

Annual  
Report

2011-

2012

---

Electrical and Computer Engineering

Department of Electrical and Computer Engineering  
North Carolina State University

Annual Report  
2010-2011

Daniel D. Stancil, Alcoa Distinguished Professor and Head  
Mike Devetsikiotis, Professor and Director of Graduate Programs  
Brian L. Hughes, Professor and Associate Head  
Cecelia Townsend, Lecturer and Coordinator of Undergraduate Programs

## I. Overview

This has been another very positive and productive year for the faculty and staff of the ECE department. We have hired several new faculty and staff members; our students, faculty, and alumni have received major awards and recognitions; and ECE research has been featured multiple times in the national and international media.

During the past year, we have had several leadership changes. Dr. Ginger Yu has assumed the responsibility of Assistant Director of Graduate Programs, and will assist with various aspects of the administration of our programs, including advising students in our non-thesis MS programs. Dan Green has assumed additional responsibilities as recognized by a new title, Director of IT and Operations. Finally, Monica Watkins joined the department as Director of Administration and Finance.

Our students and student organizations have won a number of awards during the past year. As examples, a student team led by an ECE student placed 2<sup>nd</sup> in the international Disney ImagiNations competition, an Outstanding Chapter Award was received by the Electrical and Computer Engineering Honor Society Eta Kappa Nu, and an autonomous vehicle constructed by the Underwater Robotics Club was a finalist in the international RoboSub competition. In addition, several graduate students won Best Paper Awards at international conferences.

This year three of our faculty members were named IEEE Fellows: Michael Devetsikiotis, Alexandra Duel-Hallen, and Veena Misra. In other highlights, Michael Escuti received a Presidential Early Career Award in Science and Engineering (PECASE), and Jay Baliga received the National Medal of Technology and Innovation (NMTI). These last two awards were presented at ceremonies at the White House. The PECASE is the highest recognition that the US Government gives to scientists and engineers early in their career, and the NMTI is the nation's highest recognition for scientists and engineers. Greg Byrd and Keith Townsend also received major teaching awards at the Departmental, College, and University levels. Research involving faculty in ECE has been featured in numerous regional, national, and international media venues, including the *NSF website*, *WUNC, News & Observer*, *US News & World Reports*, *Science Daily*, *EE Times*, *R&D Magazine online*, *NRC (one of the most widely read newspapers in the Netherlands)*, *Gizmag*, *Asian Correspondent*, *NPR*, *Christian Science Monitor*, *Economist*, *MSNBC*, *UPI.com*, and many more.

The alumni of the Department have also received major recognitions. Bill Dean, BSEE '88, was the recipient of a 2011 COE Distinguished Alumnus Award. Bill is CEO of M.C. Dean, Inc., a company founded by his grandfather in 1949. Under Bill's leadership the company has increased its revenues by thirtyfold since 1997. Also, Abdurrahim El-Keib, PhD '84, was named Interim Prime Minister of Libya in October, 2011. His PhD work was advised by Prof. John Grainger and was in the area of electric power systems.

Finally, the Department graduated the first students from the new Professional Master's Program in Electric Power Systems.

### A. Changes in Service Environment

The most significant change in our environment during the past year was the relocation of the students and faculty associated with the Center for Efficient, Scalable, and Reliable Computing from the Partners I building to Engineering Building II. This involved 6 faculty, 1 staff member, and about 60 students.

### B. Diversity

- There are 52 on the tenured/tenure track faculty, 5 on the teaching faculty, and 7 on the research faculty. Of these, 8 are female, and 2 are African American males.
- There are 30 permanent SPA employees in the department: 16 are white female, 3 are African American females, 1 is an African American male, and 11 are white males.

To address the “pipeline” issue, the Department participated in the Building Future Faculty program at NCSU by sponsoring two female participants interested in a future faculty position.

## II. Undergraduate program

### A. Enrollment, degrees awarded, trends

During the 2011-2012 academic year, ECE awarded 130 BS EE degrees and 76 BS CpE degrees, including double majors. The total undergraduate enrollment is given in Table 1.

