UW 2-13 REVIEW COMMITTEE FINAL REPORT

Committee:
UW 2-13 Review Committee for the Reorganization of the Departments of Computer Science (CS) and Electrical and Computer Engineering (ECE)

Committee Members:
Jeff Anderson (ECE), David Bagley (Chair, Assoc. Dean CEAS), Amy Banic (CS), Mike Borowczak (CS), Craig Douglas (Math & Statistics/SER), Dongliang Duan (ECE), Tara Evans (General Counsel), Suresh Muknahallipatna (ECE), Tom Peterson (President's Office), John Pierre (ECE), Ellie Riske (Staff Senate), and Jim Ward (CS)

Restructuring UW for the Future Recommended Action:
Reorganization, with Reservation

Submitted to Provost Carman on:
October 1, 2021

EXECUTIVE SUMMARY

The Committee recommends, with reservations, the *reorganization* of the current Department of Electrical and Computer Engineering with the current Department of Computer Science, to form a new *Department of Electrical Engineering and Computer Science* (EECS). To address these reservations (discussed in the report), the Committee strongly recommends that an Ad Hoc Committee be formed immediately with members from the affected departments to facilitate a smooth transition to the new EECS Department. The Committee reached this recommendation after considering the benefits and efficiencies of the merger, a proposed new organizational structure, proposed areas of academic endeavor including research opportunities, the unintended consequences of the reorganization, and the input of multiple stakeholders.

The Committee identified 12 potential reorganization benefits and efficiencies including increased administrative efficiency, improvements to both the undergraduate and graduate programs, and increased efficiency in hiring new faculty. Though these benefits and efficiencies could lead to cost savings and increased revenue in the future, the Committee was unable to quantify these potential monetary benefits.

The Committee determined that the new EECS Department will be unsustainably staffed at its inception July 1, 2022. To ensure the success of the new EECS Department, the Committee strongly recommends the strategic hiring of nine additional tenure-track or tenured faculty, four additional non-tenure track faculty, and nine additional technical staff over a five-year period.

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BENEFITS AND EFFICIENCIES

(These sections have been combined)

The proposal to reorganize the current CS and ECE Departments into a new Department of Electrical Engineering and Computer Science (see Organizational Restructure Section) provides the following benefits.

1. Increased administrative efficiency.

The new Department will require only one Head, one Undergraduate Programs Coordinator and one Graduate Programs Coordinator (see Organizational Restructure) instead of the two Heads, two Undergraduate Coordinators and two Graduate Coordinators currently required.

2. Increased teaching efficiency.

The new Department will help facilitate the development of a common freshman year for all three B.S. degree programs (Electrical Engineering, Computer Engineering, and Computer Science). Having common courses in the freshman year will allow the Department to offer classes with larger enrollments, thus improving teaching efficiency.

3. Increased flexibility for undergraduate students.

With a common freshman year, students will have greater opportunity to transfer between the three-degree programs without losing credits.

4. Improved recruitment opportunities and efficiency for undergraduate students.

Many students considering undergraduate studies have broad interests in computing and electrical systems but do not know which program to pursue. With three B.S. degree programs housed in the new Department, there will no longer be competition between departments to recruit new undergraduate students. Instead, all interested students can be actively recruited, and then easily move among the three B.S. programs after arriving at UW.

5. Increased retention of undergraduate students.

Retaining undergraduate students is a constant challenge. The solely administrative barrier arising from two separate departments has historically caused some students to leave the College altogether, instead of seeking to move from one department to another. In the new Department, increased retention will be facilitated by the removal of this administrative barrier, providing students the straightforward opportunity to move among the three B.S. programs.

6. Increased support for associated undergraduate degree programs.

When fully staffed, the new Department can help facilitate the efficient delivery of new undergraduate programs, such as Software Engineering and degrees offered through the proposed School of Computing.

7. Increased potential for graduate degree flexibility.

When fully staffed, the new Department will be able examine the potential for new graduate degree programs in emerging areas. For example, a new PhD program in Computer Science and Engineering may merit consideration, providing students with a broader focus than may be possible with the existing PhD programs.

8. Improved recruitment opportunities and efficiency for graduate students.
Students searching for graduate programs are more sophisticated than those searching for undergraduate programs and know how to look for the research areas and topics of interest to them. What these students may not fully understand, however, is how faculty work across academic departments and so they (students) may perceive department boundaries as a barrier. By removing that solely administrative barrier, graduate student recruitment to the new Department may be improved, especially for those students who are interested in cross-over and new research areas that may have otherwise looked elsewhere.

9. Increased efficiency in recruiting new faculty.
No longer will two separate departments be competing for new faculty positions. Instead, all new positions will benefit the entire department. New faculty whose expertise bridges key research areas can be recruited. Finally, the increased array of research areas within a single department may attract talent that may have not considered UW otherwise.

10. Opportunity to pilot larger College-wide initiatives.
The current departments have historically led initiatives in the College such as educational outreach to K-12 students and educators. The new Department will continue the innovative history of its predecessors. For example, a common freshman year for the three B.S. programs may form the foundation for a new Living-Learning Community (LLC). The new Department can lead the development of an LLC and serve as pilot for other programs in the College.

11. Increased clarity in communications to broader stakeholders.
Many external stakeholders understand and value the work of the current departments. Other important stakeholders, however, may not understand the differences between computer engineering, computer science and electrical engineering and may be confused by the current organization. The new Department will be able to communicate a "one-stop-shopping" message about the contributions of all three fields and how they interact to solve problems. This will be particularly important for cross-over and new research areas.

12. Potential for increased opportunities for research funding.
Faculty in the current departments already collaborate extensively with each other and colleagues across UW on research projects. The new Department nevertheless provides increased potential for more collaborative opportunities among faculty, especially on large research proposals and projects. This potential will be increased with strategic new hires into the new Department who provide expertise in cross-over and new research areas. One minor advantage from a solely administrative standpoint is that the new Department will receive all of the department's fraction of indirect costs instead of having those shared between the current departments.

There may be additional benefits arising from the formation of the new Department. What cannot yet be determined, however, are quantitative, and especially monetary, metrics for each benefit. The Committee cannot predict how much money will be saved compared to the current department structure nor how much extra revenue could be generated as a result of these benefits. Additionally, the Committee does not feel that any prediction is prudent at this time, given the uncertainty in staffing levels going forward (see Organizational Restructure section for additional discussion of staffing levels.)

ORGANIZATIONAL RESTRUCTURE

Proposed Name for the New Academic Unit

The new academic unit formed from the two existing departments (Electrical and Computer Engineering (ECE), and Computer Science (CS)) should have a name that represents the different programs that are housed in the new unit. Six names that were proposed are:

1. Electrical Engineering and Computer Science (EECS)
2. Computer Engineering and Science (CES)
3. Computer Science and Engineering (CSE)
4. Electrical and Computer Science and Engineering (ECSE)
5. Big Data Science
6. Bits & Electrons

For comparison, of the 24 academic units (departments and schools) across the United States that are combined (see Appendix 2), 18 are named "Electrical Engineering and Computer Science", three (3) are named "Computer Science(s) and Electrical Engineering" and the remaining three (3) are named "Computer & Electrical Engineering & Computer Science", "Electrical & Computer Engineering and Computer Science", and "Electrical and Computer Engineering", respectively.

For the new academic unit to be readily recognized, the Committee recommends that the new academic unit be named "Electrical Engineering and Computer Science (EECS)". Additionally, the Committee recommends that the new academic unit be a "Department" to specifically differentiate itself from the proposed School of Computing at UW.

Proposed Organizational Chart and Rationale

The Committee proposes the following organization for the new Department of Electrical Engineering and Computer Science (EECS) (Figure 1). A major goal of the Committee was to identify an organizational structure that would provide inclusive leadership to facilitate future growth across all the programs and research areas in the new Department. The Committee considered several organizational structures in addition to the single Head model proposed in Figure 1, including the Head/Associate Head model and the Head/Program Directors model as well as identifying Undergraduate Coordinators for each undergraduate program or having the ABET Champions serve as co-chairs of a single Undergraduate Programs Committee.

The selected organizational structure has four key benefits compared to the alternatives. First, the single Head model (without Associate Heads or Program Directors) emphasizes that the new unit is a single Department with unified goals, and not simply a collection of separate programs. Second, having only one Graduate Programs Committee, led by one Graduate Programs Coordinator, and only one Undergraduate Programs Committee, led by one Undergraduate Programs Coordinator, facilitates the development of integrated educational and research programs throughout the department. In particular, the closer integration of undergraduate programs is expected to be a source of both efficiency (in course delivery) and opportunity (for students to more readily move among programs). Third, separate ABET Champions are needed for the Computer Science B.S. and the Electrical and Computer Engineering B.S. degrees because these programs are accredited by separate Commissions of ABET: the Computing

Accreditation Commission for computing programs, and the Engineering Accreditation Commission for engineering programs. While ABET accreditation is critically important for these programs to provide graduates able to pursue subsequent licensure in the State of Wyoming, it should not drive program development. Thus the ABET Champions will serve on the Undergraduate Programs Committee but will not chair it.

