offerings that support the Regents-approved bioengineering option within electrical engineering, an option that also serves pre-medicine students and that has been in place nearly 35 years.

Laboratory support. MCDL grant-funded efforts total $5.2M, with one-third of those funds directly supporting ECE personnel and resources. Primary funding for these efforts has come from the National Science Foundation—CAREER, ITR, DUE, EEC, CRI, SIR, REESE—and Kansas EPSCoR programs, Sandia National Laboratories, K-State ECE, and the K-State Targeted Excellence Program. In-kind teaching and research contributions have come from National Instruments, SolidWorks Corporation, Spatial Corporation, iNTERFACEWARE, and Visionary Design Systems. Collaborators on these efforts have included K-State faculty—computing and information sciences, College of Veterinary Medicine, math, physics, industrial and manufacturing systems engineering, kinesiology, human nutrition, and the Center on Aging; and Sandia National Laboratories, the University of Alabama-Huntsville, U.S. Food and Drug Administration, National Instruments, Cerner Corporation, Spatial Corporation, Meadowlark Hills, the Manhattan Senior Center, and Heartspring. MCDL projects have supported 27 graduate students, 27 undergraduate students, the publication of 54 peer-reviewed papers, and 41 third-party publications and press releases.



Wearable plug-and-play medical devices. Recent MCDL accomplishments include the development of plug-and-play technology for home care that allows one to assemble wearable monitoring systems 'on the fly' that are matched to patient needs. One prototype monitoring system consists of five components: (1) plug-and-play, wearable and nearby sensor units—electrocardiogram, pulse oximeter, weight scale, and ambient temperature/humidity sensor; (2) wearable data logger; (3) Internet-enabled base station; (4) local and remote databases for storing patient data; and (5) remote patient record viewer. A base station is the external access point for the personal network created by the data logger and sensor units. At the time of its development, it was the first wearable monitoring system to support the IEEE 1073 (a.k.a. Medical Information Bus) standard for medical device interoperability, a standard originally developed for bedside devices. It was also the first 1073-based system to use Bluetooth wireless scatternet technology for sensor-to-data-logger and data-logger-to-base-station connectivity. Finally, it was one of the first ambulatory monitoring systems to employ Health Level 7 (HL7) messaging between local ambulatory monitoring systems and remote databases.



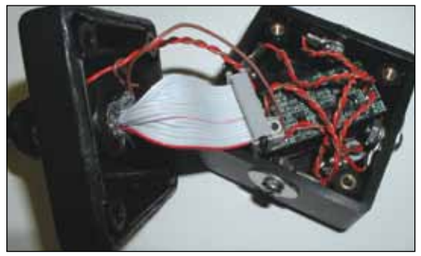


Other recent activities associated with this work have included the design of sensors better suited to wearable environments, such as the wireless pulse oximeter developed by doctoral student Kejia Li. The device incorporates a large-area sensor consisting of a central red/near-infrared LED pair surrounded by four photodiodes. It hosts a USB-rechargeable battery and can send patient data via a USB serial link or a ZigBee wireless connection. While other wireless pulse oximeters exist on the market, this sensor is unique in that the time-domain waveforms—photo-to-plethysmograms that represent blood volume changes within tissue—are intact, unfiltered, and high-fidelity—thousands of valley-to-peak digital levels.

Cattle health monitoring technology. MCDL efforts funded by the National Science Foundation Information Technology Research program have focused on the application of wearable, wireless devices to cattle health monitoring. Knowledge of the health status of every animal in a herd in real time may allow a rancher to prevent the spread of disease, whether from natural causes or bioterrorism, while at the same time improving meat quality. The current system acquires animal heart rate, core body temperature, movement, GPS location, and ambient temperature/humidity. When an animal wanders within range of a wireless, ZigBee-enabled base station, health data stored on the animal are uploaded for analysis and storage.

Novel sensors developed by K-State researchers for this effort

include a potentially swallowable pill that can obtain phonocardiographic and electrocardiographic data from its host animal. ECE investigators



filed a provisional patent in August 2008 for an electrocardiographic prototype. The wired device, which consists of two orthogonal sets of stainless steel electrodes, is inserted into the animal's reticulum, or first stomach, through a rumen fistula. The eventual design will obtain an electrocardiogram from the animal and send these data wirelessly to an outside receiver via a magnetic link. This device was an NSF CISE technology highlight for FY 2007 and has been featured in a recent NSF pamphlet for cyber-physical systems.

K-State Student Chapter of IEEE EMBS. The MCDL has also been the primary host laboratory for student design projects sponsored by the K-State Student Chapter of the IEEE Engineering in Medicine and Biology Society (EMBS), a chapter for which Dr. Warren serves as the faculty advisor. These projects focus on two areas to date: (1) research to aid persons with disabilities (RAPD) and (2) hands-on efforts to interest young women in the quantitative fields of science and engineering. Recent RAPD projects include a computer mouse design to alleviate productivity problems associated with Parkinson's tremors, a battery removal tool for arthritic individuals with limited dexterity, and a wireless door control and communication system to assist mobility-limited individuals. Service projects to garner science and engineering interest from young women are co-sponsored by the K-State Women in Engineering and Science Program's Girls Researching Our World effort. In November 2008, the K-State IEEE EMBS student chapter designed and hosted a day-long workshop entitled "Engineering The Body" that addressed joint mechanics, electrocardiograms, membrane transport, computer mouse design, and audio filters for cochlear implants. Fifty-five middle-school girls participated in this event.

Emily Mangus (BAE) works with middle school girls in the "Code Blue Shirts" electrocardiogram session in the "Engineering the Body" workshop hosted by the MCDL and the K-State Student Chapter of the IEEE EMBS.

