ECE  Shocker Report

Fall 2005

The Newsletter and Report of the Department of Electrical and Computer Engineering, Wichita State University.

Above is shown Wallace Hall, the home of the Department of Electrical and Computer Engineering.
From the Chair of the Department of Electrical & Computer Engineering:

Dr. M. Edwin Sawan

It is my pleasure to welcome you to this new issue of the ECE Newsletter and Shocker Report. I truly appreciate your interest and support of our department. In this report, we proudly present the achievements of our faculty, staff, and students during the past year. I am confident that you would share our pride in these achievements.

During the past year, our faculty continued to increase, and we were joined by a new outstanding member. Our external funded research continued to grow, and so did our publications and conference presentations. In particular, a record number of our graduate students attended national and international conferences, where they presented papers based on their graduate research. Of special note, our students had an overwhelming majority of the papers presented at the First Annual Graduate Research and Scholarly Projects (GRASP) Symposium, which was held at the Hughes Metroplex last April. A team of faculty and students from our department won the best paper award at the 23rd Digital Avionics Systems Conference (DASC). Dr. Ravi Pendse, Dr. Ravi Bhagavathula, and Mr. Sabeeh Ali will receive this award at the next conference in November 2005.

We continued our effort to strengthen our cooperative relationship with various industries. Dr. Ravi Pendse, associate vice president and a member of our faculty, has successfully arranged for a new internship program, sponsored by Cisco Systems, to be housed in our department. The plan for this internship program is to have students work as part of the Cisco Technical Assistance Center to solve customer problems with Cisco products over the phone. This program will provide our Department with funds to support about 40 students at both the undergraduate and graduate levels. More importantly, it will provide our faculty, staff, and students with a unique opportunity to be a part of this new level of technical collaboration with Cisco.

Last May, the Power Systems Engineering Research Center (PSERC) Advisory Board held its meeting on our campus. PSERC is a university-industry collaboration focusing on research and education needs in the electric power industry. It has been a National Science Foundation Industry/University Cooperative Research Center since 1996. Dr. Ward Jewell played a major role in coordinating this meeting.

As we look forward to a new academic year, we pledge to spare no effort on our path to achieve our goals of excellence in teaching and research, under the leadership of our new dean, Dr. Zulma Toro-Ramos. We value your interest and count on your continued support to our department and Wichita State University.
Update on New Engineering Research Building

The new engineering research building, to be located in the grassy courtyard area immediately south of Wallace Hall is on track for completion in 2007. Bids were recently received from eight construction firms and Conco Construction of Wichita was selected. Construction begins in October of 2005. The building will have two floors with a total, gross area, including hallways, utilities space, etc. of about 65,000 square feet. It will house new research labs for all four Departments in the College of Engineering. The first floor will include new facilities for the Optics Lab, and support the research of Dr. Skinner. On the second floor there will be three ECE labs. The Advanced Networking Lab will provide new facilities for the research of Drs. Pendse, Cetinkaya and Namuduri. The Power Quality Lab will provide new facilities in support of the research of Drs. Jewell and Teshome. And the Communications and Signal Processing Lab will provide new facilities for the research of Drs. Kwon, Jayaweera, and Paarmann.

Joel Mehler Named Tau Beta Pi Fellow for 2005/2006

Joel Mehler, WSU B.S. in electrical engineering, May 2005, has been named a Tau Beta Pi Fellow for 2005/2006 to pursue his graduate studies. Tau Beta Pi, the engineering honor society, announced the selection in April of this year. Thirty five of the young engineering applicants for the graduate fellowships were named for the 2005/2006 school year. Fifteen of this year’s winners will receive cash stipends of $10,000 for their advanced study; the others do not need financial aid from Tau Beta Pi. More than $4,212,000 in stipends will have been given by the Society when this 72nd group of scholars completes its graduate work. All Tau Beta Pi Fellowships are awarded on the competitive criteria of high scholarship, campus leadership and service, and promise of future contributions to the engineering profession. All fellows are members of Tau Beta Pi. Joel completed his B.S. degree with a 4.0 grade point average.
Mark Jong, Associate Dean, Retires

Mark Jong, Professor of Electrical Engineering, joined the ECE Department in 1967, having received his B.S. degree from the National Taiwan University in 1960, his M.S. degree from the South Dakota School of Mines and Technology in 1965, and his Ph.D. degree from the University of Missouri in 1967. Dr. Jong is the author of *Methods of Discrete Signal and Systems Analysis*, McGraw-Hill Book Co., 1982. From 1979 to 1990 he was the Graduate Coordinator for the ECE Department, and in 1990 he became Associate Dean of the College of Engineering, a position he held until his retirement in May 2005. Throughout most of his time as Associate Dean he continued to teach Digital Signal Processing and Digital Filters graduate courses. He will be missed, and we wish him well in retirement.

