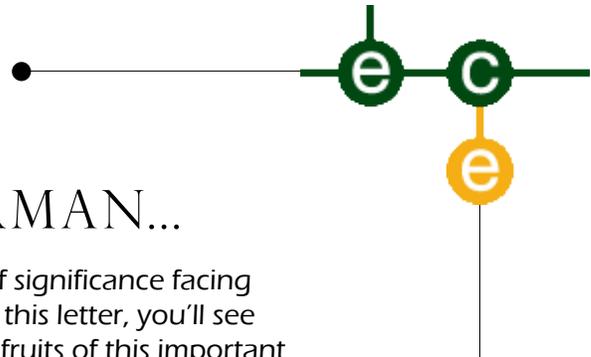


# ECE CONNECTIONS

December 2006



## LETTER FROM THE CHAIRMAN...



It's great to be in touch with you again, since we last communicated we've continued to make progress towards our goal of creating a scholarly, intellectual and creative environment within the ECE department and we're excited to tell you about it. As usual, our main source of excitement is our students who still consistently place at, or well above, the national averages in every category on a standardized national engineering exam. This speaks highly of our faculty and students. Another source of excitement, from my point of view, is our faculty members, who continue to be overworked, underpaid, but yet remain enthusiastic about their chosen career path of educating the next generation of electrical and computer engineers.

We've continued our weekly assessment meetings where we discuss edu-

cational issues of significance facing us. Throughout this letter, you'll see examples of the fruits of this important labor. In my view, the most notable is our new educational approach "*scholar teams*" started in Fall 2004. As of this writing we've evolved the concept into an entrepreneurial and innovation effort by combining our engineering efforts with the business acumen of the MBA students. Next semester we hope to create a corporation with the students involved and compete for initial seed funding. Overall, student groups have won awards, faculty have published and gotten grants – in a few words – we're making good progress.

We've created a new alumni service under the guidance of Professor Val Tareski and his scholar team, we've been videotaping our research seminars and placing them on our website for you to peruse at your leisure. You can retrieve this information from [www.ece.ndsu.nodak.edu/Research/Seminars/CurrentSeminars.htm](http://www.ece.ndsu.nodak.edu/Research/Seminars/CurrentSeminars.htm).

Thanks to all of you for your support.

### Special points of interest:

- Changes in the Dept.
- Introducing...
- Enrollment Statistics
- How to Mend a Broken Heart
- Words from the Faculty
- Engines of Innovation
- ECE Graduate receives Distinguished Engineer award

## CHANGES, CHANGES, CHANGES

The past year and a half has brought several changes to the department.

In the spring of 2005, Oscar Blaskowski, the Electrical Technician, retired and was replaced by Bart Kent.

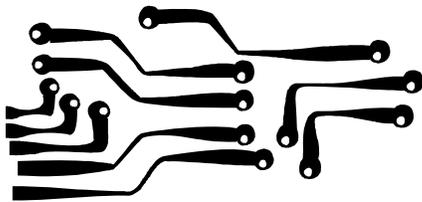
In the summer of 2005 we were able to hire two new Assistant Professors, Dr. Fei Dai and Dr. Chao You.

The spring of 2006 brought even more changes. Pam Gahner moved on to work with the IRS and Laura Dallmann moved in from the Center for Nanoscale Science and Engineering as the Administrative Secretary responsible for the finances of the department.

We were pleased to promote Dr. Rajendra Katti and Dr. Robert Nelson from Associate Professor to Professor this summer.

This year also brought some loss to the department. Sung Joo returned to Korea, his home country and Fei Dai moved to Washington state to work with Microsoft.

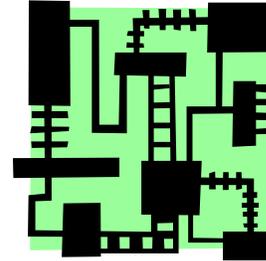
Also this summer, a long-time member of our faculty suffered from a severe heart attack. Fortunately, Floyd Patterson has recovered enough to continue teaching at a reduced teaching load. Floyd's recovery has been slow but we are extremely happy to have his presence and influence in the department.