Faculty

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: Analog and digital electronics, instrumentation, control systems

Kenneth H. Carpenter
Ph.D., Physics, Texas Christian University, 1966
M.S., Electrical Engineering, Kansas State University, 1962
B.S., Electrical Engineering, Kansas State University, 1961
Research: Electromagnetics and computing applications—device modeling and numerical simulations
Teaching: Circuits; electronics; electromagnetic theory; computer graphics; computer engineering methods for analysis, simulation, and design

Satish Chandra
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Research: Multimedia coding and communication over networks, multimedia water marking 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
M.S., Ph.D., Computer Engineering, Louisiana State University, 1994
Research: Evolutionary computation, swarm intelligence, pattern recognition, neural networks, complex systems
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Dwight Day
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Teaching: Digital computer design, computer interfacing, digital filtering, digital signal processing, computer engineering methods, digital image processing

James E. DeVault
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M.S., Business Administration, Michigan Technological University, 1971
B.S., Electrical Engineering, Michigan Technological University, 1970
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John J. Devore
Ph.D., Electrical Engineering, Kansas State University, 1984
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Faculty

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Research: Instrumentation and measurement, numerical methods, communication theory
Teaching: Electronics, electroacoustics, entrepreneurship

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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
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Teaching: Intro to electrical engineering, electronics, design of communication cir cuits, microwaves and antennas, IC design, digital radio hardware design

Don Lenhert
Ph.D., Electrical Engineering, University of New Mexico, 1966
M.S., Electrical Engineering, Syracuse University, 1958
B.S., Electrical Engineering, Kansas State University, 1956
Research: Real-time embedded systems, microprocessor applications, testing of digital systems, IDDQ testing
Teaching: Introduction to computer engineering, real-time electronics, microcomputer system design, real-time embedded systems, digital electronics, real-time embedded system design, basic R/T electronics, fault diagnosis in digital systems

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Teaching: Control systems design, microcomputer system design, digital filtering, discrete-time and computer-control systems

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Ph.D., Electrical Engineering, University of Rochester, 1990
M.S., Electrical Engineering, University of Rochester, 1985
B.S., Electrical Engineering, Lafayette College, 1984
Research: Renewable energy (wind and photovoltaic applications), electromagnetics, bioelectromagnetics, health effects of electromagnetic fields, electronics
Teaching: Introduction to electrical engineering, electronics engineering lab, electronics, electromagnetic theory, introduction to biomedical engineering, wind engineering, bioinstrumentation lab

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M.Sc., Electrical Engineering, Cairo University, Cairo, Egypt, 1978
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Teaching: Power system analysis, design, and protection; distribution system design and planning

Andrew Rys
Ph.D., Electrical Engineering, Texas Tech University, 1983
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Research: Solid-state electronics, design and processing of integrated circuits, characterization of III-V and wide band-gap III-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

Caterina M. Scoglio
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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, advanced topics in electric energy systems, flexible control of transmission systems

Steve Warren
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M.S., Electrical Engineering, Kansas State University, 1991
B.S., Electrical Engineering, Kansas State University, 1989
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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

Research

Bio-Inspired Computation Lab

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

The biologically inspired computing (BIC) research group at K-State is involved in theoretical and applied research in evolutionary algorithms; ant colony optimization; particle-swarm optimization; artificial immune systems; and memetic algorithms for multi-objective and constrained optimization, prediction, structure discovery, learning, and other tasks. Additionally, the group also engages in research in pattern recognition, neural networks, social computing, and complex systems.

The BIC group has received external funding from the U.S. National Science Foundation and the U.S. Department of Agriculture in the areas of plant gene regulatory network modeling and power distribution systems. Other applications of interest to this group include communications and networks, computer science, biology, and finance.

Communication Circuits Laboratory

http://www.ece.ksu.edu/crl/ccl/

The department's 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 tested at the board and chip levels with industry-calibre measurement equipment and probing stations. An example of research and development work is the 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. See *http://www.ece.ksu.edu/research/mars/* for additional information.

AVS LAB: The Autonomous Vehicles Systems Lab

This lab is a cooperative effort between mechanical and electrical engineering, run by Drs. Schinstock and Lewis. They custom build unmanned aerial vehicles for remote sensing applications and develop advanced image-processing algorithms. They have expertise in developing real-time navigation and control solutions and photogrammetric processing of remote imagery. Resent accomplishments include 1) development of an automatic tuning algorithm for setting autopilot gains for small unmanned aircraft, and 2) automated production of digital terrain models from stereo push broom imagery.

The Kansas Wind Applications Center

Missions at the wind applications center (WAC) 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—

- Siting of small wind turbines, including means of assessing surface roughness and turbulence.
- Networking of distributed generation sources for reliability, especially in islanded conditions.
- 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

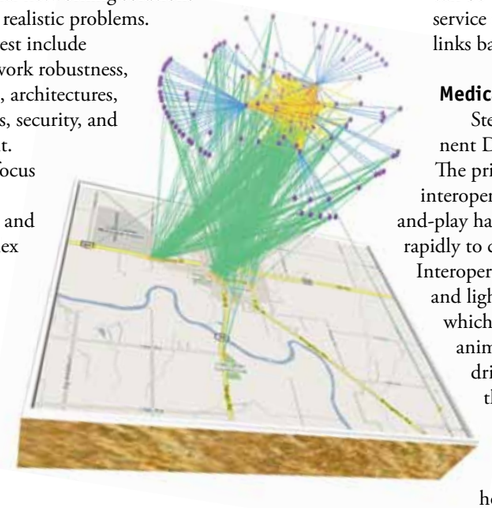
Courtesy JC Johnson

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 2008, seven turbines had been installed at Kansas schools. WAC is funded by the Department of Energy under its Wind Powering America program.