**Table 1. Total Undergraduate Enrollment in F11**

Degree Program	BS EE	BS CPE	BS EE&CPE
Unmatriculated	96	112	0
Matriculated	331*	178	201**
Total Each Degree	427	290	201
Total ECE Undergrad Students	918		

\* includes 43 REES concentration EE majors

\*\* includes 3 REES concentration EE majors

### B. Instructional program advances

The new concentration in Renewable Electric Energy Systems (REES) is gaining in popularity. We presently have 46 matriculated REES concentration EE students.

### C. Highlight student honors, measures of quality

Of 174 ECE students who earned the BS degree during the 2011-2012 academic year, 33 graduated *Cum Laude*, 14 *Magna Cum Laude*, and 27 *Summa Cum Laude*.

In addition, 15 seniors received ECE departmental awards this year:

Joshua Wayne Bowman, Outstanding Senior Award  
 Patrick A. Carroll, Outstanding Senior Award  
 Danielle M. Carmon, Outstanding Senior Award  
 Jennifer Karen Felder, Outstanding Senior Award  
 Christopher Jeffrey Grice, Outstanding Senior Award  
 Akash M. Gujarati, Outstanding Senior Award  
 Mirza Ahsen Qamar, Outstanding Senior Award  
 Joseph A. Silvers, Outstanding Senior Award  
 Kirk Thomas Stallings, Outstanding Senior Award

Heather Christine Vaughn, Outstanding Senior Award  
 Joseph A. Silvers, Faculty Senior Scholar Award  
 Joseph A. Silvers, Leadership Award  
 Patrick A. Carroll, Humanities Award  
 Akash M. Gujarati, Scholarly Achievement Award  
 Timothy Scott Moore, Service and Citizenship Award

### D. Scholarships

In Spring 2012, we awarded 80 scholarships from 42 different donors for a total of \$204,450. This includes 13 COE scholarships totaling \$38,000.

### E. Student organizations and activities

A team of 4 students received 2<sup>nd</sup> prize in the international Disney ImagiNations competition in June, 2011. In addition to Patrick Carroll in ECE, the team included Adam Newton from ISE and two students of Art and Design. Their project was entitled, “Fantasia: the Lost Symphony.”

#### Eta Kappa Nu

The Beta Eta Chapter is involved in many activities that benefit scholarly, professional, and community activities of ECE students here at NC State. This year the Chapter received an Outstanding Chapter Award from the national Eta Kappa Nu organization. Only about the top 14% of chapters worldwide received such an award.

#### Institute of Electrical and Electronics Engineers (IEEE)

The student branch hosted teams that competed in the IEEEExtreme programming competition 5.0. Over 1400 teams participated worldwide in the 24-hour, on-line programming event. One of our teams finished 9<sup>th</sup> in the region.

Again this year, the student branch actively participated in the IEEE SoutheastCon Student Program. Several students attended the event in Orlando and participated in the competitions.

Several IEEE student members and officers attended the 2012 IEEE Power and Energy Society Transmission and Distribution Conference and Exposition in Orlando, FL.

The IEEE Student Branch also sponsored several Technical Talks by companies employing electrical and computer engineers.

#### **Underwater Robotics Club (URC)**

The URC competed in the 2011 RoboSub Competition sponsored by the Office of Naval Research and the Autonomous Underwater Vehicle Systems International (AUVSI) Foundation, June 15-17, 2011, in San Diego, CA. The competition requires an autonomous underwater vehicle to navigate a course using vision, sound and environmental sensing while performing mechanical and electronic tasks. The Underwater Robotics Club's Seawolf IV autonomous underwater vehicle was a finalist in this year's competition. In addition to ECE, the team included students from Math, Computer Science, Physics, Mechanical and Aerospace Engineering, and Chemistry.

#### **Open Hardware Design Lab (ODL) and Open Hardware Makerspace (ODM)**

The ODL is an official student organization with NCSU and has received funding from Student Government. The ODL has established bylaws and procedures for operation, and the lab has been actively in operation this past year.

The goal of the organization is to provide a laboratory for students to experiment, build projects and learn outside their formal classroom activities. The club has established a number of projects that students can work on and provides mentoring to students interested in expanding their skills in design.

Analog Devices is actively working with the ODL to provide parts and mentoring to the organization.

