EE, CompE and CS Programs: Merger or Peaceful Co-Existence?

Moderator:
Issa Batarseh, University of Central Florida

ECEDHA '06
Oahu, Hawaii

Tuesday, March 14, 2006
8:00 am - 9:15 am
EE, CompE and CS Programs: Merger or Peaceful Co-existence?

Panelists

- Jitendra Malik, University of California, Berkeley
- Terri Fiez, Oregon State University
- Ronald Priemer, University of Illinois at Chicago
- Gonzalo Arce, University of Delaware

University of Central Florida
Panel Discussion Objective

To help answer some of the following questions:

- What are the current CompE/EE/ECE/CS program/dept structures?
- Does the merger with CS make sense?
- What are the advantages and disadvantages of merging with CS?
- Is it possible to overcome the “culture clash”?*
- Are the recent moves of CS into engineering colleges and/or merger announcements between CS and ECE/CompE represent a national trend?
- Why institutions have succeeded or failed in merging their programs?

*University of Central Florida
# ECE and CS Dept. Heads Surveys

<table>
<thead>
<tr>
<th></th>
<th>No. Surveyed</th>
<th>No. Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECE</strong></td>
<td>330</td>
<td>151</td>
<td>46%</td>
</tr>
<tr>
<td><strong>CS</strong></td>
<td>137</td>
<td>55</td>
<td>40%</td>
</tr>
</tbody>
</table>
Types of Department Structures

- ECE: 35%
- CS: 26%
- EE: 12%
- CE, CpE: 4%
- ECE+CS: 10%
- Other: 8%
- ECE/CS: 10%
- CES: 4%
- CompE: 4%
CS Department Within College of Engineering:

**ECE**
- College of Arts & Sciences: 34%
- Outside: 13%
- College of Eng: 53%

**CS**
- College of Arts & Sciences: 35%
- Others: 11%
- College of Eng: 54%

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Considered Merging?

**ECE**
- NO: 61%
- YES: 39%

**CS**
- NO: 72%
- YES: 28%
EE and/or CpE Merged with CS:

- NO: 88%
- YES: 10%
  - < 5
  - > 5 & < 10
  - > 10
T/TT Faculty Size Comparisons

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Student Enrollment Headcount

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Advantages of Merging - ECE

- Money saving, sharing resources
- Compatibility of class schedules, plus elimination of similar courses and duplication of administrative functions in the depts.
- Better Computer Engineering Program and increased technical content of Computer Science program
- Having a single department that offers degrees in computing
- A more comprehensive curriculum and enhanced research capabilities
- Collective expertise, with critical mass
- Program visibility and coherence
- Student easily exposed to broad academic programs
- Better collaboration, stronger programs, better reputation and more efficient management

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Advantages of Merging - CS

- Sharing/Combine resources
- Collaboration or merger between CompE and CS makes more sense.
- CompE is the big beneficiary since it gets to share both EE and CS resources.
- CS, CompE, and EE are all ABET accredited programs, there is a common assessment program which makes that process much simpler.
- It's much easier to do common cross disciplinary team projects.
- Closer ties in developing courses and research projects which require interdisciplinary skills (e.g., a systems engineering course which would mix CS and CE students in course projects).

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Obstacles - ECE

- **Different Cultures**: Philosophy, backgrounds, tenure standards, productivity, teaching loads, teaching objectives, P&T issues, personal views, funding sources, salary disparities, thought processes, research agendas, senior design projects, degree plans and course offerings, Entrepreneurial engineering vs scholarly CS.
- Lack of enough interest of faculty
- Politics, fighting over turf, courses, resources and faculty appointments
- Size of ECE+CS as a result of merge
- Different Colleges.
Obstacles - CS

- Different Cultures: The fear of losing ones distinct identity
- Expanding department makes it harder to manage
- Different culture, focus and curriculum, interest in research aspects
- CS is in school of science and not engineering – takes act of God to move it to engineering!
- Fighting over space, facilities and equipment
- Having a joint program (computer engineering) is better than merging
- CS is a good funding source for the collage of Arts and Science
- Not enough commonality
- The programs serve different student bodies
Obstacles - CS

