This will be my last letter as department chair of Electrical and Computer Engineering. I will be stepping down to pursue another opportunity. It has truly been my privilege to work with the faculty members, staff, and students throughout my 19 years at NDSU. I treasure the opportunities I’ve had to get to know so many students. This aspect of the job is truly one of its greatest rewards.

The department is on a strong footing with many talented faculty members and staff. Our student numbers and quality remain high. Our faculty research is going strong with many publications and new grants – and the credit belongs to them. Our department is engaged in a number of service learning projects to aid persons with disabilities. All-in-all I believe we make a positive impact on the lives of people within the university and those outside the university as well.

Take a look at this newsletter and see what’s been going on this past year. We’ve had some great new additions to the department and we’ve had some valued people decide to try new opportunities.

Thanks for the all the memories,

~Dan
ENROLLMENT AND DEGREES AWARDED

Enrollment Statistics

Fall 2009

Electrical and Computer Engineering
Doctor of Philosophy - 15
Master of Science - 23
Bachelor of Science - 350

Computer Engineering
Bachelor of Science - 117

Degrees Awarded

2008-2009

Electrical and Computer Engineering
Doctor of Philosophy - 2
Master of Science - 5
Bachelor of Science - 54

Computer Engineering
Bachelor of Science - 12

ECE STAFF AND FACULTY

Faculty

Dr. Dan Ewert, Professor, Chairman
Dr. David Farden, Professor
Dr. Rajendra Katti, Professor
Dr. Bapeswara Rao, Professor
Dr. David Rogers, Professor
Dr. Subbaraya Yuvarajan, Professor
Dr. Jacob Glower, Associate Professor
Dr. Roger Green, Associate Professor
Dr. Rajesh Kavasseri, Associate Professor
Dr. Cristinel Ababei, Assistant Professor
Dr. Benjamin Braaten, Assistant Professor
Dr. Samee Khan, Assistant Professor
Dr. Hongxiang Li, Assistant Professor
Dr. Ivan Lima, Assistant Professor
Dr. Mark Schroeder, Assistant Professor
Dr. Sudarshan Srinivasan, Assistant Professor
Dr. Chao You, Assistant Professor

Visiting Faculty

Dr. Prabhat Gupta, Visiting Professor

Staff

Laura Dallmann, Administrative Secretary
David DuShane, Information System Specialist
Jeffrey Erickson, Electronic Technician
Priscilla Schlenker, Administrative Secretary

Emeritus Professors

William Bares, Ph.D.
Robert Gammill, Ph.D.
Daniel Krause, Ph.D.
Bob Longhenry, MSEE
Donald E. Peterson, Ph.D.
Donald Smith, Ph.D.
Don Stuehm, Ph.D.
Val Tareski, MSEE
Congratulations to the students listed for their achievements and thank you to the scholarship who promote and reward academic achievement in Electrical and Computer Engineering.

<table>
<thead>
<tr>
<th>Scholarship</th>
<th>Recipient</th>
<th>Hometown</th>
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<tbody>
<tr>
<td>Aas, Eugene</td>
<td>Brandon Froberg</td>
<td>Fargo, ND</td>
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<tr>
<td>Anderson Ed &amp; Kay</td>
<td>Derek Schmidt</td>
<td>Williston, ND</td>
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<tr>
<td>Anderson Ed &amp; Kay</td>
<td>Erick Larson</td>
<td>Atwater, MN</td>
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<td>Anderson, Ernest</td>
<td>Micah Tangesdal</td>
<td>Esko, MN</td>
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<td>Bakken, Ashley Keith Memorial</td>
<td>Stephanie Erickson</td>
<td>Fargo, ND</td>
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<tr>
<td>Bushey, Robert R.</td>
<td>Xing Xu</td>
<td>Casselton, ND</td>
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<td>Caterpillar Global Paving Scholarship</td>
<td>Thomas Carpenter</td>
<td>Bismarck, ND</td>
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<td>Caterpillar Global Paving Scholarship</td>
<td>Vidura Wijayasekara</td>
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<td>Caterpillar Global Paving Scholarship</td>
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<td>Christopher Baumler</td>
<td>Wheatland, ND</td>
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<td>EE Scholarship</td>
<td>Christopher Pickett</td>
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<tr>
<td>Nagle, Duane</td>
<td>Jesse Morritt</td>
<td>Somers, MT</td>
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<td>Sandeep Singh</td>
<td>Fargo, ND</td>
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<tr>
<td>Ottertail Power Electrical Engineering Scholarship</td>
<td>James Leingang</td>
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<td>Ottertail Power Electrical Engineering Scholarship</td>
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<td>Skarphol Scholarship</td>
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<td>Layne Berge</td>
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<td>Kirk Jensen</td>
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<td>XCEL Energy Scholarship</td>
<td>Erik Ryen</td>
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<tr>
<td>XCEL Energy Scholarship</td>
<td>Sheyann Dunn</td>
<td>Fargo, ND</td>
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**EWERT BIOMEDICAL ENGINEERING SCHOLARSHIP**

