Spring Industrial Advisory Board Meeting
April 19, 2019
Agenda

• Department Update & Fall Action Items
• Virtual Internship Overview
• ABET Survey
• Prepare for E-Days
• View Projects at E-Days
• Working Lunch
• Breakout Session: Simulated Internships
• Discuss Results of Breakout Session
• Election
• Optional Social @ the Translational Medicine Institute
Welcome Our New Board Members

• **Lynda Allen**
  Lockheed Martin

• **Robert Burke**
  Wolf Robotics

• **Veronica Cavallaro**
  Engineers Without Borders

• **Jon Grooters**
  ACS Power
Department Update

Prof. Tony Maciejewski
Department Head
Electrical and Computer Engineering
Colorado State University
View Presentation Online

URL:
www.engr.colostate.edu/ece/industry/industrial_advisory_board.php
-or-
www.engr.colostate.edu/ece → Industry → Industrial Advisory Board
-then-

Presentation Location:

• Related Links → Meeting Presentations → Spring 2019
Recent Awards
R&D100 Award - foresee
IEEE Photonics Society

Carmen Menoni
President Elect (President 20/21)
College of Engineering Annual Award Winners

Diego Krapf
Abell Outstanding Mid-Career Faculty

Kevin Lear
Abell Teaching, Mentoring and Service
Celebrate Colorado State Awards

Katya Stewart-Sweeney
Office of International Programs
Distinguished Service Award
IEEE-HKN Outstanding Chapter Award

CSU’s Delta-Pi Chapter
Geoscience and Remote Sensing Society
Best Paper Award

Prof. V Chandra

*Using Wind Turbine State to Suppress It’s Signature in Radar Observations*
World Meteorological Organization
Team Award

Prof. V Chandra
Radar Deployment and Contributing to the Success of the 2018 Winter Olympic Operations
Other Department News
Students Compete in Annual Dumpster Dive Competition

Undergraduates transformed old electronics into functioning robots in the span of six hours
Upcoming Events

• Commencement set for Friday, May 17

• Annual Best Paper Contest in June
  (Contact Dezari Brubaker if you are interested in judging)
ECE by the Numbers
# Proposal Activity CY18

## 25 ECE Faculty

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposals submitted</td>
<td>86</td>
</tr>
<tr>
<td>Total amount of proposals</td>
<td><strong>$58.6M</strong></td>
</tr>
<tr>
<td>Highest proposal amount w/ECE PI as lead</td>
<td>$5.0M to NASA</td>
</tr>
<tr>
<td>Highest proposal amount w/ECE PI as collaborator</td>
<td>$5.3M to DOE-US Department of Energy</td>
</tr>
<tr>
<td>Lowest proposal amount</td>
<td>$4.3K to Boettcher Foundation</td>
</tr>
<tr>
<td>Primary funding agencies</td>
<td>NSF, DOD, NIH, NASA, DOE, and DHS</td>
</tr>
<tr>
<td>Collaborators (many new partners this year)</td>
<td>Soil &amp; Crop Sciences, Agricultural &amp; Resource Economics, Chemical &amp; Biological, Atmospheric Science Civil &amp; Environmental Engineering, Mechanical Engineering, Design &amp; Merchandising, Biomedical Sciences, Environmental &amp; Radiological Health, MIP, Sociology, Journalism &amp; Media Communication, Anthropology, Computer Science, Math, Psychology, Physics and Statistics</td>
</tr>
</tbody>
</table>
Teaching Productivity
ECE Student Credit Hours

Undergrad  Grad

COE Student Credit Hours (2017-18)

- ECE: 19%
- ATS: 4%
- CEE: 26%
- CBE: 11%
- ME: 38%
- Intra-College: 2%

Legend:
- ECE
- ATS
- CEE
- CBE
- ME
- Intra-College
National Enrollments by Discipline (2007-'17)

Information retrieved from ASEE Engineering by the Numbers

*Data excludes 50 colleges that no longer participate in ASEE survey. Lower totals reflect current data from participating schools.
CSU Engineering Enrollments