Sunflower Networking Group (SNG)

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

Our goals are to conduct theoretical research in emerging areas as well as apply optimal networking solutions to current and future realistic problems. General areas of interest include network science, network robustness, networking protocols, architectures, modeling and analysis, security, and network measurement. Three main projects focus on the following:



- Characterization and control of complex networks. This project concerns the study of multiple statistical metrics and performance indices which characterize complex networks with respect to the following aspects: virus spreading, targeted attacks, cascading effects, cluster detection, and weighted networks.
- GpENI: Great Plains Environment for Network Innovation. This 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. GpENI is funded in part by the National Science Foundation Global Environment for Network Innovation (GENI) Program as part of Cluster B in Spiral 1.
- Overlay, optical, and virtual networks. An overlay network is an application-layer logical network created on top of the physical network. It is formed by all or a subset of the underlying physical nodes. The connections between each pair of overlay nodes are provided by overlay links which consist of many underlying physical links. Overlay networks can be used to improve performance and provide quality of service on the IP network, by routing data on the overlay links based on performance measurements.

Medical Component Design Laboratory (MCDL)

Steve Warren directs the KSU ECE Medical Component Design Laboratory (MCDL), housed in RA 2092. 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 the needs of patients. Interoperability standards, wireless devices, wearable sensors, and light-based devices play important roles in this research, which targets physiology monitoring for humans and animals. Successful aging and quality of life are important drivers for the pervasive care environments addressed by these projects. This laboratory also plays an important role in 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 2008 included the K-State Department of Computing and Information Sciences, U.S. Food and Drug Administration, K-State Department of Anatomy and Physiology, Raytheon Corporation, Meadowlark Hills, K-State Center on Aging, K-State Mathematics Department, and the K-State Physics Department.

Research

Power and Energy Systems Group

The power and energy systems group focuses on electricity generation, transmission, and distribution systems to study various design and operation issues for effective utilization of electrical energy. The group also focuses on exploration and applications of renewable energy sources such as wind and solar.

In one project sponsored by the K-State Electrical Power Affiliates Program, researchers are studying voltage stability issues related to the fundamental nature of voltage collapse, modeling of the loads and its relationship to voltage stability, and effects of the integration of wind turbines on voltage stability. The research includes the utilization of artificial intelligence, primarily artificial neural networks and fuzzy logic, to identify load models and for classification and prediction of voltage stability problems.

Another project, also supported by the power affiliates program, focuses on improving the robustness of the power grid through distributed solar and wind generation. The power grid is being evaluated as a complex network with the aim of improving the robustness of the grid against cascading failures by adopting strategies such as intentional detachment of a part of the network to reduce the effect of failure of a node or a link on other connected components of the network. This detached portion can be powered by distributed sources of energy such as wind and solar power. Work is in progress to simulate the cascading effect and to evaluate the impact of topology of the network on the cascading failures.

National Science Foundation provided funding for a project on investigation of influence of environmental factors such as lightning, wind, trees, and squirrels on outages in electricity distribution systems. Several models based on neural networks, wavelet transform, and Bayesian models have been developed to analyze these effects. These models are useful for electric utilities for year-end analysis of the performance of their system. Results of these analyses provide guidance to utilities on future operation and maintenance expenses to improve system performance.

In addition, research was conducted on optimal utilization of small wind and solar generation systems with energy storage. An intelligent dispatch algorithm was developed, which uses load profile of the house, the energy available from the on-site renewable generator, and the battery conditions, to make decisions on buying, selling, or storing the energy on an hourly basis under different rate scenarios. Research is under progress to include options of real-time price and of deferring loads in the household to a later time for optimizing the benefits. This research, supported by the K-State Engineering Power Affiliates Program, is very important for promoting small wind and solar generation and to meet renewable portfolio standards.

Wireless Communications and Information Processing (WiCom) Group – Bala Natarajan

www.ece.ksu.edu/wicom

The WiCom group supports wide range of fundamental as well as applied research in the areas of wireless communication and information processing. The core expertise of the group lies in mathematical/statistical modeling, estimation and detection/decision theory, optimization and control theory, and information theory. The group has received funding from federal and state agencies such as National science foundation, NASA EPSCOR program, Kansas Dept. of Transportation (KDoT), Sandia National Labs (Department of Energy), U.S Marines (M2 Technologies), State of Kansas, Kansas State University Targeted excellence program as well as industry partners (e.g., Garmin Inc., Trisquare Communications, etc.). Researchers in the group have contributed to over 60 peer reviewed publications in the last five years.

Key projects in the wireless communication area over the last five years include design of a practical cognitive radio; resource allocation and quality of service assurance in a competitive cognitive radio network; precoding for MIMO and MIMO-OFDM systems; coexistence issues between ultra-wideband and GPS systems; multiuser detection in MC-CDMA systems, and biologically inspired spreading sequence design strategies. The group's contribution to the fields of spread spectrum communication and MIMO precoding has resulted in two patent applications. Projects in the area of information processing in sensor networks include resource allocation in collaborative target tracking; information fusion strategies for distributed event detection over bandwidth constrained networks; optimal control based sensor deployment strategies; sensor fusion in biomedical applications, networked control of distributed systems, and automated pavement distress detection via image processing and sensor fusion methods.

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Kenneth H. Carpenter

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Sanjoy Das

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- G. Singh, S. Das, S. Gosavi, S. Pujar, "Ant Colony Algorithms for Steiner Trees: An Application to Routing in Sensor Networks," Earlier article reprinted in: Intelligent Information Technologies: Concepts, Methodologies, Tools, and Applications (Ed. V. Sugumaran), Idea Group Publishing, pp. 1551-1575, 2008.