Finally, the selected organizational structure is the most economically efficient structure of the alternatives considered. It increases administrative efficiency over the current two department structure by three positions: one department head, one graduate coordinator, and one undergraduate coordinator.

Recommended Number of Faculty

The CS and ECE departments in Academic Year 2022-2022 combined have 16 tenure-track or tenured faculty and 4 non-tenure-track faculty (20 total). The new department to be formed may initially (July 1, 2022) have even fewer faculty if additional resignations and/or retirements occur by the end of Academic Year 2021-2022. The Committee considers this number of faculty *well below sustainable* for the proposed new department. Indeed, the Committee predicts that temporary lecturers will be necessary to successfully deliver the undergraduate programs, especially Computer Science, in Academic Year 2022-2023.

To address this sustainability challenge, the Committee recommends a five-year hiring strategy to bring the faculty complement to at least 25 tenure-track and tenured faculty (an increase of 9 versus current) and 8 non-tenure track faculty (an increase of 4 versus current) by July 1, 2027. The Committee strongly believes that this number and composition of faculty is the *minimum necessary* to achieve the goals of the new EECS Department. New tenure-track and tenured faculty should be hired to specifically support innovative research areas (see the Academic/Discipline Specific Expertise Section). Non-tenure track faculty are necessary to support the teaching missions of the new department and should be hired to retain the approximately 3:1 ratio of tenure-track and tenured faculty to non-tenure track faculty that has been successful in the past. This hiring strategy is a *key opportunity for UW to invest* in the new Department in future years, and should be aggressively pursued.

Graduate Teaching Assistants

The CS and ECE departments received a total of 14 State Graduate Teaching Assistants for Academic Year 2021-2022 (seven per department), or 0.7 GTA per faculty member. GTAs are critical for supporting the teaching missions of the programs. The Committee considers this number of GTAs *below sustainable* for the new department and recommends 1.0 GTA per faculty member. To achieve this, the State GTA assignment must grow over the next five years, and by July 2027, the target GTA allocation consistent with the target faculty numbers will be 33 GTAs for the new department.

Recommended Number of Staff

The CS and ECE departments started Academic Year 2021-2022 with only 2 staff. A third position, Office Associate, Senior, is shared between the departments and is in the process of being filled at the writing of this report. The Committee considers this number of staff *well*

below sustainable for the new department and proposes the following to address this sustainability challenge.

The current CS and ECE departments computational needs have been provided by the Engineer, Senior and non-tenure track faculty members. This has decreased the bandwidth of these individuals to more aggressively support research projects (in the case of the Engineer, Senior) and teach (in the case of non-tenure track faculty). The Committee recommends remedying this deficiency by hiring a Computer Support Specialist, Executive for the new department. This position would "provide basic, routine, and advanced level computer and software technical expertise" for the new department, and "act as liaison between Information Technology and the supported unit", "while working under limited supervision." (see UW Human Resources job descriptions.) This would provide a *Technical Support Group* (see Figure 1) able to provide robust support for the new Department's research and teaching enterprises as they will exist on July 1, 2022. As the department's faculty complement grows, the *Technical Support Group* staffing must also grow. The Committee recommends a ratio of one new technical staff person per new tenure-track and tenured faculty member, providing an increase of 9 technical staff by July 1, 2027 (for a total count of 12 technical staff). The general classifications of the new staff should be consistent with current (Technician, Engineer, Computer Support Specialist) but the ranks may be lower than the current ranks.

The financial staff needed to support the new Department will be provided by the College, as they are now. The administrative staff complement of one Office Associate, Senior (OAS) is sufficient for July 1, 2022 for a new Department of 23 faculty and staff (including the OAS). Additional administrative staff will likely be needed by July 1, 2027 to accommodate the 46+ faculty and staff in the new Department at that time. The number and rank of the administrative staff will depend as well on growth of student enrollment.

Selecting a Department Head

The Committee has identified the following pools of qualified individuals who may be considered to serve as the Head of the new EECS Department.

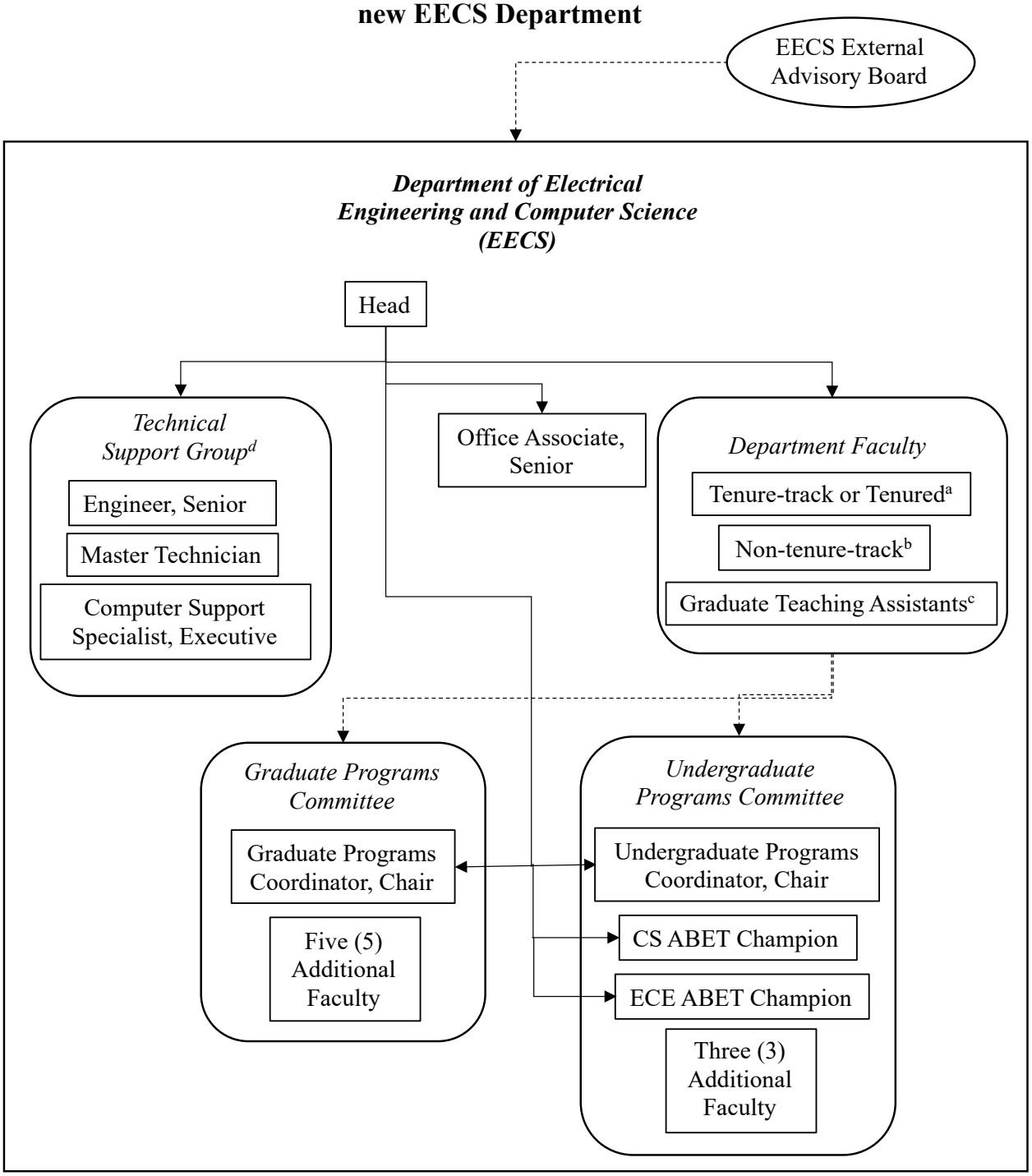
1. Current tenured faculty in the existing CS and ECE Departments.
2. Current tenured faculty at the University of Wyoming who are outside of the existing departments but who have an appropriate technical background.
3. Qualified external faculty identified from an international, open search.

A Department Head identified from either of Pools 2 or 3 would count toward the strategic increase in tenured faculty in the new Department. The selection of a Department Head should be made by the College Dean after considering extensive faculty input.