Currently, we are conducting a search for two Assistant Professor positions to be filled in the summer of 2007. One position will focus on Power Systems and the other position will focus on Computer Networking. (See [http://www.ndsu.edu/ndsu/jobs/non\\_broadbanded/positions/00019933.shtml](http://www.ndsu.edu/ndsu/jobs/non_broadbanded/positions/00019933.shtml) for details.)

This year we saw our first group of students from the Ansal Institute of Technology (AIT) in Gurgaon, India. The students are a part of an exchange partnership between NDSU and AIT in which AIT students will transfer to NDSU to complete the last year of their education. We are happy to welcome these students and we look forward to a continued relationship with AIT.

NDSU-ECE is also considering partnerships with other schools in India and Malasia in the future.



### Faculty:

Dr. Dan Ewert, Professor, Chairman

Dr. David Farden, Professor

Dr. Rajendra Katti, Professor

Dr. Robert M. Nelson, Professor

Dr. Bapeswara Rao, Professor

Dr. David Rogers, Professor

Dr. Subbaraya Yuvarajan, Professor

Dr. Jacob Glower, Associate Professor

Dr. Roger Green, Associate Professor

Floyd Patterson, M.S. Associate Professor

Val Tareski, M.S. Associate Professor

Dr. Rajesh Kavasseri, Assistant Professor

Dr. Ivan Lima, Assistant Professor

Dr. Mark Schroeder, Assistant Professor

Dr. Chao You, Assistant Professor

### Staff:

Laura Dallmann, Administrative Secretary

David DuShane, Computer Technician

Bart Kent, Electrical Technician

Priscilla Schlenker, Administrative Secretary

# INTRODUCING...

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## CHAO YOU

Dr. You received his Bachelors of Science in Physics in August 1999 from Nankai University, Tianjin China. He received his Master of Science in Electrical Engineering in May 2003, his Master of Science in Management in December 2004, and his Doctor of



Philosophy in Electrical Engineering in May 2005, all from Rensselaer Polytechnic Institute.

Dr. You joined the Department of Electrical and Computer Engineering at North Dakota State University in August 2005 as Assistant Professor. He is teaching

Very Large Scale Integrated Circuit (VLSI) and Integrated Circuit fabrication.

His research interests are focused on VLSI design, involving such areas as high speed Field Programmable Gate Array (FPGA) and energy harvesting.

Currently Chao has six Masters students and two Ph.D. students in his research group.

## LAURA DALLMANN

Laura Dallmann is a native of North Dakota. Upon graduation from high school, she served in the ND National Guards as a water purification specialist for a short time then transferred to the United States Army as a Russian Linguist for 6 1/2 years.

Prior to moving back to North Dakota, Laura held several administrative positions in South Florida, worked in Utah as a software tester, and as a team leader in charge of software testing procedures. She has also

been involved with web development and design; and writing technical procedures.

In September 2002, she joined the Center for Nanoscale Science and Engineering, and the Center for Advanced Technology Transfer and Traineeship as an Administrative Secretary.

In April of 2006, Laura moved to the Electrical and Computer Engineering department.

Laura is currently pursuing her bachelors degree in Management Information Systems at NDSU as a part-time student.

In her free time, she enjoys vol-

unteering in her community. She is an active member of her church and is currently involved in a Young Women's organization. Laura has also served as a full-time missionary for her church.



## BART KENT

Bart hales from Bronx, NY. In 1965 he joined the US Air Force and has been many places thanks to his time in the service. Bart has been in ND since 1981 and has lived in all four major cites.

In 1989, he retired from the Air Force and resumed his education.

Bart has achieved a BS in Man-



agement/Marketing Management and an MBA. Most of his AF career was spent working on electronic and physical dimensional equipment as a precision measurement (Metrology) technician and a construction manager (engineering assistant).