Number of Students

Department by Year

- B.S.
- M.S.
- Ph.D.
Biomedical Dual Majors

- Bio Eng w/EE & LO
- Bio Eng w/CB
- Bio Eng w/ME

Department by Year

Number of Students
ECE Nontraditional Undergrads

*Does not include Biomed dual majors*
ECE First-Generation Undergrads

*Does not include Biomed dual majors*
ECE Freshman Enrollment

Number of students

SP15 | SP16 | SP17 | SP18 | SP19
---|---|---|---|---
Biom/EELO | Biom/EE | Electrical Engr | Computer Engr

Colorado State University
Department of Electrical and Computer Engineering
# Freshman Admissions Outlook (April)

<table>
<thead>
<tr>
<th></th>
<th>Computer Engineering</th>
<th>Electrical Engineering</th>
<th>Freshmen Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirms 4/5/19</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirms 4/2/18</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirms 4/5/19</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirms 4/2/18</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April 2019</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April 2018</td>
<td>67</td>
<td></td>
<td></td>
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</tbody>
</table>
National Persistence in Engineering

Persisted to 2nd year
Degree within 6 years
Degree within 4 years
ECE Freshman Retention to 2\textsuperscript{nd} Fall

Cohort Size of First-Year ECE Students

Persistence Rates of First-Year ECE Students Through 2\textsuperscript{nd} Fall

Persistence Rates Within Department by Cohort Department and Cohort Term

Dot com bubble

“The World is Flat”

The Great Recession
ECE Freshman Retention to 6th Fall

Cohort Size of First-Year ECE Students

Persistence Rates of First-Year ECE Students through the 6th Fall

Persistence Rates Within Department by Cohort Department and Cohort Term
WSCOE Women in Engineering (SP19)

**Undergraduate**
- CBE, 16%
- ECE, 6%
- Intra-College, 34%
- CEE, 29%
- ME, 14%

**Graduate**
- AS, 17%
- CBE, 3%
- ECE, 22%
- Intra-College, 13%
- CEE, 34%
- ME, 5%
- BME, 5%
ECE Undergraduate Degrees Awarded

<table>
<thead>
<tr>
<th>Year</th>
<th>Electrical Lasers/Optics</th>
<th>Computer Engr</th>
<th>Electrical Engr</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>40</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>2014-15</td>
<td>45</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>2015-16</td>
<td>50</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>2016-17</td>
<td>55</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>2017-18</td>
<td>60</td>
<td>35</td>
<td>45</td>
</tr>
</tbody>
</table>

Full Year Summer/Fall/Spring
ECE Graduate Degrees Awarded

Full Year Summer/Fall/Spring

Number of Graduates

MS  Ph.D.

International Enrollments

Growth Rate of International Enrollment, by Destination

After a spike in 2014, the rate at which students come to the U.S. to study has slowed relative to the growth seen by many other countries.

Global Emphasis on the Decline

The share of colleges reporting that internationalization is a high priority in their strategic plans and mission statements rose and then dropped between 2006 and 2017.

SOURCE: Project Atlas

SOURCE: Association of International Education Administrators
ECE Percent of International Degrees Awarded

<table>
<thead>
<tr>
<th>Year</th>
<th>Ph.D.</th>
<th>MS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>80%</td>
<td>60%</td>
<td>70%</td>
</tr>
<tr>
<td>2014-15</td>
<td>70%</td>
<td>60%</td>
<td>65%</td>
</tr>
<tr>
<td>2015-16</td>
<td>50%</td>
<td>60%</td>
<td>55%</td>
</tr>
<tr>
<td>2016-17</td>
<td>50%</td>
<td>60%</td>
<td>55%</td>
</tr>
<tr>
<td>2017-18</td>
<td>55%</td>
<td>60%</td>
<td>57.5%</td>
</tr>
</tbody>
</table>

Full Year Summer/Fall/Spring

Colorado State University
Department of Electrical and Computer Engineering
Tech Unicorns Founded/Co-Founded by Immigrants