Ad Hoc Committee for Further Implementation

Many tasks must be completed to successfully launch the new EECS Department on July 1, 2022. The Committee strongly recommends the establishment of an *Ad Hoc Committee*, composed of a cross-section of members from the current CS and ECE departments and appropriate stakeholders, to oversee and accomplish these tasks. The Ad Hoc Committee should start immediately and be formed and charged in accordance with the current College bylaws.

Figure 1. Proposed Organizational Chart for the new EECS Department



[a]Includes Head (Tenured), Programs Coordinators and ABET Champions. See text for number of faculty required.
[b]Includes Senior Lecturers, Professors of Practice and other non-tenure track faculty as defined in UW Regulation 2-1. See text for number of faculty required.
[c]Includes State-Funded Graduate Teaching Assistants. See text for the number of GTAs required.
[d]This identifies the necessary positions. See text for number of individuals required in each position.

ACADEMIC/DISCIPLINE SPECIFIC EXPERTISE

The proposed reorganization of the existing ECE and CS departments into a new Department of EECS would encompass a total of seventy-seven specific research areas [Source: IEEE and ACM], providing a wide variety of research areas for a faculty to be research active. For the new Department to be nationally and internationally competitive and relevant to the state, however, faculty expertise should be focused on areas with significant anticipated funding growth and economically disruptive technologies. The research areas and disruptive technologies of focus should have a near-enough potential impact for the new Department to succeed with increased external funding and student enrollment. Considering the ten key technology focus areas of funding proposed in the Endless Frontier Act for a reorganization of NSF [Source: NSF's key priority areas], twelve disruptive technologies identified by the McKinsey Global Institute [Source: www.mckinsey.com/mgi], and the recent funding successes in the current ECE and Computer Science departments, the Committee *recommends four areas of research* of faculty expertise (Figure 2 and described below).

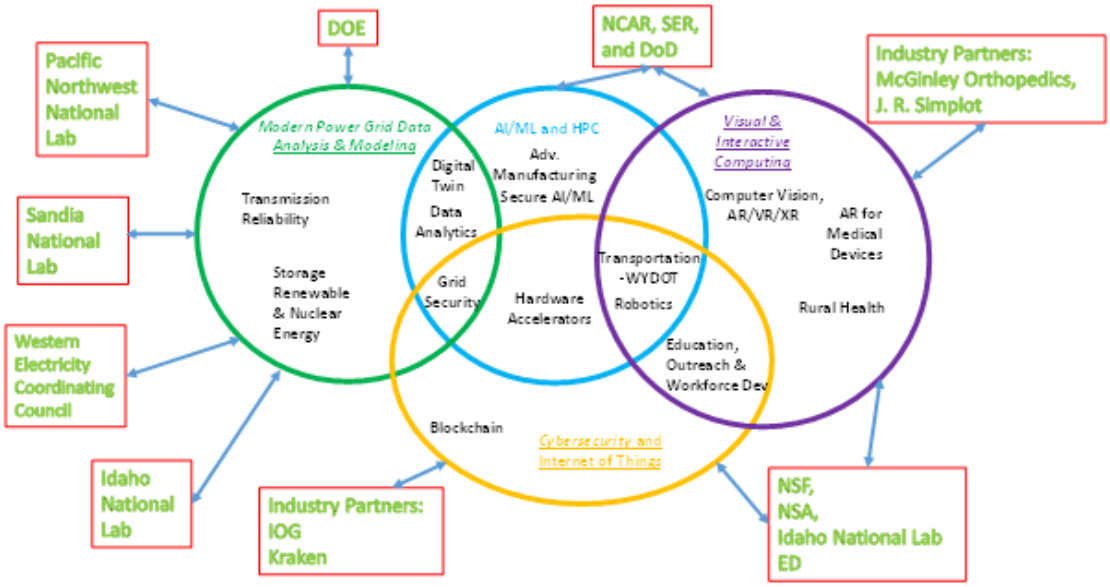


Figure 2. Research Areas of Faculty Expertise

These four recommended research areas consider the near-term potential for increasing funding in the new Department and a long-term research vision with strategic faculty hires in areas like next-generation nuclear fission and renewable energy, quantum computing, 3D and volumetric displays for rural health to mention a few [Source: www.mckinsey.com/mgi] (Figure 3).

1. Modern Power Grid Data Analysis & Modeling

The long-term goal of power system research in EECS is to provide better power system monitoring and operation with the support of signal processing, advanced computing, and intelligent control. To accomplish this goal, current faculty have diverse and interdisciplinary areas of expertise including statistical signal processing, high-performance computing, power system dynamic analysis, machine learning, data modeling, power system control, and renewable energy integration. There are three main directions of this work: 1) developing and supporting

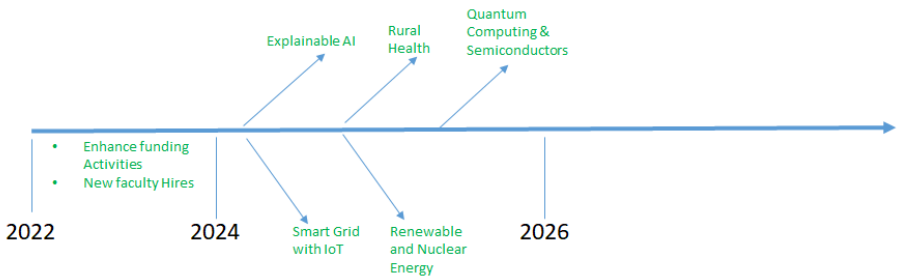


Figure 3. Potential Near-Longterm Research vision of the new combined departments

techniques for more advanced measurement devices and systems for the power grid; 2) data analytics for the monitoring and operations of power systems; and 3) stability analysis, optimization, and control for power grids with high penetrations of renewable energy resources.

Current faculty have conducted over $5.5 million in electric energy delivery research. This has included funding and/or collaboration with the DOE, NSF, the Western Electricity Coordinating Council (WECC), three industry partners, four utilities, and four national laboratories. These efforts progressed from fundamental research to practical applications having a significant impact on the safe day-to-day operation of the US power grid. This impact has been dramatic in two ways: (1) advanced software, developed at UW, is now going into operation at power grid control centers to monitor in near real-time how close a power grid is to a major blackout, and (2) UW helps plan system wide tests for the western US power grid.

2. AI/ML and HPC

Advances in artificial intelligence (AI)/machine learning (ML) and convergence with high-performance computing (HPC) are making possible the automation of many knowledge worker tasks leading to the possibility of sweeping changes in various economic sectors like energy, transportation, advanced robotics, rural health, and agriculture. The current departments have active research grants in the use of AI/ML+HPC to address specific problems of grid stability, smart emergency vehicle protection, production of advanced materials, automated machine learning, collaborative human-robot planning, and fertilizer/produce measurement using drones. The funding agencies are NSF, NASA, WYDOT, and seed grants from several private industries. Building on these existing research capabilities can pave the way for the new Department to increase research funding in explainable AI and ML-based weather forecasting, for example. Targeted hiring of several new faculty in computer vision, quantum computing, and advanced ML areas can lead to long term sustainable growth in research funding and graduate students.

3. Visual and Interactive Computing (VIC)

Areas of computing disciplines concerning images, computer graphics, 2D/3D models, data processing and visualization, displays, and interactivity are foundational to most computing applications, systems, and state-of-the-art facilities. Current research activities in VIC at the University of Wyoming include Computer Vision, Augmented/Virtual/Mixed Reality (AR/VR/MR-XR), 3D User Interfaces, Mobile and Emerging Computing, and Human-Computer Interaction. XR being very new, disruptive technologies, current research activities at UW are in the infancy stages with a few external grants from federal agencies (NSF, INBRE), an industry partner, national laboratories (INL, NREL), and campus partners (i.e. Shell 3D Visualization Center). Additionally, faculty have attracted an NSF REU grant for VR training using a patented

and FDA-approved AR-based medical device commercialized by the industry partner. Research activities to design, create, and evaluate better VR/AR mixed reality interaction techniques and input devices for a 3D environment [Source: www.mckinsey.com/mgi] addressing rural health, medical applications, workforce/training, collaboration, and remote/hybrid education have the near-term potential for externally funded research from NIH, DoD, NSF, DOE, and industries.

VIC requires fundamental and applied research and teaching that is widely interdisciplinary across computing disciplines, including those proposed for the new Department (such as AI/ML and Cybersecurity), and the UW campus. Faculty in health, kinesiology, psychology, geology, anthropology, education, art, and other areas conduct interdisciplinary research and teaching with VIC disciplines. Growth of faculty in VIC will expand and strengthen interdisciplinary and transdisciplinary research necessary to be competitive for larger external funding sources.

