ECE welcomes new faculty in optoelectronics, power

The Holcombe Department of Electrical and Computer Engineering is pleased to announce the addition of two new faculty to the department this fall: Professor Liang Dong and Visiting Lecturer Dr. Visvakumar Aravinthan.

Dr. Dong obtained his B.S. degree in electronics from Harbin Institute of Technology, Harbin, P.R. China, his M.S. degree in digital electronics and telecommunication from University of Manchester Institute of Science and Technology, UK, and his Ph.D. degree in fiber optics from Southampton University, UK, in 1991. After working with the Optoelectronics Research Center, Southampton University for seven years, he joined Corning Inc., in 1998. He had also worked with Corvis Corporation and Lightwaves2020. He was most recently a senior R&D manager at IMRA America.

Dr. Aravinthan, a native of Sri Lanka, obtained his B.S. degree in electrical engineering from the University of Moratuwa, Sri Lanka, in 2001 and his M.S. degree in electrical and computer engineering from University of Southern California, Los Angeles, in 2005. Prior to coming to Clemson, he served as a Visiting Lecturer at the Institution of Engineers, Sri Lanka. As a graduate student, he gained experience as a graduate research assistant and graduate teaching assistant.

ECE students honored for device that lets children feel computer interaction

CLEMSON NEWS — Developing a device that allows third-graders to “feel” their interaction with a computer has won a national award for a team of Clemson University engineering students.

The project adds a sense of touch to the computer interface, allowing children to actually feel force and vibration as they compare shapes, sizes and weights of objects shown on the computer screen.

The student team from the Senior Capstone Design Class in Clemson’s Holcombe electrical and computer engineering department earned a $7,500 award in the design competition sponsored by the National Council of Examiners for Engineering and Surveying (NCEES).

Their project — “Engineering Haptic Virtual Manipulatives to Enhance K-12 Math and Science Education” — seeks to help elementary school children learn basic math and science concepts, such as rotational symmetry and the relative weights of objects.

“The idea is to use real-world objects to teach abstract concepts,” said Tim Burg, an assistant professor of electrical and computer engineering who heads the Haptic Interaction Lab. “The students adapted manipulatives-based teaching methods from Math Out of the Box presented by Dot Moss and turned them into computer-based haptic virtual manipulatives.

“A haptic device, essentially a computer-controlled robot that uses electric motors to push or pull against the user, is a unique computer output device that allows the user to actually feel forces or vibrations,” Burg said. “Creating haptic virtual manipulatives holds the potential to revolutionize the educational field of math and science instruction.”

The computer engineering students collaborated with faculty in other disciplines — including Clemson’s bioengineering and psychology departments — to complete the project.

Members of the award-winning team are: Katelyn Aggas, Jacksonville, Fla.; Tatum Boulware, Elon, N.C.; Christopher Cooper, Charleston; Justin Coulston, Charleston; Shawqi El-Tarazi, Abu Dhabi, United Arab Emirates; John Furmanski, Simpsonville; Andrew Kinard, Swansea; Joshua Knuckles, Gaffney; Robert Kriener, Surfside Beach; Mary Maier, Cheraw; Tyler Rowe, Catawba, N.C.; Adam Thompson, Rock Hill; Brandon Shropshire, Boiling Springs; and Kristen Wallis, Centreville, Va.

The electrical engineering senior design classes are taught by Burg and Richard Groff, an assistant professor of electrical and computer engineering.

The NCEES Engineering Award for Connecting Professional Practice and Education is an annual competition sponsored by the organization, which develops, administers, and scores the examinations used for engineering and surveying licensure in the United States. Louis Hapeshis, P.E., of Schneider Electric’s Square D Services served as the liaison to local engineers who helped critique the projects.

“An important goal in our undergraduate engineering program is to prepare students for engineering careers according to the standards set by NCEES through the F.E. (Fundamentals of Engineering) and P.E. (Professional Engineer) exams. The NCEES endorsement of our senior design projects through this award helps to validate our efforts to reach these standards,” Burg said. “Additionally, the award is inspiring in that it helps to reinvigorate our efforts to improve the quality and relevancy of the student design projects.”
ECE Faculty, KEMET Scientists Win Best Paper Award

This spring, a paper co-authored by Clemson researchers Dr. Rod Hamell in Electrical and Computer Engineering, Dr. Igor Luzinov in Materials Science, and Mr. Brian Holman in Electrical and Computer Engineering, and KEMET researchers Dr. Yuri Freeman and Dr. Philip Lessner was awarded the John D. Moynihan Best Paper Award at the Capacitor and Resistor Technology Symposium (CARTS) 2010, held in March.