Dr. Hyuck Kwon on Sabbatical

Hyuck M. Kwon is on sabbatical leave for Fall 2005. He is conducting research and collaborating with Prof. Yong Hoon Lee, Korea, at the Advanced Institute of Science and Technology. Their research is concerned with 3GPP Long Term Evolution Wireless Communications Systems.

ECE Roundtables

Frequently on Friday afternoons the department will hold an ECE Roundtable. As currently planned, some of these Roundtables will be open, and students will be encouraged to attend, while others will perhaps not be open. The purpose of the Roundtables will be for the exchange of ideas and the sharing of information about the programs and activities of the department. Check the web site for announcements about open Roundtable discussions:

http://webs.wichita.edu/?u=ECE&p=/ecertl/

Student Branch of the IEEE

The IEEE (Institute of Electrical and Electronics Engineers) is a non-profit, technical professional association of more than 360,000 individual members in approximately 150 countries. Through its members, the IEEE is a leading authority in technical areas ranging from computer engineering, biomedical technology and telecommunications, to electric power, aerospace engineering and consumer electronics, among others.

**IEEE-WSU**

The Student Branch at WSU aims to enhance the academic, professional and technological development of its student members through entertaining and informative programs. Its mission is fourfold:

- **Technology:** To create awareness of cutting-edge technologies and provide opportunities for collaborative efforts towards technological development.
- **Career:** To provide resources for members to explore career opportunities, gain better understanding of their field, network with future employers and acquire valuable leadership experiences.
- **Networking:** To serve as a forum for members to network with their peers and with faculty/professionals for academic, professional and social support.
- **Leadership:** To provide opportunities for student members to get involved, assume leadership roles and take pride in IEEE and Wichita State University.
**Events and Programs**

Regular meetings of IEEE-WSU are held on the 1st and the 3rd Wednesday of each month at 12:30 p.m. in Room 310, Wallace Hall. Through these meetings and other events IEEE-WSU sponsors the following programs:

- **Technical Seminars**: exploring hot new technologies and exciting issues relating to engineering.
- **Career and Professional Development Programs**: to explore the “soft skills” required for a successful career.
- **Fieldtrips**: to local electrical and computer engineering companies.
- **Tutoring**: for undergraduate courses (provided by upper-division undergraduate and graduate students).
- **IEEE Competitions**: like the undergraduate robotics competition and undergraduate/graduate paper competitions.
- **Social Events**: including movie nights, bowling nights, intramural sports and outdoor cookouts.

**Executive Council for 2005-2006**

- **President** – Shantanu Rao
- **Vice President** – Sumakanth Kambhampati
- **Student Activities Chair** – Amarnath Jasti
- **Secretary** – Charles Collins
- **Treasurer** – Muhammad Sabeeh Ali

For more information and events details please visit the following website:

http://www.wichita.edu/ieee

Email IEEE-WSU at:

ieee@wichita.edu

**Epsilon Xi Chapter of Eta Kappa Nu**

Eta Kappa Nu is the honor society for electrical and computer engineering students. The officers of the Epsilon Xi Chapter (the WSU Chapter) of Eta Kappa Nu for the 2005/2006 academic year are:

- **President**: Chibizor (Chi) Nwoke
- **Vice President**: Mitchell Boutz

Inducted into the organization during the 2004/2005 school year were the following students:

- Frank Bartonek
- Eeching Chen
- Tony Eck
- Mark Hansen
- Joshua Jones
- Joel Mehler
- Thao Nguyen
- Thuy Pham
- Jose Rico

To be eligible for Eta Kappa Nu membership, a third year student must be in the top one fourth of his class, and a fourth year student must be in the top one third of his class. Invitations to new members are sent out each semester. The Fall 2005 invitations will be sent out in November.

**ECE Graduates**

(from July 1, 2004 through June 30, 2005)

During the time frame indicated above, the ECE Department had 79 B.S. graduates, 91 M.S. graduates, and 4 Ph.D. graduates.

