Electrical & Computer Engineering Department
Industrial Advisory Board (IAB) Meeting Minutes
Friday, April 25, 2008

IAB Present: Colin Baldwin, Paul Beiser, Jon Benson, Dan Byers, Michael Coddington, Chuck Duey, Kamran Eftekhar Shahroudi, Jason Gentry, Elena Gonzalez, Jim Greener, Lance Guymon, Duncan Halstead, Ed Hulls, Alvin Loke, Scott Lukes, Scott Makinen, Grant Miller, Paul Monson, John Nichols, Mike Pichler, Chuck Quire, Wayne Rewinkle, Diane Sparn, Fernando Tomasel

Faculty & Staff: Anura Jayasumana, Andrea Leland, Rockey Luo, Tony Maciejewski, Olivera Notaros, Jerry Potter, H.J. Siegel, Peter Young

Guest Speakers: David Keyser, Research Economist; Martin Shields, Regional Economist and CSU Associate Professor of Economics; Wade Troxell, College of Engineering Associate Dean for Research and Economic Development

ECE Students: Michael Bazzo, Brian Brady, Joshua Dickerson, Jon Kay, Mike Neuberg, Garet Scranton

1. Introduction and Welcome (Fernando Tomasel, IAB President)
   Fernando kicked off the meeting by welcoming new members and visitors: Kamran Eftekhar Shahroudi, Woodward; Michael Pichler, Coors Brewing Company; Wayne Rewinkle, Analog Devices; and ECE student representatives. He reviewed the agenda and then turned it over to Tony Maciejewski for the Department Update.

2. ECE Department Update (Tony Maciejewski, ECE Department Head)
The presentation included the following topics:
   a. Dr. Carmen Menoni leads $2.5M ONR laser project
   b. Chandra named Associate Dean for International Research
   c. $2M antenna upgrade to the CHILL radar
   d. ECE participates in Collaboratory energy projects (see item 7)
   e. ECE research and student projects in the news
      — SimPooch published in media outlets throughout Colorado and the world, including the BBC
      — Laser research featured
   f. ECE to celebrate 100 years of graduates – we will be seeking ideas from the IAB
   g. Adjunct faculty member Bill Eads establishes scholarship for ECE students
   h. Engineering Career & Internship Fair becomes two-day event – thanks for your participation
   i. Department continues emphasis on recruitment with special events and personal visits
   j. Engineering Exploration Day draws record turnout
   k. Professional Development Institute picks up steam
1. ECE gets rave reviews in fall 2007 ABET visit!

m. Remaining Spring Events:
   — ECE Graduation Reception (announce Best Paper Contest winner) and Commencement Ceremony: May 16

n. Planned Fall Events (dates forthcoming):
   — Student Advising Day
   — Alumni and Friends Event
   — IS&T Day for High School Students and Counselors
   — Engineering Exploration Day

o. ECE enrollment trends

p. Trends in freshmen enrollment

q. Undergraduate degrees awarded – calendar year 2007

r. Graduate degrees awarded – calendar year 2007

s. Percentage of graduate degrees awarded to international students

t. ECE research expenditures

3. Update on Action Items from Fall Meeting (Tony Maciejewski)

Tony’s presentation provided an update on the following action items:

   o Action item: Revisit agenda items not addressed during the first breakout session
   o Status: Discussing during today’s breakout session.

   o Action item: Obtain feedback from board regarding department’s wish list.
   o Status: Karen Ungerer sent the list following the fall meeting. We have not yet received any feedback or ideas from the board on how to better communicate our equipment needs.

   o Action item: Increase student-to-student interfacing.
   o Status: Held phone-a-thon in January, where current students called prospective students to “sell” them on the ECE department and answer questions. Current students also provide tours and meet with prospective students.

   o Action item: Educate high school counselors of who we are and what we do.
   o Status: Presented department overview as part of ISTeC’s IS&T Day for High School Students and Counselors; reached 22 counselors from high schools around Colorado.

   o Action item: Utilize high school counselors to identify students interested in STEM disciplines.
   o Status: Leveraged new FIRST scholarship to reach out to counselors for assistance in identifying top-tier students.

   o Action item: Improve perception of engineers; get away from “geek” image.
   o Status: Examples of “cool” ECE careers were featured in Exploration Days presentation and as part of new bulletin board in the engineering building.

   o Action item: Provide personal attention to ECE students.
   o Status: ECE forums for faculty and students held in fall and spring to personally address students’ questions and concerns. “Connections” lecture series created to increase faculty interaction with students. ECE Degree Exploration Fair with faculty and students was held.

   o Action item: Target older, non-traditional students; partner with employers to get their employees advanced degrees.
   o Status: Submitted proposal to grad school to solicit funding for this effort. Invited industry to ECE Grad Visit Day.