4. Cybersecurity and Internet of Things (IoT)

The security, resilience, stability, and gained efficiencies of systems and processes within our society require fundamental and applied research which intersects with the entire computing spectrum, including the research areas proposed for the new Department. While interconnected computational networks have existed for the past 50 years, advances in edge devices with efficient communication techniques have embedded a diverse set of computation sensing/decision making devices as critical components within our society. Current research activities in this space at UW (Autonomous Swarms, Security of AI/ML systems, Industrial Control Systems, Blockchain) would be expanded and refocused to programmatically connect with other research initiatives and projects. Focusing on research initiatives and faculty within four areas of computing, namely physical infrastructure/ distribution, communication networks, component hardware, and software security, enables us to quickly gain critical mass that can be leveraged to attract competitive mid-scale funding (~$5 million) to then support re-enforcement and growth of core programmatic research areas. An interesting characteristic of the proposed cybersecurity thrust includes a focus on offensive (Red-Teaming) research that informs defensive research and commercial applications. Existing partners span industry, DoE (labs), and federally entities interested in fundamental research and workforce development. Given the importance of this thrust to national security, we expect this area to grow in terms of available funding (federal and industry), commercialization opportunities, and researcher/student interest.

Impact on Undergraduate and Graduate Education

Most new graduate students in the current departments graduated from UW with a B.S. degree. Additionally, both departments had a significant number of international graduate students but conditions external to UW have decreased that pipeline significantly. The proposed new Department's well-defined research vision and focus on significantly growing funding and economically disruptive technologies will help attract more graduating UW B.S. students and also international students. Furthermore, elective courses tailored to address specific research activities in new areas of research will enhance the doctoral degree programs. A constant and large pipeline of our own high GPA UG students via the QuickStart BS/MS program and international students is an essential and crucial component for the proposed combined department to sustain and grow the external research funding.

Faculty Positions This is described in the Organizational Restructure section.

UNINTENDED CONSEQUENCES, MITIGATION STRATEGIES, AND SUGGESTIONS FOR ALTERNATIVE APPROACHES

Consistent with its charge, the Committee has focused this overall report on the vision of a new academic unit formed from the existing ECE and CS departments. Yet, there are many unintended consequences, challenges, and risks arising from combining the departments, and a strong case can be made to leave the Departments separate implementing instead other mechanisms to increase the collaboration and reduce expenses. In December 2020, a report from the CEAS Dean and respective Department Heads was submitted to the Provost recommending against the merger of the two Departments. This section examines these unintended consequences, challenges, and risks as well as approaches to minimize them including the possibility of keeping the Departments separate.

First, the Committee wants to emphasize that a combined department is not the common model for these disciplines. Most programs in these disciplines (ECE and CS) are in separate departments. Specifically, there are 387 ABET accredited Programs in Electrical Engineering, 292 in Computer Engineering, and 354 in Computer Science yet the Committee identified only 24 departments that included Computer Science and Electrical & Computer Engineering in a single department (see Appendix 2). Thus, the combined department model is the exception and not the norm. Regionally, combined departments are also the exception.

One reason that instutitions maintain separate deparments is that these are large and disparate disciplines with some overlapping areas in the computing field. For example IEEE, the professional society for electrical and computer engineers, has 36 sub-societies. Of those 36 sub-societies only two have “computer” in their title. Is being different than other institutions in the best interest of UW? Does combining the Departments make us look small compared to regional institutions that do not have the Departments combined? Does that make us more or less attractive to perspective undergraduate and graduate students as well as to new faculty recruits?

There are substantial differences in the cultures of the two Departments that may be overcome but add risk to the merger. These differences exist at most universities across the country, not just at UW. One difference are the criteria for reappointment, tenure, and promotion (RTP). In evaluating ECE scholarship an emphasis is placed on publications in top-tier, peer-reviewed journals in the field while in CS scholarship, the emphasis is on conference publications at top-tier conferences. The topic of RTP came up as a major concern in the four listening sessions that the committee had (see Appendix 1 and Appendix 6).

Additionally, the origin of these Departments is very different with CS arising from mathematics and ECE having a traditional engineering origin. Again, this is not unique to UW but is common with many programs across the country. These issue are not insurmountable but they do add hurdles to overcome and they may add a risk of tension and animosity in a new department.

Another risk is that the merger may have the opposite of the desired outcome of making one larger academic unit will provide teaching and research benefits as well as cost savings. The risk is that faculty may become alienated in the combined department and that factions may form resulting in a dysfunctional department. The department could get bogged down in turf wars, new departmental policies, and issues around faculty hiring, state GA allocations, and RTP as

discussed above. The question becomes, can an approach be taken that reduces these risks but maintains many of the desired benefits?

The alternative model of leaving the departments separate but increasing crossover could be more fruitful to achieving the benefits with reduced risk. Crossover approaches could include a curriculum oversight committee comprised of members from both departments, collaborative research groups based on research areas (see Academic/Discipline Specific Expertise section), adjunct faculty appointed in both departments, and a joint department seminar series, just to name a few. These crossovers could also be viewed as steps toward combining the departments at a later date with reducing the risk associated with the proposed "shotgun wedding" approach.

Both advisory boards for the two Departments opposed discontinuance (see Appendix 6) but had different opinions on the merger. The faculty in both Departments overwhelmingly opposed the merger in December 2020 (this report is included in the ECE Advisory Board letter in Appendix 6). Alternative approaches could lead to more faculty buy-in and more support from the advisory boards. One approach would be to give the College time to formulate a strategic plan to optimize interdisciplinary work between departments and explore the benefits of merging departments.

Logistically, separate Departments would continue to share one Office Associate, Senior (OAS) but the Heads' offices would located be on the same floor, with the OAS office located between them. This would improve the ability of the OAS to support both Departments. Additionally, the two Departments are currently only one floor apart on the 4th and 5th floors of Engineering Hall. Retaining separate departments also retains the cost of two Department Heads but with the smaller department sizes, the Heads can maintain research activity.

Other unintended consequences of a new Department include: (1) transitioning new graduate students into the new Department, and (2) graduate committee membership. New graduate students in both the ECE and CS Departments are committing to current programs, policies, funding and resources. Creating a new Department will result in a reallocation of resources and changes in policies that may impact their intended research and study. Care will need to be taken in offer letters to new graduate students. With respect to graduate committees, currently faculty in the separate departments often serve as the Outside Member for graduate committees in the other department. To avoid complications, students with currently approved committees should not be required to make changes to their committee memberships.

There is also concern that the new Department will have difficulty teaching all of its required courses. As noted in the Benefits and Efficiencies section, new curricula may be developed but this must be done carefully to facilitate students being able to complete the curriculum in which they originally enrolled. Additionally, the proposed reorganization has inspired a number of highly productive faculty from both Departments to look for other jobs. If the overall faculty count is further decreased going into Fall 2022, teaching loads will increase and will impact faculty research productivity.

Because the proposal for discontinuance of ECE and CS was withdrawn during the September Trustees meeting, the unintended consequences associated with discontinuance are now summarized in Appendix 5.

OTHER

The following six appendices provide additional information and context for readers.

Appendix 1. Summary of Committee's Activities
Appendix 2. Review of Other Merged Programs in the United States
Appendix 3. Proposed Common First Year Curriculum
Appendix 4. Selected Data for Current Departments
Appendix 5. Unintended Consequences Related to Discontinuance
Appendix 6. Summary of Reponses from Stakeholders

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Appendix 1. Summary of Committee's Activities

Committee Meetings:
The Committee met 14 times by Zoom after receiving the charge:

July 30	Organizational meeting
August 5	Met with Bryan Shader and Gabrielle Allen to learn about the proposed School of Computing
August 11	Brainstorming and identifying tasks to complete
August 20	Review of preliminary tasks and preparation for meeting stakeholders
August 27	Listening session with CS Department faculty (department has no staff)
August 27	Listening session with ECE Department faculty and staff
August 30	Listening session with ECE Department Head, Dr. John McInroy
August 30	Listening session with CS Department Head, Dr. Ruben Gamboa
August 31	Discussed feedback received during listening sessions
September 7	Discussed final report preparation and assigned authors for sections
September 14	Discussed preliminary drafts of report sections
September 21	Finalized Organizational Restructure section
September 28	Finalized Benefits and Efficiencies section and Academic/Discipline Specific Expertise section
September 30	Finalized Executive Summary and reviewed final comments on report

Each meeting was scheduled for one hour but several meetings ran to one hour and 30 minutes when discussion merited. The meetings were not recorded and no minutes were taken.

Anonymous Information Collection:
At its August 20 meeting, the Committee directed the Chair to create a mechanism for faculty and staff from the affected departments to submit input anonymously for the Committee's review. This was set up as a Qualtrics survey that was sent to the departments on August 24. Feedback was collected through September 7. The results are included in Appendix 6.

Request for Information from External Stakeholders:
The Committee Chair contacted the external advisory boards (via e-mail) for both Departments on August 26, specifically requesting information. The Department Heads were copied on the request to their respective advisory boards. Both advisory boards prepared responses. These are included in Appendix 6.

