Industrial Advisory Board (IAB) Meeting Minutes

Friday, October 7, 2011
Lory Student Center Grey Rock Room

IAB members present:

ECE department present:
Diego Krapf, Andrea Leland, Tony Maciejewski, Branislav Notaros, Olivera Notaros, Sid Suryanarayanan, HJ Siegel, Karen Ungerer, Peter Young, and a group of undergraduate ECE students.

1. Introduction and Welcome (Jim Greener, IAB president)
Jim opened the meeting by welcoming new IAB members: Rich Laubhan, LSI; Matt Bold, Lockheed Martin (was not present).

2. Department Update (ECE Department Head Tony Maciejewski)
Tony began his presentation by recognizing and thanking IAB members with at least 10 years of service: Jason Fegley and Grant Miller.

Tony then gave his department update, addressing the following topics:
- Chandra named 2011 University Distinguished Alumnus
- Biedron and Milton win $2 million grant to support the Office of Naval Research
- Bartels, Backus receive DOE grant to develop x-ray source
- National Academy of Engineering taps ECE Prof. Sid Suryanarayanan for prestigious symposium
- CSU among nation’s research leaders with $330 million this past fiscal year
  i. 10% growth; 24% in past 6 years
- BC-Infill Renovation Completed! (Tiger Team initiative)
- Best Paper Contest winners: Nicholas Annis and Michael Gilliland, "Web Application for Enterprise Computing"
- Coffee group formed to address recruitment and retention of women in ECE (Tiger Team initiative)
- Special thanks for equipment gifts:
  i. Intel (Scott Makinen)
  ii. Agilent (Dan Ferguson)
  iii. Vaisala (Chuck Quire)
  iv. HP (Kevin Matherson)

Graphs and charts:
• Trends in College of Engineering research expenditures (FY05-11)
• Distribution of College of Engineering research expenditures (FY10-11)
• Trends in ECE research expenditures (FY05-11)
• National engineering enrollment trends
• ECE enrollment trends
• Distribution of COE student credit hours
  i. ECE ranked in the top 5 among CSU departments with the largest percent increase in student FTE in AY 09/10 (17%)
• Undergraduate degrees awarded
• Enrollment trends by class
• Freshmen enrollment
• ECE persistence
• Percent of ECE Colorado freshman enrollment (2006 vs. 2010)
• Percent of ECE Colorado total enrollment (2006 vs. 2010)
• Graduate degrees awarded
• Percentage of graduate degrees awarded to international students

Question posed regarding retention: Do you know where students go when they leave?

Tony’s response: It’s all over the board. Most stay within the University. Approximately 70% graduate from CSU.

Question about graduation rates: What is the grad placement rate for Mechanical Engineering?

Tony’s response: We will need to follow-up and report back.

3. Update on Spring Action Items
At each meeting Tony provides progress updates on notable suggestions from previous board meetings. He reported on the following action items from the May 2011 meeting.
• Action item: Offer ECE lab tours after a future meeting.
  • Status: ECE Prof. Sid will lead tour of EECL after today’s meeting.
• Action item: Provide Mike Freeman’s contact information to the board, along with details about IEEE panel discussion.
  • Status: Information distributed following spring meeting. Mike recently accepted new position as CEO of the Rocky Mountain Innovation Initiative.
• Action item: In developing new online curriculum, focus on flexibility.
  • Status: Using a certificate model, the online ME in ECE will provide the highest possible level of flexibility in course offerings.
• Action item: Offer certificates in focus areas that are of greatest interest to the industry.
  • Status: Certificates established based on IAB feedback and survey results: Computer Engineering, Software Engineering, Systems Engineering, Embedded Systems, Power & Energy Engineering, and Interdisciplinary Options (includes business and management courses).
• Action item: Use feedback from the IAB and the survey to determine which courses need to be developed for online delivery.
  • Status: Used IAB input to determine which existing courses should be implemented first for online delivery. New courses will be developed based on market needs.
• Action item: Rely on industry partners to help spread the word about the online degree program.
• **Status:** Additional details and marketing materials will be distributed this winter. The degree will launch in FA12.

• **Action item:** Consider developing case studies/testimonials to promote the online program.

• **Status:** This idea will be considered as part of phase II of the marketing plan.

• **Action item:** Visit companies to spread the word about the online program.

• **Status:** Carl Melle, director of CSU OnlinePlus, would like to schedule visits beginning in February. If interested, contact Andrea.

• **Action item:** Consider hosting a future IAB meeting somewhere in the Denver area.

• **Status:** Chuck Quire recommended a possible venue for future consideration. Thoughts on hosting off-campus?

*We learned that about half of ECE board members travel from Denver. Bob Gresham volunteered to host our group at his workplace in downtown Denver. A downside is that it would be harder to get students to attend. The board agreed to take a poll by email to see if members like the idea of hosting a meeting off-campus. Andrea will follow-up before the spring meeting.*

• **Previous action item:** Expand program and research in the area of Power.