The ODM is a new student organization that is also focused on enabling student project creativity, but with an emphasis on service. This group was honored with a Deborah S. Moore Service Award as the emerging non-service student organization of the year. The Moore awards recognize exemplary service and outstanding volunteerism.

Both organizations share a dedicated lab space in Engineering Building 2.

#### **F. Cooperative education program**

In the 2011-2012 academic year, there were 57 EE undergraduate students participating in 68 cooperative education sessions, and 58 CPE undergraduate students participating in 71 cooperative education sessions with 39 different employers.

#### **G. Career placement**

There are now 405 ECE undergraduate students that have posted their resumes on ePACK.. This is more than a 50% increase over last year's posted resumes. The placement statistics for our May 2011 and December 2011 graduates are given in Table 2 below.

**Table 2. Placement statistics for May 2011 and December 2011 ECE undergraduates.**

University Planning and Analysis has begun tracking Career Surveys for the Career Center, so the data points have changed for the 2011-2012 academic year.

Semester	Graduates	Reported Status	Grad School	Employed	25th Percentile	Average Salary	75th Percentile
Spring 2011	107	83	21	41	57,500	59,792	66,250
Fall 2011	72	56	10	26	55,000	62,656	68,750

### III. Graduate program

#### H. Enrollment, degrees awarded, trends

The total graduate student enrollment in the fall of 2011 was 594 (Increased from 513 in fall of 2010). The number of PhD students was 214 (up slightly from 202 last year), and the number of MS students was 380 (significantly up from 311 last year). The figures for the current year are shown in Table 3.

**Table 3. Graduate enrollment and degrees granted in Fall 2011 – Spring 2012.**

Majors	Fall 2011 Enrollments*	Fall 2011-Spring 2012 Degrees Granted**
EE MS	230	81
CPE MS	112	72
CNE MS	38	15
EPSE MS	0	2
Total MS	380	170
EE PhD	166	28
CPE PhD	48	6
Total PhD	214	34
Total	594	204

\*Source for Enrollments: UPA

\*\*Source for Degrees Granted: SIS/Graduation Lists (estimated values)

#### I. Instructional program advances, including curriculum development

Our new accelerated Professional Master's Degree program in Electric Power Systems (EPSE), funded by a \$3.4M grant from the Department of Defense, received final approval from the Board of Governors. The first two students received their MS EPSE at our Spring 2012 graduation ceremony. The first full class of MS EPSE students were admitted in the summer of 2012.

Both the MS EPSE and our MS in Computer Networking (CNE) received the "professional science masters" (PSM) designation from the Board of Governors. The members of the MS CNE faculty are in the process of forming the requisite industrial advisory board and the group of student industrial mentors.

#### J. Fellowships and Awards

Twenty eight graduate students received fellowships, totaling \$308,603. In addition, the following students received best paper awards and scholarships:

**Babak Parkhideh and Nima Yousefpoor** won third place in the North Carolina State University Graduate Research Symposium with their poster presentation on "Active Mobile Substation."

**Xi Chen**, working with Dr. Rhett Davis, won the best student paper award at the IEEE International Conference on Electrical Performance of Electronic Packaging and Systems (IEEE EPEPS) 2011. The paper was co-authored by Dr. Rhett Davis and Dr. Paul Franzon. The topic of the paper was "Adaptive Clock Distribution for 3D Integrated Circuits."

Dr. Huiyang Zhou and his students **Saurabh Gupta, Ping Xiang, and Yi Yang** were awarded the best paper award for the 2012 IEEE International Parallel and Distributed Processing Symposium (IEEE IPDPS). The topic of the paper was "Locality Principle Revisited: A Probability-Based Quantitative Approach."

**Niket K. Choudhary, Salil V. Wadhavkar, Brandon H. Dwiell, and Sandeep Navada**, together with Dr. Rotenberg, co-authored a paper selected for the IEEE Micro Top Picks Issue (2012), a special issue from the Computer Architecture Conferences. The paper's topic was FabScalar: Composing SynthesizableRTL Designs of Arbitrary Cores within a Canonical Superscalar Template. Former students of NCSU who also co-authored this paper include Tanmay A. Shah, Hiran Mayukh, Jayneel Gandhi, and Hashem Hashemi Najaf-abadi.