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Appendix 2. Review of Other Merged Programs in the United States

A review of merged programs (housing electrical and computer engineering in the same unit as computer science) was conducted. Twenty-four such programs were identified (Table 2.1). There is no particular pattern regarding size of the programs. The number of full-time faculty ranges from 14 to 178 and the number of undergraduates in the departments ranges from 200 to 3,800. Additionally, the "prestige" of the university ranges from highly prestigious (e.g. MIT and Cal-Berkeley) to regional (e.g. North Dakota and South Dakota). Interestingly, no such programs exist in Mountain West conference universities.

Table 2.1 Other Merged Electrical and Computer Engineering and Computer Science Programs in the United States

University	Department Name	Full Time Faculty	Undergrad Count
University of Michigan-Ann Arbor	Electrical Engineering and Computer Science	178	3,800
University of Kansas	Electrical Engineering and Computer Science	40	780
University of Iowa	Electrical and Computer Engineering	24	360
University of Cincinnati-Main Campus	Electrical Engineering and Computer Science	45	522
University of California-Berkeley	Electrical Engineering and Computer Science	130	3,172
The University of Tennessee	Electrical Engineering and Computer Science	50	800
Pennsylvania State University - Main Campus	Electrical Engineering and Computer Science	112	2,500
Massachusetts Institute of Technology	Electrical Engineering and Computer Science	160	1,300
Florida Atlantic University	Computer & Electrical Engineering & Computer Science	39	NA[a]
Washington State University	School of Electrical Engineering & Computer Science	54	1,100
University of Toledo-Main Campus	Electrical Engineering and Computer Science	16	NA
University of North Dakota	School of Electrical Engineering & Computer Science	20	440
University of New Haven	Electrical & Computer Engineering and Computer Sci.	16	200
University of Missouri-Columbia	Electrical Engineering and Computer Science	51	375
University of California-Irvine	Electrical Engineering and Computer Science	38	1,000
Technische Universität Berlin	Electrical Engineering and Computer Science	60	2,500
Syracuse University	Electrical Engineering and Computer Science	45	452

University	Department Name	Full Time Faculty	Undergrad Count
South Dakota State University	Electrical Engineering and Computer Science	14	250
Oregon Health & Science University	Computer Science and Eletrical Engineering	Programs Closed July 2021	
Ohio University-Main Campus	Electrical Engineering and Computer Science	28	425
Marshall University	Computer Sciences and Electrical Engineering	14	200
Brigham Young University-Idaho	Computer Science and Eletrical Engineering	15	NA
University of Central Florida	Electrical Engineering and Computer Science	NA	NA
Oregon State University	Electrical Engineering and Computer Science	65	3,900

[a]NA = data not available

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Appendix 3. Proposed Common First Year Curriculum

FRESHMAN YEAR – PROPOSED MODIFICATIONS

COMPUTER ENGINEERING, BSCP

FALL					SPRING				
Course Number	Course Title	USP	CR	Min Grade	Grade	Course Number	Course Title	USP	CR	Min Grade	Grade
FRESHMAN YEAR											
CHEM 1020 General Chemistry I OR SCIENCE/MATH COURSE Prerequisite: ACT Math 23 or concurrent MATH 1400, 1405 or 1450		PN	4	D		COSC 1030	Computer Science I Prerequisite:C in COSC 1010		4	C	
COSC 10XX Intro to Python Programming Prerequisite: Concurrent MATH 2200			4	C		MATH 2205	Calculus II Prerequisite:C in Math 2200		4	C	
	USP: First Year Seminar	FYS	3	C		EE2800 or Any ES, EE, BE course (2000 or higher) or COSC 3011 or COSC 3750			3	D	
	USP: Communications I	C1	3	C		PHYS 1210	Engr Physics I Prerequisite:Concurrent in Math 2205		4	C	
MATH 2200	Calculus I Prerequisite: C in Math 1405 or 1450, MPE 5, Math ACT 27, Math SAT 640	Q	4	C							
	Total		18				Total		15		

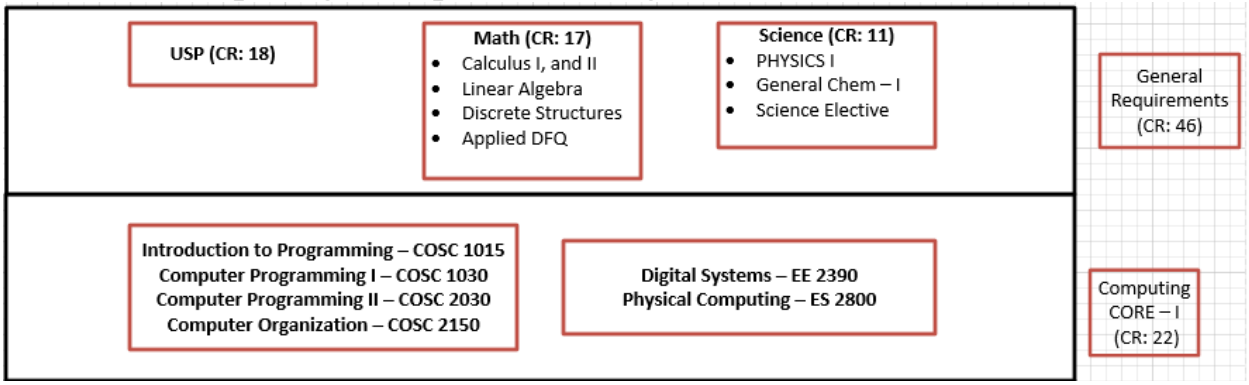
COMPUTER SCIENCE, BSCS

FALL						SPRING					
Course Number	Course Title	USP	CR	Min Gra	Grade	Course Number	Course Title	USP	CR	Min Gra	Grade
FRESHMAN YEAR											
COSC	Intro to Python Programming		4	C		COSC 1030	Computer Science I		4	C	
						Prerequisite:	*C in COSC 1010*				
MATH 2200	Calculus I	Q	4	C		MATH 2205	Calculus II	Q	4	C	
Prerequisite:	*C in Math 1405 or 1450, MPE 5, Math ACT 27, Math SAT 640*					*Prerequisite:*	*C in Math 2200*				
	Science Elective- *see list*	PN	4	D			Science Elective- *see list*	PN	4	D	
	rec Chem 1010						*rec Phys 1210*				
	USP: First Year Seminar	FYS	3	C		MATH 2250	Elementary Linear		3	C	
	USP: Communications I	C1	3	C		*Prerequisite:*	*C in Math 2200*				
	Total		18				Total		15		

ELECTRICAL ENGINEERING, BSEE

FALL					SPRING				
Course Number	Course Title	USP	CR	Min Grade	Grade	Course Number	Course Title	USP	CR	Min Grade	Grade
FRESHMAN YEAR											
CHEM 1020 General Chemistry I OR SCIENCE/MATH COURSE Prerequisite: ACT Math 23 or concurrent MATH 1400, 1405 or 1450		PN	4	D		MATH 2205	Calculus II Prerequisite:C in Math 2200		4	C	
	USP: First Year Seminar	FYS	3	C		EE2800 or Any ES, EE, BE course (2000 or higher) or COSC 3011 or COSC 3750			3	D	
	USP: Communications I	C1	3	C		MATH 2250	Elementary Linear Algebra Prerequisite:C in Math 2200		3	C	
MATH 2200	Calculus I Prerequisite: C in Math 1405 or 1450, MPE 5, Math ACT 27, Math SAT 640	Q	4	C		PHYS 1210	Engr Physics I Prerequisite:Concurrent in Math 2205		4	C	
COSC 10XX	Intro to Python Programming Prerequisite:Concurrent MATH 2200		4	C							
	Total		18				Total		14		

School of Computing – Proposed UG Degree



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Appendix 4. Selected Data for Current Departments

A summary of the current staffing for the ECE and CS Departments, as of the start of Fall 2021, is shown in Table 4.1. The total number of faculty in each department is 10 (including tenure-track, tenured, and non-tenure track). If combined today, the total number of faculty is 20. This number would make the UW EECS department larger than five of the 24 departments identified in Appendix 2 and tied with the University of North Dakota. The five-year proposed strategic hiring plan (see Organizational Restructure section) would increase the combined department faculty number to 33 (including tenure-track, tenured, and non-tenure track). This would make the UW EECS department larger than eight of the 24 departments identified in Appendix 2.

