

UNIVERSITY OF WYOMING

COLLEGE OF ENGINEERING AND APPLIED SCIENCE



Department of Electrical and Computer Engineering Plan

Mission

The Department of Electrical and Computer Engineering (ECE) at the University of Wyoming is committed to outstanding undergraduate education, world class graduate education and research, and service to the state of Wyoming and the engineering discipline. The department focuses on preparing students with a strong background in engineering fundamentals, while offering opportunities to gain experiences that go beyond the typical curriculum in their chosen field of engineering. Small classes with research opportunities for undergraduate and graduate students enhance their learning experience, while dedicated faculty and staff work to increase the students' exposure to new industry ideas and trends. The department's faculty and staff are among the best in the country and many have achieved national and international recognition for their work.

Goals and Aspirations for the next five years

- Complete an equipment upgrade to all undergraduate laboratories
- Increase undergraduate enrollment in both electrical and computer engineering
- Increase participation in the BS/MS Electrical Engineering Program
- Receive six year ABET/EAC accreditation for each of the department BS programs
- Introduce new coursework in cutting-edge technologies
- Increase enrollment of graduate program, with emphasis on Ph.D. students
- Continue to promote and participate in interdisciplinary research areas, such as neuroscience, wind energy, robotics, biomedical instrumentation, and materials science and engineering.
- Continue to promote active research in Control Systems, Electric Energy Systems, Electronic Systems and Devices, and Signal Processing and Computer Networks
- Introduce an interdisciplinary masters program, such as one focused on wind energy

Previous Planning Accomplishments

The department was actively involved in the development of the University of Wyoming's Academic Plan II 2004-2009. Department members were involved with creating various sections within the plan as well as serving as final reviewers for the Vice President of Academic Affairs.

Relevant Institutional Issues

Provided below is a brief summary of our progress in areas of university distinction as well as several institutional issues.

- **Environment and Natural Resources:** The technologies utilized for monitoring environmental systems rely upon basic electronic instrumentation systems as well as computer and communication facilities which our graduates design. Natural resource utilization, including alternative energy sources, and pollution abatement processes include control systems technologies and electronic techniques, which are founded in our core disciplinary studies. Wherein the enabling technology is the electronics, synergistic research projects currently exist with department faculty and other college faculty. Dr. Mark Balas, ECE head, and Dr. John Naughton, ME, received a \$2 million donation in September 2007 from BP America to establish a center dedicated to wind energy research.
- **Life Sciences:** The bioengineering option of the electrical engineering BS degree continues to be popular both with students seeking careers in clinical systems engineering (medical technology product design or facilities-based deployment) as well as those seeking an applied engineering path to subsequent professional programs in medicine. This program was renamed the F.M. Long Memorial Bioengineering Option. Furthermore, our advanced electronics design lab was renamed the Francis M. Long, Ph.D. Memorial Laboratory this year. At the graduate level, cooperative research in life sciences is currently underway with department faculty and associates across the university and other institutions, including participation in NIH and NSF-funded programs. Dr. Steven Barrett and Dr. Cameron Wright are members of the University of Wyoming Neuroscience Center for Biomedical Research Excellence (COBRE). We are also actively involved in a number of life sciences related research projects involving the development of the next generation of fly inspired vision sensors, as well as developing the next generation of battlefield health monitoring equipment, and the custom design of assistive technology for challenged individuals.
- **Critical Areas of Science and Technology:** ECE is the fastest growing area of future demand for young engineers. Computer and communications technologies are driving the information systems which are the foundation for our worldwide economy. The reliability and safety of public infrastructure elements, including power systems, communication and public transportation, are dependent upon the technologies at the core of the undergraduate programs in the Department. The long-standing hexapod controls research program, led by Dr. John McInroy and Dr. John O'Brien, is part of a national effort in smart structures and materials that fits UW's materials efforts. Dr. John Pierre's computationally intensive research in monitoring the stability of the power grid is part of a national effort by the DOE to improve the reliability of the US power grid infrastructure. In addition, the ECE Department forms a central focus for the computational sciences expertise at UW.
- **Professions and Issues Critical to the Region:** A major fraction of our undergraduates find employment in the Rocky Mountain and Pacific Coast regions. Growth of the Colorado Front Range technology corridor has included a large number of our graduates at all levels. Small business opportunities in Wyoming are growing with a notable increase in electrical and computer engineering technologies, including support by University of Wyoming alumni as well as department faculty and students. Faculty have been and will continue to support small business and technology growth through the SBIR and STTR programs. Dr. Wright has been working with DRT, Incorporated on a non-invasive critical care monitor. Drs. Hamann, Kubichek, and Pierre continue to work with Intermountain Laboratories (IML) in Sheraton, on infrasonic arrays for avalanche detection. The department will continue to support research of electric power issues in the State and Nation. Dr. Ula has been involved with a number of power related projects throughout the state.