   o Action item: Create an energy cluster involving NREL, CSU, CU, Mines.
   o Status: “Collaboratory” under way. Wade Troxell leads the initiative at CSU.
Action item: Explore possibility of expanding mentoring opportunities.
Status: Currently seeking ideas and feedback from freshmen to determine effectiveness of ECE Peer Mentoring Program.
Action item: Explore shadowing program and make internships available early on in student’s career.
Status: Andrea is working with IAB on Shadow Day. We have included freshmen and sophomores on distributions of available internship opportunities.
Action item: Investigate the pre-engineering curriculum in high schools.
Status: Participated in local summit held by Poudre School District. PSD, area businesses, and university reps discussed how to better prepare high school and college students for today’s workplace.
Action item: Involve students early on concerning elements of senior design.
Status: The department formally adopted courses to give students credit for early involvement in senior design. Currently there are 8 underclassmen working on 7 projects with 6 professors. In addition, some seniors have expressed an interest in continuing work on their projects after graduation. As a result, the new course sequence will be: Pre-Senior Design, Senior Design, and Post Senior Design.
Action item from SP07 meeting: Investigate the possibility of expanding the ECE seminar series to include two-part seminars from companies. The seminars would occur at CSU on the same day, back-to-back. The first seminar would focus on the company’s research initiatives, the second seminar would include more detailed information about the company.
Status: QUALCOMM’s VP of Engineering recently gave a technical talk followed by a Q&A session and overview of QUALCOMM, including employment and other opportunities for ECE students.

4. Update on Global Competition (Tony Maciejewski)
Tony provided an update on global competition, a major topic discussed at past IAB meetings. The information comes from the Journal of Engineering Education, Jan 2008. A copy of the full report is available on the ECE web site: http://www.engr.colostate.edu/ece/ind_relations/IAB.shtml.
- The gap between the number of engineers produced in the U.S. vs. those in India and China is smaller than previously reported.
  - Statistics commonly used are inaccurate indicators because engineers are defined differently across international borders.
- Engineering grads in China and India face the prospect of substantial unemployment, despite high corporate demand for their service.
  - Quality of private institutions in India varies significantly.
  - Despite (or because of) recent surge in engineering grads, only a fraction of China’s top institutions have maintained their commitment to the quality of education they deliver.
- U.S. remains a leading source of high-quality global engineering talent.
  - Respondents stated that 80.7% of U.S. engineers were employable, while only 10% of Chinese engineers and 25% of Indian engineers were similarly employable.
- Dynamic vs. Transactional Engineers
  - Dynamic Engineers – individuals who are capable of abstract thinking and high-level problem solving using scientific knowledge, and are most likely to lead to innovation.
- Transactional Engineers – individuals who possess technical training, but not the experience or expertise to apply this knowledge to larger domains.

5. **Possible Topics for Fall IAB Meeting (Tony Maciejewski)**
   - New Systems Engineering program under way (led by Ron Sega, ECE Professor and VP for Energy, the Environment, and Applied Research at CSURF)
   - Work with IAB to update science and technical electives for specific career fields.

6. **Northern Colorado Economic Outlook (Martin Shields, Regional Economist and CSU Associate Professor, and David Keyser, Research Economist)**
   Martin and David presented employment statistics and the economic forecast for Northern Colorado, with specific information related to engineering. A copy of the full Northern Colorado Economic Outlook Report is available on the ECE web site: [http://www.engr.colostate.edu/ece/ind_relations/SP08_IAB.shtml](http://www.engr.colostate.edu/ece/ind_relations/SP08_IAB.shtml).

7. **Colorado Collaboratory (Wade Troxell, College of Engineering Associate Dean for Research and Economic Development)**
   Wade provided an overview of the Colorado Collaboratory, a research partnership among the National Renewable Energy Laboratory and Colorado’s premier research universities: Colorado State University, the University of Colorado at Boulder, and Colorado School of Mines. The Collaboratory will receive up to $2 million per year from the state of Colorado to attract research grants and contracts from federal and private sources. The ECE department will play a major role in the Collaboratory, utilizing its expertise in controls to manage and maximize efficiency of wind turbines and “smart” grid technology.

8. **Breakout Session: ECE Focus Areas of the Future (Facilitator: John Nichols, IAB VP, Plexus Technology Group)**
   John asked the board to consider and discuss among their tables the following questions:
   - In which areas should we hire new faculty?
   - Based on your view of the industry and where it’s headed, which research areas make the most sense for the ECE department?
   - What curriculum changes are needed?
   - What mechanisms do we implement to execute suggested changes (e.g., hire more adjunct faculty)

**Summary of group discussions:**

Remarks related to focus areas:
- Understanding of systems engineering is critical. The board was pleased to hear that a program is currently under way.
- Too late for unique power curriculum, but the department could weave in additional power courses to existing program of study.
- Create a “green” curriculum. The department would continue focusing on its strengths but identify ways in which current courses help the environment, provide clean energy solutions, and support a green lifestyle. Market these attributes to prospective and current students to position the ECE department as a green major. Offer additional green-related courses from other disciplines as
electives to further develop this concept. In addition, reach out to industry leaders along the I-36 corridor (e.g., Conoco-Phillips) and form partnerships that will position CSU and ECE as a frontrunner in renewable energy. Finally, conduct a competitive analysis of premier Colorado research universities (CU and Colorado School of Mines), identify weaknesses as it relates to renewable energy, and fill in the gaps.