Table 4.1 Fall 2021 Staffing in the ECE and CS Departments

	ECE[a]	**CS[b]**	**Total**
Tenure-Track and Tenured Faculty			
Professors[c]	3	3	**6**
Associate Professors	4	1	**5**
Assistant Professors	2	3	**5**
Total:	**9**	**7**	**16**
Non-Tenure Track Faculty			
Senior Lecturers	1	2	**3**
Professors of Practice	0	1	**1**
Total:	**1**	**3**	**4**
Staff			
Engineer, Senior	1	0	**1**
Technical, Master	1	0	**1**
Office Associate, Senior	**0.5**	**0.5**	**1**
Total:	**2.5**	**0.5**	**3**

[a]ECE = Department of Electrical and Computer Engineering
[b]CS = Department of Computer Science
[c]The number of professors in ECE becomes 5 and the total number of professors becomes 8 if Dean Cameron Wright and Vice Provost Steven Barrett are included. ECE is their home department.

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A summary of the student enrollments in the ECE and CS Departments, as of the start of Fall 2021, is shown in Table 4.2. The EE, EE/BE and CPEN programs are all housed in the ECE Department. Those three programs have a total of 160 undergraduate students, compared to the 231 undergraduate students in the COSC program which is housed in the CS Department.

The total graduate student enrollments are similar between the two departments (24 in ECE and 28 in COSC) but the distribution between MS and PhD students is almost exactly flipped with ECE having 4.5 times the MS students of CS and CS having 4 times the PhD students of ECE.

If combined today, the total number of undergraduate students is 391. This number would make the UW EECS department larger than five of the 24 departments identified in Appendix 2 on the basis of undergraduate student count. The current overall undergraduate student to faculty ratio for a combined department today is 19.6. If the student to faculty ratio remains constant over the five-year strategic hiring plan, the EECS department would have 647 undergraduate students, larger than nine of the 24 departments identified in Appendix 2.

Table 4.2 Fall 2021 Program Enrollments in the ECE and CS Departments

	EE[a]	**EE/BE[b]**	**CPEN[c]**	**COSC[d]**	**Total**
Undergraduate					
Freshmen	25	0	9	45	**79**
Sophomore	17	1	13	45	**76**
Junior	14	2	20	59	**95**
Senior	32	3	24	82	**141**
Total:	**88**	**6**	**66**	**231**	**391**
Graduate					
MS	18	0[e]	0[e]	4	**22**
PhD	6	0[e]	0[e]	24	**30**
Total:	**24**	**0[e]**	**0[e]**	**28**	**52**

[a]EE = Electrical Engineering
[b]EE/BE = Electrical Engineering with Bioengineering Option
[c]CPEN = Computer Engineering
[d]COSC = Computer Science
[e]EE/BE and CPEN are only undergraduate programs

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Appendix 5. Unintended Consequences Related to Discontinuance

1. Loss of Faculty Due to:

(a) Uncertainty:
Discontinuance of the ECE and COSC Departments may result in the termination of faculty in those two departments. These faculty will be eligible to express interest in joining the new combined department, but some faculty may not be comfortable with that uncertainty and will simply leave UW. This represents an unnecessary loss of experienced faculty and potentially talented young faculty.

(b) Impending Extra Work:
Faculty may predict that if they remain, they will be subject to extra work, both administrative work necessary to address the transition and teaching needed to cover the required courses that faculty who have left used to teach.

(c) Job Searches Already in Progress:
Some faculty had already generated packets prior to the reorganization announcement and sent them out in hope of retention negotiation. There are currently 400+ job openings in Computer Science alone. For example, The Ohio State University is doing a 20 faculty cluster hire exactly in the proposed EE+CS space.

2. UW Gains Reputation for Breaking Tenure:
Discontinuance of the ECE and COSC departments may result in the termination of all faculty in those two departments, including tenured faculty. UW could gain the reputation for breaking tenure to facilitate reorganization. This will likely provide an added barrier to recruitment of new faculty who will instead choose institutions that continue to respect tenure. This represents an unnecessary barrier to future recruitment.

3. Possible Legal Action:
If ‘discontinuance’ is used as a tool to terminate underperforming faculty in the ECE and COSC departments, then it is possible that a lawsuit could be filed against the University. An argument will be that the units are actually being reorganized and not discontinued because the degree programs will remain in the new reorganized unit and many of the faculty and staff will be rehired. Regardless of the outcome of legal actions, the media coverage would not be positive for the University.

4. ABET accreditation:
The ABET accreditation process will most certainly be disrupted in the case of ’discontinuance’ of the ECE and COSC departments. Both departments are scheduled for ABET accreditation review this fall. The Departments typically receive 6 year accreditation and strive to maintain a smooth accreditation process. At the minimum, the discontinuance will disrupt the process and increase the likelihood of having to go through remedial actions to maintain accreditation. This creates significant additional work for faculty in a time when the number of faculty in the combined department is being reduced. It may not be possible to accredit a new program that has yet to be defined.

5. Additional challenge to hire future faculty and staff:
Currently it is very challenging to attract qualified faculty and staff applicants to open positions in the Departments. Electrical Engineering, Computer Engineering, and Computer Science PhDs are already in high demand nationally in industry as well as academia. Industry salaries are much higher and UW is typically low on the salary scale for academia. Additional barriers to successful recruiting of faculty should be avoided. The discontinuance of the ECE and COSC and possible elimination of tenure will damage the reputation of these program areas and erode the number of qualified applicants that are interested in these program areas.

6. Negative impacts on undergraduate programs:
The concern centers on more faculty and lecturers leaving the Departments than anticipated. The anticipated reduction comes from the proposed discontinuance including a reduction of both Department budgets by 15% and since budgets are dominated by personnel, this equates to a reduction in the number of faculty and lecturers. But the discontinuance could lead to the unanticipated loss of additional faculty who look for other jobs because of the possibility of discontinuance. This could leave the new Department short staffed to cover the necessary courses for the three degree programs. These programs need adequate staffing to cover existing degree requirements and also to cover new degree requirements being proposed elsewhere in this document. The hiring of temporary instructors for these programs is difficult since Laramie has a very small pool of qualified adjuncts for these disciplines. The frequency of course offerings will likely have to be reduced and remaining faculty will have to teach more courses.

7. Negative impacts on graduate programs:
The discontinuance, with its uncertainty as to what faculty will remain, makes current recruiting of graduate students very difficult especially at the PhD level. We have already had a student change his mind about continuing for a PhD because of the uncertainty. Current graduate students are concerned if their advisors will still be here to see them to completion of their degrees. This concern is also shared by faculty chairs of graduate committees and committee compositions will likely need to be reformed. Also, reduced numbers of graduate students makes filling graduate level courses more difficult. Graduate students are also concerned about their assistantship funding whether they are on a research grant or state GA. Finally, if a faculty member leaves and their student(s) do not follow them, these students may end up working in research areas that do not correspond with their interests, posing a serious potential challenge for students interested in working in academia.

8. Negative impacts on research funding:
The discontinuance and the uncertainty associated with it may hinder the success of pending grants and ones to soon be submitted. How does one in good conscience submit a grant proposal knowing that they may be terminated in November? How does one participate in multi-institution proposals with colleagues from other universities or in interdisciplinary proposals across campus when one may be terminated in November and the rehiring process timeline is not well defined? What impression of UW and the Departments does it give outside collaborators when the University has decided to discontinue the Departments and possibly fire the UW collaborator?

9. Negative impacts on fund raising and donations:
Alumni tend to be proud and supportive of their home departments. The discontinuing of departments has a negative connotation that could cause alumni to rethink their donations. This Committee has heard from donors who are reconsidering future gifts. The combined departments could also be a detriment in fund raising since some donors would see the combined Department being a dilution of their gift.

10. Negative impacts on outside collaboration:
The ECE and Computer Science Departments currently have extensive interaction and collaboration with NCAR, PNNL, Sandia, INL, WECC, and Rocky Mountain Power. The Departments are continuously trying to strengthen these relationships. The discontinuance sends a message to these other institutions that UW lacks confidence in its own Departments. This is not a message UW wants to send and could have significant impact on these relationships.

11. Inability to teach all courses through transition due to probable shortage of teaching resources: There will be a transition period between the current ECE and COSC programs and the new combined unit where students will be completing their current course of study and new students will be starting new course curricula that may be developed. It may not be possible to honor the 'teach out' commitments to current students and offer new curricula with reduced teaching resources.

12 Grants Awarded:
Current faculty may serve as PIs on grants awarded to UW that extend past July 1, 2022. When discontinued, these faculty may not be retained in the new combined department creating an awkward situation with the funding agency.

The unintended consequences, challenges and risks associated with the discontinuance of the ECE and CS departments can be mitigated in a number of ways:

- Remove the 'discontinuance' of the two departments from the proposal and consider a possible merger and reorganization of the departments into a new unit.
- Use the post tenure review process and performance evaluations as tools to address issues with underperforming faculty and staff.
- Create solid plans that ensure that a smooth transition from current programs of study to new programs of study. This will need to consider any 'teach out' requirements for current courses and introduction of new courses. This will also be important for ABET accreditation reviewers.
- Promote the advantages of the new academic units that appeal to future students, faculty and donors.

