

Intensive Research Lays Foundation for Doctoral Program

Guangxi Wang '03 took full advantage of the opportunities Lafayette offered to do research with faculty and participate in extracurricular opportunities. He graduated summa cum laude with honors in electrical and computer engineering and is now a doctoral student at California Institute of Technology.

Wang's research paper took third place, topping all but two submitted by Ph.D. students, at the Sarnoff Symposium on Advances in Wired and Wireless Communications in March. His presentation grew out of research conducted as an EXCEL Scholar for the past two years with William Jemison '85, associate professor of electrical and computer engineering.

They explored the unique designs of transmitter and receiver architectures for wireless communication and coauthored two papers. "I had wonderful experiences working with Dr. Jemison, who was also my honors thesis adviser," says Wang.

"When I came to Lafayette, I wanted not only to excel in academics, but to involve myself in campus activities," says Wang, of Shanghai, China, who speaks Chinese and German. "My goal was to grow as a person and learn more about American culture. I found more opportunities than I expected; the close interaction with faculty members has impressed me the most."

Being a teaching assistant in physics and webmaster for computing services gave Wang practical experience. He says that members of the engineering and mathematics departments helped him learn, grow, and succeed. "Without their hard work and valuable advice, none of my achievements would have been possible."

Wang will research radio frequency and microwave circuits at California Institute of



Guangxi Wang '03 (right) explored ways of improving high-speed wireless applications with William Jemison, associate professor.

Technology. "My plan to attend grad school derived from the research experiences," he says, adding that electrical and computer engineering faculty gave him advice and helped with graduate school applications. Wang was one of three students internationally to receive a Microwave Theory and Techniques Society Scholarship from the Institute of Electrical and Electronics Engineers. He was a leader on the team that placed in the top echelon of the William Lowell Putnam Mathematical Competition.

Former vice president of the Asian Culture Association and volunteer tutor with area school children, Wang won several academic awards in engineering and mathematics. ■

Electrical and Computer Engineering Program Accredited by ABET

The new electrical and computer engineering program was accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, Md. 21202-4012. As part of the periodic accreditation review process, a team from ABET composed of faculty from other institutions and practicing engineers visited Lafayette last year to examine the programs in electrical and computer engineering, chemical engineering, civil

engineering, and mechanical engineering. All were accredited. Engineering programs at Lafayette have been accredited by ABET for more than 65 years.

"The faculty worked hard to prepare for this review for accreditation," says Ismail Jouny, professor and department head. "We are pleased the quality of our faculty, students, and electrical and computer engineering program were recognized by this team of outside experts." ■

ECE Instructional Labs Upgraded

In the past five years, almost \$200,000 has been spent to upgrade equipment in the four ECE instructional laboratories.

The Computer Systems Laboratory is used for required courses in digital circuits and the first of two capstone senior design courses. These topics are treated with the support of six PC's, Xilinx FPGA tools, standard benchtop instruments, OrCAD Design tools, and M68HC11 microprocessor development boards. For digital circuits courses, up to 14 students work in teams of two or three at six workstations. The Digital Design sequence culminates in the design of a special purpose computer to play NIM with students' printed circuit boards fabricated on a T-Tech Circuit Milling machine. The senior design laboratory course includes a capstone design exercise with student teams designing and constructing a Token Ring and an Ethernet communication system.

The Solid State Electronics Laboratory is used for two required courses in electronics and for student project work. Fundamentals of solid-state electronics and the design of analog integrated circuits are taught using this laboratory. The major equipment and computing elements include six PC's, Pspice [industry standard version] simulation software, MATLAB® tools, IC Design tools, and shared [with DSP/VLSI Laboratory] Unix workstations. For instruction in solid-state electronics, up to 14 students work in teams of two or three at six workstations. The second course in the sequence culminates in student team projects which involve the design to strict specifications of an analog or analog/ digital system. Projects



Students work in the new computer systems laboratory in Acopian.

Mission:

Our mission is to be one of the nation's premier undergraduate ECE departments. We are dedicated to providing students a thorough technical preparation, the continuous development of professional awareness, and a heightened sense of social responsibility.

This mission statement leads to three major goals:

(1) to bring together students of high ability and a faculty composed of teacher-scholars in the major fields of electrical and computer engineering for the purpose of learning through study, inquiry, discourse, and discovery—our people.

(2) to maintain a continuous evolution of curriculum, pedagogical practices, and resources to educate students in the guiding principles of the engineering profession and the best practices in both electrical and computer engineering—our program.

(3) to create an interactive environment between students and faculty which fosters a dedication to learning and an appreciation of both the history and future of the discipline—our learning environment.

