The department has recently added workspaces and six major pieces of equipment to augment its already first-class facilities. The benefits will be felt throughout the department, with undergraduates, graduates and faculty utilizing the expanded resources.

The innovative Micro/Nano-Scale Manufacturing Laboratory features two new pieces of equipment – an atomic-force microscope (AFM) and a high-power optical microscope with probe, all of which support the department’s continued interest in micro/nano-scale manufacturing. The AFM provides a means of visualization and measurement at the nano scale that was not previously achievable, as well as a new opportunity to explore nano-scale friction technology. The high-power optical microscope with probe allows a higher-level of visualization, but also the ability to manipulate nano-scale objects on the microscope. Dr. Jingyan Dong, whose work in micro/nano manufacturing was noted in the last edition of inGear, will use the lab and equipment for a newly-developed course in micro/nano fabrication in conjunction with the systems he and his students have developed, including a micro-scale active cantilever device and a meso-scale nanomanipulator with ultrahigh bandwidth for high-rate metrology and video-rate imaging.

Another addition will be a Projects Laboratory, which offers a large area for students and faculty to complete hands-on projects and will include bench space for project development, composites layup and painting and coating technologies. This lab will undoubtedly be heavily utilized by undergraduate students as they work to complete senior design projects.

The department is also adding several pieces of equipment to existing labs, including an injection molding machine as well as a 5-axis machining center to its Processes Lab. The injection molding machine is all-electric and boasts a 50-ton holding pressure. The injection molding machine will be used in multiple courses and allow considerable interaction with local biomedical device industry. The machining center will be a hugely useful addition as it will allow users to machine complex sculpted surfaces not achievable with traditional 3-axis machining centers. The machining center will use used in courses and to support work in biomedical and aerospace manufacturing. In the Manufacturing Systems Lab, two robots are being added, which will be utilized in conjunction with the lab’s existing equipment and allow students to create automation solutions by tying multiple processes together – excellent experience to have for real-world industry work.

In addition to providing expanded resources for students and faculty, the department is excited for the collaborative opportunities the new labs and equipment offer with local industry partners.
FACULTY SPOTLIGHT: DR. T. CULBRETH EXPANDS STUDENTS’ EXPERIENCE

A mainstay in the NC State ISE Department for more than three decades, Dr. Tom Culbreth has always been one to bring industry into the classroom.

As such, it’s no surprise that after spending 20 years conducting collaborative research with the furniture industry as the Director of the department’s Furniture Manufacturing Center, he decided to branch out and create a new pathway to introduce students to other emerging and relevant areas of engineering. He’d been teaching quality engineering to undergraduates, but wanted to ensure graduates of the department were better trained in the area of “biomanufacturing” – a fast-growing industry group in the Research Triangle Park area.

With that in mind, Dr. Culbreth and several other NCSU ISE faculty members organized a symposium with area biotech, pharmaceutical, and medical device companies to discuss what they were looking for in new hires and how the department could better equip graduates with the necessary knowledge and skills. In addition, Dr. Culbreth immersed himself in learning about regulatory agencies, particularly the FDA, their regulatory requirements, and impact of regulation on the “biomanufacturing” industry.

The work culminated in the creation of ISE coursework specifically designed to familiarize students with compliance procedures that manufacturers of pharmaceuticals, medical devices, and biological products must have in place to legally produce and market their products.

At the undergraduate level, Dr. Culbreth offers students an introduction to the regulatory bodies, giving them the appropriate groundwork to develop a more comprehensive understanding of the regulatory environment as they continue their education or as working professionals.

At the graduate level, the department now offers a quality engineering in biomanufacturing class that goes into considerable detail about the need for companies to validate their product design procedures, manufacturing processes and operational procedures to demonstrate that products are safe and effective. Strict adherence to good manufacturing practice (GMP) in design, manufacture, and distribution is an FDA requirement and students develop an understanding of what constitutes GMP and how it is achieved and documented.

Dr. Culbreth’s top priorities are that students come out highly trained in quality engineering, that they understand the principles of parametric release of products, and that they have a well-rounded general knowledge of the regulatory environment and how it impacts everything they will do on a day-to-day basis.

The most gratifying part of Dr. Culbreth’s work has been continuing to cultivate industry relationships and witnessing NCSU ISE graduates being hired and excelling in those organizations.