After retirement from the AF, with the aid of the Veterans

Administration, he was able to acquire training on working with computers and LANS. He is Novell and Microsoft certified as a network administrator.

Bart worked for the Department of Public Instruction at the state capital and later as an IT Director at United Tribes Technical College.

In December 2004, he moved to Fargo and joined ECE as the Electronics Lab Technician.

# ENROLLMENT AND DEGREES AWARDED

## Enrollment Statistics Fall 2006

### Electrical and Computer Engineering

- Doctor of Philosophy 14
- Master of Science 27
- Bachelor of Science 355

4% Increase

### Computer Engineering

- Bachelor of Science 120

3% Increase

## Degrees Awarded 2005-06

### Electrical and Computer Engineering

- Doctor of Philosophy 1
- Master of Science 4
- Bachelor of Science 67

### Computer Engineering

- Bachelor of Science 6



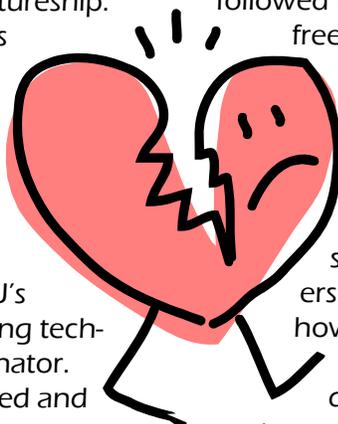
# HOW TO MEND A BROKEN HEART

Daniel L. Ewert, professor and chair of electrical and computer engineering at North Dakota State University, has been selected for the university's prestigious 48th Faculty Lectureship. The honor recognizes sustained professional excellence in teaching, scholarly achievement and service among faculty members.

Ewert serves as NDSU's biomedical engineering technical specialty coordinator. He conceived, modeled and helped develop a new ventricular assist device that was named one of the National Institutes of Health top five inventions for fiscal 2004.

Ewert's lecture, "How Do You

Mend a Broken Heart?" was scheduled for 7 p.m. Tuesday, April 4, 2006 in the Memorial Union Century Theater. A reception in the Peace Garden Room followed the talk. Both were free and open to the public.



He discussed how extreme situations challenge the human cardiovascular system, what researchers have learned and how the information was used to develop new diagnosis and treatment concepts for helping cardiac patients.

Ewert earned his bachelor's degree, master's degree in mechanical engineering and doctorate in physiology at the Uni-

versity of North Dakota. He joined NDSU in 1990 after being a research fellow at the Biodynamics Research Unit of the Department of Physiology and Biophysics at Mayo Medical School, Rochester, Minn. His vita lists more than 30 papers, 40 conferences or reports and two patents pending. Among his other awards are the 2001 NDSU College of Engineering and Architecture Dean's Award for Excellence in Teaching, the 2000 NDSU Apple Polisher Award, 1996 NDSU College of Engineering and Architecture Researcher of the Year, 1993 Mortar Board Preferred Professor and 1993 Mortar Board Outstanding Academic Adviser.

—Courtesy of University Relations

# WORDS FROM THE FACULTY...

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## DAVID ROGERS

Dave Rogers serves on the editorial board for an on-line journal dealing with microwave and optical technology. He also advises two M.S.E.E. students. They are both doing research dealing with microwave devices and he serves on about ten other thesis committees in ECE, Physics and Computer Science.

In the fall of 2005 Rogers presented two papers on teaching professional ethics, one at the 2005 Frontiers in Education Conference in Indianapolis and the other at the North Midwest Regional Meeting of the American Society for Engineering Education in Brookings, SD. He also chaired a session on software engineering at the Indianapolis conference. Earlier in 2005 he was honored by the NDSU Quarter Century Club for completing 25 years of service at NDSU.

Rogers continues to teach ENGR 312, *Impact of Technology on Society*, which he has done for over 10 years. This semester the class viewed Vice President Al Gore's film *An Inconvenient Truth* in its entirety. The film was followed by extensive class discussion. The class prepares students to deal with the complex global social issues that are related to existing or new technologies.