OBJECTIVES

Graduates will have the ability to:

- educate themselves continually;
- adapt to changing job assignments/challenges;
- function in a team and provide leadership;
- apply their engineering education in solving a broad range of problems;
- be involved in professional/public/community service;
- excel in their chosen area of professional activity;
- communicate in a mature and effective manner, and
- appreciate business enterprise, technology management, and social and legal issues.

PROGRAM OUTCOMES

Upon graduation, students will:

- value life-long learning and understand contemporary issues;
- function in a multi-disciplinary team;
- analyze data and communicate results;
- solve broad-based engineering problems in a socially conscious and ethical manner;
- be able to design, simulate, build, and test both complex analog and digital circuits;
- use mathematical technique and science knowledge to model and analyze communication and control systems;
- use modern engineering hardware and software tools;
- be able to formulate an engineering problem and solve it by creating, debugging, and testing a team-based solution;
- understand microscopic material properties and how they are used to develop modern electronic devices.

From the Department Head

Welcome to the first edition of the electrical and computer engineering department newsletter. We want to take this opportunity to reintroduce the ECE department to you and your colleagues.

As you might know, the department now offers a single B.S. degree in electrical and computer engineering. Lafayette is one of a handful of institutions that offer an accredited single degree in electrical and computer engineering. The renovations of the engineering building are completed, and we are enjoying our new labs and offices on the fourth floor of Acopian Engineering Center. The building will be dedicated on Friday, Oct. 24 and you are invited to join the celebration and tours of the building at 5 p.m.

As we reintroduce ourselves to you, I hope to hear from all of you—colleagues, alumni and alumnae, and friends. We begin by presenting our mission and educational objectives. Brief stories about our faculty and students are also included. Please feel free to send us your comments, news, or any information you would like to relay to us.

Future newsletters will focus more on students, faculty, and alums. You are encouraged to visit our website for additional information about our department and for email addresses should you be interested in contacting us. Go to www.lafayette.edu, click on “academics,” then “departments and majors,” then “electrical and computer engineering.”

Ismail I. Jouny
Ismail I. Jouny



Marquis Scholar Mark Kolba '03 conducted research with Ismail Jouny, professor and department head, to diminish the devastation caused by forgotten land mines. Kolba is attending graduate school at Duke University this fall.

Labs Upgraded

(continued from page 1)

may be IC designs with layout parameter extraction using PSpice to verify circuit performance. Student chip designs are fabricated for later analysis.

The Circuits and Systems Laboratory is used for the introductory course in analog circuits, the senior-level Feedback Control Systems course, and the second senior design course. Basic experiments involving linear circuits are performed in this laboratory, culminating in active filter applications and phasor analysis. Control system experiments for this laboratory lead to a capstone design which involves motion control. This laboratory includes six PCs running Electronics Workbench Multisim and PSpice (full version) simulation software. It also includes standard [scope-multimeter-signal generator-power supply] benchtop instruments, Electronics Workbench Multisim simulation software, MATLAB® tools, and Feedback Control Equipment Units. This laboratory supports up to 14 students per section working in teams of two or three at six workstations. This laboratory underwent a complete refurbishment and upgrade since the last accreditation visit.

The VLSI/DSP Laboratory represents a rearrangement and upgrades to existing laboratory facilities to create this resource. This laboratory will support a two-course sequence in integrated circuit design and a course in digital signal processing. Major elements of the facility are eight PCs, ten Sun Workstations, Synopsys IC design tools, Texas Instruments C67 DSP boards,

MATLAB® Software, Speech and Image processing peripherals, and IC test equipment. IC designs are created and simulated using computing resources in the lab and fabrication of student designs is done through the MOSIS facility. Tests on the returned, fabricated chips are then conducted in this laboratory. For DSP experiments, students work in teams of two or three at six stations. However, IC designs often are completed by individual student designers. An unusual feature of this lab is the introduction of mixed-signal designs, done by undergraduates, incorporating principles of both analog and digital IC's.

The PC Board Milling Center has been set up in the engineering shop area. With support from shop technicians, the printed circuit board fabrications can be completed without the need for chemicals. This center is used for projects associated with the department's instructional and research laboratories.

Research Laboratories

The electrical and computer engineering department, along with the institution, support faculty members' research activities through space allocations, equipment purchases, and travel funds. Two existing research facilities, distinct from instructional labs, are the Photonics Technology Lab and the Microwave Systems Lab. Three additional research labs are planned in the areas of biomedical applications, analog IC design, and VLSI circuits. Facilities in instructional labs are also used, whenever appropriate, for research purposes. ■

Faculty News

Associate Professor Kim Bennett teaches electromagnetics (ECE241) and optoelectronics (ECE442). He also teaches electives in fiber optics and optical sensors. Last year he taught a First Year Seminar on China and engineering ethics (ES225). Bennett is on leave in Shanghai, China in 2003-2004. He continues to do research in optical sensors.