STUDENTS ORGANIZE SIX SIGMA CERTIFICATION COURSE

Last semester, the department’s student chapter of IIE organized and hosted a weekend Six Sigma class. Thirty undergraduate and graduate students from various engineering disciplines including industrial, chemical, aerospace and nuclear engineering dedicated the weekend of November 20-22 to learning about statistical quality control and Six Sigma philosophy. The class proved to be a successful venture; scoring higher than any other university on the exam, all students passed the course and received the IIE Green Belt in Process Improvement. NCSU’s IIE student chapter hopes to host similar courses to further students’ future professional development.
In a continuing effort to gain greater awareness of the ISE major, so students can make an informed major and career choice, the Edward P. Fitts Department of Industrial and Systems Engineering has recently launched a “Virtual Tour” on its Web site http://www.isc.ncsu.edu/vtour/ISE-interface.html. The intent is to share with visitors how the department enables students to reach their maximum potential and prepare for their future as engineers and leaders of industry.

The tour explores the comprehensive and broad-based NCSU ISE undergraduate program, with its foundation in mathematical and physical sciences and outstanding computer and laboratory facilities. It highlights personalized learning experiences and community atmosphere with small class sizes, an excellent group of award-winning faculty and outstanding advisors. Visitors can explore the Web site further for information on its two undergraduate degree programs: a traditional Bachelor of Science in Industrial Engineering (B.S.I.E.) and a Furniture Manufacturing track within the Bachelor of Science in Industrial Engineering (B.S.I.E., F.M.).

Visitors also learn that NC State has one of the nation’s elite graduate programs in industrial and systems engineering with graduate faculty supporting a variety of academic and research interests leading to M.S.I.E. (requires a thesis), non-thesis M.I.E. (both resident and through Engineering On-Line), and Ph.D. degrees. Core competencies include four recognized areas of concentration: Human Factors and Ergonomics, Manufacturing Systems, Production Systems, and Systems Analysis and Optimization.

Highlighted are the emerging interdisciplinary thrust areas developed to ensure NCSU ISE graduates are poised to become successful thought leaders, contributors and innovators in such a rapidly growing profession. These include: Biomedical Manufacturing Systems, Health Systems and Logistics Systems Engineering.

The tour showcases high-profile opportunities available post-graduation, as NC State ISEs work in nearly all areas of human endeavor – on problems that impact daily lives and are of critical global importance. Visitors are made aware of sector opportunities including: aerospace, automotive, biopharmaceuticals, biomedical products, banking and financial, chemical, consumer products, electronics, defense products, distribution, energy, government, micro/nano-scale manufacturing, transportation, and more.

It is also imparted on visitors that alumni often begin their careers in traditional ISE roles, but frequently find they have many opportunities outside engineering due to their technical and “systems” skills, and often progress to upper management positions within a variety of industries. We’d love for you take some time “touring” our department and welcome any feedback you may have (debbie_allgood@ncsu.edu).
TWO NCSU ISE FACULTY MEMBERS RETIRE

This month, the department will say goodbye to two long-standing faculty members, Dr. Salah Elmaghraby and Dr. Mahmoud A. Ayoub, as they enter full-time retirement.

Dr. Elmaghraby has been University Professor of Operations Research and Industrial Engineering at North Carolina State University since 1967. Prior, he was an Associate Professor at Yale University and Research Leader at the Western Electric Engineering Research Center in Princeton, N.J. He was a Visiting Professor at Cornell University, Ithaca, N.Y.; the University of Alexandria, Egypt; the Catholic University of Leuven, Belgium; University Lyon I, France; and the Nagoya Institute of Technology, Japan. In addition, he has 12 years of industrial experience, including eight abroad (in Egypt, Europe and Kuwait) and has been awarded an Honorary Doctorate by the University Lyon I, France.

He has written four books, two of which were translated into Japanese and Romanian; edited/co-edited three books including the Handbook of Operations Research, which was translated into Russian; authored/co-authored eight book chapters; wrote 11 book reviews; and authored/co-authored over 118 scientific papers. He is a registered PE, a Fellow of the IIE and INFORMS, and a member of APICS and NSPE.

Most recently, the International Conference on Information Systems, Logistics, and Supply Chain created a paper competition for doctoral students in his name as a tribute to Dr. Elmaghraby and aims to reward excellence in scientific work.