Of the **M.S. students** who wrote a thesis, the details are as follows:


**Ph.D. Graduates**


The ECE Department Outstanding M.S. Student Award for 2005 was awarded to Madhavi Chebolu.

The ECE Department Outstanding Ph.D. Student Award for 2005 was awarded to Patricia Best.

**GRASP Awards**

GRASP: Graduate Research and Scholarly Projects.

M. L. Chebolu was awarded the Dora Wallace Hodgson Outstanding Master’s Level Student Award. Advisor: Sudharman Jayaweera.


Third Place in Poster Presentation: “Quantum Gates using a Pulsed Bias Scheme,” presented by P. Kumar. Advisor: Steven Skinner.

**Engineering Open House Awards for 2005**

IEEE Wichita Section First Place Award, and SME Professional Section First Place Award. **BUGS Robot.** Eeching Chen, Joel Mehler, Thao Nguyen, Shan Rao, and Paul Rau III. Advisor: Steven Skinner.

IEEE Wichita Section Second Place Award, IEEE Student Branch ECE585 First Place Award, ECE Department ECE585 First Place Award, Society of Women Engineers Award, and ME Thermal / Fluid Science Research Group Award. **E85 Ethanol Fuel Injection Modification.** J.D. Ast, Russell Demitras, Nicholas Herbert, and Sarah Wallis. Advisor: Paul York.

IEEE Wichita Section Third Place Award. **Autonomous Fire Detecting Robot.** Matthew Childs, Matthew Crosby, Ryan Seitz, and Andrew Williams. Advisor: John Watkins.

IEEE Wichita Section Third Place Award. **Simulation of Wireless Communication Using SystemView.** Wu Fong Banh, Yeoh Yi Chien, and Tze Wong Colin. Advisor: Hyuck Kwon.


**ECE Student Awards**

**ECE Department Awards**

The ECE Department Outstanding Scholastic Achievement Award in Computer Engineering for 2005 was awarded to Krishna S. Ravichandar.

The ECE Department Outstanding Scholastic Achievement Award in Electrical Engineering for 2005 was awarded to Timothy J. Harder.
ECE Department ECE595 First Place Award, and IEEE Student Branch ECE595 First Place Award. Fire Fighting Robot. Jim Nguyen, and Kathryn Tiscareno. Advisor: John Watkins.

ECE Department ECE595 Second Place Award, and IEEE Student Branch ECE595 Second Place Award. Design of a Motorcycle Starter Generator. Dennis McDonald, Mai Nguyen, Robby Starr, Phuc Tran, and Nami Yousefi. Advisor: Ward Jewell.

Research in the ECE Department

The faculty of the Department of Electrical and Computer Engineering conduct research in various areas, including computer architecture, computer networking, wireless communication, control theory, digital signal processing, distance learning, electromagnetics, optics, power systems, and power quality.

Research in the computer architecture area involves design and implementation of efficient block replacement algorithms for CPU cache and Disk cache. The computing facilities in the CARG lab are used to conduct this research.

Research in computer networking involves comparison of networks that use voice over IP and Voice over Frame-Relay. The impact of fragmentation and interleaving is also explored. Challenges associated with Voice over IP over wireless methods are also being investigated.

Research in information security includes security issues in ad-hoc sensor networks, digital forensics analysis, and biometric security (iris, fingerprint, and face recognition methods).

Research in image processing and video communications includes wavelet-based video processing and compression, joint source-channel coding, visual sensor networks, video surveillance, and information theoretic aspects of video communications.

Research in the area of digital communications systems includes smart antennas, third generation (3G) and fourth generation (4G) code division multiple access (CDMA) wireless communications systems, US Army future frequency-hopping (FH) spread spectrum communication systems. Current projects include advanced signal processing techniques for future wireless systems based on WCDMA, UWB and OFDM, energy-aware communications schemes for wireless sensor networks, distributed detection and data fusion, distributed estimation in low-power wireless sensor networks, statistical methods for super-resolution imaging and remote video surveillance systems.

Research in information theory considers fundamental limits of communication and compression systems. Current research projects include distributed coding, joint source-channel coding, quantum coding and capacity of MIMO systems and wireless ad-hoc networks.