- **Bolstering Graduate Education:** The department has established a BS/MS program as a method of enabling the best and brightest of our undergraduate students to remain at UW for graduate studies. We have also worked energetically to recruit other graduate students to the program. We graduated our first BS/MS Electrical Engineering student in May 2007.
- **Strengthening Interdisciplinarity:** The department has been an active member of UW's National Institutes of Health, Center for Biomedical Research Excellence (COBRE) in Cellular Signaling. This is a team research effort with the Zoology and Physiology Department. The department also participates in the Molecular and Cellular Life Sciences (MCLS) Program.
- **Expanding Internationalization:** The department has been active in the college level efforts to institute an international option for our students. This program was approved at the university level in Spring 2006. The department has actively supported this program and have encouraged our students toward an international experience. One of our Ph.D. candidates, Brian Zuelke, studied aerosol-particle measurement technologies in Germany during this past academic year. Included in this year of study is a semester of study at the Technical University in Braunschweig, as well as an internship with Sympatec GmbH. Additionally, one of our graduating seniors, William O'Keefe studied Russian at Saratov State University in the Volga Region of Russia. One of our undergraduate students, John Barksdale, is President of the Engineers Without Borders student chapter.

Action Items/Implementation

- Complete an equipment upgrade to all undergraduate laboratories
 - o Summer 2008-2009: A partial laboratory furniture and equipment upgrade is in progress
 - o Continue to work with department alumni to fund future upgrades
- Increase undergraduate enrollment in both electrical and computer engineering
 - o Continue to participate in technical recruiting programs HSI, ESP, JETS, STEM, Middle School Girls
 - o Work with college's new Office of Student Service to visit regional high schools
- Increase participation in the BS/MS Electrical Engineering Program
 - o Continue to highlight program to juniors/seniors
 - o Continue to highlight program during Tau Beta Pi Career Services/Graduate School Seminar given twice per academic year
- Receive six year ABET/EAC accreditation for all department BS programs
 - o Summer 2008: Complete EE Draft Self Study
 - o September 2008: Complete CPEN Draft Self Study
 - o July 1, 2009: Self Study material due to ABET
 - o Nov 1-3, 2009: On site visit
- Increase enrollment of graduate program, with emphasis on a greater percentage of Ph.D. students
 - o Continue to highlight graduate program opportunities during Tau Beta Pi Career Services/Graduate School Seminar given twice per academic year
- Continue to promote and participate in interdisciplinary research areas, such as neuroscience, wind energy, robotics, biomedical instrumentation, and materials science and engineering.

- Introduce new coursework in cutting-edge technologies
 - o Recent/Upcoming new offerings:

EE5880 Dr. McInroy	3D Computer Vision	New course offering Spring 2008
EE5880 Dr. O'Brien	Advanced Classical Control	New course offering Spring 2008
EE5880 Dr. Barrett	Industrial Controls	New course offering Spring 2008
EE5880 Dr. Stefanovic	Multivariable Control	New course offering Fall 2008
EE5880 Dr. Balas	Dynamics and Control of Wind Turbines	New course offering Spring 2010
EE5880 Dr. Wright	Electronic Imaging and Fourier Optics	New course offering under development

- Introduce an interdisciplinary masters program, such as one focused on wind energy
 - o Dr. Balas offering new course EE5880, Spr 2010, Dynamics and Control of Wind Turbines
 - o Goal is to have degree in place by Fall 2010

Required Faculty, Resources and Equipment

- To continue to grow our graduate program we need faculty positions in the following areas:
 - o Energy and Power
 - o Biomedical Engineering
 - o Robotics
- During the past two academic years the ECE Department has completed a major renovation of some of our department laboratories. The department has spent approximately \$134,500 on laboratory equipment and furniture for the Electronics II, Digital Design, Network Design and Senior Design laboratories.
- The department also completed major laboratory renovation to support coursework in Industrial Control. This technology is vital to gas and oil based industries throughout the state. The renovation was funded by a gracious donation of \$25,000 from Bruce and Carla Pivic of Infinity Power and Controls, Rock Springs, WY.
- Two department laboratories are in critical need of major equipment upgrades: Electromechanics laboratory supporting our power and energy related coursework and our heavily used basic circuits laboratory. Much of the equipment in these two laboratories is no longer supportable. It will require approximately \$150,000 to upgrade these laboratories.
- Additional laboratory space for instructional and research laboratories is needed. Specifically, a large senior design space capable of hosting joint mechanical and electrical/computer engineering projects is desirable. Additional research laboratory space is required for some of our burgeoning programs (e.g. wind energy, joint robotics sponsored research programs).