Professor William Hornfeck was on sabbatical in the fall of 2002. In the spring, he taught circuits (ECE221) and computer arithmetic (ECE415). He is enjoying his new spacious office and is becoming increasingly involved in recruiting and campus life. He is also interested in fuel cell research.



Professor John Greco works with students.

Professor John Greco taught numerous courses in 2002-2003. He teaches the basic digital courses (ECE211 & ECE212), and he also teaches the first senior design course (ECE491), in which students build simple token ring and Ethernet networks using the MC6811 as the controller. He was promoted to full professor effective September 2003.

Associate Professor William Jemison taught ES101 to all incoming engineering students. He also taught senior design II (ECE492). Students designed and built a wireless digital data link. Efforts to integrate ECE492 with ECE491 have concluded and will be implemented in the future. Jemison will be on sabbatical in 2003-2004. He will be doing research on hybrid wireless/optical systems. He continues to be busy with two NSF grants, and a major Navy grant. His research on hybrid wireless/optical systems continues to appear in many national and international venues.



Oliver Bowen '05 (left) is working with computer hardware description languages in EXCEL Scholar research with John Nestor, associate professor.

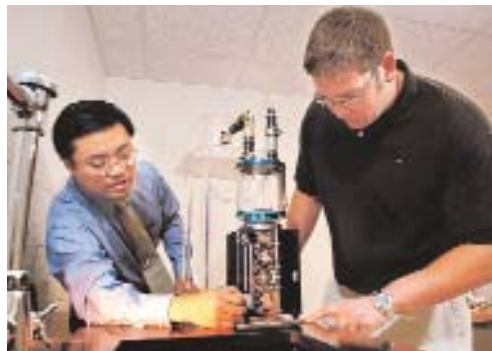


Brandon Cochenour '03 (right) researched how to improve stereo loudspeaker acoustics with David Rich, associate professor.

Professor Ismail Jouny is the current ECE department head. He teaches signals & systems (ECE331), digital signal processing (ECE434), and communications (ECE332). He also teaches electives in computer networks and speech & image processing. His research focus is on landmine detection, array processing for wireless communications, and multimedia applications. He publishes his work in several national and international venues.

Associate Professor John Nestor has concluded his third year at Lafayette. He taught VLSI design (ECE425 and ECE426) and computer organization (ECE313). His research focuses on computer-aided design. He received a best presentation award from the American Society of Engineering Education National Meeting in 2002. He has received and successfully tested the third group of VLSI chips designed by his students in ECE425. This year's design is an analog to digital converter.

Associate Professor David Rich teaches solid state electronics (ECE322 and ECE323). He also teaches an elective in mixed-signal electronics (ECE424). His research is mixed signal IC design and electro-acoustics. He is publishing his work at national and international conferences and in the *Journal of Audio Engineering*.



Christopher Royle '03 (right) did research on ventricular-assist devices, which are used to help heart failure-patients recover, as an EXCEL Scholar with Yih-Choung Yu, assistant professor.

Assistant Professor Yih-Choung Yu developed and taught a course in biomedical systems. His research is in biomedical modeling, and he continues to publish his work in several venues. He has received a grant from the Lindback Foundation. ■

ECE Students/Faculty Publish Research

The ECE faculty published 19 papers in 2002-03. Nine papers were coauthored by ECE students and faculty:

Wang, G. '03 and Jemison, W. "A Simulation Approach for Mach Zehnder Modulator (MZM)-Based Microwave/Photonic Systems," *IEEE Sarnoff Symposium: Advances in Wired and Wireless Communications*, The College of New Jersey, March 11-12, 2003: 309-12.

Wesmiller, A. '03 and Jouny, I. "Mine Detection Using a Fuzzy Logic Approach," *Proceedings of SPIE*, Vol. 5094, 2003.

Kolba, M. '03 and Jouny, I. "Detection of Variable Depth Mines Using GPR," *Proceedings of SPIE*, Vol. 5098, 2003.

Czarnecki, R. '03 and Jouny, I. "Interference suppression in M-QAM OFDM mobile wireless receivers using antenna arrays," *Antennas and Propagation, 2003 IEEE Society International Conference, Volume 2*, pp. 839-842, 2003.

Kolba, M. '03 and Jouny, I. "Clutter suppression and feature extraction for land mine detection using ground penetrating radar," *Antennas and Propagation, 2003 IEEE Society International Conference, Volume 2*, pp. 203-206, 2003.

Cochenour, B. '03 and Rich, D. "Sensitivity of High Order Loudspeaker Crossover Networks with All-Pass Response," *Audio Engineering Society 114th Convention*, Amsterdam, The Netherlands, March 22-25, 2003.

Wang, G. '03 and Jemison, W. "High Speed Microwave-Photonic Vector Modulator (MPVM) with Wideband Carrier Tuning and Spectral Control," *2003 IEEE International Microwave Symposium*, pp. 1370-1382, 2003.

