IAB members: Jim Barnes, Bruce Doyle, Chuck Duey, Scott Evans, Jason Fegley, Dan Ferguson, Jason Gentry, Elena Gonzalez, Jim Greener, Bob Gresham, Lance Guymon, Susan Hunter, Scott Lukes, Steve Martin, Paul Monson, John Nichols, Mike Pichler, Chuck Quire, and Julie Zinn.

ECE department: Anura Jayasumana, Andrea Leland, Tony Maciejewski, Olivera Notaros, Branislav Notaros, Sudeep Pasricha, HJ Siegel, and Sid Suryanarayanan.

Students: A group of ECE graduate students; six sophomore-level student teams who gave demos of their ECE 202 design projects.

Guests: Shirish Bahirat, Micron; Mike Hawes, Agilent; David Lacey, Hewlett-Packard; Kerry McBee, Xcel Energy; Ed Minnock, Minnock and Associates; Greg Nuccio, Jeppesen; Richard Robinson, CA Technologies.

1. Introduction and Welcome IAB Guests (Jason Gentry, IAB president)
   Jason opened the meeting by welcoming the new IAB guests (outlined above) who are considering becoming members of the board. He then turned it over to Tony Maciejewski, ECE department head, for the department update.

2. Agenda and Department Update (ECE Department Head Tony Maciejewski)
   Tony reviewed the day’s agenda and asked the board for feedback on the format of the meeting, which includes participation in Engineering Days. He also delivered an update on the department, touching on the following topics.
   • 10 years of service
     - Congratulations to John Nichols and Susan Hunter for 10 years of service to the board!
   • Faculty News
     - Professor Jade Morton to join ECE in FA14
     - Professor Reising lands $4.5M grant to help NASA study clouds and climate
     - ECE faculty garner new fellow awards
       - Sandra Biedron: SPIE & American Physical Society
       - Carmen Menoni: SPIE
       - Jade Morton: IEEE
       - Randy Bartels: American Physical Society
     - ECE Professors propel innovation
       - Chandra leads partnership to install tornado radar
       - Menoni bolsters reputation as role model for women in science
         - Featured in *International Innovation*
         - Chosen to deliver worldwide webinar for Women in Engineering
   • Student News
     - Student-led annual IEEE Open Design Competition a success!
Winners: Free EMG (ECE), Diggerbot (ME), Math Racerz (ECE)
- EE major Wirtz wins Goldwater Scholarship
- 7th Annual Best Paper Contest started May 6; winner is Single Molecule Tracking team
- Commencement held May 16

- Charts and data
  - ECE faculty rank 28th (out of 370 programs) in the country for research expenditures per faculty member, based on NSF data.
    - ECE is 36th overall for total research funding
  - ECE outranks:
    - Purdue
    - Princeton
    - U. CA, Davis
    - Texas A&M
    - CU Boulder
  - COE research expenditures
  - ECE research expenditures
  - National enrollment trends
  - ECE spring enrollment
  - Undergraduate degrees awarded
  - Freshman enrollment
  - ECE freshmen enrollment: Colorado institutions (2007 vs 2012)
  - Fall->spring freshmen enrollment
  - Spring enrollment trends by class
  - CSU College of Engineering undergraduate persistence rates
  - Women in engineering (FA13)
  - Women in ECE
  - Graduate degrees awarded
  - Percent of international degrees awarded
  - The value of a college degree: median first-year earnings by CO institution
  - Median first-year earnings in EE by CO institution (CSU EE students earned highest salaries)
  - Median first-year earnings in CpE by CO institution (CSU CpE students earned highest salaries)

- ABET Update
  - Department reaccredited
  - Design Your Future Day cited as program strength (action item from previous IAB meeting)
  - New Program Education Objectives (PEOs) developed and approved by ECE faculty and the IAB
  - The ECE PEOs are designed and implemented around three principal attributes:
    - Master
    - Innovation
    - Leadership

- Adjunct teaching opportunities
  - Hands-on training with FPGA programming
  - Hands-on training with Verilog and VHDL
  - Hands-on training with optimizing embedded software
  - VLSI System Design I w/lab – design of integrated circuits at the system level including cell design, digital systems, parallel architecture, systolic arrays

Update on fall action items:
- **Action item:** Visit new Advanced Beam Lab as part of a future IAB meeting.
• **Status:** Add to IAB agenda for fall 2014.

• **Action item:** Find out if it’s possible to allow students to slightly delay their decision to pursue a dual major, but still move in the desired direction of BME/EE.

• **Status:** Students need to make a decision after the completion of freshman year to stay on track.

• **Action item:** Find out if it’s possible to earn a master’s in systems engineering as part of the accelerated BS/MS program.

• **Status:** Possible with graduate school approval; in addition, accelerated BS/Ph.D. is currently under review by CSU Graduate School.

• **Action item:** Share feedback from faculty retreat regarding ECE’s role in MOOCs.

• **Status:** Prof. Chandra is considering a MOOC; general consensus is to expand coursework through OnlinePlus rather than put effort into MOOCs.

• **Action item:** Utilize presentations like Todd Hansell’s Covidien overview to recruit students.

• **Status:** Todd Hansell is working with ECE & BME to participate in outreach events; he tweaked his IAB talk for an H.S. audience.

• **Action item:** Share salary benefits of biomedical industry, if available.

• **Status:** Results of 2014 Salary Survey:
  - Bioengineering & Biomedical Engineering - $47,300
  - Computer Engineering - $70,900
  - Electrical/Electronics Engineering - $63,000

• **Action item:** Leverage NSF Research Experience for Teachers site grant to maximize recruitment.
  - **Status:** Teachers in NSF RET program promote STEM careers to their students and arrange campus tours; special focus on women and minorities.