The ECE Department continues to collaborate with the Physics Department in the maintenance and improvement of the undergraduate optics laboratory, which was initially implemented under National Science Foundation funding by adapting successful laboratory experiments developed at the New Jersey Institute of Technology and

through commercially available fiber optics kits from Newport Corporation. The lab has four 4x8 foot Newport optical tables. These work out very well, allowing plenty of space for the laboratory experiments and enough room so that students have their own dedicated space for experiments. A large number of items have been acquired for the lab (kits, systems, computers, individual components, etc.), usually in multiples of four. The specifications for each component or system needed to be evaluated to determine if it would work for the proposed experiments. We chose a LabVIEW Instruments Kit from National Instruments that includes a high-speed digitizer (oscilloscope card), digital multimeter card, and function generator card installed in personal computers in addition to the LabVIEW Full Development System for our data acquisition. This was a cost-saving approach over purchasing individual instruments and also allows for computer data acquisition. The optical fiber experiments offer important opportunities and challenges. The experience of the students in cleaving their own fibers is invaluable. We have recently added CCD cameras to automate measuring the intensities of diffraction and interference patterns and record mode patterns from fiber optics. A significant objective of the course is to team up two or three students to do an expanded laboratory project related to their academic major as the final project in the course. Rogers typically advises one or two of these projects every fall semester.



Rogers presented the ECE Department seminar on Oct. 17, 2006 dealing with engineering ethics. In brief he reported that engineering ethics is taught from the perspective of promoting the common good or within the tradition of the shared values of the supporting community. There is a logical connection between these two perspectives that can serve as the foundation for the teaching of applied engineering ethics. Ethics is at the foundation of engineering education. New technologies bring new ethical challenges to the engineer. The life experience of the student if rooted in the shared values of a community or in the pursuit of the common good elevates the way the profession is practiced and improves the quality of the products and systems that flow out of the activities of the profession.

Rogers also serves as a member of the College of Engineering and Architecture Promotion, Tenure, and Evaluation (PTE) Committee and chair of the ECE PTE Committee. Both groups are working hard this year to update the tenure and promotion policies for their respective units. This will result in new documents that should be in the Provost's hands by early 2007.

In the community Rogers serves as a volunteer instructor and license examiner for the local amateur radio club and as a lay scripture reader and Men's Choir member at First Lutheran Church. He is also an active participant in the Fargo-Moorhead Brazilian Connection.

## ROGER GREEN

Dr. Green continues his teaching and research activities for the ECE department. During the past year, he has taught courses in Applied Digital Signal Processing, Communications, and Signals and Systems.

During January 2007, Dr. Green will offer for the first time a not-for-credit MATLAB short course, which has attracted students from many departments including electrical and computer engineering, mechanical engineering, civil engineering, industrial and manufacturing engineering, agriculture and biosystems engineering, and transportation and logistics. Dr. Green continues to lead the



Digital Signal Processing (DSP) Scholar Team (ST). Last spring, the DSP ST, in conjunction with a senior design group, completed a probabilistic music generator.

Currently, the DSP ST is developing two systems: a desk-top DSP-controlled inverted pendulum and, in partnership with a senior design group, a DSP-controlled self-balancing robot. A discussion of the ST concept as well as activities specific to the DSP ST was published in the 4th IEEE Workshop on Signal Processing Education in a paper entitled "An Introduction to Scholar Teams: A Method to Enhance DSP Education and

Competence." In July 2006, Dr. Green's research team concluded a U.S. Air Force sponsored grant to develop an advanced electrochemical impedance spectroscopy (EIS) instrument. Results of this work were published, with graduate student Greg Middlestead, in the 12th IEEE Digital Signal Processing Workshop in a paper entitled, "An Improved DSP-Based EIS Instrument using Real-Time Performance Monitors and Parameter Adjustment." During the upcoming year, the U.S. Army will fund an extension of this work to develop a hand-held EIS health monitor. In August 2006, Dr. Green and several co-inventors were awarded a patent on their "Vector Calibration System."