Research in the area of control theory includes design of robust controllers for complex systems. Singular perturbation methods are used to develop reduced-order controllers for continuous-time and discrete-time models, as well as unified models based on the delta operator. Mixed norm techniques are used to develop robust controllers for large-scale decentralized systems. Research is also being conducted in networked control systems, time-delay systems, spacecraft dynamics and controls, active magnetic bearings, active noise control, control design, fault detection, and robust filtering.

Research in the area of digital signal processing includes analysis and architecture design of delta-sigma data converters and speech processing for the hearing impaired. Design of mixed-signals integrated circuits, layout, and realization is part of this signal processing effort.

The present work in electromagnetics consists of experimental research into the electromagnetic (lightning) protection integrity of systems in aging aircraft.

Research in the area of optics includes optical and quantum computing architectures and fiber optic communications. In optical computing, theoretical and experimental research is being conducted to realize optical neural computing architectures. In quantum computing, theoretical work is being performed in realizing computing techniques in very small or quantum systems. In fiber optics, research is being conducted to exploit the nonlinear properties of the optical fiber in order to increase data rates.

Research in the area of electric power quality includes power quality troubleshooting, power system design to better serve loads, disturbance and susceptibility testing of loads, and load design to decrease disturbances and susceptibility. Power quality research is performed through the WSU Power Quality Lab, which provides field and laboratory equipment, computer analysis, and simulation capabilities.

Research in the area of power systems includes development of the Jacobian Matrix for Power System flow Analysis, Dynamic and Voltage Collapse Stability in Power Systems, and modeling and simulation of static shunt reactive power compensators for quasi-steady-state studies.
Dr. Coskun Cetinkaya, Assistant Professor, Department of Electrical and Computer Engineering, Wichita State University.

Education: Ph.D., Rice University, 2002

Research Area: Dr. Cetinkaya conducts research in computer networking, wireless ad hoc and sensor networking. He is currently investigating admission control, quality of service, medium access control (MAC) protocols, transport protocols, and scheduling algorithms for wireless networks.

Dr. Sudharman Jayaweera, Assistant Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., Princeton University, 2003

Research Area: Dr. Jayaweera conducts research in wireless communications, information theory, statistical signal processing, wireless sensor networks, bio-medical image processing, quantum information processing. As the lead PI of an NSF EPSCoR award, he founded the Advanced Wireless Sensors Research Lab (AWSRL), which conducts multi-disciplinary research on low-power wireless sensor networks for homeland security, environmental as well as consumer applications in collaboration with several WSU and KSU researchers.

Dr. Ward Jewell, Professor, IEEE Fellow, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., Oklahoma State University

Research Area: Dr. Jewell conducts research in power systems, power quality, distributed generation, renewable resources and distance learning. His current activities in the area of power quality include power quality troubleshooting, power system design to better serve loads, disturbance and susceptibility testing of loads, and load design to decrease disturbances and susceptibility. Power quality research is performed through the WSU Power Quality Lab, which provides field and laboratory equipment, computer analysis, and simulation capabilities.
Dr. Hyuck Kwon, Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., University of Michigan

Research Area: Dr. Kwon conducts research in the areas of digital communications, wireless communications, and satellite communications. His current activities include smart antennas, the third generation (3G) and fourth generation (4G) code division multiple access (CDMA) wireless communication systems, and US-Army future frequency-hopping (FH) spread spectrum communication systems.

Dr. Fred “Jackie” Meyer, Assistant Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., University of Massachusetts at Amherst

Research Area: Dr. Meyer conducts research in digital design, testing and diagnosis, and VLSI yield.

Dr. Kamesh Namuduri, Assistant Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., University of South Florida

Research Area: Dr. Namuduri conducts research in information security and image/video communications. Dr. Namuduri was the co-founder of the information assurance and security laboratory (with Dr. Pendse) and also the advanced sensor network laboratory (with Dr. Jayaweera).
John O’Loughlin, Associate Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: M.S., Massachusetts Institute of Technology

Research Area: Mr. O’Loughlin is director of the CAD/CAM Lab in NIAR, and conducts research in electromagnetics. His current activity in electromagnetics consists of experimental research into the electromagnetic (lightning) protection integrity of systems in composite and aging aircraft.

Dr. Larry D. Paarmann, Associate Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., Illinois Institute of Technology, 1983

Research Area: Dr. Paarmann conducts research in the area of signal processing and integrated circuit design and fabrication. His current activities include analysis and architecture design of delta-sigma data converters and speech processing for the hearing impaired. Dr. Paarmann is developing the theoretical background and simulations to better understand the weaknesses and limitations of delta-sigma data converters, which may lead to better converter architectures. He is also performing the design and layout of integrated circuits to realize new data converter architectures.