**Rita Brugarolas** received the prestigious Beca Posgrado EE.UU Scholarship from Fundación Caja Madrid in Spain. This scholarship was awarded to only 40 students out of over 1000 applicants. Rita Brugarolas also received the Diversity Travel Award to attend the Neural Interfaces Conference 2012 in Salt Lake City, Utah. The award was offered to only 5 students this year.

#### IV. Faculty and staff

##### A. Administrative achievements and staff changes

There were several changes in the departmental administrative staff:

**Asia Gray-Battle** joined as Administrative Assistant

**Michelle Howington** joined as Administrative Support Associate

**Monica Watkins** joined as Director of Administration and Finance

**Dr. Pam Carpenter** joined as Education Program Manager for the new MS-EPSE degree

**Mike Belangia** joined as Linux Administrator

**Mitch Amiano** joined as Web Programmer

**Allen Moore** joined as Web Designer

**Dan Green's** title was changed to Director of IT and Operations

**Dr. Ginger Yu** assumed the new role as Assistant Director of Graduate Programs

**David Lassiter** retired from Facilities Support

The following new faculty members joined the ECE Department during 2011-12:

**Dr. Doug Hopkins** joined NCSU in August 2011 as Research Professor. He received his Ph.D. from Virginia Tech in 1989. Prof. Hopkins has over 20 years of experience in electronic energy systems. His early career was at the R&D centers of the General Electric and Carrier Air-Conditioning Companies in advanced power electronics systems for military and commercial applications up to the low MW range. Immediately prior to joining NC State, he was Director of the Electronic Power & Energy Research Laboratory, School of engineering and Applied Sciences, State University of New York at Buffalo. He is developing an advanced electronics packaging laboratory at NC State.

**Dr. Iqbal Husain** joined NC State in August of 2011 as Distinguished Professor after serving as a faculty member at the University of Akron, Ohio, for seventeen years. He received his PhD in Electrical Engineering from Texas A&M University in 1993. Dr. Husain's research interests are in the areas of control and modeling of electrical drives, design of electric machines, development of power conditioning circuits, microinverters for distributed power generation, inverter controls for grid synchronization, and modeling of electric and hybrid vehicle systems. The primary application of Dr. Husain's work is in the transportation, automotive, and aerospace industries. As a result of this exposure, Dr. Husain has developed courses for graduate and undergraduate education in electric and hybrid vehicles, and published the textbook *Electric and Hybrid Vehicles: Design Fundamentals*.

**Dr. Edgar Lobaton** joined NCSU in August 2011 as Assistant Professor. He completed his Ph.D. in electrical engineering and computer science from the University of California, Berkeley in 2009. Prior to joining NCSU, he was awarded the 2009 Computer Innovation Fellows post-doctoral fellowship award and conducted research in the Department of Computer Science at the University of North Carolina at Chapel Hill. His areas of research include robotics, sensor networks and computer vision. He works on applications ranging from surveillance using smart camera systems to motion planning for medical robotic applications.

**Dr. David Lubkeman** joined NCSU in April 2012 as a Research Professor. He received his Ph.D. from Purdue University in 1983. Dr. Lubkeman has 28 years of experience in electric power systems engineering, and comes to us most recently from Sensus, Inc. His experience includes 15 years in academe, having previously been on the faculty at Clemson and NC State. His research interests include utility distribution system modeling, reliability, analytics and automation.

**Dr. Omer Oralkan** joined NCSU in January 2012 as Associate Professor. He received his Ph.D. from Stanford University in 2004. Prior to joining NC State, he was a Research Associate (2004-2007) and then a Senior Research Associate (2007-2011) in the E. L. Ginzton Laboratory at Stanford. He also served as an Adjunct Lecturer in the Department of Electrical Engineering at Santa Clara University, CA (2009-2011). His research interests are at the

interface of electrical engineering and the life sciences, particularly on using integrated circuits and underlying technologies to implement medical devices and supporting systems for diagnostics and therapy.