Dwight Day

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James E. DeVault

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John J. Devore

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Stephen A. Dyer

- S. A. Dyer, "Signal Conditioning," in Mechatronic System Control, Logic, and Data Acqui-

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William B. Kuhn

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Chris Lewis

- D. Deneault, D Schinstock, and C. Lewis, "Tracking Ground Targets with Measurements Obtained from Single Monocular Camera Mounted on an Unmanned Aerial Vehicle," to appear in 2008 IEEE International Conference on Robotics and Automation, Pasadena, California May 19-23 2008.
- J. Finley and C. Lewis, "Universal Object Segmentation in Fused Range-Color Data," in Proceedings of GEOBIA 2008, Aug. 5-8, 2008. Calgary, Alberta, Canada.

Ruth Douglas Miller

- R.D. Miller, "Introduction to Wind Power," Renewable Energy, Food, and Sustainability Short Course/Conference, Kansas State University, January 2008.
- R.D. Miller, "Kansas Wind for Schools," KATS Kamp (Kansas Association of Teachers of Science Annual Meeting), Rock Springs 4-H Center, April 2008.
- R.D. Miller, "Renewable Energy for Brownfields Projects," EPA Brownfields Workshop, Kansas State University, September 2008.
- R.D. Miller, "Wind Turbines for K-12 Education," Kansas Wind and Renewable Energy Annual Conference, Topeka, KS, September 2008.

Medhat M. Morcos

- M.M. Morcos and J.C. Gomez, "Distributed Generation: Short-Circuit Current Supplied by Induction Generators," in Proceedings of IEEE Transmission and Distribution Conference, Bogota, Colombia, 2008.
- J.C. Gomez and M.M. Morcos, "Distribution Generation: Exploitation Of Islanding Operation Advantages," in Proceedings of Power Systems Conference, Clemson, South Carolina, 2008.

Bala Natarajan

- L. Akter, B. Natarajan and C. Scoglio, "Spectrum Usage Modeling and Forecasting in Cognitive Radio Networks," Cognitive Radio Networks, Auerbach Publications, 1st edition, December 24, 2008.
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- R. Krishnan, B. Natarajan and S. Warren, "Motion Artifact Reduction in Photopleythysmography Using Magnitude-Based Frequency Domain-Independent Component Analysis," Proceedings of the 17th IEEE International Conference on Computer Communications (ICCCN), St. Thomas, Virgin Islands, August 2008.
- L. Akter and B. Natarajan, "Modeling and Forecasting Secondary User Activity in Cognitive Radio Networks," Proceedings of the 17th IEEE International Conference on Computer Communications (ICCCN), St. Thomas, Virgin Islands, August 2008.
- K. Rajan, D. Day and B. Natarajan, "Analysis of Pavement Condition Employing Principal Component Analysis and Sensor Fusion Techniques," Proceedings of 2008 International Conference on Image Processing, Computer Vision, and Pattern Recognition, IPCV 08, Las Vegas, vol. 2, pp. 422-427, June 2008.
- K. Rajan and B. Natarajan, "A Distance-Based Comparison of Optimal Power Allocation to Distributed Sensors in a Wireless Sensor Network," Proceedings of IEEE International Conference on Communications, ICC 2008, Beijing, China, May 2008.
- H. Zamat and B. Natarajan, "Use of Dedicated Broadband Sensing Receiver in Cognitive Radio," Proceedings of IEEE Cognitive Networks Workshop (CogNets), part of IEEE International Conference in Communications, ICC 2008, Beijing, China, May 2008.
- S. Hijazi and B. Natarajan, "An Improved Decorrelator MUD for Asynchronous MC-CDMA with Extended Observation Window," Proceedings of IEEE International Conference on Communications, ICC 2008, Beijing, China, May 2008.
- N. Anand, C. Scoglio and B. Natarajan, "GARCH Non-Linear Time Series Model for Traffic Modeling and Prediction," Proceedings of IEEE/IFIP Network Operations and Management Symposium NOMS 2008, pp. 694-697.
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Anil Pahwa

- S. Das, A. Pahwa, M. Gui, "Artificial Immune Systems for Anomaly Detection," Advances of Computational Intelligence in Industrial Systems (Eds. Y. Liu, A. Sun, H. T. Loh, W. F. Lu, E. P. Lim), Studies in Computational Intelligence, Vol. 116, Springer-Verlag, Heidelberg, pp 231 – 248, 2008. (Refereed Book Chapter, Published)
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- M. Hopkins and A. Pahwa, "Monte-Carlo Simulation of Energy Production by a Small Wind Generator," Proceeding of the 40th Annual North American Power Symposium, Calgary, Alberta, Canada, Sep.2008.
- A. Pahwa, "An AIS-ACO Hybrid Approach for Multi-Objective Distribution System Reconfiguration," Intelligent Techniques for Power System Distribution Control (Panel Session), IEEE Power Engineering Society General Meeting, Pittsburgh, PA, July 2008.
- A. Pahwa, Editor and Chairman, "Distribution Automation Tutorial," IEEE Power Engineering Society General Meeting, Pittsburgh, PA, July 2008.
- M. Gui (Advisors: A. Pahwa and S. Das), "Prediction of Animal-Related Failures in Overhead Distribution Systems," Student Paper Contest, IEEE Power Engineering Society General Meeting, Pittsburgh, PA, June 2008.
- M. Hopkins (Advisor: A. Pahwa), "Renewable Energy Intelligent Dispatch," Student Paper Contest, IEEE Power Engineering Society General Meeting, Pittsburgh, PA, June 2008.
- G. Karady and A. Pahwa, "Phasor Analysis, Power Definitions, Single-Phase and Three-Phase Circuits," Power System Educational Track, SESSION ES01, IEEE/PES T&D Conference and Exposition, Chicago, IL, April 2008.
- A. Pahwa, "Effects of Lightning, Wind, and Squirrels on Power Distribution System Reliability," Graduate Power Seminar, Iowa State University, Ames, Feb. 2008.
- A. Pahwa, "Power Outages Due to Lightning, Wind, and Squirrels," Electrical and Computer Engineering Seminar, University of Waterloo, Waterloo, Canada, Dec. 2008.