- Provide students with breadth in other areas besides ECE, making them more marketable and employable. Facilitate exposure to other disciplines such as atmospheric science, mechanical engineering, business, etc. Introduce these other areas in the freshmen year then tie everything together in senior design.
- Consider more depth in networking and architecture.

**Remarks related to faculty:**

- Figure out a way to better connect faculty with students so that the undergraduate population does not feel like the professors are focused solely on research. The teaching and outreach aspects are critical for faculty, along with continuing to grow their research.
- Provide more opportunities for faculty to gain industry experience. One possible avenue: encourage industry interaction through sabbaticals. This gives faculty a better sense of what is expected of employees and what will make students more employable. A few board members said that recent graduates need to learn how to wrap up a project, understanding when enough is enough. Projects in the real-world sometimes have short timelines and deadlines that need to be met.
- Hire more adjunct faculty with industry experience. Partner with industry to pay 50/50 salary. Target senior professionals, possibly nearing retirement. Most likely, these seasoned professionals are not quite ready for retirement but they have a wealth of experience and knowledge to impart. Consider one course/one-year service contracts to gauge their abilities without being locked into a long-term agreement.

**Remarks related to curriculum:**

- The board feels that students need to be more adaptable and flexible, given the rapidly changing marketplace.
- Some board members feel that students don’t know how to properly use lab equipment and that they aren’t as “high tech” as they should be. They suggested creating a lab that is focused solely on teaching students how to use various types of cutting-edge equipment such as network analyzers and oscilloscopes.
- Continue with in-depth courses in the fundamentals.
- Specific courses recommended:
  - Analog IC Design
  - More 400 level courses
  - Bio tech courses
  - Systems engineering courses: firmware, control systems, and power distribution and integration.
  - Power engineering (one course or more): grid transmission, distribution, and integration; motors and machines; introduction to distributed energy; proper use of energy.

**Suggested areas related to research:**

- Post-silicon technology
- Software systems/firmware
9. **Industry Spotlight: Intel (Scott Makinen, Design Automation Manager for the Itanium Development Group)**
Scott presented an overview of Intel, with specific information on the Fort Collins facility, which held its grand opening last year.

10. **Student Design Presentations**
Two student groups presented their senior design projects to the board. Jonathan Kay and Garet Scranton shared their Remote Door Opener for wheelchair-users, while Michael Bazzo, Brian Brady, and Joshua Dickerson gave an overview of their DMX-512 Theater Controller.

11. **IAB Elections (Facilitator: Fernando Tomasel)**
The board unanimously voted in favor of Alvin Loke as the new IAB vice president. John Nichols becomes IAB president.

11. **Closing Thoughts (Tony Maciejewski)**
Tony wrapped up the meeting and thanked the board for their participation. He encouraged everyone to attend the fall IAB meeting on October 24.

**ACTION ITEMS:**

- Discuss new Systems Engineering program under way.
- Work with IAB to update science and technical electives for specific career fields.
- Create a “green” curriculum. The department would continue focusing on its strengths but identify ways in which current courses help the environment, provide clean energy solutions, and support a green lifestyle. Market these attributes to prospective and current students to position the ECE department as a green major. Offer additional green-related courses from other disciplines as electives to further develop this concept. In addition, reach out to industry leaders along the I-36 corridor (e.g., Conoco-Phillips) and form partnerships that will position CSU and ECE as a frontrunner in renewable energy. Finally, conduct a competitive analysis of premier Colorado research universities (CU and Colorado School of Mines), identify weaknesses as it relates to renewable energy, and fill in the gaps.
- Provide students with breadth in other areas besides ECE, making them more marketable and employable. Facilitate exposure to other disciplines such as atmospheric science, mechanical engineering, business, etc. Introduce these other areas in the freshmen year then tie everything together in senior design.
- Figure out a way to better connect faculty with students so that the undergraduate population does not feel like the professors are focused solely on research.
- Provide more opportunities for faculty to gain industry experience. One possible avenue: encourage industry interaction through sabbaticals. This gives faculty a better sense of what is expected of employees and what will make students more employable.
- Hire more adjunct faculty with industry experience. Partner with industry to pay 50/50 salary. Target senior professionals, possibly nearing retirement. Most likely, these seasoned professionals are not quite ready for retirement but they have a
wealth of experience and knowledge to impart. Consider one course/one-year service contracts to gauge their abilities without being locked into a long-term agreement.

- Address concern that recent grads aren’t as “high tech” as they should be and aren’t able to properly use lab equipment.
- Review and consider implementation of recommended curriculum changes: analog IC design, additional 400 level courses, systems engineering courses, power engineering courses, and bio tech courses.
- Review and consider implementation of research recommendations: post-silicon technology, software systems/firmware, bio tech, and reassess current research strengths.

Please mark your calendar for the fall IAB meeting on Friday, October 24, 2008.