- The fear of losing one's distinct identity
- Leadership – Finding someone who could lead a large, combined department successfully and maintain the integrity and quality of both programs is a bit daunting, not to mention finding someone with the experience of both sets of majors and their needs.
Advantages of Merging

- Absolutely nothing!
- This is a wrong question!
- I have nothing to say!
- ???!!!!
- Higher sales of Tylenol and Aspirin!
# Obstacles for Merging - ECE

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Different Cultures, Philosophy…etc</td>
<td>29%</td>
</tr>
<tr>
<td>No Interest to Merge</td>
<td>17%</td>
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<tr>
<td>Politics</td>
<td>17%</td>
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<tr>
<td>Different Colleges</td>
<td>13%</td>
</tr>
<tr>
<td>Large Size</td>
<td>12%</td>
</tr>
<tr>
<td>Other Dept. Does not want</td>
<td>11%</td>
</tr>
</tbody>
</table>
Obstacles for Merging - CS

- Different Cultures, Philosophy…etc: 31%
- No Interest to Merge: 29%
- Politics: 15%
- Diff. Colleges: 8%
- Large Size: 12%
- Other Dept.: 6%
### Obstacles for Merging – ECE/CS

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>CS</th>
<th>ECE</th>
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</thead>
<tbody>
<tr>
<td>Different Cultures, Philosophy...etc</td>
<td>29</td>
<td>31</td>
</tr>
<tr>
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<td>17</td>
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<tr>
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<td>12</td>
</tr>
<tr>
<td>Other Dept.</td>
<td>6</td>
<td>11</td>
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Size Issue - T/TT Faculty

University of Central Florida
Size Issue - Student Headcount

Ave ECE

UnderG

Grad

Size Issue
More CS programs are now in engineering colleges than science colleges.

Large number of CS and ECE depts have considered merging issues.

Cultural differences are the main concern.

Politics is major factor as well.

Merging CS and CompE make more sense.

CS faculty oppose merger more than ECE/CompE faculty.

ECE Depts with more than 35 faculty were concerned about size.
Other Merger/Split Experiences:

1) U of Central Florida – EECS Split/Merger Experience

2) Iowa State University – Views on merger

3) University of California at San Diego – Merged before 1987, now split in ECE and CS

4) University of Illinois at Chicago – Views on Split
University of Central Florida
Experience

School of Electrical Engineering and Computer Science
University of Central Florida
UNIVERSITY OF CENTRAL FLORIDA
FROM PROMISE TO PROMINENCE

1969 – Enrollment: 1,948 Students
2005 – Enrollment: 45,000 Students
In 1994, EE and CompE Depts were merged as ECE Dept. (CS Dept was in the College of Arts and Sciences)

In 1998, CS moved to engineering and merged with ECE to form the School of EECS.

In 2003, CS and ECE were split for administrative reasons.

In 2005, CS and ECE were merged again into the School of EECS under new leadership in the college and school.
Why did we split in 2003?

- Merged units were still separated administratively, including different faculty searches, budgets and curriculum.
- Unequal distribution of resources
- Walls were created/not torn down between the three programs
- Faculty, classes, programs were not truly integrated
Why succeed this time?

- New leadership in the college and department, committed to the true merger.
- One department, one chair, one budget, one faculty- no more walls for separation!
- More than 25 faculty lines will became available for the combined ECE & CS unit
- The move to EN III (Harris Corp Engineering Center) through $6M donation
- Increased resource allocation in terms of staff, faculty expertise, space, technical support …etc.
- Stronger faculty support!!!
CECS Programs of Study

- Computer Science
- Information Technology
- Civil Engineering
- Environmental Engineering
- Construction Engineering
- Electrical Engineering
- Computer Engineering
- Engineering Technology
- Industrial Engineering
- Aerospace Engineering
- Mechanical Engineering
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- Computer Science
- Information Technology
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- Environmental Engineering
- Construction Engineering
- Electrical Engineering
- Computer Engineering
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- Mechanical Engineering