In recognition of all the contributions the departing chairperson Daniel Ewert has made to the Department of Electrical and Computer Engineering and university, a scholarship has been started in his name. The Ewert Biomedical Engineering Scholarship was established this year in honor of Dr. Daniel L. Ewert. The scholarship goes to a deserving student who demonstrates a balance of scholarship, innovation, hands-on ability, and commitment to improving society. Friends and alumni who wish to help support this scholarship should direct contributions to the NDSU Development Foundation to the “Daniel Ewert Biomedical Engineering Scholarship.”
Currently, the applied electromagnetics laboratories of the Electrical and Computer Engineering Department are getting a much needed update.

This fall the students voted to use $75,000 of their student program fee money to remodel the undergraduate electromagnetics lab in EE room 205.

This money will be used to purchase new test equipment, computers for a new CAD portion being added to existing courses, new ESD benches, chairs and storage for various lab components.

In parallel with the remodel of EE room 205, the shield room in EE room 113 is being finished into an anechoic chamber.

The anechoic chamber will be used extensively for ongoing research and design in the area of applied electromagnetics.

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**HAILS AND FAREWELLS**

**Jeff Erickson** has a degree in Electronics Technology, and has been employed in the Home Consumer Electronics field for twenty-seven years. He has taught as an Electrical Technology Instructor at NDSCS and has been self-employed for the last twenty-three years. Recently he has joined the staff at NDSU in the Electrical & Computer Engineering Technical Services department.

Jeff is a lifelong resident of Minnesota. He currently resides in Underwood with his wife, Wendy and his son, Daniel. He also has a daughter, Melissa and two grandchildren. Jeff is also an avid sportsman.

**Benjamin D. Braaten** joined NDSU in the fall of 2009. Dr. Braaten received his B.S., M.S. and Ph.D. degrees in Electrical Engineering from North Dakota State University, Fargo, in 2002, 2005 and 2009, respectively. In the fall of 2009, Dr. Braaten was a post doctoral research assistant at the South Dakota School of Mines and Technology in Rapid City, SD where he worked on modeling printed antennas embedded in artificial anisotropic dielectrics (and returned to his favorite hobby of fly fishing). He is currently an assistant professor in the electrical and computer engineering department at North Dakota State University.

His research interests include printed antennas, radio frequency identification, complex radiation problems, methods in computational electromagneticsciences, source modeling and electromagnetic compatibility. Dr. Braaten is a member of the Applied Computational Electromagnetic Society (ACES), Institute of Electrical and Electronics Engineers (IEEE) and the national mathematics honor society Pi Mu Epsilon.

**Dr. Lingling Fan** has left NDSU to take a position as an assistant professor in the Department of Electrical Engineering at the University of South Florida. Dr. Fan leaves North Dakota to go to Tampa with her husband, Zhixin Miao, and her two sons.

Dr. Fan was at North Dakota State University from August 2007 until August 2009 as an assistant professor focussing on power system dynamics and control, reliability and economics. While at NDSU, Dr. Fan worked on developing controllers to interface wind generators to the electrical grid.

Prior to her work at NDSU, she worked at Midwest ISO for six years in expansion planning.

**Bart Kent** has left the Department of Electrical and Computer Engineering this summer. Bart joined the department as the electronics technician in 2006.

Bart leaves the department to retire and stay in the area with his wife, Becky and his daughter, Abigail.

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**REMODELING EE 113 (THE SHIELD ROOM) AND EE 205 (ELECTROMAGNETICS LAB)**

Currently, the applied electromagnetics laboratories of the Electrical and Computer Engineering Department are getting a much needed update.

This fall the students voted to use $75,000 of their student program fee money to remodel the undergraduate electromagnetics lab in EE room 205.

This money will be used to purchase new test equipment, computers for a new CAD portion being added to existing courses, new ESD benches, chairs and storage for various lab components.

In parallel with the remodel of EE room 205, the shield room in EE room 113 is being finished into an anechoic chamber.