“The controversial H-1B visa has been highlighted in a new report on research” from the National Foundation for American Policy “that found 55% of U.S. tech startups valued at $1 billion or more were founded or co-founded by immigrants.”
Career Outlook for ECE Majors

• Among the top 10 majors in demand for B.S., M.S., and Ph.D. degrees
• 91% employed/grad school
• 97% employed in major

• Average starting salaries:
  ➢ Electrical engineering – $72,000
  ➢ College average – $61,000
  ➢ CSU average – $49,000

*National Association of Colleges and Employers Annual Job Outlook Reports
**CSU First Destination Study, 2016-2017
Fall Action Items
Update on Fall Action Items

• **Action item:** Distribute the “Unconscious Bias Survey” from Harvard
  
  – **Status:** *Project Implicit* links have been shared via IAB/ECE webpage [https://implicit.harvard.edu/implicit/](https://implicit.harvard.edu/implicit/)
  
  – [https://www.tolerance.org/professional-development/test-yourself-for-hidden-bias](https://www.tolerance.org/professional-development/test-yourself-for-hidden-bias)
Update on Fall Action Items

- **Action item:** Offer diversity training for ECE faculty, staff, and students; leverage campus resources
  
  - **Status:** Many offerings available:
    
    - Safe Zone Training
    - Social Justice Leadership Institute
    - Creating Inclusive Excellence Program
    - Faculty Institute for Inclusive Excellence
    - Training and Organizational Development Opportunities
    - **NEW Fall 2019** Inclusive Pedagogy Workshop Series for WSCOE Faculty
Update on Fall Action Items

Women in ECE Group

• Canvas Painting
• Bowling
• Weekly Coffee Club
Update on Fall Activity Items

- **Action item:** Results of fall IAB survey
  - Question 1: Have you ever noticed students/faculty/employees treating each other differently based on their gender, sexual orientation, race, ethnicity, religion, family status, age veteran status, economic status, ability, etc.?
Update on Fall Activity Items

- **Action item:** Results of fall IAB survey
  - Question 2: How comfortable would you feel intervening in a situation like this?
Update on Fall Activity Items

• **Action item:** Results of fall IAB survey
  - Question 3: Have you ever been treated differently in a professional setting (classroom, workplace, conference, meeting) based on your gender, sexual orientation, race, ethnicity, religion, family status, age, veteran status, economic status, ability, etc.?
Update on Fall Activity Items

- **Action item:** Results of fall IAB survey
  - Question 4: If you answered yes to the above question, did anyone intervene?
Update on Fall Activity Items

• **Action item:** Brainstorming exercise follow up
  
  – **Question:** *Best practices to change the culture around diversity and inclusion from your experience?*

  • Case studies, actual experiences from your company, “microinequities” training, strong executive sponsors
  • Share personal stories of those that have been discriminated against
  • Celebrate diversity, if you observe an intentional/unintentional bias—say something, pause before judging
  • Build diverse teams because it the right thing to do! Versus defined policy
  • Promote awareness especially with unconscious bias, e.g. examples and solutions in real life
  • Having a clear message that “This is NOT ok” when someone says an insensitive comment
  • Take an unconscious bias test
Update on Fall Activity Items

• **Action item:** Sticky note exercise follow up
  – **Question:** *What initiatives can ECE implement to create a more inclusive environment where all people feel welcomed and valued?*
    • Run realistic classroom scenarios for faculty and see how they respond and then have discussion group to review
    • ECE for women type actions, ECE t-shirts for spreading the word, empowers current ECE students to be diversity ambassadors
    • Diverse role model mentorship, diverse faculty

**Status:**
• Becky Atadero’s NSF project
• Socially responsible engineering thread
• Women in Electrical and Computer Engineering group
• Topic for today – Diversity/inclusion in virtual internships
Primary Focus for Today
Virtual Internships

- What professional skills should be included?
- How are they best simulated?
Virtual Internships Launched in FA17

- Partnership with University of Wisconsin-Madison enhances professional formation and creativity threads
- NSF-funded virtual internships simulate engineering workplace through design projects
Design of Simulated Internship

