

# **Electrical and Computer Engineering Department Strategic Plan**

**By**

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And the Professoriate of the  
Electrical and Computer Engineering Department**

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This document is based on the assessment of our undergraduate programs in electrical engineering and computer engineering by our accreditation agency, ABET, on the review of our department and undergraduate programs by the Dean of CEPS, on the review of the graduate program by the Dean of the Graduate School, and by the ECE-Industrial Advisory Board and the ECE-Student Advisory Board.

## **Vision**

To be recognized internationally for education and research in Electrical and Computer Engineering.

To realize this vision, the Department shall foster:

- A faculty committed to its students' educational success;
- The enhancement of breadth and depth of its undergraduate education;
- Graduate programs that prepare students to conduct research and solve complex engineering problems;
- Innovation and creativity of students, staff and faculty;
- Internationally recognized research programs with strong support from professional constituencies;
- Demonstrable leadership, service, and outreach in advancing engineering professionalism to meet society's needs;
- Educational and research partnerships with agencies, universities, and industries;
- Highly successful alumni who contribute to the profession in the global society.

## **Mission**

The Mission of the Department is to foster and advance knowledge in Electrical and Computer Engineering.

The mission involves:

- Teaching courses in Electrical and Computer Engineering, and related fields, at the Bachelor's, Master's and Doctoral levels;
- Advancing knowledge through research and scholarship;
- Serving the State and Nation by making the Department's intellectual resources available to industry and government agencies.

The undergraduate EE and CE programs shall provide a firm foundation in electrical and computer engineering theory and practice, with a mix of laboratory and design experiences. The programs shall also foster teamwork and project management skills.

The graduate ECE program shall lead to the degrees of Master of Science in Electrical Engineering and the Doctor of Philosophy in Electrical Engineering. Research and scholarship are core components of the Department's mission and they directly impact undergraduate and graduate education. Success in obtaining funds to procure equipment and support research efforts is therefore an essential objective for the Department.

## **Department Strengths**

*Metrics for determining Departmental Strengths include a history of long-term collaborative research, positive feedback from stakeholders, unique faculty knowledge base, and attainment of successful continuous improvement strategies.*

- Core Strengths in Signal Processing, Control and Embedded Systems Engineering, Mobile Computing, and Applied Electromagnetics
- Faculty Directly involved with Hands-on Laboratory Experiences

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- Knowledge Base and Leadership in Distance Learning
- Programs at the MS and PhD Levels with Opportunities for Research Funding (e.g. IOL and Project54)
- Well-subscribed Graduate Program in CEPS
- Active Industrial and Student Advisory Boards

### **Departmental Challenges**

- Research Productivity and Collaborative Effort
- *Diversity of the Active Research Portfolio*
- Undersubscribed EE and CE Programs
- Visibility to Industry and the Public
- Diversity in Program Students and Faculty

### **Objective I: Efficient Use of Faculty Resource**

#### **2007 – 2008 Academic Year Accomplishments**

- ECE Workload Policy has been implemented as of Fall Semester 2007 that is equitable for faculty and fulfills our programmatic needs.
- Through new funding lines (undergraduate differential tuition) the computer cluster has been updated along with all laboratories requiring computers. Equipment housed in the freshman, sophomore, and junior laboratories have been updated and/or replaced with new models. All laboratories including the senior project laboratory have new stools and/or chairs that are adjustable.
- ECE Teaching Assistant Policy has been implemented as of Fall Semester 2007 that directs the Chairman to assign teaching assistants to laboratory and teaching responsibilities and assign non-laboratory course grading to paid hourly students.
- To ensure adequate course populations and to contain resources a Departmental Practice was approved to offer no more than three senior-level elective courses (7XX/8XX) and three graduate-level courses (9XX) per semester.
- To ensure maximum use of educational laboratory space a Departmental Practice was approved to assign multiple uses for each laboratory space. Laboratories have either a multiple-course use or a course and faculty-research use.
- ECE Flexible and Strategic Course Release Program have been implemented as of Fall 2007 to promote research interests and/or Departmental initiatives. Faculty may be released from teaching on a course basis or semester basis to strategically advance research opportunities. The use of this program requires an unusual opportunity, for example a major research initiation, which is collaborative in nature with a high likelihood of success or administrative thrust identified in the ECE Department Strategic Plan. During the first semester of the 2008-2009 academic year Professor Carter will have a one-course release to develop articulation agreements from two-year institutions and high schools to enhance enrollment. *The metric for success will be the attainment of direct course transfer and/or identified course paths to obtain successful admission to our programs.* During the first semester of the 2007-2008 academic year Professor Kraft received a one-course release to visit high schools to attract students and increase our visibility. *This effort was successful in that high school students and teachers*