## ROBERT NELSON

Professor Robert Nelson (NDSU Electrical and Computer Engineering Department) was recently elected Chair of the Education and Student Activities Committee (ESAC) of the IEEE (Institute of Electrical and Electronics Engineers) Electromagnetic Compatibility (EMC) Society. ESAC is comprised of engi-

neers from around the world who join together to promote education-related activities of the IEEE EMC Society. Nelson has been a member of ESAC for sixteen years, and was elected by the IEEE EMC Society's Board of Directors after previously serving as Secretary and Vice-Chair of ESAC.



## FLOYD PATTERSON



The "Near Coincident Event Detection and Counting" scholar team progress was slowed this year due to Professor Patterson's cardiac health. We do have good simulation of signals in which separation of near identical waveforms was achieved. We were expecting to get more real field data and efforts for this

will continue. Professor Patterson continues to teach in the areas of probability, senior design and communication/signals.

## RAJ KATTI

Two of my students Hareesh Khatri (MS) and Kumar Mangipudi (PhD) were hired as computer security engineers by Intel Corporation. Their job is involved with the evaluation of security of all Intel processors.

Another student of mine Xiaoyu Ruan was hired by Corsec Security, a Washington D.C. based security company that evaluates Cryptographic protocols for the



Government.

Below I have a short description of my research: Raj Katti's research.

This year Raj was working on two projects both in the area of cryptography. One of them was funded by Intel Corporation and involved implementing and evaluating the performance of cryptographic protocols in the 802.11

wireless standard when implemented on the Intel IXP 425 network processor. The other project was funded by the National Science Foundation and involved designing new algorithms for efficient implementation of elliptic curve cryptographic protocols. These projects have resulted in 10 conference and 5 journal publications in the last year.

Words from Raj Katti: When cryptography is outlawed, asdv iyuop yoiuijh boim.

## SENIOR DESIGN BY JOEL ASLAKSON & MARK SCHROEDER

Eighteen groups from ECE 403 Senior Design II are wrapping up the first semester of their year-long design projects. The sponsored projects are evenly split between industry (e.g. Bobcat, Daktronics), the National Science Foundation (NSF) sponsored Projects to Aid Persons with Disabilities, and ECE faculty for an interesting mix. First time instructor Joel Aslakson (BSEE '88 NDSU; MSEE '97 NDSU) is enjoying the process and thanks the faculty advisors for their assistance. With almost 60 students, including about 10 from the AIT exchange program, Aslakson says one of his biggest challenges was getting to know the names of each student. "I didn't know a single student coming in, but I think it helps establish better accountability," he says. "My main emphasis has been gearing them toward the importance of delivering a final product that meets specs and is 100% complete — and to have fun doing it, of course."

"I like the atmosphere in the department. It's upbeat, there's a new attitude and it's a fun place to be. I've gotten to see some

familiar faculty faces and meet a lot of new ones."

The ECE 405 Senior Design III class is also wrapping things up for the semester. There were a total of eight groups, half of which were NSF-funded projects. One of the NSF projects is a wireless door monitoring system to aid in the supervision of children at the Anne Carlsen Center in Jamestown, ND. This device will help alert the staff whenever a child attempts to leave the building unsupervised. An internally funded project that will benefit the ECE department is the door lock card key system. This project will replace the department's antiquated system and allow card key access to be added to more rooms at a greatly reduced cost compared to alternate options. You can access more detailed information on these and other design projects at the department's own wiki site located at: [http://saturn.ece.ndsu.nodak.edu/ecewiki/index.php/ECE\\_Senior\\_Design\\_Groups](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. Spon-

sorship is generally \$3,000 or less per two-semester project and it is a great way to develop a closer relationship with graduating students and the ECE department, 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 can contact Prof. Mark Schroeder at [mark.j.schroeder@ndsu.edu](mailto:mark.j.schroeder@ndsu.edu) or (701) 231-8049.