Caterina M. Scoglio

- Pompili, Scoglio, Lopez. "Multicast Algorithms in Service Overlay Networks." Computer Communications Journal vol. 31, pp. 489-505, August 2008.

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- McBride, Scoglio. "Constructing Traffic-Aware Overlay Topologies: A Machine Learning Approach." In proceedings of workshop on Peer-to-Peer Systems (IPTPS 2008), Tampa Bay, USA, 2008.
- Youssef, Choi, Scoglio, E. K. Park. "Dynamic Hybrid Topology Design for Multicasting Constrained WDM Networks." Proceedings of ICCCN 2008, St. Thomas, USA, 2008.
- Akter, Natarajan, and Scoglio. "Modeling and Forecasting Secondary User Activity in Cognitive Radio Networks." Proceedings of ICCCN 2008, St. Thomas, USA.
- Akter, Natarajan, and Scoglio. "Spectrum Usage Modeling and Forecasting in Cognitive Radio Networks." World Scientific Review.
- Scoglio, Kooij, Schumm, Sydney, and Youssef. "Metrics for Robustness in Complex Networks." Poster presented at "Complex Systems Conference," National Academies Keck Futures Initiative, November 12-15, 2008, Arnold and Mabel Beckman Center, Irvine, CA.
- Anand, Scoglio, and Natarajan. "GARCH—Non-Linear, Time- Series Model for Traffic Modeling and Prediction." Proceedings of IEEE/IFIP NOMS 08, Salvador da Bahia, Brazil, April 2008.
- S. Bowe, S. Wisely, C. Scoglio, P. Schumm, and A. Sydney. "Striped Skunks Host Ecology in Urban and Rural Habitats: Modeling Exposure Risk to Rabies in the Midwest." Presentation at the International Conference on Emerging Infectious Diseases. March 2008.

David L. Soldan

- D. L. Soldan, R. W. Ives, R. P. Broussard, and L. R. Kennell, "Effects of Image Compression on Iris-Recognition System Performance," Journal of Electronic Imaging, Volume 17, Number 1, January – March 2008.

Steve Warren

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- Warren, and DeVault. "A Biosignal Acquisition and Conditioning Board as a Cross–Course Senior Design Project," Frontiers in Education 2008, Saratoga Hotel and Conference Center, Saratoga Springs, NY, Oct. 22–25, 2008, pp. S3C-11 to S3C-6.
- Warren, Martinez, Sobering, and Andresen. "Electrocardiographic Pill for Cattle Heart Rate Determination," 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Vancouver Convention and Exhibition Centre, Vancouver, British Columbia, Canada, August 20-24, 2008, pp. 4852–4855.
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- Griffith, Connor, Gruber, Young, Humphrey, and Warren. "Service Design Projects Sponsored by the Kansas State University Student Chapter of the IEEE EMBS," 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Vancouver Convention & Exhibition Centre, Vancouver, British Columbia, Canada, August 20-24, 2008, pp. 1587–1590.

Grants

Grants

Kenneth H. Carpenter

- PI, "Integrated Firing-System / Initiation-Train Modeling Enhancement," Research Subcontract No. B543310 from the University of California /Lawrence Livermore National Laboratory. Three-year funding of $220,350. Incrementally funded. $70,000 received for the second year's work.

Sanjoy Das

- Co-PI, NSF ECS "Investigating the Influence of Environmental Factors on Reliability of Distribution Systems," $240,000, 2005 – 2009.
- Senior investigator, NSF FIBR, Molecular Evolutionary Ecology of Developmental Signaling Pathways in Complex Environments, $4,999,836, 2005 – 2009.

Dwight Day

- Co-PI (with PI D. Gruenbacher), Quality Dependent Traffic, Sandia National Laboratories, $272,000, October 2004 – October 2008.
- PI (with Co-PI C. Lewis), Video-Log Data Mining Analysis, Kansas Department of Transportation, $50K per year.
- Co-PI , (with PI B. Natarajan), Kansas Department of Transportation, KTRAN KSU-08-1: Analysis of Road Condition Data Employing Sensor Fusion and Data Visualization Techniques, $50,000, June 2008 – May 2009.

John J. Devore

- PI (with co-PIs B. Natarajan and C. Lewis), Communication and Controls Development, Sandia National Labs, Ongoing Research, $75K per year.

Don Gruenbacher

- Co-PI (with PI B. Natarajan, co-PI W. Kuhn), Shared Laboratory Experience: A Comprehensive Approach for Teaching Engineering Concepts, National Science Foundation CCLI, $160,000, August 2005 – August 2009.
- PI (with co-PI D. Day), Quality-Dependent Traffic, Sandia National Laboratories, $272,000, October 2004 – October 2008.
- PI (with PIs J. Sterbenz, C. Scoglio, D. Gruenbacher, G. Monaco, B. Ramamurthy, D. Medhi), GpENI: The Great Plains Environment for Network Innovation, NSF – GENI (Global Environment for Network Innovation), $462,000, September 2008 – August 2011.
- PI (with PI D. Soldan), Modeling the Economic Cost of Inadequate Teaching and Mentoring, NSF, $148,390, January 2009 – December 2009.
- PI (with PI B. Natarajan), Enhancing IT Infrastructure Monitoring via Advanced Baselining, Event Detection and Prediction Techniques, eG Innvoations, $161,497, August 2008 – July 2010.