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*were better informed of the quality and breadth of our curriculum; however, expected increase in student admissions did not occur from the schools visited.*

- Research laboratories have been realigned into core thrust areas to increase critical faculty/staff mass for obtaining research funding and student interest. Present research laboratories are the Bioengineering Laboratory, CATlab, Critical Infrastructure Dependability Laboratory, Energy Laboratory, Mix Signal Laboratory, and the Synthetic Vision and Pattern Analysis Laboratory.

#### **2008 – 2009 Academic Year Accomplishments**

- The ECE professoriate now includes a new hire, Dr. Nick Kirsch, with a specialty area of communications. Dr. Kirsch position replaces Dr. Zhang who resigned and the retirement of Dr. Sivaprasad.
- The equipment in the senior level laboratories in has been upgraded. Focus was on the communications, image processing, biomedical engineering, energy, and digital systems laboratories.

#### **2009 - 2010 Academic Year Tasks (Prioritized)**

- Conduct periodic dialogue between faculty, industry, and government to explore research opportunities through biannual “ECE Research Review” workshops and develop a current profile of faculty expertise for distribution to current and potential industrial and government “clients”.

### **Objective II: Unify and Expand the Graduate Program**

#### **2007-2008 Academic Year Accomplishments**

- The ECE Department has established a Non-Thesis MSEE degree program effective the second semester of the 2007-2008 academic year. (Approved by the ECE Department on December 11, 2007; Approved by the Graduate School on April 4, 2008.)
- The ECE Department has established a Five Year BSEE/MSEE degree path to be effective by Fall Semester 2008.
- The ECE Department has renamed its doctoral program from a PhD in Engineering with an option in Electrical Engineering to a PhD in Electrical Engineering effective Fall Semester 2008. (Approved by the CEPS Faculty on May 8, 2008).
- The PhD Preliminary Examination has been revamped for uniformity and is more informative to requirements.
- The ECE Department has established a relationship with the IOL and Project54 for project assistantships and graduate projects.

#### **2009-2010 Academic Year Tasks (Prioritized)**

- *Increase the number of research active faculty in the department to serve our graduate research mission. Our mission requires faculty to be Research Active. Research Active is described in our “Department of Electrical and Computer Engineering Workload Policy” as a faculty member who publishes an average of 2 papers per year in peer-reviewed engineering/science-related journals or conferences in the most recent 3-year period, and actively pursues external funding annually, with at least one successful proposal every three years. External funding must include student support.” Results of research active faculty will be increased numbers of doctoral students and prestige of our faculty.*

- Establish a set of core courses that all entering Master's Degree candidates must complete. Core courses will offer foundational material and guarantee yearly scheduling.
- Increase graduate course offerings by identifying courses in other departments that may enhance the ECE program.
- Streamline the graduate program by providing uniform standards and identifying a limited number of graduate areas of concentration with course selection paths.
- Seek industrial and governmental sponsorship of graduate fellowships.
- Identify courses that may be offered through FarView. Classes taught through distance education allow archiving lectures for future offerings and also allows a greater attendance by non-traditional students.

### **Objective III: Enhance the Undergraduate Experience**

#### **2007-2008 Academic Year Accomplishments**

- Curricula modifications have been completed for both the EE and CE Programs for increased professional elective course opportunities in the senior year by completing general education courses earlier in the curricula.
- The ECE Department has established a relationship with the IOL and Project54 for research support and undergraduate projects.
- The ECE Laboratory and Equipment Committee have established a policy and plan to upgrade and replace laboratory equipment.
- To increase enrollments and visibility the ECE Department has initiated several thrusts to accomplish this goal. To date we have:
  - Designated faculty to visit high schools.
  - Contracted the Society of Women Engineers to visit high schools.
  - Invited High School Counselors and Science Teachers to Senior Project Day and CEPS Open House.
  - Initiated articulation agreements with Budapest University of Technology and Economics, New Hampshire Technical Institute, University of Novi Sad and SRM.
- The ECE Department has developed its first Inquiry Course. The course is entitled, "Bionics: Technology from Nature" and fulfills a biology general education requirement. It has a laboratory and is writing intensive.
- MatLab has been designated a software tool that is to be integrated throughout both the electrical engineering and computer engineering curriculum.