University of Central Florida
## Faculty/Staff Count

<table>
<thead>
<tr>
<th></th>
<th>ECE</th>
<th></th>
<th>CS</th>
<th></th>
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<tbody>
<tr>
<td>Tenured / Tenure Track</td>
<td>Visiting Full Time</td>
<td>Staff</td>
<td>Tenured / Tenure Track</td>
<td>Visiting/Lect Full Time</td>
</tr>
<tr>
<td>32</td>
<td>3</td>
<td>7</td>
<td>24</td>
<td>13</td>
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</tbody>
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### EECS

<table>
<thead>
<tr>
<th>Total Tenured / Tenure Track Faculty</th>
<th>With New Faculty Lines</th>
<th>Total Staff</th>
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<tbody>
<tr>
<td>56</td>
<td>73</td>
<td>20</td>
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</tr>
<tr>
<td>TOTAL Undergraduate Headcount</td>
<td>2109</td>
<td></td>
</tr>
<tr>
<td>TOTAL Graduate Headcount</td>
<td>560</td>
<td></td>
</tr>
<tr>
<td>TOTAL HEADCOUNT</td>
<td>2669</td>
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</table>
Engineering III - EECS
Harris Corp Engineering Center

University of Central Florida
Iowa State University

CS in COE vs. LAS? Where do they belong?

- Three Models: CS in Engr, CS in LAS, CS in Engr with ties in LAS
- Four programs: E Engr, Comp Engr, Software Engr, Comp Science
- Two points of View
  - All computer Science graduates need engineering thinking – Be in Engineering
  - Computer Science is essentially about algorithmic approaches, complexity theory and math – Be in LAS
- I believe CS should be in Engr with close ties to ECE and LAS
  - Will allow the four program continuum to perform well
  - Will allow to bring depth in programs without inter-college admin hassles
  - Will allows better system research (embedded and other)
- Issues in Move to COE: How does mathematicians feel? misconceptions about work loads, focus on research dollars, research breadth vs. depth, theory vs. applications as research topics, CS is in HUB in LAS departmental wheel (but so will be the case in COE)
- Most top successful schools have EECS/ECE-CS/EE-CSE, but all in Engr
University of California at San Diego

The EECS program proved to be effective at UCSD to bring up the cohesiveness of the undergraduate and graduate programs. It was discontinued in 1987, with the formation of 2 departments: CSE and ECE, mainly due to the difference in the faculty evaluation which lead to a slower growth of the CS segment in the mid 80's.

Advantages for merging:

1. Avoidance of duplication, CS emphasis is evolving in time and it is highly likely it will evolve into areas that can benefit from the expertise of traditional EE programs.
2. Comphrensiveness of the undergraduate and masters programs in that the coursework can be streamlined in the merged department.
3. A joint program can better position into new ventures, e.g. one that involves biomedical research.

Disadvantages for merging:

1. Growth in the number of faculty in both programs can be slowed.
2. A big department can be a challenge to manage.
3. Standards for promotion/merit files can be different in the EE & CS segment.
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In 2001, the EECS Department at UIC was split into ECE and CS with both departments remaining in the College of Engineering.

Rationale: numbers — EECS faculty totaled 60+ in a college of 115 faculty in five departments.

This seems to have worked well for both departments in terms of streamlining teaching, defining departmental research thrusts, overall funding, morale etc.

Looking towards the future in a post Moore’s law world - it would appear to make sense to keep EE and CE curriculum developing closely.

There are no plans for re-merging ECE and CS at UIC in the future.
Panel: ECE/CIS Mergers

Gonzalo R. Arce
University of Delaware

March 14, 2006
- ECE in Engineering & CIS in Arts and Sciences

- In 2005 CIS considered moving into EG
  - The Opportunity
    - Dean of A&S left UD
    - CIS Chair not reappointed
  - Group of CIS faculty proposed move
    - ECE and CIS have long tradition of collaboration
    - Move not merger
Electrical and Computer Engineering
- 1,400 UG s
- 24 FT Faculty
- $12 M research/yr
- 180 graduate students
- 1 of 5 departments in College

Computer and Information Sciences
- Arts and Sciences
  - 10,000 UG s
- 20 FT Faculty
- $2M research/yr
- 70 graduate students
- 1 of 26 departments in College
Top 4 list for CIS to move into EG

