Industrial Advisory Board
April 22, 2022
What We’ll Cover Today

• Updates, News, Numbers
• Strategic Direction
• Prep for E-Days & Afternoon Breakout Session
• Review Senior Design Projects
• Select Top 3 Projects
• Breakout Session on Recruitment and Outreach
New Members and Guests

- **Mike Dolan**
  Ball Aerospace

- **Ben Fox**
  Keysight

- **Ben Gookin**
  Northrop Grumman
Department Update

Edwin Chong
Professor and Acting Department Head
Department Updates
Thank you, Tony!
Two Searches Underway

• Department Head
  – Currently interviewing candidates; estimated start date is July 1

• Department Manager
Curricular Changes to Meet Demand and Foster Flexibility

ECE Degree Programs

Computer Engineering
- Aerospace Systems
- Embedded & IoT Systems
- Networks & Data
- VLSI & Integrated Circuits

Electrical Engineering
- Lasers & Optics
- Aerospace

ECE + Biomedical
- Lasers & Optics
- Electrical Engineering

---------New Concentrations---------
Online Programs Recognized for Excellence

2022 Top Pick for Best Online Master’s Degree Computer Engineering

Top 30 Best Online Master’s Programs for Veterans
SpaceX Launches ‘Small but Mighty’ Weather Satellite Sensor Led by ECE

The mission, led by Prof. Steve Reising, is a technology demonstration to show the feasibility of smaller satellite systems for gathering critical weather data.
CSU-Led Satellite Mission Set to Launch in 2026

Reising is part of the $177 million NASA mission to increase scientists’ understanding of storm physics and related climate processes
National Weather Service Credits CASA Radar for Detecting Tornadoes in North Texas

The network of radars are a result of decades-long research led by Prof. Chandra
Extending Reach Into the Cosmos

Prof. Menoni’s team developed new mirror coatings to increase detection of gravitational waves

Photo courtesy of Caltech
LaserNetUS Consortium, Including ECE, Receives $18M from DoE

Prof. Rocca and his team are hosting the annual LaserNetUS meeting at CSU this summer
Pasricha Named Distinguished Speaker

The Association for Computing Machinery selected him for a three-year term
Chong and Maciejewski Named Fellows of AAIA

The Asia-Pacific Artificial Intelligence Association aims to promote the development and application of AI in STEM
Chandra Elected to Fellow of American Geophysical Union
Student Accolades
Fall 2021 Outstanding Grad: Janaye Matthews

“Janaye is one of the most amazing people I’ve ever worked with in my 30-plus years in academia.”

--Brett Beal, academic advisor
Newly Named Astronaut Scholar: Kori Eliaz

With extensive experience in the aerospace field, the EE senior was one of 60 students selected for the prestigious honor.
Taking Wastewater Epidemiology to Next Level

EE student Wyatt Suit is working on a cross-disciplinary team to create parts for a new, streamlined wastewater sampling system to monitor SARS-CoV-2 virus levels.
Winner of Best Research Poster Competition: Asif Mirza

He is co-advised by Profs. Nikdast and Pasricha on his work entitled, "Design and Optimization of Novel Silicon Photonic Devices for Emerging Datacom and AI Applications"
Tell Us Your Story Ideas!

Contact Andrea with news and ideas
Teaching Productivity
ECE Student Credit Hours

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<thead>
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<td>Undergrad</td>
<td>6,000</td>
<td>7,000</td>
<td>8,000</td>
<td>9,000</td>
<td>10,000</td>
<td>11,000</td>
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<td>Grad</td>
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<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Undergrad | Grad
---|---
6,000 | 2,000
7,000 | 1,000
8,000 | 1,000
9,000 | 1,000
10,000 | 1,000
11,000 | 1,000
Engineering Student Credit Hours (‘20–’21)

- ECE: 20%
- ATS: 5%
- CEE: 29%
- CBE: 11%
- ME: 33%
- Intra-College: 2%

- ECE
- ATS
- CEE
- CBE
- ME
- Intra-College
Enrollment Trends
National Undergraduate Enrollments

Information retrieved from ASEE Engineering by the Numbers

*ASEE by the Numbers

ELECTRICAL AND COMPUTER ENGINEERING
COLORADO STATE UNIVERSITY
Engineering Undergraduate Enrollments at CSU