#### **2008-2009 Academic Year Accomplishments**

- Enrollments are on the rise. Presently the ECE Department has approximately undergraduate 180 students and 60 graduate students. The split between EE and CE is 50% for freshman. Increased enrollment maybe due to our strategic program to liaison with public and private high schools, develop relationships with technical institutes and community colleges, structure facility visits for counselors and teachers by compensation for travel, distance learning via the internet, handouts for admission officers, and a diversity plan targeting under-represented minorities.

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- Our senior project course sequence has been strengthened by setting up rules for procedures for ME/ECE Teams. Furthermore, a one-credit class was added to the second semester of the junior year to cover professional practices and to allow the choice of a senior project earlier in the curriculum.

#### **2009-2010 Academic Year Tasks (Prioritized)**

- Review and redesign the University Honors-in-Major Program. Set entrance rules, increase the number of Honors' Courses, and establish a tracking program.
- Develop and implement strategies for increasing retention. While our retention rate of 44% is consistent with other electrical and computer programs, the faculty finds the rate unacceptable. Under consideration are tutoring services, student mentors, visibility with undeclared students, and promoting student organizations.
- With the concurrence of ABET and the External Review Committee for a laboratory-based science experience for the computer engineering program students, the Chairman directs the ECE Undergraduate Committee to discuss and recommend a suitable laboratory-based experience for computer engineering students.
- The Chairman will hold faculty and stakeholder meetings to explore new undergraduate offerings. For example, majors in Bioengineering, Computer and Communications, Embedded Systems, Security Engineering and minors in "alternative energy", biotechnology, may be considered.

### **Objective IV: Continually Increase the Awareness of Industry, State Leaders, Alumni and University Leaders Concerning the ECE Department's Accomplishments and Excellence; and thus, Obtain their Financial Support and Enhance our Image**

#### **2007-2008 Academic Year Accomplishments**

- The ECE Professoriate has developed a working relationship with the University Foundation through Mathew Carylton, our contact for gifts and alumni support. The ECE Faculty maintains a close relationship with past donors through pre-game activities and alumni reunions.
- The ECE-Industrial Board continues to serve as an advisory board to 1) provide assistance in identifying individual and corporate prospects, 2) serve as advocates for the department, and 3) provide direction and guidance.

#### **2009-2010 Academic Year Tasks (Prioritized)**

- Update the ECE Web-based information to be up-to-date and captivating and easy to navigate for visitors.
- Publish an annual alumni magazine (Signals and Noise).
- Establish an "ECE Capstone Engineering Society" to create an atmosphere of cohesion.

### **Far-Term Goals**

The present strategic plan responds to the Vision and Mission of the ECE Department for the near-term (2 years). However, the present plan has foundation for far-term goals. Far-term goals include: 1) Increasing the undergraduate enrollment that is split evenly between electrical and computer engineering majors. To accomplish this goal the

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Department plans to visit high schools and develop articulation plans with two-year community colleges, high-schools, and universities, develop minors and/or concentrations in bioengineering and energy, participating in the Discovery Program and enhancing the Honors Program. 2) Increasing retention rates. To accomplish this goal the department proposes to modify its curriculum to enhance creativity and remove redundancy, to provide an introductory course spread over two semesters of the freshman year that stimulates students, and to improve the advisory program that will speak to the student's needs. 3) Increasing research activity and thereby increasing funded graduate research assistantships. To accomplish this goal the department proposes to add new assistant professors for balance in rank and critical mass and at the same time adhere to the Department's Workload Policy whereby faculty able and willing to teach instead of performing research activities will have their teaching load increased and those faculty interested in research activities will have their teaching load decreased. 4) Increasing our visibility to the Nation as an engineering professoriate that provides a practical experience for students as well as modern engineering theory and engineering faculty that is recognized for their contributions to society. To accomplish this goal the department will work with the Alumni Association to locate alumni who are willing to speak to their accomplishments grown from their experience at UNH, work with the ECE-IAB to gather information about the success of our students, and publish faculty accomplishments such as participation in conferences, holding professional office, editorship, and/or scientific writings.