• **Status:** Drs. Liqing Yang and Sid Suryanarayanan hired. The Power & Energy Engineering team will offer a certificate through the online degree program.

• **Previous action item:** Continue working with Math department to get mathematics courses for engineering students taught by regular faculty (not TAs).

• **Status:** Issue is currently under review by the undergrad director for the Math dept. They are discussing implementation and like the idea of including the ECE-perspective into some of the classes, possibly taught by ECE faculty. Updates to follow.

4. **Research Spotlight: Diego Krapf**

Dr. Diego Krapf, ECE assistant professor, shared detailed information about his work on super-resolution imaging and single molecule tracking in living cells. He provided video footage and examples to explain his research. The board seemed very interested and impressed with his presentation. They asked a number of questions afterward.

5. **Industry Spotlight: Arrow Electronics (Scott Evans)**

Scott Evans shared a broad overview of Arrow Electronics, touching on the company’s areas of focus, customers, business philosophy, etc. Arrow is a Fortune 140 company headquartered in Colorado. Scott also shared information about his background. His current title is field applications engineer, but he spent a number of years in marketing and finance.

6. **Overview of Aerospace & Clean Energy Park (Paul Czarnecki)**

Paul provided an update on the Aerospace and Clean Energy Park (ACE) in Loveland. Paul, who recently retired from Anheuser-Busch, got involved in the project because of his manufacturing experience. Paul explained the primary goals of ACE and the economic benefits, including upwards of 10,000 jobs for the region. He said the project is moving forward very aggressively. ACE is not government funded; a company in Kentucky has agreed to a long-term commitment to support the park. Paul emphasized the importance of collaboration between industry and universities. He noted that Northern Colorado is recognized as a high-tech region with great potential for growth. He said research is a big draw, which enhances the talent pool. Paul has been meeting with stakeholders since July and expects to have new tenants move to the campus by the end of July, with more to follow later in the year.
The board asked how they can help with the project. Paul said they didn’t need anything in the short-term; in the long-term, he’d appreciate support in promoting and selling the concept of ACE.

7. Recap of 2005 meeting (Tony Maciejewski)
Tony framed the breakout session by sharing the results of the 2005 IAB meeting when the board talked about *The Engineer of 2020*. The goal was to help board members understand the areas of importance at that time to compare/contrast with their current outlook.

Summary:
- **Key factors impacting higher education**
  - Increased homeland security
    - Restrictive visa policies dissuading students from applying to study in the U.S.
  - Increased quality in graduate programs abroad
    - Foreign countries are building up S&E at a faster rate than the U.S. can achieve
    - China graduates more engineers than any other country in the world; the U.S. is fourth in engineering graduate production, also behind India and Japan. (IEEE, Nov. 2004)
    - The U.S. has relied heavily on foreign-born engineers
- **Long-term ramifications**
  - Critical need to educate students for competitive careers in a global economy
    - IAB input is key
  - Ramp up recruitment
  - Increase emphasis on continuing education and retraining in excessively outsourced fields
- **Summary of ’05 discussions**
  - Board did not recommend major changes to the ECE curriculum; emphasis on core fundamental courses essential.
  - Look at expanding continuing education opportunities.
  - Continue to collaborate with industry and encourage the pursuit of engineering among K-12 students.
- **Review of follow-up activities since 2005 report (dept-level)**
  - Visa Impact
  - Recruitment focus shifted to U.S. born students
  - Noticeable improvements in processing times
  - Research funding skyrocketed and still growing – ECE benefited from ARRA funds
    - 400% growth in research expenditures since FY02-03
  - Continuing education initiatives underway, including online M.E. degree due to launch in FA12.
  - Continuing to encourage industry involvement from senior design to K-12 outreach to special events.

Tony also provided a summary of the current report, *Rising Above the Gathering Storm, Revisited*.
- **Current State: Three Trends**
- Decreased financial wherewithal to address the competitiveness challenge
- Progress... abroad
- The U.S. higher education outlook
  - Other nations placing extraordinary priority on higher education, particularly in S&E
  - Due to recent financial reversal, U.S. universities are in greater jeopardy than at any time in nearly a century

**Current State: Quality vs. Quantity**
- Engineering Colleges in India Have Tens of Thousands of Vacant Seats
  - The Indian government is considering temporarily stopping the approval of new engineering schools
  - IT boom has led to thousands of new engineering colleges in the last 5 years and now tens of thousands of seats are vacant

**Current State: Priority Actions**
- Provide teachers in every classroom qualified to teach the subject they teach
- Double federal investment in research – competitively awarded (largely to universities)

**Innovation is Driver of Change**
- Knowledge capital
  - Newly acquired knowledge, often in the form of scientific and technological advancements
- Human capital
  - Workforce education
  - Science, engineering, and mathematics
  - Production of scientists and engineers
  - Importing talent

8. **Breakout session: Rising Above the Gathering Storm (Facilitator: Scott Makinen)**
   The board split into groups to discuss and brainstorm the following:
   1. What steps should be taken to create a learning environment that addresses the changing face of engineering?
      - How do we plan for 2015, 2020, and beyond?
      - What should we do differently?
   2. If you could start with a blank slate, how would you design an electrical and computer engineering curriculum?
   3. What are the skills needed for future engineers?
   4. What will (or should be) the relationship between industry and universities in terms of research collaboration, online/continuing education, etc.?