Includes BME dual degrees
ECE Undergraduate Enrollment Trends

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of students</th>
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<tbody>
<tr>
<td>FA11</td>
<td>275</td>
</tr>
<tr>
<td>FA12</td>
<td>304</td>
</tr>
<tr>
<td>FA13</td>
<td>339</td>
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<td>FA14</td>
<td>347</td>
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<td>FA15</td>
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<td>FA16</td>
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<td>FA19</td>
<td>444</td>
</tr>
<tr>
<td>FA20</td>
<td>435</td>
</tr>
<tr>
<td>FA21</td>
<td>408</td>
</tr>
</tbody>
</table>

Undergraduate Primary Majors (includes BME)
Undergraduate Enrollments by Major

<table>
<thead>
<tr>
<th>Year</th>
<th>Computer Engineering</th>
<th>Electrical Engineering</th>
<th>Biomed + EE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2016</td>
<td>131</td>
<td>249</td>
<td>53</td>
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<tr>
<td>Fall 2017</td>
<td>149</td>
<td>267</td>
<td>54</td>
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<tr>
<td>Fall 2018</td>
<td>133</td>
<td>256</td>
<td>50</td>
</tr>
<tr>
<td>Fall 2019</td>
<td>147</td>
<td>258</td>
<td>39</td>
</tr>
<tr>
<td>Fall 2020</td>
<td>136</td>
<td>258</td>
<td>41</td>
</tr>
<tr>
<td>Fall 2021</td>
<td>138</td>
<td>229</td>
<td>41</td>
</tr>
</tbody>
</table>
Freshman Enrollment

<table>
<thead>
<tr>
<th>Semester</th>
<th>Biomed + EE/LO</th>
<th>Biomed + EE</th>
<th>Computer Engineering</th>
<th>Electrical Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2017</td>
<td>11</td>
<td>53</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Fall 2018</td>
<td>9</td>
<td>43</td>
<td>36</td>
<td>36</td>
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<tr>
<td>Fall 2019</td>
<td>4</td>
<td>49</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Fall 2020</td>
<td>7</td>
<td>30</td>
<td>44</td>
<td>44</td>
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<tr>
<td>Fall 2021</td>
<td>5</td>
<td>35</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>
Freshman Enrollment: ECE vs. CS

- Fall 2017: 53, 46, 11
- Fall 2018: 43, 36, 9
- Fall 2019: 49, 45, 4
- Fall 2020: 30, 44, 7
- Fall 2021: 35, 32, 5

- Biomed + EE/LO: 140, 142, 133, 118, 158
## 3-Year Comparison of Confirmed Undergrads as of April 1

<table>
<thead>
<tr>
<th>Confirms</th>
<th>Fall 2022</th>
<th>Fall 2021</th>
<th>Fall 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME + EE</td>
<td>6</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Computer</td>
<td>25</td>
<td>33</td>
<td>25</td>
</tr>
<tr>
<td>Electrical</td>
<td>20</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>EE/Lasers</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52</strong></td>
<td><strong>61</strong></td>
<td><strong>58</strong></td>
</tr>
</tbody>
</table>
ECE Freshman Enrollment: Colorado Institutions

Data does not include biomed dual degrees.
First-Generation Undergrads in ECE

Includes BME dual degrees; not all students reported status.
International Students in ECE at CSU

Number of Students

FA13 | FA14 | FA15 | FA16 | FA17 | FA18 | FA19 | FA20 | FA21
---|---|---|---|---|---|---|---|---
0 | 250 | 200 | 150 | 100 | 50 | 0 |

Undergraduate | Graduate

ELECTRICAL AND COMPUTER ENGINEERING
COLORADO STATE UNIVERSITY
Computer Science Enrollments

<table>
<thead>
<tr>
<th>Year</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2017</td>
<td>767</td>
<td>97</td>
</tr>
<tr>
<td>Fall 2018</td>
<td>755</td>
<td>101</td>
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<tr>
<td>Fall 2019</td>
<td>776</td>
<td>129</td>
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<tr>
<td>Fall 2020</td>
<td>752</td>
<td>132</td>
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<tr>
<td>Fall 2021</td>
<td>813</td>
<td>123</td>
</tr>
</tbody>
</table>