William B. Kuhn

- PI, Sandia National Laboratory, "RFIC Development in Peregrine SOS Phase II," $195,000, October 2007– September 2009.
- PI, Honeywell Kansas-City-Plant, "Research in Fractional-N Synthesizer Design and LTCC Inductor Performance, Phase II," $86,000, November 2008 – August 2009.
- PI, Honeywell Kansas-City-Plant, "Research in Fractional-N Synthesizer Design and LTCC Inductor Performance," $80,000, November 2007 – September 2008.
- PI, Toyon Corporation, "RFIC Development in SOS," $50,000, November 2007 – April 2008.
- PI, Peregrine Semiconductor Corporation, "Micro-Power Radio Transceivers in Peregrine Semiconductor's SOS Process," $35,000, July 2007 – December 2008.
- PI, NASA Jet-Propulsion Lab, "Wide-Band Integrated Si-Based Single-Chip TR Module for UHF Radar," $68,000, January 2007 – July 2008.
- Co-PI (with B. Natarajan), Garmin International, "UWB Technology for GPS Products," $35,575,

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January 2007 – April 2008.
- Co-PI (with PI B. Natarajan and D. Gruenbacher), NSF CCLI A&I proposal # 0511669 – "Shared Laboratory Experience: A Comprehensive Resource for Teaching Engineering Concepts," $160,000, October 2005 – September 2008.

Chris Lewis
- Co-PI (with PI D. Schinstock), Topographic Models with Multi-Spectral Image Registration from Orbiter Data, Kansas EPSCoR RID, $135,434.
- Co-PI (with PI J. Devore, Co-PI B. Natarajan), Communication and Controls Development, Sandia National Labs, Ongoing Research, $75K per year.
- Co-PI (with PI D. Day), Video-Log Data Mining Analysis, Kansas Department of Transportation, $50K per year.

Ruth Douglas Miller
- PI, National Renewable Energy Laboratory, US Department of Energy, "Kansas Wind Applications Center," $116,796, February 2008 - January 2011.
- Senior investigator (with PI K. Hohn, L. Erickson, J. L. Anthony, W. Griswold, B. Champion, O. Saulters, D. Wang, A. Pahwa, M. Rezac, J. Li), National Science Foundation (Research Experience for Undergraduates), "Earth, Wind and Fire: Sustainable Energy for the 21st Century," $100,000, May 2009 - August 2011.
- Content author (with L. Erickson, J. Schlup, S. Staggenborg, S.L. Hutchinson, and K. Walton, and PI G. Gerhard), National 4-H Council, "Engineering for Sustainability: Development of a 4-H SET Curriculum," $96,580, July 2009 - June 2011.

Bala Natarajan
- PI, Sandia National Labs – Department of Energy, "Model-Based Design and Simulation of GPS Receiver Track Loops for High-Dynamic Applications," $75,000, October 2007 – 2009.
- PI, U.S Marine Corps— Urban Operations Environmental Laboratory, Automated Surveillance and Control Using Smart Robots, $121,000, October 2007 - 2009.
- PI (with D. Day), Kansas Department of Transportation, KTRAN KSU-08-1: Analysis of Road Condition Data Employing Sensor Fusion and Data Visualization Techniques, $50,000, June 2008 – May 2009.
- PI (with D. Gruenbacher), eG Innovations, Enhancing IT Infrastructure Monitoring via Advanced Baselining, Event Detection and Prediction Techniques, $161,497, August 2008 - July 2010.
- PI (with W. Kuhn and D. Gruenbacher), NSF, Shared Laboratory Experience: A Comprehensive Resource for Teaching Engineering Concepts (NSF-DUE (CCLI), October 2008 – September 2009.
- Co-PI (with G. Singh, D. Andresen, S. Warren, S. Deloach), NSF CRI, An Experimentation Platform for Developing Customized Large-Scale Sensor Systems, $200,000, April 2006 – March 2010.

Anil Pahwa
- PI (with co-PI S. Das), NSF, "Investigating the Influence of Environmental Factors on Reliability of Distribution Systems," $240,000, 2005 - 2009.
- Department Coordinator, World Bank/Ministry of Higher Education in Afghanistan, "Partnership of Kabul University and Kansas State University to Strengthen the Faculty of Engineering," $3,186,826, 2007 - 2010.
- PI, K-State Engineering Power Affiliates Program, "Intelligent Dispatch of Small Wind and Solar Generators," $10,000, 2008 - 2009.

Caterina M. Scoglio
- PI (with J. Sterbenz [KU], D. Gruenbacher, G. Monaco, B. Ramamurthy [UNL], D. Medhi [UMKC]), "GpENI: The Great Plains Environment for Network Innovation," NSF - GENI (Global Environment for Network Innovation), $462,000, September 2008 – August 2011.
- PI (with co-PIs T. Easton [IMSE], R. Kooij [ECE], W. Schumm [HumEc]), "SGER: Exploratory Research on Complex Network Approach to Epidemic Spreading in Rural Regions," NSF SES-0841112, $50,001, September 2008 – August 2009.

David L. Soldan
- PI, USDA Department of Agriculture, Grain Marketing and Production Research Center, Development of Computer Models for Stored-Product Insect Population Dynamics in Flour Mills," $14,185, August 2007 - June 2009.