• **Action item:** Leverage biomedical recruitment efforts to attract more women to ECE; make recruitment materials more tangible.

• **Status:** Messaging revamped to show real-world applications of ECE/BME work; new materials include banners for recruitment events, web content, and promotional video.

3. **Prepare for Engineering Days (Tony Maciejewski)**

In preparation for the board’s participation in E-Days, Tony provided an overview of program changes based on the IAB’s assessment of senior design in 2006:

**Design**

– **Action item:** Incorporate design throughout the curriculum.
– **Status:** Projects now required in ECE 202.
– **Action item:** Generate more interdisciplinary projects.
– **Status:** Now have multiple projects each year that span disciplines.

**Communication**

– **Action item:** Create Best Paper Contest to reinforce importance of written communications.
– **Status:** Contest in its 7th year.
– **Action item:** Ask IAB members to serve on panel to review project presentations.
– **Status:** Several board members are heavily involved in senior design and judge oral presentations each fall.

**Project Management**

– **Action item:** Teach project management skills through the senior design lecture series.
– **Status:** Weekly lectures touch on a range of topics to enhance professional development, including project management; test plan now required for each project, and a dedicated industry partner reads and evaluates each plan.

**Teamwork**

– **Action item:** Offer professional development courses to address team dynamics.
–Status: COE Professional Learning Institute established, led by former IAB member Alma Rosales.

**Multi-year Projects**

–Action item: Consider creating more multi-year, multi-phase projects.
–Status: A number of projects span multiple years, with new teams building on the work of previous students.

Tony then shared a list of considerations for judging the students’ projects.

- How are we doing overall?
  - Can you see the impact of your previous suggestions?
- What are the strengths and weaknesses of the senior design program?
- What changes/improvements would you recommend?
- What are the top three projects? What makes them great?

4. **Lunch and Breakout Session: Discuss Senior Design Program (Facilitators: Jason Gentry and Scott Evans)**

The board split into groups to share their feedback on E-Days and the ECE students’ senior design projects.

**Results of breakout session:**

**Overall feedback on senior design program:**

- Program is impressive overall; identified weaknesses are “nit-picking,” according to IAB.
- 202 projects are great for developing interest in project work.
- The board likes the projects that are more design and application oriented.
- The IAB likes the emphasis on multi-disciplinary projects, as the format emulates industry practices.
- They like the diversity of projects: novel research-oriented vs. integration of existing technology.
- Perceived program strengths: real-world applications, budgets, requirements. Obstacle: some ECE projects are difficult to convey/promote. For example, it’s hard for a highly theoretical laser project to compete with a race car.
- With several multi-year projects, the board wondered how it is determined when a project ends.

**Industry sponsorships and involvement:**

- The board liked seeing corporate sponsorships.
  - Suggestion:
    - Develop best practices guidelines for corporate sponsors. Woodward did this for mechanical engineering and Wolf used a similar model.
- Some teams were able to effectively communicate why their project is important, but many couldn’t compare their work to what’s currently being done in the field. Maybe there’s an opportunity for industry input to help students evaluate and improve their projects, and bridge the gap between their work and what is considered state-of-the-art in industry.

**Communications and marketing:**

- Students need to work on the soft skills, such as communication and marketing.
- Students need to refine their presentations skills. They need to be able to answer the simple question, “Why is this project important?” Many students struggled with this.
- Several students need to work on their posters. The poster should clearly explain the project without too much detail. Many of the project posters included too many words and it was hard for IAB members to understand or determine the key messages.
  - Suggestions:
Partner with the marketing department to help students present their projects in a way that’s appealing. The students need to be able to convey their work to both a lay person and someone with an engineering background.

- Require students to finish their project posters a week or two before E-Days, allowing time for outside review and edits. Posters should convey WHY the projects are important. Too many words and small font should not be allowed!

- Tony’s comment: There are similarities between the IAB feedback regarding project marketing and the board’s previous remarks about test and evaluation. To address the board’s concerns about test and evaluation, the department now requires a test plan for each project and a dedicated industry partner reads and evaluates each plan. Would it make sense to create a similar new requirement that teaches students marketing skills? And, instead of having a marketing student on the project team, assign someone from industry or the CSU marketing department to serve as a consultant/resource.

- One person suggested involving the IEEE student chapter in this effort.

Projects identified as noteworthy by the IAB:
- Hex Heat – for passion.
- Antenna Test Range – for scientific and technical excellence and continuous improvement.
- Puzzle Assembly – for starting with an open-ended problem and filtering it down into a concise solution.
- MIMER – for passion and ability to answer the basic question, “Why is this project important?”

5. **Election (Jason Gentry)**
   The board unanimously voted in favor of Lance Guymon (Wolf Robotics) to serve as the IAB vice president for the upcoming academic year; Scott Evans becomes president.

6. **Closing Remarks (Tony Maciejewski)**
   Tony wrapped up the meeting and thanked the board for their participation. He encouraged the board to contact him or Andrea with additional ideas or comments regarding the meeting topics. Following the meeting, some members participated in a social event with the mechanical engineering advisory panel at Fort Collins Brewery.

**ACTION ITEMS:**
- Share with the board the process for determining when a senior design project ends.
- Develop best practices guide for corporate sponsors of senior design.
- Encourage students to identify where their projects fall on the spectrum of technology in industry.
- Address the issue of students not being able to explain WHY their projects are important.
- Work with students to improve their project posters including messaging and appearance.
- Help students improve their communication and marketing skills; consider including someone outside the department to assist with this effort.
- Hold future IAB meetings in conjunction with Engineering Days.

The Fall IAB meeting is scheduled for **Friday, October 24**.