- Undergraduate
- Graduate
Ph.D. Enrollment

<table>
<thead>
<tr>
<th>Year</th>
<th>Ph.D. CpE</th>
<th>Ph.D. EE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2017</td>
<td>2</td>
<td>77</td>
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<tr>
<td>Fall 2018</td>
<td>2</td>
<td>64</td>
</tr>
<tr>
<td>Fall 2019</td>
<td>9</td>
<td>59</td>
</tr>
<tr>
<td>Fall 2020</td>
<td>11</td>
<td>54</td>
</tr>
<tr>
<td>Fall 2021</td>
<td>10</td>
<td>45</td>
</tr>
</tbody>
</table>
## Graduate Enrollment Outlook
Comparison of admitted students (main campus) as of mid-March

<table>
<thead>
<tr>
<th>Admits</th>
<th>Fall 2022</th>
<th>Fall 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS EE</td>
<td>37</td>
<td>52</td>
</tr>
<tr>
<td>MS CpE</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>PhD EE</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>PhD CpE</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Declining International Student Numbers

• The total number of international students at U.S. universities dropped by 15% 2019 to 2021

• The number of new international students enrolling in U.S. universities dropped by 45.6% in that time frame

• China and India sent 14.8% and 13.2% fewer students, respectively, in that time period

• Data points to a possible rebound

*U.S. News & World Report – 11/15/21
New Measures to Boost Enrollments

• To enable a holistic review, we announced that GRE scores are no longer required for admission into our graduate programs.

• Hosting new events in partnership with CSU International Programs, e.g., Admitted Student Webinar.
Bachelor’s Degrees to Women (2020)

- Bio and environmental disciplines have largest share of women

Source: ASEE by the Numbers, 2020
Bachelor’s Degrees to Women (2020)

- Electrical, computer, mechanical, and aerospace still unacceptably low

Source: ASEE by the Numbers, 2020
Women in Engineering (FA21)

Undergraduate

- Biomed Dual Degrees: 32%
- CEE: 32%
- ME: 14%
- ECE: 5%
- CBE: 13%
- Intra-College: 4%

Graduate

- Biomed Dual Degrees: 32%
- Systems: 6%
- ME: 7%
- BME: 8%
- ECE: 17%
- CEE: 34%
- AS: 24%
- CBE: 4%

ELECTRICAL AND COMPUTER ENGINEERING
COLORADO STATE UNIVERSITY
Degrees Awarded
Undergraduate Degrees Awarded

<table>
<thead>
<tr>
<th>Year</th>
<th>Computer Engineering</th>
<th>Electrical Engineering</th>
<th>EE/BME</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-16</td>
<td>20</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>2016-17</td>
<td>20</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>2017-18</td>
<td>15</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>2018-19</td>
<td>15</td>
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<tr>
<td>2019-20</td>
<td>15</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>2020-21</td>
<td>15</td>
<td>60</td>
<td>0</td>
</tr>
</tbody>
</table>

Legend:
- Blue: Computer Engineering
- Orange: Electrical Engineering
- Black: EE/BME
Projected Undergraduate Degrees for Spring 2022

- Computer: 45
- Electrical: 31
- Lasers and Optics: 3
- Aerospace: 11
Research Updates
COE Total Research Expenditures FY21

- CIRA: 37%
- ATS: 16%
- College of Engineering: 47%
- ECE: 12%
- CEE: 15%
- ME: 16%
- CBE: 4%

ATS • CIRA • ECE • CEE • ME • CBE
COE Total Research Expenditures

- 2017: $8,000,000
- 2018: $12,000,000
- 2019: $10,000,000
- 2020: $12,000,000
- 2021: $14,000,000

CBE, CEE, ECE, ME
ECE Total Research Expenditures

- 2006: $0
- 2007: $2,000,000
- 2008: $4,000,000
- 2009: $6,000,000
- 2010: $8,000,000
- 2011: $10,000,000
- 2012: $12,000,000
- 2013: $14,000,000

- 2014: $8,000,000
- 2015: $8,000,000
- 2016: $8,000,000
- 2017: $8,000,000
- 2018: $8,000,000
- 2019: $8,000,000
- 2020: $8,000,000
- 2021: $8,000,000

- Actual was $12,985,706
- Actual was $7,782,847
- Computer Science FY21: $3,005,537
## Proposal Activity FY21