Steve Warren
- Co-PI (with D. Zollman, S. Rebello, 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 2008 – June 2011.
- Co-PI (with J. Hatcliff, D. Andresen, Robby), "Development of an Open Test Bed for Application of Formal Methods to Medical Plug-and-Play Architectures," National Science Foundation, U.S. Food and Drug Administration, Scholars In Residence Program, $55,000, August 2007 – July 2008.
- Co-PI (with A. Bennett, S. Rebello), "Center for Quantitative Education," Kansas State University, Targeted Excellence Program, July 2006 – June 2012, $998,498, reduced to $100,000 for the period of July 2006 – June 2008.
- Co-PI (with G. Singh, D. Andresen, S. Deloach, 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 2006 – March 2009.
- Co-PI (with G. Singh, D. McGregor, J. Edgar), "Center for Sensors and Sensor Systems," Kansas State University, Targeted Excellence Program, $1,500,000, July 2006 – June 2010.
- Co-PI (with D. Andresen, H. Erickson, D. Poole, M. Spire), REU Supplement to ITR–0205487. "ITR: An Infrastructure for Veterinary Telemedicine – Proactive Herd Health Management for Disease Prevention from Farm to Market," National Science Foundation, $12,000, October 2003 – September 2009.
- Co-PI (with D. Andresen, H. Erickson, D. Poole, M. Spire), ITR–0205487, "ITR: An Infrastructure for Veterinary Telemedicine – Proactive Herd Health Management for Disease Prevention from Farm to Market," National Science Foundation, $12,000, October 2003 – September 2009.
- Co-PI (with D. Andresen, H. Erickson, D. Poole, M. Spire), ITR–0205487, "ITR: An Infrastructure for Veterinary Telemedicine – Proactive Herd Health Management for Disease Prevention from Farm to Market," National Science Foundation, $899,996, October 2003 – September 2009.

PROFESSIONAL
service/recognition

Professional

Sanjoy Das
- Technical Committee, IEEE Conference on Evolutionary Computation, Hong Kong, 2008.
- Technical Committee, IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology, 2008, Sun Valley, Idaho, 2008.
- Reviewer for ACM Transactions on Autonomous and Adaptive Systems, IEEE Transactions on Systems, Man and Cybernetics B, IEEE Transactions on Evolutionary Computation, Swarm Intelligence.

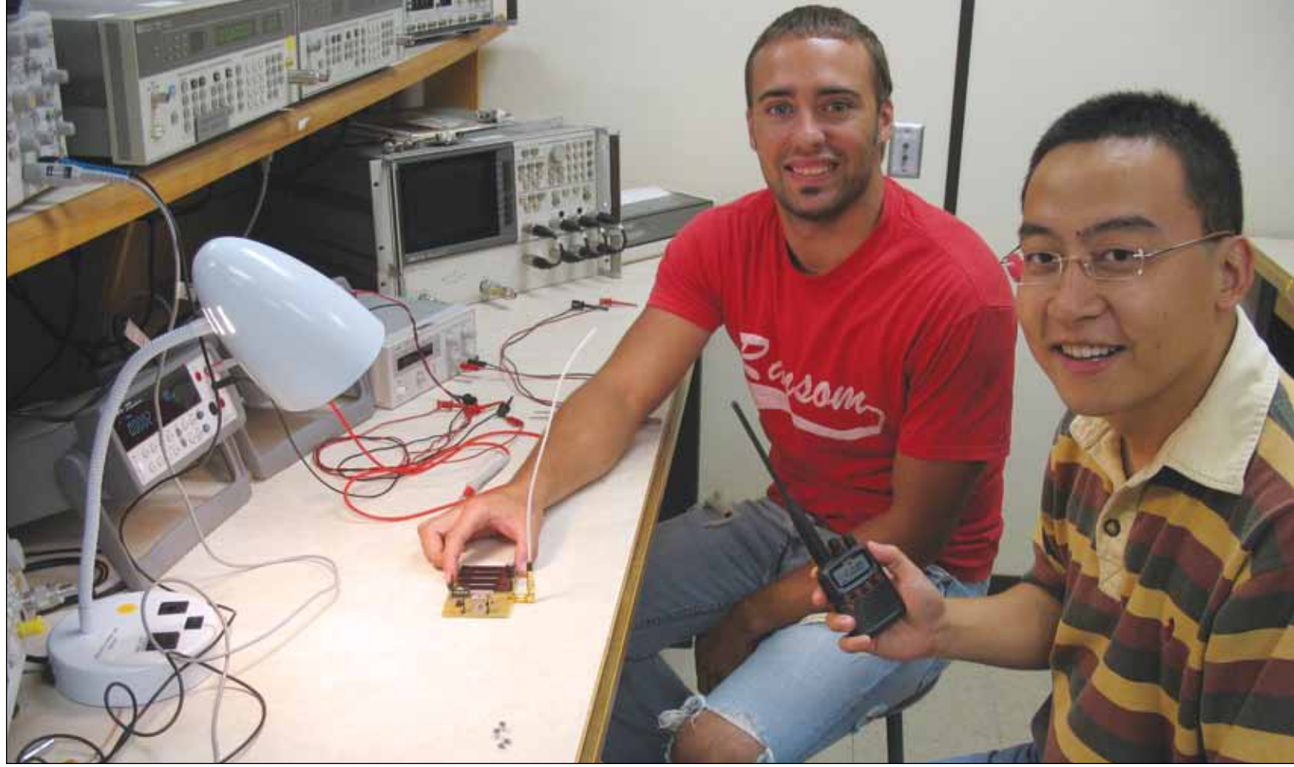
Stephen A. Dyer
- Junior Past President, IEEE Instrumentation and Measurement (I&M) Society.
- Elected Member-at-Large, Administrative Committee (AdCom), IEEE Instrumentation and Measurement Society (2006–2009 term).
- Chair, Long-Range Planning Committee, IEEE Instrumentation and Measurement Society.
- Chair, Nominations and Appointments Committee, IEEE Instrumentation and Measurement Society.
- Chair, Organization Committee, IEEE Instrumentation and Measurement Society.
- Member, Management Committee, IEEE Instrumentation and Measurement Society.
- Member, Finance Committee, IEEE Instrumentation and Measurement Society.
- Member, Administrative Committee, IEEE Nanotechnology Council.
- Member, Editorial Board, IEEE Instrumentation and Measurement Magazine.
- Corresponding Member, IEEE Technical Activities Board (TAB) Strategic Planning Committee.
- Member, 2008 International Instrumentation and Measurement Technology Conference (I2MTC/2008) Technical Program Committee.
- Chairperson, "Measurement-Data Management (I)," IEEE 2008 International Instrumentation and Measurement Technology Conference (I2MTC/2008), Victoria Island, British Columbia, Canada, 12–15 May 2008.
- Chairperson, "Mechanical Measurements (II)," IEEE 2008 International Instrumentation and Measurement Technology Conference (I2MTC/2008), Victoria Island, British Columbia, Canada, 12–15 May 2008.