- EG is the top college at UD: students, research
- Resources:
  - Space crunch in CIS vs. new $50M building for ECE/MSE
  - Endowed and named professors
  - Endowment tap
- EG: vibrant and competitive college
  - Promotion and tenure
- Decentralized budget: approx 70% overhead returns to college
Top 3 list for EG to bring CIS on board

- EG has about 100 faculty
  - Increase 20% faculty lines

- Long-Term Investment
  - Loss in the short term
  - Decentralized budget with 90% overhead return

- Shared vision and growth with ECE
  - Hiring, UG education, courses, …
- CIS move not completed
  - CIS faculty split on vote
  - New A&S Dean
    - Space high on his priorities
  - Inertia

- Conclusion
University of Illinois at Chicago

EECS Split in 2001
Background

- 1900 students in College of Engineering with traditional set of departments and approximately 100 faculty
- Within the EECS Department there were EE, CE and CS areas of concentration having
  - 350 EE
  - 400 CE
  - 275 CS
  undergraduate students
- The department had approximately 55 faculty members, split evenly between EE/CE and CS, with 5-10 adjuncts, depending on teaching needs
- The department head at the time had a strong EE background
Points of Contention

- Almost all advanced level undergraduate courses in EE and CE had enrollments ranging from 50 to 100 students
- Many EE and CE students took CS courses causing high enrollments in CS courses
- TAs were allocated to courses with labs and high enrollments
- CS faculty felt highly overburdened
- There was much debate between EE and CS faculty about the nature of the CE curriculum
- Given very limited open lines, there was much debate between EE, CE and CS faculty about areas in which new faculty would be hired
- The EECS Department dominated all college level faculty voting
- The Dean at the time had an appointment in Mechanical Engineering
- Given its high student to faculty ratio, the EECS Department was severely underfunded, compared to other departments in the college
Split

- Driven by senior EE faculty and junior CS faculty, splitting EECS discussions began in 2000
- The impact of the .com bust was not fully realized
- There was much heated debate about the location of the CE curriculum, which greatly polarized the entire faculty and accelerated the split

- The EECS faculty was split evenly between the ECE and CS Departments
- About 800 students elected for ECE and approximately 250 students went to CS

- Over the next few years the ECE department struggled against lower state support, while enrollments went down and a few new faculty lines were filled
ECE/CS or EE/CSE

The case of UIC

• In 2001 the EECS Department at UIC was split into ECE and CS with both departments remaining in the College of Engineering.
• Rationale: numbers. EECS faculty totaled 60+ in a college of 115 faculty in five departments.
• This seems to have worked well for both departments in terms of streamlining teaching, defining departmental research thrusts, overall funding, morale etc.
• Looking towards the future in a post Moore’s law world - it would appear to make sense to keep EE and CE curriculum developing closely.
• There are no plans for re-merging ECE and CS at UIC in the future.
Reflection on Merging ECE & CS

*Three Years and Counting*

Terri Fiez

Oregon State University

Undergrads: 1400
Grads: 275 (125 PhD)
Tenure/tenure-track Faculty: 45
Research: $7M
Merger Timeline

• Feb. 2002 - CS Head Steps Down
  – Concerns over loss of momentum
    • Lose key faculty
    • 1-1.5 years to find replacement and no guarantees
  – Begin “Dating” process
    • ECE & CS Faculty luncheons
    • ECE faculty discuss tradeoffs
    • CS faculty discuss tradeoffs – Senior CS faculty leading support for merger
Why Merge?

- Combines strengths to create larger, more visible unit
  - CS: senior faculty, good govt. agency contacts
  - ECE: leadership, good industry contacts
  - Both: strong new faculty
- We’re going to be sharing a new building anyway
- Other universities have done it effectively
- Hiring should be focusing on faculty, rather than administrators
  - To support increased enrollments
  - To improve competitiveness for external funding
Why Merge?