## RFID CATTLE TAGS BY JACOB GLOWER

Faculty and researchers from ECE, CNSE, and the Dickinson Research Extension Center (DREC) conducted the (to our knowledge) world's first successful demonstration of using high-frequency RFID cattle tags to identify 100% of the cattle running under a gate on November 6th. As part of a day-long seminar showcasing activities associated with the USDA's "Disease Surveillance and Public Health" initiative, sixty cattle were tagged with RFID tags developed at Alien Technologies and placed on cattle-tags by Y-Text corporation. In front of a live audience of about 150, these sixty cattle were off-loaded from a truck and identified as they ran under a gate. Forty of the cattle subsequently ran through a second gate several more times and finally all sixty cattle were again identified as they returned to the truck on finale.

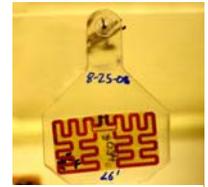


Cattle wearing the RFID ear tags.

During this day, all tags were successfully read 440 out of 440 times as the cattle ran under the gates en-mass and unimpeded. To our knowledge, this is the first time anyone has demonstrated a 100% read rate using passive RFID to identify cattle as the load, unload from a truck as well as running under a gate.

Dr. Nelson and his graduate students have developed the first generation of passive RFID cow tags at NDSU. These tags include a custom RFID antenna, developed at NDSU, which is designed to be placed inside a conventional-looking cow ear tag. This involves limiting the size of the antenna to the shape

of conventional tags as well as tuning the antenna while taking into account the dielectric of the plastic tag as well as the large body of water near the tag when in operation (i.e. the cow). This first generation of tag is already displaying comparable performance to commercial RFID tags. (note: in this comparison the latter is



Clear Tag



Cattle passing through gateway as tags are being read.

placed in an environment they were never designed for, but still work very well.) With more development time, we hope to develop an NDSU-designed custom RFID tag for ear tags which have even better range characteristics.

## ECE GRAD RECEIVES MICROSOFT AWARD



Val Tareski congratulates Tim Brookings on his Distinguished Engineer award.

Tim Brookings was recently awarded Microsoft's Distinguished Engineer award. Brookings is a graduate of North Dakota State University with Bachelor and Master of Science degrees in Electrical Engineering.

This award is given to employees that demonstrate a lifelong career of consistent contribution to the technical field in and outside of Microsoft.

The standards for the award are set high. Only 32 of over 70,000 of Microsoft's employees have received this award. Another distinction Brookings owns is that

he is one of the few recipients outside of the company headquarters in Redmon, Washington to ever receive the award.

Brookings was an employee of Great Plains Software before the acquisition by Microsoft. He is currently contributing to future Microsoft business solutions in the Fargo, ND office.

## VAL TARESKI

Scholar teams rock! If you have not had the chance to check out the ECE Scholar Team operation, I encourage you to see the ECE website (and ECE wiki site) to learn more about our scholar teams and what they've been doing. This is our third year of



working with scholar teams, and I think that they have been a big success. A group of students (first year undergraduate through graduate students) work with a faculty member on an activity to develop a concept of interest to the group. In most cases

the students get hands on exposure to systems engineering, as most projects involve many different aspects of engineering. Each team meets weekly to discuss issues and to do group problem solving related to the project. During the rest of the week, the students work individually or on small teams for their portion of the project.

## BISON VENTURES: ENGINES OF INNOVATION

The College of Engineering and Architecture and the College of Business have initiated a multi-disciplinary, academic, economic development plan that has completed two years of pilot testing and evolution. This process encourages investment by venture capitalists, external investors, and companies.

The College of Business and the College of Engineering and Architecture at NDSU have collaborated in a novel plan to develop spin-off companies by leveraging the intellectual capital of faculty and students at NDSU. The plan, in brief, contains the following proposed sequence. Investors provide seed funds to a multi-disciplinary team of students and faculty who develop a technology and/or product, a business/financial/marketing plan and register a corporation in the state of North Dakota over a period of a semester or two, with the final output of the experience being a Phase I SBIR/STTR.