Appendix 6. Summary of Reponses from Stakeholders

Requesting Anonymous Feedback from Faculty and Staff in the Departments of Electrical and Computer Engineering, and Computer Science.
Faculty and Staff of the Departments of Electrical and Computer Engineering, and Computer Science were invited on August 24, 2021 to provide their input anonymously through a Qualtrics survey (see Example 1). On September 3, 2021, the Faculty and Staff were reminded of the survey and informed the survey would be open through September 7, 2021 (see Example 2). The survey was closed on the morning of September 8, 2021. The anonymous results are included below.

Example 1. *Message Sent to ECE Faculty and Staff Announcing Anonymous Portal*

Dear Faculty and Staff of the Department of Electrical and Computer Engineering:

At our meeting last week, the UW Regulation 2-13 Review Committee Examining the Discontinuance of the Departments of Computer Science and Electrical and Computer Engineering asked me to set up a portal for you to provide feedback anonymously to the Committee. This is in addition to the listening session that the Committee will have with you on Friday August 27 starting at 3:40 pm. The Committee wants to be sure that everyone has an opportunity to provide input and especially input that you may not feel comfortable providing in a meeting.

To that end, I have asked Jeanne Moede to set up a Qualtrics survey. Please go to this link and provide input. You may reply to all or any fraction of the questions. Jeanne will then provide the anonymous results to me to share with the Committee.

Thank you in advance for providing your input!

Dave B.

David M. Bagley, Ph.D., P.E.
Professor and Associate Dean,
Graduate Education and Research
University of Wyoming
College of Engineering & Applied Science
Department of Chemical Engineering
1000 E. University Ave., Dept 3295
Laramie, Wyoming 82071
Bagley@uwyo.edu
1 (307) 766-3186

Example 2. *Reminder Message Sent to COSC Faculty and Staff*

From: David Bagley <Bagley@uwyo.edu>
Subject: UW Reg 2-13 Anonymous Feedback
Date: September 2, 2021 at 11:57:37 AM MDT

Dear Faculty of the Department of Computer Science:

If you have already provided anonymous feedback about the UW Regulation 2-13 process through the link Jeanne Moede sent you last week - Thank you! If not, there is still time to do so. We will collect feedback through Tuesday September 7. If you have misplaced the link that Jeanne sent you, please contact Jeanne and she can send it to you again (I do not have access to that information).

Thanks!

Dave B.

David M. Bagley, Ph.D., P.E.
Professor and Associate Dean,
Graduate Education and Research
University of Wyoming
College of Engineering & Applied Science
Department of Chemical Engineering
1000 E. University Ave., Dept 3295
Laramie, Wyoming 82071
Bagley@uwyo.edu
1 (307) 766-3186

Request for Feedback from Advisory Boards in the Departments of Electrical and Computer Engineering, and Computer Science.
The external Advisory Boards for the Departments of Electrical and Computer Engineering, and Computer Science were invited on August 26, 2021 to provide their input. (see Example 3).

Example 3. *Message Sent to ECE Advisory Board Requesting Input*

From: David Bagley <Bagley@uwyo.edu>
Subject: Proposed Discontinuance of Department of Electrical and Computer Engineering at UW
Date: August 26, 2021 at 12:04:20 PM MDT

Dear Advisory Board for the Department of Electrical and Computer Engineering:

As you may have heard, on July 14, 2021 the University of Wyoming presented a proposed reorganization plan to its Board of Trustees (to view the presentation and see the proposal, please visit http://www.uwyo.edu/acadaffairs/program-review/current/program-documents.html and click on the July 21 Trustees Meeting Materials/Background Data link). One part of this proposal is to discontinue the Department of Electrical and Computer Engineering and the Department of Computer Science at UW, and then create a new, single academic unit that will offer the degree programs that are currently offered by the two departments.

The key word here is "discontinue." According to UW Regulation 2-13 (https://www.uwyo.edu/regs-policies/_files/docs/regulations-2021/uw_reg_2-13_approved_6-16-21.pdf), discontinuance allows all faculty in the discontinued unit, including tenured faculty, to

be terminated. Discontinuance is the only action that specifically allows the termination of tenured faculty. Other actions described in the regulation, such as reorganization or consolidation, do not allow termination of tenured faculty.

Shortly after the announcement was made, UW created a set of review committees to provide input and recommendations related to the proposal. Specifically, the "UW Regulation 2-13 Review Committee for the discontinuance of the Departments of Computer Science and Electrical and Computer Engineering" was created. The committee membership and charge can be found at http://www.uwyo.edu/acadaffairs/program-review/current/committees.html. I was appointed to chair the committee.

The committee has been working toward completing its charge and has reached the point where we are collecting input from stakeholders. We would particularly like to receive input from you – the Advisory Board for the Department of Electrical and Computer Engineering. There are three mechanisms for you to provide your input.

First, you may as individuals go to https://uwyo.sjc1.qualtrics.com/jfe/form/SV_5cGngx5Q5dQOZYW and provide input directly to the UW administration through this survey tool. If you have not already done so, I encourage you to submit your personal input through this site.

Second, you may as individuals send your input to me and I will share it with the rest of the committee and we will incorporate it into our report.

Third, you may as a group send a letter to me for the committee to examine but also to be directly shared with the UW administration.

Please note that the discontinuance of the two departments and the creation of a new academic unit are currently proposals by the University to the Board of Trustees. The University is gathering input until October 1 at which time the UW administration will evaluate the input and may modify the proposal in preparation for the November Board of Trustees meeting, where a vote will be taken on the proposal.

The importance of your feedback cannot be overstated. We want to ensure that the UW administration has the best information available to it for examining their proposal and its possible effects. Your input, coming from outside the University, will provide particularly important insights.

If you have any questions, please contact me or the Head of the Department of Electrical and Computer Engineering, Dr. John McInroy (McInroy@uwyo.edu)

Sincerely,

David Bagley

Results of Anonymous Feedback from Department Faculty and Staff

Question 1

What name do you recommend for the new academic unit formed from the combination of the Computer Science and Electrical and Computer Engineering departments?

Answers to Question 1

Electrical and Computer Science and Engineering (ECSE)

Department of Computer Science and Engineering. It's the most common name for this type of department.

EECS - Department of Electrical Engineering and Computer Science

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Question 2

On what research areas do you recommend the new academic unit focus?

Answers to Question 2

Research interests of current faculty

According to the NSF's key priority areas, I would suggest (but not limited to) computational intelligence, high performance computing, robotics and automation, information systems, AI, semiconductors and advanced computer hardware, advanced communication technology, advanced energy.

I would say to focus on our existing strengths of AI, cybersecurity, and blockchain. However, this depends on whether we retain faculty in these areas. It may have to be the areas of whoever is willing to stay and whoever is willing to come here after UW's plans to discontinue the department and fire everyone in the department.

Power Systems, High Performance Computing, Rural Health

Question 3

How do you think the new academic unit should be organized?

Answers to Question 3

One head, one UGC (two subcommittees), one GC (subcommittees?), two ABET coordinators

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I'd recommend establishing one or two research centers that are composed of faculty members from both ECE and COSC and even faculty members outside of ECE and COSC. The research centers will be dedicated to flagship research areas through collaboration between faculty members with diverse expertise. The research centers would facilitate cross-disciplinary research to address emerging research problems, and thus to amplify the impact of our research and education.

Part of the College of Computing.

Department Head, possible an associate department head from other half; graduate program coordinator and graduate committee with equal numbers from both halfs, undergraduate and abet coordinators from each half who also chair an undergraduate committee. Advisory board with roughly equal representation from ECE and CS constituents.

Question 4

What unintended consequences may arise from combining the existing departments into a new academic unit?

Answers to Question 4

I think it will be fine, but we have to be careful about creating factions (see English, Math depth)

Since the intentions behind the merger have not been stated, I am unsure which consequences are intended and which are unintended. I will simply list some consequences, each of which may be intended or unintended:

Decreased morale. After being told we are all going to be fired, we don't feel valued anymore.

Faculty will leave, possibly taking grants and grad students with them. Multiple faculty are already looking for new positions.

Reduced course offerings because of small faculty size. Students will be limited to a core of courses, with few options.

Reputation damage - both to the department and the university. This will impact student recruiting and faculty recruiting. Who wants to come to a department where all of the faculty were fired (or almost fired) regardless of tenure status? I'd never send an application there.

Decreased enrollment, especially at the graduate level. There are going to be fewer faculty to work with on a PhD, therefore fewer graduate students will come.