Dr. Ayoub, Professor of Industrial Engineering, joined the NCSU ISE department in 1971 and has taught and conducted research in ergonomics, occupational safety and decision analysis, all areas in which he has published widely. He is a Fellow of the Institute of Industrial Engineers (IIE), as well as a member of several professional societies. He was also the founding director of the Ergonomics Center of North Carolina, an outreach and research center established in 1994.

He continues to consult, applying and implementing his research findings. This work has involved many companies, industrial concerns, and governmental agencies throughout the U.S. and abroad.

Dr. Ayoub is the recipient of numerous awards and citations. The list includes: the Phil Carroll Award for outstanding achievement in work measurement (IIE), Dr. David Baker Distinguished Research Award (IIE), Jack A. Kraft Award for innovative research in human factors (Human Factors and Ergonomics Society), Outstanding Faculty (NCSU ISE), and Outstanding Teacher (NCSU).

The department will greatly miss Dr. Elmaghraby and Dr. Ayoub both personally and professionally. Their substantial contributions to NCSU, the ISE department and the profession will continue to be celebrated for years to come.

ISE GRADS GET LinkedIn

Whether you graduated in ’62, ’92, ’02 or some other fine year, we’d love to get reconnected with you. Please consider joining the Edward P. Fitts Department of Industrial and Systems Engineering group on LinkedIn, the professional networking site. LinkedIn is a way to network, ask questions, reconnect with classmates, and help other alumni.

By joining our group and reaching out to other NC State ISE grads, you will be strengthening our alumni network, which helps us all succeed. To join, please visit our LinkedIn Profile or send an email to Debbie Allgood at debbie_allgood@ncsu.edu or 919.515.6416. You can also contact Lori Richards, director of development at lori_richards@ncsu.edu or 919.513.1338.
UPDATE: NCSU ISE IMPROVING NC HEALTH CARE WITH CDC

As first reported in the winter 2008 email blast, the ISE department has been working with the Centers for Disease Control and Prevention (CDC) to improve the North Carolina Health Alert Network (NCHAN), a system designed to immediately alert key state health officials and care providers to acts of bioterrorism and other types of emerging disease threats.

Last year turned out to be a busy, but relevant time for work to begin, as the NCSU ISE team was able to study the NCHAN as H1N1 made headlines around the world. Focusing on the outbreak, one masters student pursued work on a simulation-based compartmental disease model with optimization, comparing self isolation to vaccination. A second worked on stochastic program modeling analyzing points of dispensing mass vaccinations and optimizing non-health care facilities for this work (e.g., gymnasiums, etc.).

The outbreak itself turned out to be an unexpected case study and, as a result, the ISE team is able to better examine the strengths and weaknesses of NCHAN systems. The team has been conducting interviews with local health departments to gain insight into how they used NCHAN, how they felt about it, how they think it can be improved, and how they’d like to use it in the future. The real-world feedback is imperative as they move forward and make continued improvements in how North Carolina responds to health emergencies.

The team is also interested in pertussis, or, whooping cough. Though it is vaccine preventable, whooping cough remains one of the most-reported diseases to NCHAN. A graduate student is currently examining the resources required to manage the disease and creating models to optimize the effectiveness of these resources using North Carolina’s available health surveillance systems.

Looking forward into year two of the program, the NCSU ISE team plans to further relationships and build partnerships with area health departments in order to develop, test and inform rapid prototyping simulation-based models to represent the NCHAN system. The team will use these models to perform “what-if” analyses and assist in developing stochastic decision models as well as scheduling and logistics models to support the operation of NCHAN when faced with a specific emergency.

The ISE department’s work on the project is unique, as it is one of the only groups of engineers working on NCHAN. In addition, the department is heavily involving students in an effort to produce ISE graduates who are well-versed in improving health care delivery, a particularly relevant area as the recent health care legislation includes an emphasis on optimizing delivery. Last year, students and faculty were able to attend and present at the North Carolina Public Health Association’s annual meeting, as well as a CDC-sponsored preparedness summit.

In February of 2010, the team hosted the CDC on a site visit to present and discuss the work being done in the department by students and faculty.

The NCSU ISE team is comprised of ISE Professors Stephen Roberts and Reha Uzsoy, Assistant Professors Brian Denton and Julie Ivy and Research Associate Professor Javad Taheri, along with several students in master’s and Ph.D. programs. This group is working with the North Carolina Institute for Public Health, part of the University of North Carolina at Chapel Hill Gillings School of Global Public Health, which serves as the lead institution.