**Breakout Session** – The following points were noted by the board:

**ECE department strategic planning:**
- Continue to focus on innovation: create an environment that trends more toward outside the box thinking, not just regurgitating.
- Keep the bar high; continue to differentiate as a department.
- Spark interest in the electrical and computer engineering early in the undergraduate program (perhaps use circuits to excite them?). If we don’t capture their attention early enough, they gravitate toward other, more engaging pursuits.
• The IAB likes the idea of a new freshman course directed at design that would, among other things, connect freshmen with senior design to show the relevance of their learning.
• The board also likes the idea of cross-functional senior design teams as well as cross-year teams – an integrated approach to learning that shows students the application of their work early in their academic career.
• One idea is to revive the ECE field trips to local companies. While HKN continues to coordinate such field trips, they are no longer a college requirement. College-wide field trips were replaced a few years ago with the Professional Learning Institute (PLI). All College of Engineering students get one Friday off per semester for PLI Day.
  o ECE will work with the College of Engineering to see if they will accept field trips as PLI credit.
  o Consider incorporating field trips into the new freshman class mentioned above.
• Reinforce the importance of engineering, particularly for the “common good.” Engineering, and the resulting industry stemming from engineering (technology, manufacturing, etc.), are foundational to our country’s economy.
• Try to mitigate negative press associated with outsourcing.
• More integrated labs, perhaps with more length, to reinforce hands-on opportunities.
• Modernize teaching methods by taking advantage of methods in which current students take in information – blogs, podcasts, Google, Facebook, Twitter, Youtube, etc. Engineering subject matter will always require a professor, a white board, and some degree of lecture, but modernize where appropriate to engage students.
• Consider adding robotics opportunities earlier in the curriculum as a way to bring engineering concepts to life.

Skills needed for future engineers:
• Students must be agile learners.
• Critical thinking and problem solving will always be important.
• More systems-level thinking, i.e., systems engineering.
• Must have solid core fundamentals; students need to know the engineering basics.

Relationship between industry and universities:
• Collaboration is important. Within CSU, advertise seminars across disciplines.
• IAB members said they would like to help create more opportunities for collaboration, e.g., shared research projects.
• Consider partnering with industry (e.g., IEEE) to generate interest in engineering. Target K-12 students, such as AP physics courses.

K-12:
• It was generally lamented that students aren’t getting the preparation they need at the K-12 level – math skills aren’t what they should be, for example. Thus, we need to work on K-12 outreach strategies to help engineering students enter the university better prepared.
• Innovation starts at a young age. The K-12 learning environment needs to spark interest in more people than it currently does today.
• Not having qualified teachers is a real issue. Several board members reported that they didn’t have qualified teachers during their K-12 studies.

9. Student Design Presentations – Two teams of students presented their senior design projects to the board:
  ➢ Smart Power Management
10. **Closing Remarks (Tony Maciejewski)**

Tony wrapped up the meeting and thanked the board for their participation. Some members participated in the tour of the Engines and Energy Conversion Laboratory immediately following the meeting.

**ACTION ITEMS:**

- Report back on the grad placement rate for Mechanical Engineering.
- Follow-up on discussions with Math Department regarding mathematics courses for engineering students taught by regular faculty (not TAs).
- Take a poll by email to see if IAB members like the idea of hosting a meeting off-campus, e.g., Denver.
- Share details of online ME in ECE degree program. Ask for help with marketing, company visits, etc.
- Determine ways to spark interest in electrical and computer engineering early in the undergraduate program, possibly by adding a new freshman course.
- Work with the College of Engineering to see if they will accept field trips as PLI credit.
- Modernize teaching methods by taking advantage of methods in which current students take in information – blogs, podcasts, Google, Facebook, Twitter, Youtube, etc.
- Consider adding robotics opportunities earlier in the curriculum as a way to bring engineering concepts to life.
- Within CSU, advertise seminars across disciplines.
- Consider partnering with industry (e.g., IEEE) to generate interest in engineering. Target K-12 students, such as AP physics courses.
- Work on K-12 outreach strategies to help engineering students enter the university better prepared.

The spring IAB meeting is scheduled for **Friday, April 27**.