The anechoic chamber will be used extensively for ongoing research and design in the area of applied electromagnetics.
The NDSU power engineering group from the Department of Electrical and Computer Engineering won a National Science Foundation grant in the amount of $240,001 for their project titled “Control of Wind Generation for Inter-Area Oscillation Damping.” Group members include Lingling Fan, principal investigator; Rajesh Kavasseri, co-principal investigator; and Subbaraya Yuvarajan, co-principal investigator.

The project addresses stability enhancements in power systems, given the increasing presence of and unique challenges in wind farms. The focus lies in developing robust damping controllers through a novel concept of real and reactive power modulation in wind farms to help mitigate instability concerns in the overall interconnected power system. The project also will help convey the benign effects of stability enhancements if grid interconnected systems are equipped with such controllers.

According to investigators, the project will help reduce some of the barriers to grid integration of wind farms. If successful, the research will facilitate penetration of large scale wind power into the year.

A MESSAGE FROM DR. ROGER GREEN

In collaboration with a co-author in California, Dr. Roger Green completed the draft of a new digital signal processing textbook. This text, which has been approximately three years in the making, targets an undergraduate audience and is approximately 700 pages in length. The book contains nearly 200 worked examples, around half a thousand high-quality figures, hundreds of drill exercises including full solutions, many hundreds of end-of-chapter problems, and integrated use of MATLAB throughout. During 2010, peer reviews, corrections, solution manual creation, and other final activities will be conducted with the target of having the first edition of this book available to schools for the 2010 Fall semester.

Throughout 2009, Dr. Green also taught courses in random processes (ECE 341), signals and systems (ECE 343), and applied digital signal processing (ECE 444/644). Dr. Green and student Karan Batra presented “A Practical Investigation into Multi-Tone Electrochemical Impedance Spectroscopy” at the 215th meeting of the Electrochemical Society. Further, Dr. Green and Ph.D. candidate Michael Schmitz submitted a paper on the “Optimization of Multisine Excitations for Receiver Undersampling” to the 2010 IEEE International Conference on Acoustics, Speech, and Signal Processing.

Working with colleague Dr. Victoria Gelling in the department of Coatings and Polymeric Materials, Dr. Green secured approximately $12,000 through an Army Research Laboratory subcontract to fund undergraduate student Kai Johnson for the “Development of an Improved Hand-Held EIS Health Monitor”. In fall 2009, the National Science Foundation awarded a $124,910 grant for a proposal entitled “Enhancing Entrepreneurialism through Design Projects to Aid Persons with Disabilities”. This work, lead by Dr. Mark Schroeder and including Dr. Jacob Glower, Dr. Green, and Dr. Chao You, will provide funding and research opportunities for NDSU ECE senior design students over the next five years.

During 2009, Dr. Green participated in various activities as part of a $3.75 million grant to improve gender equity and climate at NDSU, referred to as NDSU Advance FORWARD. Following an application process, Dr. Green was selected as an Advocate for the NDSU Advance FORWARD team. Further, Dr. Green was appointed to the NDSU Commission for the Status of Women Faculty, which works to improve NDSU policies. A team of Dr. Green, Dr. Bilen-Green, Dr. Birmingham, and Dr. Burnett will present two papers at next year’s American Society of Engineering Educators (ASEE) Annual Conference and Exposition on the NDSU Advance FORWARD program as well as enhancing recruitment, retention, and advancement of women faculty in engineering at NDSU.
RESEARCH EXPERIENCE FOR UNDERGRADUATES

To better prepare ECE seniors for competitive job market and graduate studies, two senior design teams, SD0903 (PMU Power Grid Coverage group) and SD0904 (Energy-aware Data Centers group), undertook research projects on making power grids robust and data centers energy-efficient, respectively. The sheer enthusiasm, talent, and perseverance of the students made these two research projects a success.

The research finding of the students of SD0903, Joshua Adamek, Brady Brodsho, and Garrett Kropp was submitted as a journal paper to the IEEE Transactions on Power Systems.

The students of SD0904, James Leingang, Peder Lindberg, and Daniel Lysaker submitted a research paper to the Journal of Supercomputing and another paper to the Computer Journal. We are hopeful that the excellent research conducted by the ECE seniors will be appreciated by the research community and all three research papers will be accepted.

More information about SD0903 can be obtained by visiting: http://saturn.ece.ndsu.nodak.edu/ecewiki/index.php/Group_SD0903.

More information about SD0904 can be obtained by visiting: http://saturn.ece.ndsu.nodak.edu/ecewiki/index.php/Group_SD0904.