Dr. Ravi Pendse, Associate Professor, Department of Electrical Engineering, Wichita State University. Dr. Pendse is also Associate Vice President and also Cisco Fellow.

Education: Ph.D., Wichita State University, 1994

Research Area: Dr. Pendse conducts research in the areas of computer architecture and computer networking. His current research in the computer architecture area involves design and implementation of efficient block replacement algorithms for CPU cache and Disk cache. The computing facilities in the CARG lab are used to conduct this research. His current research in computer networking involves comparison of networks that use voice over IP and Voice over Frame-Relay. Impact of fragmentation and interleaving is also explored. Challenges associated with Voice over IP over wireless methods are also being investigated.
ECE Faculty and Research Areas (continued)

Dr. M. Edwin Sawan, Department Chair, Graduate Coordinator, and Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., University of Illinois at Urbana, 1979

Research Area: Dr. Sawan conducts research in the area of control theory and its applications. His current research activities include design of robust controllers for complex systems. He uses singular perturbation methods to develop reduced-order controllers for continuous-time and discrete-time models as well as unified models based on the delta operator. Mixed norm techniques are used to develop robust controllers for large-scale decentralized systems.

Dr. Steven R. Skinner, Associate Professor, Department of Electrical and Computer Engineering, and Bombardier-Learjet Fellow, Wichita State University

Education: Ph.D., University of Iowa, 1991

Research Area: Dr. Skinner conducts research in the areas of optics. His current activities in the area of optics include optical sensors, communication and computing, and electromagnetics. Optical sensors are being investigated for aviation and medical applications. Theoretical and experimental research is being performed in optical neural computing and quantum computing. His current activity in electromagnetics consists of experimental research into the electromagnetic (lightning) protection integrity of systems in aging aircraft.

Dr. Asrat Teshome, Associate Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., Cornell University, 1980

Research Area: Dr. Teshome conducts research in the area of power systems. His current activities include development of the Jacobian Matrix for power system flow analysis, dynamic and voltage collapse stability in power systems, and modeling and simulation of static shunt reactive power compensators for quasi-steady-state studies.
Dr. John Watkins, Associate Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., Ohio State University, 1995

Research Area: Dr. Watkins conducts research in the area of control systems. His current activities include work in networked control systems, time-delay systems, spacecraft dynamics and controls, active magnetic bearings, active noise control, control design, fault detection, and robust filtering.

Dr. Paul K. York, Professor, Department of Electrical and Computer Engineering, Wichita State University

Education: Ph.D., Texas A&M University, 1967

Research Area: Dr. York conducts research in the areas of wind energy, signal processing, and navigational and avionics systems. His most recent activities include participation in the collection and analysis of wind data from six sites throughout the state of Kansas. His analyses of these data have focused on correlation of data between sites and the value of geographical diversification of wind generation assets.
ECE Faculty Report

(for the calendar year 2004)

Journal Papers


Conference Papers


Conference Papers (continued)


Technical Reports


ECE Faculty Patent Awarded


ECE Faculty Conference Session Chairs


K. Namuduri, Session Chair, session on adaptive wireless networks, at the Globecomm Workshop, Dallas, TX, December 2004.

ECE Faculty Awards

S.K. Jayaweera was appointed as a NIAR Faculty Fellow for the year 2004.

W. Jewell was awarded the WSU Engineering Student Council Polished Professor Award.

K. Namuduri, listed in Who’s Who in Engineering.

L.D. Paarmann, listed in Who’s Who in American Education.

S. Skinner was appointed as Bombardier Learjet Fellow.

**ECE Faculty Research Funding**

E.C. Behrman (CPI), S. Han (CPI), J.E. Steck (CPI), and S.R. Skinner (CPI), “Theoretical and Experimental Investigation of Quantum Computing,” NSF, $400,000.


K.R. Namuduri (PI), C. Cetinkaya (CI), R. Pendse (CI), P. Ramanan (CI), and C.-C. Chang (CI), “SFS Capacity Building: Enhancing the Information Assurance and Security Curriculum at WSU,” NSF Division of Undergraduate Education, $200,000.


J. Steck (CPI), and S.R. Skinner (CPI), “Paint Thickness Measurement over Composites,” State of Kansas, $70,000.