The following faculty were promoted:

**Greg Byrd**, promoted to Full Professor  
**Yan Solihin**, promoted to Full Professor

## B. Awards and Honors

**Jay Baliga** (Distinguished University Professor)

- Named among top 35 Indian Thinkers since 1975 by India Today, a leading news magazine in India with a readership of over 15 million.
- Awarded National Medal of Technology and Innovation

**Subhashish Bhattacharya** (Associate Professor) was named the ABB Term Associate Professor

**Greg Byrd**—

- Received the ECE William F. Lane Teaching Award
- Received the COE Outstanding Teacher Award

**Michael Escuti** (Associate Professor)

- Received the Alcoa Foundation Engineering Research Achievement Award for 2011
- Received a Presidential Award for Young Scientists and Engineers (PECASE)

**Brian Floyd** (Associate Professor) received a DARPA Young Faculty Award

**Alex Huang and FREEDM Center** (Progress Energy Distinguished Professor) hosted visit by members of Obama's Council on Jobs and Competitiveness in June

**Veena Misra** (Professor) received the 2011 Alcoa Foundation Distinguished Engineering Research Award

**Michael Steer** (Lampe Distinguished Professor)

- Received the Distinguished Educator Award from the IEEE Microwave Theory and Techniques Society
- Named one of the "Most Creative Teachers in the South" by the Oxford American Magazine

**Keith Townsend** (Professor) Received the Alumni Distinguished Undergraduate Professor Award

Three of our senior faculty were named **IEEE Fellow**:

- **Alexandra Duel-Hallen**
- **Veena Misra**
- **Michael Devetsikiotis**

## C. Seminars, visitors

The Department has continued its Interdisciplinary Distinguished Seminar Series, coordinated by Dr. Hamid Krim, and the ECE Distinguished Speaker Colloquium. The Colloquium featured presentations from distinguished speakers drawn from both academia and industry who addressed a wide variety of topics of interest to our community. The seminar is directed to everyone, from undergraduates on up to faculty and industry friends—the level of the presentations is for non-specialists and accessible to students. The Distinguished Speaker Colloquium was sponsored by our friends at Fluor. Colloquium speakers for 2011-12 were:

**Joseph Torrellas**, Professor, University of Illinois at Urbana-Champaign, "Variation-tolerant Computer Architectures"

**Jay Baliga**, Distinguished University Professor at NC State, "Creating a Sustainable Society"

## D. Staff

The following Staff members received Pride of the Wolfpack awards:

- **Catherine Lull**
- **Katy Wilson**

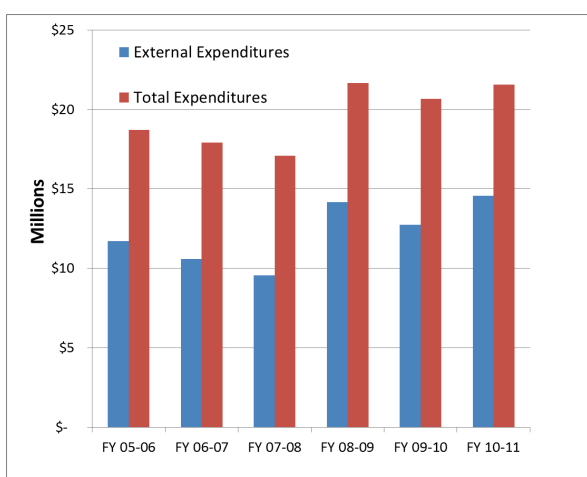
The following Staff members were nominated for COE Awards for Excellence:

- Catherine Lull
- Kim Orłowski

## V. Research programs

The research activities in ECE are healthy and growing. Strategically, we are focusing on three interdisciplinary thrust areas: Energy, Health, and Security. This is well-aligned with the college and university strategic directions. With the activities associated with the FREEDM Center, we have a well-established thrust in Energy. A significant effort this past year to establish a new large-scale research effort associated with health appears to have been successful. Assuming this is so, we will have the second thrust established. The activity associated with national and homeland security in the Triangle area and NC in general is expected to continue growing, offering us significant opportunities to establish the third thrust. Activities toward this goal are continuing.