Don Gruenbacher
- Program committee member, IEEE Vehicular Technology Conference, 2009.
- Member, Great Plains Network (GPN) GENI Task Force.
- Member, U.S. Senator Pat Roberts Committee on Information Technology.

William B. Kuhn
- Commerce Bank Outstanding Undergraduate Teaching Award, 2008.

Medhat M. Morcos
- Associate Editor, Electric Power Components and Systems.
- Dr. Ron and Rae Iman Outstanding Faculty Award for Teaching, Kansas State University, 2008.

Bala Natarajan
- Chair, Track on Wireless Communications and Signal Processing, IEEE International conference on computer communications and networks, ICCCN 2008.
- Invited Speaker, Cyber Warfare Symposium, Ft. Leavenworth, Kan., 2008.
- Session Chair, IEEE International Conference in Communications, 2008.
- Session Chair, IEEE Global Telecommunications Conference, 2008.
- Program Committee Member, IEEE Consumer Communications and Networking Conference, 2008.
- Program Committee Member, IEEE Vehicular Technology Conference, 2008.
- Program Committee Member, IEEE Wireless Communications and Networking Conference, 2008.
- NSF Theoretical Foundations, Review Panel, 2008.
- Elevated to status of Senior IEEE Member.



Anil Pahwa
- Faculty Advisor, HKN, Kansas State University Blue Key Advisor of the Year Award.
- Secretary, Power Engineering Education Committee of IEEE Power and Energy Society
- Fellows Working Group of Power Engineering Education Committee.
- Vice Chair and Technical Committee Program Chair, IEEE PES Power System Planning and Implementation Committee, IEEE Power and Energy Society.
- 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.
- Chair, Technical sessions at DistribuTECH Conference and Expo, Tampa, Fla., 2008.
- Chair, Technical session at North American Power Symposium, Calgary, Canada, 2008.
- Professorial Performance Award, Kansas State University.

Caterina M. Scoglio
- Chair, Technical Program Committee, IEEE IPOM 2009, 9th IEEE International. Workshop on IP Operations and Management, 2October 2009, Telecom Italia Future Centre, Venice, Italy.
- Organizing Committee for NSF Workshop on Bridging the Cyber, Physical, and Social Worlds, Kansas City, Mo.
- Technical Program Committee Member, Complex 2009.
- Technical Program Committee Member, IEEE ICC '09.
- Technical Program Committee Member, IWSOS '08.
- Technical Program Committee Member, IPOM '08.

David L. Soldan
- IEEE Education Society, 2008 Distinguished Member Award.
- Chair, IEEE Education Society Fellows Committee.
- Member, Eta Kappa Nu Board of Directors.
- Member, Executive Committee, ABET Engineering Accreditation Commission.
- Member, NSF IEECI Review Panel.

Undergraduate Studies

The department of electrical and computer engineering offers B.S. degrees in both Both 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 that exist within the department include solar car, 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, examples of which follow:

- The Department of Energy sponsors the 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.

- The industry-sponsored Electrical Power Affiliates Program supports multiple research projects that aim to involve undergraduates in power-related research. Projects which support 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."
- Study and enhancement of a flight control system for an existing sub-orbital missile system sponsored by Sandia National Labs.
- NASA-sponsored image processing using stereo pairs of images to create terrain models of Mars and other locations.
- Various mathematical models in epidemic modeling and their corresponding software implementation realized by undergraduate research student in the EPICENTER group.
- Energy-harvesting radio developed for remote sensing applications.
- Development of the K-State UHF microtransceiver with frequency-hopping, spread-spectrum capabilities.

Graduate Studies

Electrical and computer engineering graduate programs have an excellent base of students that are 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, and are often recognized for their accomplishments with national scholarships and best-paper awards.

The department offers a master of science degree 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 hardware 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. There are numerous well-equipped instructional and research laboratories including the Communications Lab, Signal Processing Lab, Instrumentation Lab, Microcomputer Lab, Digital Systems Lab, Audio 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 use in their studies and research.

For additional information, please contact:
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Kansas State University
Manhattan, KS 66506-5204
Phone: (785) 532-5600

E-mail: *grad@ece.ksu.edu*
Web: *http://www.ece.ksu.edu/*

Advisory Board

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 L. Abrams, P.E.
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Black & Veatch

Roderick K. Blocksome
Senior Systems Engineer
Rockwell Collins

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Professor, Electrical Engineering
University of Texas-Dallas

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Operations Sprint LDD, KSOPKC0401

Craig Mehan
Engineering Manager for Marine Products
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Terry R. Weaver, P.E.
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