GREEN COMPUTING AND COMMUNICATIONS

Computing service providers are continually upgrading their infrastructures to high-performance systems that can meet the increasing demands of powerful newer applications. In parallel, almost in concert, high-performance computing manufacturers have consolidated and moved from stand-alone servers to rack mounted blades. The above mentioned trends alone are increasing electricity usage in large-scale computing systems, such as data centers, computational grids, and cloud computing. This increase in electricity utilization has reached to a point that many researchers have embarked on the journey to find practical and applicable solutions to make high-performance computing system green, which can: (a) reduce electricity consumption of large-scale computing systems and (b) simultaneously improve upon or maintain the current throughput of the system.

The Electrical and Computing Engineering (ECE) Department faculty Samee U. Khan along with colleagues from the University of Luxembourg (UL) are performing cutting-edge research on making high-performance systems green. In the year 2009, the collaboration resulted in the publication of 2 journal articles and 6 conference papers on the topic. Moreover, Dr. Khan along with UL collaborators is: (a) guest editing a special issue of the Journal of Supercomputing on green computing, (b) guest editing a special issue of the International Journal of Communication Networks and Distributed Systems on green communications, and (c) organizing a workshop on optimization issues in energy efficient distributed systems (OPTIM 2010), Caen, France. Furthermore, their efforts were recently appreciated with a €432K grant from the Fonds National de la Recherche Luxembourg (FNR) to make cloud computing infrastructures energy-efficient.

The research community in 2009 also acknowledged the efforts of Dr. Khan by appointing him the associate editor of two journals and to the editorial boards of seven journals. Moreover, he also was invited to be member of the technical program committees of 8 conferences.
There are currently 23 senior design projects, ten of which are ECE 405 Design III projects that were recently demonstrated at the Senior Design Final Product Demo Day. The ECE 405 projects involved a wide variety of topics that included optimization in power distribution and energy management, voice modification and emulation, antenna impedance matching, asynchronous circuit design, and switching-mode amplifier design.

Some projects involved potential intellectual property including an intelligent restaurant paging system, an advanced cardiac pacing system and an advanced stud finder and digital level device. Most of these groups intend to file a patent application as well as contemplate the feasibility of mass producing their devices. The cardiac pacing system group intends to submit a small business technology transfer (STTR) grant application.

Dr. Khan developed his two groups (PMU Power Grid Coverage and Energy-aware Data Centers) with a focus on research. His two groups will submit three papers that they hope will be accepted for publication in prominent journals.

There are also a number of interesting projects that just started this semester in the ECE 403 class. One of these is an international project involving NDSU, Stanford and an organization in India that makes the Jaipur foot, one of the most commonly used prosthetic devices in India. Through this joint effort, the various groups hope to contribute to the device by incorporating various electromechanical sensors and actuators to enhance the overall performance.

Another group is investigating the wireless transfer of energy over distances of a few meters. This is a relatively new technology that will likely be used to power numerous devices in homes and buildings in the near future. The group hopes to further the state of the art and apply their findings to marketable devices.

Other projects involve a wireless calendar system, a miniature electromyography biofeedback device, wireless sensor network systems for the elderly and disabled, an FPGA-based hardware accelerator, an RFID project, and an ASIC design project.

You can access more detailed information about many of the design activities and projects mentioned here at the department’s wiki site located at: http://saturn.ece.ndsu.nodak.edu/ecewiki/index.php/ECE_Senior_Design_Groups.

The ECE department encourages individuals and companies to sponsor student design projects. Sponsorship is $3,000 per two-semester project and is a great way to develop a closer relationship with the ECE department and graduating students, provide skill-set development for students, obtain preliminary designs and prototypes, and help support student design activities within the department. If you would like to sponsor a project or have questions, please contact Prof. Mark Schroeder at (701) 231-8049 or mark.j.schroeder@ndsu.edu.
INTERNATIONAL AGREEMENTS

The Electrical and Computer Engineering (ECE) Department is being recognized for research, mentorship, and leadership by two foreign universities, namely, the University of Luxembourg (UL) and COMSATS Institute of Informational Technology (CIIT). The recognition comes in the form of a memorandum of understanding (MoU) that will enable exchange of students, staff, and faculty between NDSU and the two foreign universities. As early as Fall 2010, the ECE Department may induct PhD students from UL and CIIT to carry out cutting-edge research with ECE faculty. The PhD students from UL and CIIT will be fully funded by their originating institutions. The two MoUs will provide a base for long-term educational and research partnerships. The ECE Department is looking forward to work with the students, staff, and faculty of both UL and CIIT.