– Strategic move that helps jump whole college forward in Oregon and Nationally
  • Better positioned for research funding
  • Better positioned for expanding in “crossover” areas (e.g., networking, graphics/image processing)
  • Creates test bed for out-of-the-box approaches that can be replicated in other departments
– Makes clear statement that faculty are committed to goals
– Within OSU, makes strong statement by joining two strong departments to create research synergy
Merger Timeline (2)

• April 2002 – Strawman Vote Supports Merging
  – Small group of CS faculty (~25%) opposed but not research/education leaders
  – ECE faculty generally supportive but no change in leadership for them
  – Proposal put together to put merger forward
Merger Timeline (3)

• May 2002 – Meet with University Graduate Committee to Review proposal
  – Former CS Head previously supportive shoots down proposal at committee
  – Interim CS Head appointed
  – Transition begins by developing common processes for workload, P&T, Staff operations
Merger Timeline (4)

• Oct.-Feb. 2002 – Completion of University committee approval
  – Continued transition between ECE & CS
• Feb. 2003 – Merger official
Wedding Feb. 27, 2003
Was it Worth All the Headaches?

• As with any major change, there is a period of setback before you can realize the true benefits (about 2.5 years in our case)

• Moving into one building last fall has helped cohesiveness and morale

• EECS appears to be attractive for new hires

• Twice as many leaders to further our goals

• Developed new P&T & PhD qualifying processes and many operational changes
  – Taking the best from each department and leveraging for the School

• Number of PhD students doubled

• Future funding from State will be focused on research and PhDs
What Conditions Should You Consider Merging?

• Clear benefit for attaining your goals
  – Funding, research, education, students

• Key leaders in the faculty see benefits & support the idea

• Clear leader identified to pull it all together along with key supporting cast
DEAN: Dearly beloved, we are assembled here in your presence to join Computer Science and Electrical Computer Engineering in a mutually beneficial union.

Who gives these two into merged bliss? Together, the State of Oregon and Oregon State University have declared that CS and ECE shall become one.

Now, in honor of that blessed decision, please join me in the merger vows of commitment.

**Exchanging Vows**
CS please repeat after me:
We now accept ECE to be our merged partner, in good budget years and bad, in times of smart algorithms and slow breakthroughs, in prolific textbook publishing and dryspells, with best wishes for beautiful programming languages, accurate software testing, quick machine learning and quality animation,
as long as we both shall be merged.

ECE please repeat after me:
We now accept CS to be our merged partner,
in good budget years and bad,
in times of good research productivity and slow breakthroughs,
in times of many new devices, circuits and systems and voids,
with good journal articles and bad,
with best wishes for strong computer engineering,
unique analog/mixed-signal,
quality image and signal processing
and great power engineering
as long as we both shall be merged.

As members of this new entity, please exchange your tokens with
someone from a different department.

By the power invested in me, I now pronounce you the School of EECS!
Eat some cake!
EECS at UC Berkeley

Jitendra Malik
Department Chair
History of EE and CS at Berkeley

• 1965 EE becomes EECS
• 1968 CS in College of Letters & Science
• 1973 Forced merger of CS into EECS, with a guaranteed “local autonomy” to CS. Division of CS with its own chair in the department of EECS
• 1996 First EECS chair from CS. Structure made symmetric with EE and CS divisions.
EE and CS interface is more than CE

- Computer Architecture
- Networks
- Image Processing/Computer Vision; audio processing/Speech Recognition
- Pattern Recognition/Machine learning
- Information theory/Complexity theory
- …
Sources of conflict between EE and CS

• Culture: EE sees itself as an engineering discipline. CS is divided among people who self-identify as mathematicians, scientists or engineers.

• Power: Partly because of numbers and partly because of seniority, chairs of EECS departments are often from EE.

• Teaching Load: During the dotcom years, CS professors had to teach much larger classes.

• …
Making it work at Berkeley

- Chair and Associate Chair model, with each serving as division chair
- Four department-wide Vice Chairs (2 EE and 2 CS currently)
- Almost all committees have Chair & Co-Chair model
- Hiring, Promotion and Tenure processes have mix of divisional and departmental processing
- Undergraduate curriculum is departmental responsibility with several courses having joint EE/CS teaching
- Several research clusters/areas cut across divisional boundaries
- Alternate weeks have departmental and divisional lunches; annual two day faculty retreat
- Keep trying....