The paper, Electrical Characterization of Polymer Tantalum Capacitors with Poly(3,4-ethylenedioxythiophene) Cathode, was presented at CARTS USA in April 2009.

Singh named “Champion of Photovoltaic Technology”

Photovoltaics World, a trade magazine for the photovoltaic industry, has selected Rajendra Singh as one of the ten Global “Champions of Photovoltaic Technology”. Rajendra Singh is D. Houcer Banks Professor of Holcombe Department of Electrical and Computer Engineering and Director of Center of Silicon Nanoelectronics. Photovoltaics World saluted a few of the technologists that have made this incredible journey possible, and those who have more recently joined the incredible worldwide effort that is making PV a viable competitor to existing power generating technologies.

Dr. Singh is a leading Photovoltaic (PV) expert with over 30 years of industrial and academic experience in the PV and semiconductor industries with proven success in operations, project/program leadership, R&D, and product/process commercialization. Technology invented by Dr. Singh is used in the manufacturing of amorphous thin-film PV modules sold by United Solar. Dr. Singh is one of the few persons in the world who have rich experience in both the photovoltaic and semiconductor industries. He has had six patents issued with one pending patent for PV & semiconductor manufacturing. He has received numerous international honors, published over 300 papers and delivered over 50 keynote addresses and invited talks through various conferences and panels. Dr. Singh is one of the rare individuals distinguished as a Fellow with four international professional engineering societies (IEEE, SPIE, AAAS and ASM).

Dr. Singh’s fundamental work with Rapid Thermal Processing (RTP) technology and the related semiconductor equipment manufacturing industry is now valued at over one billion dollars per year. The use of RTP in solar cell manufacturing is due primarily to Dr. Singh’s contributions. Other technology invented by Dr. Singh is in use under license to RTP tool manufacturer AG Associates from a prototype developed in his laboratory. His work on solar cells is a part of many recent textbooks on solar cells and has been cited by researchers throughout the world.

His early work on ultrathin gate oxide led to the passivation techniques used in surface preparation of commercial silicon solar cells. Similarly his fundamental work on conducting oxide semiconductor led to the use of these materials in all kinds of commercial thin film solar cells. From solar cells to integrated circuits, he has led the work on semiconductor and photovoltaic device processing by manufacturable innovation and defining critical path.

In Fall 2010, Dr. Singh introduced a new course (ECE 461) on Solar Energy. This course is part of the Renewable Energy Certificate introduced by ECE department.

Professor Liang Dong receives AFOSR grant

Professors Liang Dong and John Ballato have recently received a major grant from the Air Force Office of Scientific Research (AFOSR) to investigate the use of advanced optical fibers for high power lasers. Fiber-based lasers have a broad range of military “speed-of-light” defensive applications on air, land and sea platforms. Fiber-based lasers typically require less power and are more compact and lightweight than chemical, gas and other types of lasers; hence, fiber-based lasers can be used in a wide variety of applications and platforms and bring tremendous benefits to a variety of military operations.

A fiber-based laser is tested in a photonics research facility.

Fiber-based laser technology can also be used for many other types of applications including precision machining, optical communications, medical applications, and spectroscopy.

As part of the AFOSR High Energy Laser (HEL) Multidisciplinary Research Initiative (MRI) program, Principal Investigator (PI) Dong and Co-PI Ballato will received approximately $1.4M over next three years. If the first three years are successful, a potential two-year $1.1M extension will be made available for a total of $2.5M over five years. The competition for this research award was extremely high. There were four major thrust areas being solicited under the HEL MRI which was sponsored by the Joint Technology Office (JTO) and the Office of the Deputy Undersecretary of Defense for Science and Technology. The primary focus of the HEL MRI program is to enhance the capabilities of the U.S. institutions of higher education to perform basic science and engineering research related to lasers, optics, laser interaction physics and advanced concepts necessary for national defense applications. AFOSR, in conjunction with other government officials, selected the eight winning proposals based on the evaluation criteria listed in the broad agency announcement.
The power engineering research group, led by SCE&G Professor of Electrical and Computer Engineering, Elham Makram, has received a U.S. Department of Energy (DOE) grant that will have a major impact on South Carolina’s power industry workforce. DOE is underwriting an effort to develop three online certificate programs and an online Masters of Engineering program. The certificate programs will include a Power Systems Engineering Certificate, a Renewable Energy Certificate and an Advanced Power Systems Certificate. The Master of Engineering program will be focused on training the work force in power systems. These programs will provide engineering graduates with courses in power, renewable energy, and principles of power systems. The group plans to leverage existing Web and video conferencing capability at Clemson to serve a potential student body without regard to geographical location.
New technical tracks developed in bioengineering and electric vehicle technology

In order to prepare students for careers in the dynamic and expanding fields of electrical and computer engineering, the ECE department has developed two new technical depth tracks in bioengineering and electric vehicle technology.