The total research expenditures by ECE faculty in FY 10-11 were in excess of \$21M, representing an increase of about 4.4% over the previous year. A summary of research expenditures from FY 05-06 to FY 10-11 is shown in the figure below.



## VI. Departmental sponsors

### A. Donations

Sponsorship by Corporations, Alumni and Friends of the Department increased significantly in fiscal year 2011/2012. As of the end of April 2012, we received \$1,361,257 in donations. This is an increase of 61% over the receipts at the end of April of 2011, and an increase of 50% over the total gifts in FY 2011/12. The majority of this increase was from a new endowed professorship from ABB accounting for \$583,389. However, giving remained strong from existing corporate partners. The following companies each contributed over \$30,000: ABB, AMD, IBM, Imagineoptics, Mentor Graphics, Nayak Corp., and SRC.

Donations from Alumni and Individuals in the first ten months of the fiscal year totaled \$45,479, down from \$86,926 during the same period last fiscal year. Most of these donations are for scholarships, fellowships and support of department activities. As a result of our emphasis on the Brick Campaign during the past year, we are now in the process of installing 16 new bricks in the walkway near Engineering Building 2.

### B. Strategic Advisory Board

Our Strategic Advisory Board had two productive meetings during the 11-12 AY: one on October 5, 2011, and one on February 24, 2012. A highlight of the October meeting was a discussion of university intellectual policy by Board Member Laura Shoppe, while a highlight of the February meeting was a tour of several of the research laboratories in ECE.

We were also pleased to add four new members, while one previous member resigned owing to a change of job responsibilities. The members of the Advisory Board are listed below, with the new members this year shown in



bold type. Andy Rindos from IBM completed his term as Chair of the Board, and Nelson Peeler from Duke Energy was elected as the new Chair.

<i>Name</i>	<i>Title</i>	<i>Company</i>
Caren Anders	Vice President	Progress Energy Carolinas
<b>Don Broeils</b>	<b>Vice President, Solid Fuels &amp; Envir. Compliance</b>	<b>Fluor Corporation</b>
Wes Covell	President	Harris Corporation, GCSD
Dean Hering	Chief Innovator	NetCentrics
Serge Leef	Vice President	Mentor Graphics Corporation
Gary May	Dean of Engineering	Georgia Institute of Technology
Tony Montalvo	Vice President	Analog Devices
Nelson Peeler	Vice President	Duke Energy Corp.
Andy Rindos	Head, CAS and World-Wide CAS Strategist	IBM
Laura Schoppe	President	Fuentek
<b>Anders Sjoelin</b>	<b>President and Division Manager, Power Sys. Div.</b>	<b>ABB North America</b>
<b>E.C. Sykes</b>	<b>President, Industrial &amp; Emerging Industries</b>	<b>Flextronics</b>
<b>John A. Toebes</b>	<b>Director, Patents Effect., Tools &amp; Processes</b>	<b>Cisco</b>
Robbie Troxler	Director, Advanced Technology	Troxler Electronic Laboratories
Jan van Dokkum	Operating Partner	Kleiner, Perkins, Caufield& Byers

## VII. Recommendations and concerns for the future

Specific challenges that the department will focus attention on during the next year include:

- *Emphasis on development.* We will continue an increased emphasis on both individual and corporate gifts. A particular goal will be to devise a plan for regularly generating funds for discretionary use such as moving expenses for new faculty.
- *Continue development of faculty-staff-student mixer opportunities.* To foster and strengthen a departmental identity, we will continue our existing activities and develop new ideas for faculty, staff, and students to interact informally.
- *Continue increased emphasis on public relations.* We will continue our efforts to rethink our public and alumni relations through e-newsletters, web site updates, social media, and mailings to increase the visibility of the department.
- *Improved staff environment.* We will give particular attention to the support of our staff in their efforts to support the students and faculty. This will include an emphasis on keeping the staff well-informed about departmental activities, and making sure the department's appreciation of their contributions is clearly communicated.
- *Look for opportunities for large interdisciplinary research projects.* Priorities in the department are to emphasize major interdisciplinary challenges that can draw on strengths across the department. Of particular interest are areas related to national and homeland security.
- *Review undergraduate curriculum.* During the next year, we plan a comprehensive review of our undergraduate curriculum.