In this proposed plan, the investors receive position (s) on the board of directors and a proportion of company shares related to the amount of their initial investment. Faculty involved receive a proportion of the company shares, students on the team may comprise the executive team and/or receive company shares. Finally, NDSU retains IP and the grants the company right of first refusal and exclusive licensing arrangements, or may trade IP ownership for company ownership in some proportion. If the Phase I proposal is successful, NDSU would grant the start-up company one-year free rent in the incubator space.

*Pilot Testing and Evolution:*

Fall semester 2004 ECE implemented a concept of vertical integration where teams of students from freshman through graduate students form a team

(Scholar team) with a faculty member and work on engineering innovations.

Fall semester 2005 Spring semester the Colleges of Business and Engineering and Architecture received funding from 3M to encourage collaboration.

Spring 2006 A Business student joined an ECE scholar team comprised of mechanical and electrical engineering students and developed a business plan for the team.

Fall 2006 The College of Business participation expanded to include two MBA students on two different scholar teams and these students are developing business plans for a biomedical device test platform and for an instrumented space suit. Both of these have potential for commercialization and eventual company formation. Both business plans will be submitted to InnovateND to compete for additional seed funding.

Fall 2006 outside investors approached ECE and desired to develop a product. This proposed plan was presented to investors and they stated their desire to become involved and also seek federal funding.

Fall 2006 Chairs of ECE, MEAM and ABEN agreed to collaborate and formalize multi-disciplinary design and development efforts in the college.

Fall 2006 the College of Business and College of Engineering and Architecture agreed to continue developing the Engines of Innovation plan and seek formalization and approval of the process from NDSU.

Spring semester 2007, the hopeful launch of a formalized and approved process that encourages investment in this academic economic development plan by venture capitalists, external investors, and companies pending institutional approval.

## FACULTY PUBLICATIONS IN 2005-06

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- R. Green and A. Haq, "B-spline Enhanced Time-Spectrum Analysis," *Signal Processing* (Elsevier), No. 85, pp. 681-692, 2005.
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- Kumar Mangipudi, Rajendra Katti, and Huirong Fu, "Authentication and Key Agreement Protocols with User Anonymity," accepted by the *International Journal of Network Security*, 2005.
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- Rajesh G. Kavasseri and R. Nagarajan, "A Multifractal Description of Wind Speed Records", *Chaos, Solitons and Fractals*. Vol. 24, No.1 pp : 165 - 173, 2005.
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- A. O. Lima, I. T. Lima, Jr., and C. R. Menyuk, "Error estimation in multicanonical Monte Carlo simulations with applications to polarization mode dispersion emulators," *IEEE/OSA Journal of Lightwave Technology*, Vol. 23, No. 11, pp. 3781-3789, November, 2005.
- A. O. Lima, C. R. Menyuk, and I. T. Lima, Jr., "Comparison of two biasing Monte Carlo methods for calculating outage probabilities in systems with multi-section PMD compensators," *IEEE Photonics Technology Letters*, Vol. 17, No. 12, pp. 2580-2582, December, 2005.
- R.M. Nelson, B.D. Braaten, M.A. Mohammed, "An Extended Quasi-static/Full-Wave for Electromagnetic Scattering Problems," *IEEE Transactions on Antennas and Propagation*, submitted 8/05.
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# GREETINGS FROM STAFF AND FACULTY



Front (left to right) : Rajendra Katti, Mark Schroeder, Jacob Glower, Chao You, Roger Green, Daniel Ewert, Ivan Lima.

Back (left to right) : Robert Nelson, Laura Dallmann, David Rogers, Priscilla Schlenker, Floyd Patterson, Bapeswara Rao, Rajesh Kavasseri, Subbaraya Yuvarajan, Bart Kent, Val Tareski. Not pictured: David Farden.

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