The bioengineering track has been developed in collaboration with the Department of Bioengineering at Clemson, and became available to ECE students beginning in the fall of 2010. This track consists of three courses in the areas of organ replacement, bioinstrumentation, and bioimaging. As the demand for better medical devices, computer-assisted surgery methods, and bioimaging equipment increases along with increased concerns for cost efficiency and effectiveness, engineers are increasingly becoming an integral part of a team of health care professionals. As part of this health care team, engineers are often called upon to design instruments and devices, to compile knowledge from many sources, to develop new procedures, or to carry out research in order to solve new problems. This technical track prepares students for career opportunities at hospitals, medical research corporations, equipment manufacturing firms, and government regulatory agencies.

The electric vehicle technical track is designed to infuse important advanced electric vehicle knowledge and capabilities into the undergraduate ECE experience. The electric vehicle elective set of courses focus on key engineering skills for the development of electrified vehicles and include a vehicle electronics course, an electric vehicle and energy storage course, and a power electronics course. Electrical vehicle technologies are currently facing several challenges among which are: limited driving range, high cost and overall limited efficiency. As vehicle electrification expands, the automotive industry’s need for electric vehicle savvy engineers is growing, and hence, creating increased demand for electric vehicle related engineering education. To meet this demand, the ECE Department has created the electric vehicle technical track. The associated electric vehicle related courses will be eventually available online, making them available not only to Clemson students, but undergraduates at other institutions and industrial personnel who wish broaden their knowledge in electric vehicle related areas.

These new technical tracks have been added to the ECE curriculum as electives that satisfy requirements for technical depth courses. A third new technical track in renewable energy was made available to students beginning in the Fall 2010 semester. For more information on these new technical elective tracks, visit www.clemson.edu/ces/departments/ece/undergrad/new_electives.html.

Zhang receives $100,000 Gates grant for diagnostics research

Guigen Zhang, a Clemson University professor in both bioengineering and electrical and computer engineering, has received a $100,000 Grand Challenges Explorations grant from the Bill & Melinda Gates Foundation.

Awarded through a program to support innovative global health research, the grant will help fund Zhang’s work to create low-cost diagnostic tools for doctors in developing countries.

“Our work is designed to develop highly sensitive, specific and direct-molecule-interfacing biosensors that are inexpensive to build, simple to use and rugged to deploy,” Zhang said.

Inexpensive, simple and rugged medical tools are important in remote, underdeveloped areas. That’s the reason Zhang’s research turned to development of tiny “biosensors” to replace more expensive and delicate mechanical and electrical devices.

Zhang, who also is deputy director of Clemson’s Institute for Biological Interfaces of Engineering, conducts research on the “electrical double layer,” a natural phenomenon that scientists have long recognized, but only recently begun to explore for its engineering potential. Zhang intends to take advantage of “nanostructures” — tiny objects roughly on the scale of atoms and molecules — to help doctors diagnose disease.

Zhang’s grant is part of the Gates Foundation’s fourth funding round of Grand Challenges Explorations, an initiative to help scientists around the world explore new and largely unproven ways to improve health in developing countries. From almost 2,700 proposals, just 78 grants were provided.

Alumni News

Michael Hollis, Jr., a Clemson grad and systems engineer with Northrup Grumman Corporation, has been chosen to receive the 2011 GEM Outstanding Young Alumnus Black Engineer of the Year Award.

The award will be presented at the annual Black Engineer of the Year Awards Conference in the spring. According to the Career Communications Group, Inc., who organizes the event, the awards honor innovators who demonstrate excellence in engineering or science, exemplary leadership in their workplaces and communities, and outstanding work as role models and mentors who help boost the minority presence in the nation’s technology enterprise.

Hollis received his bachelor’s degree in electrical engineering from Clemson in 1997 and earned a Masters from the University of Michigan.