### 21 ECE Faculty Submitted Proposals

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposals submitted*</td>
<td>73 (down from 86 FY20)</td>
</tr>
<tr>
<td>Total amount of proposals</td>
<td>$81.7M</td>
</tr>
<tr>
<td>Highest proposal amount w/ECE as lead</td>
<td>$4.8M to University CA-Irvine</td>
</tr>
<tr>
<td>Highest proposal amount w/ECE as collaborator</td>
<td>$17M to NSF w/Math Department</td>
</tr>
<tr>
<td>Primary funding agencies</td>
<td>Chan Zuckerberg Initiative, DHS, DOD, DOE, DOJ, NAVY, NASA, NIH, NSF</td>
</tr>
<tr>
<td>Collaborators</td>
<td>Atmospheric Science, Biomedical Sciences, CIRA, Chemistry, Computer Science, Math, and Systems Engineering</td>
</tr>
</tbody>
</table>

*ECE faculty are PI or co-PI*
Career Outlook for ECE Majors

100% Employment Related to Major

Top 10 Majors in Demand for B.S., M.S., and Ph.D.

Highest Starting Salaries in College of Engineering

Salaries Climb Even in Face of Pandemic

- One of the Top-Paid Majors in 2020 for Grads Earning Bachelor’s Degrees
- Ranked Among Most Valuable Majors in 2021
  ECE majors earned highest median salaries
- CSU EE salaries up 6% in 2020
- CSU CS salaries down 1%

*National Association of Colleges and Employers Annual Job Outlook Report, 2019
**CSU First Destination Study, 2019-2020
***NACE Top-Paid Majors Among Class of 2020 Grads Earning Bachelor’s Degrees
****Bankrate: The most valuable college majors in 2021, ranked
Promising Future Trends in ECE

• Computer occupations are behind strong STEM employment growth in the 2019-29 decade

• Demand for computer engineers is expected to surge over the next 10 years due to continued growth in the digital economy

• As technology advances across sensors, connectivity, processing power, and AI, new opportunities will emerge in aerospace and defense industry

*Bureau of Labor Statistics, Beyond the Numbers Jan. 2021
**"What's Next for Aerospace and Defense: A Vision for 2050"
Background for Recruitment & Outreach Discussion
Recruiting & Outreach Priorities

• Increase undergraduate and graduate enrollments with emphasis on underrepresented groups

• Increase participation in new online dual enrollment courses

• Expand relationships with high schools and community colleges

• Inform target audiences about our department and discipline; increase understanding about who we are, what sets us apart from our competitors, and why we matter

• Leverage ECE and College outreach teams in recruiting

• Expand promotion of new ECE concentrations
Challenges

• ECE enrollments declining or leveling off

• Confusion about the discipline – students have only a general understanding of what ECE entails; need to develop more concrete examples from industry to show societal impact and career opportunities

• Representation of our majors at the University and College levels

• Mechanical engineering seems easier for students to understand from the start; comparatively, EE is almost exclusively referred to as dealing with circuits, systems, power grids, and wires
Possible Ideas for IAB Engagement

• Adopt/sponsor a high school STEM program in partnership with our department

• Provide us with more information about potential internship and career openings within your companies, and how we can best communicate those opportunities to future and current students

• Share information about successful recruiting efforts you’re involved with or have been exposed to, e.g., after school programs, events, tours, shadow days, marketing campaigns, etc.
Prep for Project Reviews
Instructions for Judging

1. Evaluate the six finalists. (Upon return, you will be asked to vote for the top three teams.)

2. Evaluate professionalism skills for selected projects using the forms provided.

3. Visit any other additional teams you can within the available time.
Depart for LSC Ballroom
Return by 1:00 p.m.
Lunch
Choosing Top 3 Projects

Facilitator: Edwin Chong and Jeremiah Corrado
Sharing General Feedback

• How are we doing overall?

• Are students equipped with the skills they need to seamlessly transition into the workplace?

• What are the strengths, weaknesses of the teams you observed?

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

• How can we improve?
Breakout Session: Partnering with Industry to Bolster Recruitment and Outreach

Facilitators: Steve Pacheco & Lynda Allen
Questions for Breakout Discussions

1. As employers, what are your biggest pain points in recruiting and hiring engineering talent?

2. How can we collaborate to improve student recruitment, increase diversity, and fill the pathway with career-ready engineers?

3. How can industry play a role in helping us achieve our recruiting priorities outlined earlier today?
Discuss Results of Breakout Session

Facilitators: Steve Pacheco & Lynda Allen
Closing Remarks

Join us from 4 to 6 p.m. for a casual social at

**Stodgy Brewing Company**
1802 Laporte Ave.

Edwin Chong