Weerakoon, P. '04 and Jouny, I. "An Email Retrieval System Through a Phone Line," *Proceedings of IEEE ICME 2003*, Baltimore MD, Demo 1.5, 2003.

Kolba, M. '03 and Jouny, I. "Buried Landmine Detection Using Complex Natural Resonances on GPR Data," *Proceedings of IEEE-IGARSS 2003 Conference*, July 2003. ■

LAFAYETTE

A NATIONAL REPUTATION FOR ACADEMIC EXCELLENCE

Electrical and Computer Engineering Department
Acopian Engineering Center
Easton, PA 18042-1775

Presorted
First-Class Mail
U.S. POSTAGE
PAID
Easton, PA
Permit No. 108

Students Conduct Research with Faculty

Twelve students worked on research with ECE faculty in 2002-03:
Pujitha Weerakoon '04: Hearing email over the phone (with Dr. Jouny);
Brandon Cochenouer '03: Optimizing cross-over networks and loudspeaker acoustics (with Dr. Rich);
Ashley Wesmiller '03: Landmine detection (with Dr. Jouny);
Matthew Loh '04: Simulations of the human circulatory system (with Dr. Yu);
Prashant Poddar '04: Waveguide for excitation of laser crystal (with Dr. Jemison);
Chris David '04: Network of control nodes using FPGA's (with Dr. Greco);
Volkan Oktem '04: Optical sensors for measuring lateral displacement (with Dr. Bennett);
Erik Geissenhainer '04: Op Amp design to drive a telephone line for DSL applications (with Dr. Rich);
Peter Susi '03: Retrieving lost packets in streaming audio (with Dr. Jouny);
Usman Khan '05: Fuel cell research (with Dr. Hornfeck);
Tarik Ghanem '03: CMOS Integrated circuit process technology (with Dr. Rich);
Chris Royle '03: Simulation of circulation system in human body (with Dr. Yu)

THE LAFAYETTE Experience

- Student-focused teaching and mentoring by an exceptionally qualified faculty, committed to each student's success.
- A challenging, broad-based academic curriculum that offers strong programs in the liberal arts, sciences, and engineering.
- A small college environment with large college resources.
- A friendly residential community offering an exciting social life with a broad spectrum of extracurricular activities.

Eight Honors Theses Completed

The following graduates successfully completed honors theses:
Carlos Chai: Power distribution in two mode fiber (with Dr. Bennett);
Mark Kolba: Landmine detection (with Dr. Jouny);
Eric Case: Quality FM receiver architecture (with Dr. Rich);
Robert Czarnecki: Interference suppression in wireless OFDM using arrays (with Dr. Jouny);
Greg Stazowski: Prediction in the Eurodollar future contract market (with Dr. Jouny);
Matt Johnston: Power efficient Class D amplifier (with Dr. Nestor/Rich);
Kerem Ok: FM detector with extended range and improved distortion characteristics (with Dr. Rich);
Guangxi Wang: Microwave photonic vector modulators (with Dr. Jemison).

Students Receive Graduate Assistantships

The following ECE students have received funding to attend graduate school:

Guangxi Wang	California Institute of Technology- Ph.D.
Eric Case	Ohio State University M.S. or Ph.D.
Mark Kolba	Duke University Ph.D.
Kerem Ok	Oregon State University Ph.D.
Matt Johnston	University of Washington Ph.D.
Chris Alworth	Drexel University M.S. or Ph.D.
Carlos Chai	Rochester Institute of Technology-M.S. or Ph.D.
Kristin Kelly	Georgia Institute of Technology-M.S. or Ph.D.



Professor William Hornfeck explains a point to his class.

"Lafayette's academic standards are very high. With an engineering program that is top notch for a small liberal arts school, opportunities for research usually available only at larger schools, and great accessibility to professors, Lafayette presents a superlative academic package to those interested in engineering, business, pre-law, and pre-medical studies."

—The Princeton Review The Best 345 Colleges 2003

Updated Curriculum

The ECE department has revised its curriculum to better prepare students to meet the changing demands of the profession. To view the new curriculum, visit the department's web site (see below).



Editor: Ismail I. Jouny, Professor

ECE is produced annually by the Office of Public Information for the Electrical and Computer Engineering Department and distributed to Lafayette engineering alumni and students. The department welcomes your comments and letters. Send to: Ismail I. Jouny, ECE Department, Acopian Engineering Center, Lafayette College, Easton, PA 18042; (610) 330-5414, jounyi@lafayette.edu
On the web: www.lafayette.edu.

Photography: Joe Edelman, Dennis Connors

To keep up to date on department news, visit the home page on the College's web site (www.lafayette.edu). Choose "academics," then "departments and majors," then "electrical and computer engineering."