Megan Emmons
Motivation

- Internships are key experience for many engineering graduates
  - Practical application of concepts
  - Connect experience to technical course material
  - Increase student confidence

- Can extend benefits to ALL students, present EARLIER in academic career
  - Guided format allows more concentrated connection to core engineering classes
  - Increase retention by providing motivation for incoming Freshmen
  - Showcase diversity of ECE
  - Reproducible and improvable experience
Internship History at CSU

- Have used platform from University of Wisconsin
  - One semester lab course: first half internship, second half hands-on Arduino project
- Successful experience based on feedback, can do better
  - Internship weakly connected to ECE
    - Disconnect between two halves of course
  - Had clear ‘front-runner’ design
    - Result in same final design for all teams
    - Arguably unrealistic model of engineering
  - Less flexible because not our system
  - Restricted interactions to chatrooms, reduces possible feedback
Project Goals

- Highlight many subdisciplines of ECE to emphasize breadth of applications
  - Computing and optimization, communication and signal processing, power and energy, electromagnetics, lasers
- Have physically tangible, relevant topic
  - Students can connect to a familiar feature, understand at a deeper level
  - Share knowledge, gain confidence
- Ensure nature of final design is dependent on many different variables so can create variety of final designs
Project Idea: Wind Farm

● Phase 1 - Focus on technical solutions
  ○ Divide class into technical subteams
  ○ Develop ‘project bid’ so each subteam contributes short list of design options
    ■ Blade design, farm location, utility constraints, blade control, system monitoring

● Phase 2 - Integrated solution
  ○ Won bid, now focus on actual solution for community
    ■ Form new teams from technical experts
  ○ Introduce city councillors and concerned citizens who impose additional constraints
  ○ Vary constraints between teams for unique solutions
    ■ Emphasize importance of constraints on final design

*Image: Arne Nordmann
Motivation of Phase Designs

Phase 1 - Technical Experts

- Directed research
- Professional report pieces
- Understand key variables/trade-offs present in technical design
  - Carry in to next segment
- Learn individually and as member of a team

Phase 2 - System Experts

- Enrich student experience
  - See technical solutions shaped by environmental, cultural, and economic considerations
- Team rely on expertise of other members to reach final design
- Final presentation to disseminate knowledge gained
Summary of Internship Plan

- Next semester, introduce simulated internship experience
  - Can modify material based on student feedback and adjust between sessions
- Will focus on internship component
  - Future plans to extend wind farm into hands-on portion using Arduinos
    - Control turbine blade angles for varying input wind signals
    - Maybe connect to site visit or wind tunnel testing

Still very open so we welcome your input! Thank you for your time!
ABET Survey
Updated ABET Outcomes

Graduates of the Electrical Engineering {Computer Engineering} program will be able to:

• Identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.
• Apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline.
• Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
• Communicate effectively with a range of audiences.
• Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
• Recognize the ongoing need to acquire new knowledge, to choose appropriate learning strategies, and to apply this knowledge.
• Function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment.
Prepare for E-Days
E-Days Considerations

• 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?

• Which projects stand out, and what makes them great?
Assessing Professionalism in Projects

- Complete enclosed rubric to build on SP16, SP17, SP18
- Acceptable to use “n/a” or “.5” in your ratings

Focus Areas
Communication
Cultural Adaptability
Ethics
Leadership
Teamwork
Results of SP18 Assessment of Professionalism in Senior Projects

Averages per category

- Global And Cultural Awareness
- Ethics & Professional Responsibility
- Leadership and team leader
- Teamwork
- Communication

0 - Unacceptable
1 - Developing
2 - Exceptional
E-Days Feedback

• 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?

• Which projects stand out, and what makes them great?
Breakout Session

Simulated Internships

Facilitators: Jeannine Looney and Mike Stiles
Considerations for Breakout

• What professional skills are possible to simulate in this type of class?

• How are these skills best simulated?

• How much should be virtual and how much in person?
Report Results of Breakout Session
Election for VP

Facilitator: Jeannine Looney
Closing Remarks