UL (http://wwwen.uni.lu/) established in 2003 offers bachelors, masters, and doctoral degrees in 12 disciplines. Located in the heart of Europe the goal of UL is to establish itself as a modern research university. The university is structured around research units that host over 200 permanent researchers. Currently, around 13,239 students attend CIIT (http://www.ciit-isb.edu.pk/) that was established in 2000. CIIT is offering 41 different degree programs in the fields of Information and Communication Technology, Management Sciences, Electrical Engineering, Chemical Engineering, Mathematics, Physics, Biosciences, Development Studies, Environmental Science, Meteorology, and Architecture and Design.

The formal signing of the two MoUs is expected by the first quarter of 2010. For more information on the MoUs, please send queries to: samee.khan@ndsu.edu.

A MESSAGE FROM DR. DAVID ROGERS

This year Dr. David A. Rogers served as joint advisor with Dr. Robert Nelson (University of Wisconsin-Stout) of two Ph.D. students who finished in May (Dr. Benjamin Braaten and Dr. Mike Reich). This fall Braaten and Rogers traveled to Belem, Brazil in November to attend the 2009 International Microwave and Optoelectronics Conference (IMOC) where Rogers was chair of a conference session on new developments in antennas. He was also a co-author with Drs. Braaten and Nelson of an invited paper that was presented at the conference by Dr. Braaten: “Current Distribution of a Printed Dipole with Arbitrary Length Embedded in Layered Uniaxial Anisotropic Dielectrics.” Rogers and Braaten also served as reviewers of technical papers for IMOC. Rogers serves regularly on the technical program committee for the conference. At the conference Professors Rogers, Braaten, and Ivan Lima met with NDSU Computer Engineering exchange student Brandon Hacker who spent the fall semester at the Universidade Federal do Para in Belem as part of a U.S. Department of Education program for which Dr. Lima serves as director. Braaten and Rogers then flew to Sao Paulo to visit the Universidade Estadual de Campinas (UNICAMP) as guests of the School of Electrical and Computer Engineering (FEEC). FEEC is one of the best known ECE programs in Latin America. Currently it has 1100 undergraduate students and 700 graduate students. The Director of the School is Dr. Max Costa who was Rogers’ M.S. student in the 1970’s. Rogers was a UNICAMP faculty member during the period 1972-1980. Braaten and Rogers visited the ailing Dr. Attilio Giarola, Rogers’ colleague and well-known researcher in microwave and electromagnetic theory. They also spent several hours talking to colleagues at UNICAMP about common research interests. Dr. Braaten gave a seminar for the School entitled “Metamaterial-Based Antenna Designs for Applications to RFID.” Rogers and Braaten also visited with Cody Dienslake, NDSU exchange student in Electrical Engineering, who spent fall semester at UNICAMP. Rogers and Braaten are thankful for the warm welcome they received wherever they were in Brazil.
PUBLICATIONS, PRESENTATIONS AND REPORTS

- V. de Paulo, C. Ababei, “A Framework for 2.5D NoC Exploration using Homogeneous Networks over Heterogeneous Floorplans,” IEEE Int. Conference on Reconfigurable Computing and FPGAs, Cancun, Mexico, Dec. 2009.


STAFF AND FACULTY OF ELECTRICAL AND COMPUTER ENGINEERING

Front (left to right): Jeff Erickson, Cristinel Ababei, Ivan Lima, Prabhat Gupta, Sudarshan Srinivasan. Back (left to right): Laura Dallmann, Rajendra Katti, Bapeswara Rao, Subbaraya Yuvarajan, David Farden, Priscilla Schlenker, Jacob Glower, Roger Green, Mark Schroeder, Chao You, David Rogers, Rajesh Kavasseri, David DuShane, Hongxiang, Li. Not pictured are: Dan Ewert, Samee Khan, Benjamin Braaten

YOUR DONATIONS MAKE A DIFFERENCE

We want to express our sincere appreciation for those donations received by the department over the past year. Those funds have helped our department in a large part to support our new faculty members this past year and the upcoming year. The donations have helped our new faculty members establish themselves in the department and get their research projects going.

For your convenience, you can make your donation online at www.ndsfoundation.com and select “Make a Gift Online.” When you make a donation, you may direct it to the Electrical and Computer Engineering Department. To do this simply go to the Web site previously listed and select “Other” in the ‘Designation’ field. Then type “Electrical & Computer Engineering Department” in the field entitled ‘Other’ that will appear. Alternatively, if you select “College of Engineering and Architecture in the designation field, it benefits the College as a whole.

Again, thanks for your generosity!