Combining departments seems highly risky. If the faculty do not get along it could be highly counter productive to put them in one department. Also, the combined department is not the predominate mode for ECE and CS departments. The combined model might be the case, say in 10% of the cases. This makes us look small and different than our comparator institutions which puts us at a disadvantage. Also if the faculty do not get along it could be a disaster. Combining the two department really creates much busy work taking away from the research and teaching mission of the University. When recruiting faculty, a combined department makes us look small and less desirable.

Question 5

What potential benefits may arise from combining the existing departments into a new academic unit?

Answers to Question 5

Cooperation between faculty across the departments, e.g., Suresh could collaborate with COSC,

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This is a question for the President and Provost. They haven't articulated any benefits that would result from this proposal. The president actually said he hadn't really thought about the new department. Two committees (faculty senate and graduate council) looked at this last year and both recommended no merger. I would like to hear the rationale for why their advice was ignored.

I don't think there are any additional benefits that can be achieved by the combination that couldn't be achieved as separate departments.

Question 6

Other comments that you would like the Committee to consider as it prepares its report.

Answers to Question 6

To avoid factions, we should select the first head from one department for one term only, then alternate at least once, Maybe by then, the two will be close enough that this is no longer needed, so the third chair can just come from the combined department.

Faculty members in the new unit could be either teaching-oriented or research-oriented. Faculty members who are active for research and seeking external funding could have less teaching load compared to teaching-oriented faculty members. Current teaching load in ECE/COCS, especially for junior faculty members, is generally higher than some departments (as far as I known) that are not affected by the reorganization proposal, and leave less time for research and grant proposal writing.

If the departments were not combined they could still share an office associate, but the two department head offices should be near each other with the department office and office associate located between the two department head offices. This should be achievable with existing space on the 4th or 5th floor. In general, it appears that the University President does not understand the true challenges and opportunities for a school the size of UW. He seems to be approaching UW's challenges as if we were a much larger institution. Challenges that are much more significant at a school the size of UW, at least in the engineering discipline, include tremendous hurdles in hiring and retaining excellent faculty. These hurdles are not just low pay but many not wanting to come to a rural state and small town, the challenges of spousal hires, etc. We are just not the first choice of many potential faculty candidates. This is much less of an issue at larger institutions that are much more desirable to most faculty applicants. The discontinuance will make our ability to hire that much worse. A school that breaks tenure does not improve its appearance to potential hires. Who wants to join a Department that was just obliterated. A significant challenge to schools the size of Wyoming, is attracting new graduate students. These departments have gone from having 100's of international graduate applicants to having just a handful. The university should be focusing on helping these departments attract more graduate students. While large universities have seen a decrease in graduate applicants, they still have enough to provide a pool from which to draw. Thus schools UW's size ECE and CS departments are currently relying heavily on or own undergraduates to continue as graduate students. Announcements of a discontinuance does not reassure these students that their chosen major professor or necessary courses or other support will be there for them. So this just makes the graduate student shortage that much worse.

Feedback from Student

From: Brady Wagstaff <bwagsta1@uwyo.edu>
Subject: Re: Proposed Discontinuance of Department of Electrical and Computer Engineering at UW
Date: September 3, 2021 at 9:27:23 AM MDT
To: "David M. Bagley" <Bagley@uwyo.edu>

Professor Bagley,

First, I would like to thank you for considering my input on the reorganization. I have talked to other students to gather more opinions to devise a proper response.

I believe the biggest concern I have seen from my peers is about graduate degree programs in the ECE Dept., being that my peers and I are seniors. For example, I had planned to specifically go to UW to obtain a master's degree in Electrical Engineering. However, I have now been advised by multiple people, such as faculty and outside sources, that I should apply to and look at other programs as well due to the uncertainty here. Many of my peers have had this same experience and I know of a few who are not planning on attending UW Grad School anymore due to the current restructuring.

Another concern is research funding. In the ECE department we are very lucky to have multiple research grants that allow us to do research as undergraduate and graduate students. If the ECE dept. is discontinued, what will happen to these projects? Many of them have timelines that extend 2-3 years from now. I had planned on working on the same project I am now since we are starting to make real headway and there is much more to do. If our research mentor is not in the new department will these projects get redistributed or cancelled?

I think the main reason that people have the concerns above from what I've seen is that it doesn't really make sense that the goal of this restructure is to lower the budget and increase academic quality at the same time. The general opinion is that there will be less classes and less differentiation between ECE and COSC. If you could address these questions in the final decision, many of the people I have talked to will be more comfortable staying in the program.

In conclusion, it seems like the confidence in most people that the program will maintain its quality is quite low. I believe that the proposal has good intentions and could help the university, but most others I talked to disagree with me. If you could make the changes easier to understand and address all the big questions students have, I believe the restructure will bring new life to the department.

Thank you,
Brady Wagstaff
University of Wyoming
Computer Engineering, Undergraduate
bwagsta1@uwyo.edu

Jim Geringer
Chair, Advisory Board
Department of Computer Science
University of Wyoming

September 17, 2021

Dr. Kevin Carman
Provost and Executive VP
University of Wyoming
Laramie, WY 82071

Dear Dr. Carman,

As members of the Advisory Board to the Department of Computer Science, we have been following the proposed reorganization of the University of Wyoming very closely. We welcome the university's leadership in undertaking a long overdue long-term re-thinking of the organizational and cost structure that UW must have in order to fulfill its responsibilities to the state over the long term. We are aware that the university faces budgetary constraints, and we laud the effort to address these seriously while also re-envisioning the role that the University can serve its stakeholders.

The summary attached to this letter demonstrates that our board members encompass a wide spectrum of the University community in the realms of academia, business, and government, and especially so in the dimension of market-driven technological innovation and commercialization. Board members are actively engaged across all aspects of the business-building process in Wyoming as founder/CEO's, UW instructors, members of senior management, financiers, board members and consultants. Technology businesses in Wyoming founded by or being assisted by Advisory Board members include

- Avanti Bank, a venture-backed startup bank employing blockchain-based technology awaiting membership in the Federal Reserve Bank of the United States.
- Gannett Peak Technical Services, a custom software development and consulting firm serving companies and government agencies across the country.
- Handel Information Technologies, a leading client relationship management software provider to tribal government and juvenile justice agencies.
- Language I/O, employing machine learning and artificial intelligence in language translation software being used by some of the largest Fortune 500 corporations.
- McGinley Orthopaedic Innovations LLC, a high-precision surgical device design and manufacturing company.

Each of these companies addresses large market opportunities, most have attracted large sums of venture investment, and each employs UW students as employees and interns. The proposed reorganization runs the risk of diminishing the current quality and capability of the graduates.

As a board, we offer our unique experience and perspective to you in support of building the UW of tomorrow and strengthening the university's benefits to its students, faculty, employers, and the state.

For students and faculty, the proposed merger of the Department of Computer Science and the Department of Electrical and Computer Engineering brings both challenges and opportunities. The Board strongly approves of the decision by UW's administration not to discontinue the departments, but to simply reorganize them. Discontinuance would have been an egregious act that could have ultimately led to the demise of both departments, and it would have set a terrible precedent for other units in the university. The Board also believes that merging the two departments should result in positive synergies, including shared courses and combined research efforts. We look forward to helping in the merger efforts.

For the state, the University serves to pass on knowledge to students and create new knowledge. These serve the state economy by providing well-educated employees to existing businesses and communities in the state and by encouraging the formation of new businesses. Computer Science plays a major role in this mission, as evidenced, for example, by the many new blockchain companies in the state. For employers, the most important consideration is that graduates in Computer Science and Computer Engineering maintain a strong technical foundation. Moreover, graduates should be prepared for lifelong learning, to keep up-to-date in a field that sees continuous and accelerating change. Ensuring the graduates' technical expertise and commitment to life-long learning should be a major focus of the new merged department.

The proposed School of Computing should be designed to foster much more than applied computing solutions across a wide range of domains. We believe that the result of any proposed merger of departments should play a major role in educating students and developing new foundational knowledge that is synergistic with the efforts in the School of Computing.

For perspective, the Haub School was held up as an example of what the proposed School of Computing could be. That is, provide insight into environmental issues so that the breadth of degree offerings from UW could incorporate environmental literacy and environmental responsibility into unrelated degree offerings. The School of Computing could likewise be an introduction to computing and technology applications that are ubiquitous in nearly every program and occupation. While the Haub School has engendered greater societal responsibility, simply introducing computing and technology literacy in diverse fields should not be the result of the School of Computing. That could dramatically minimize the innovation and creativity that has been the hallmark of UW's computer science and computer engineering graduates in the past. Computing literacy assures awareness of the impact of technology. Computer design and the science of software design and

application create new knowledge and assure innovation. It's the difference between mediocre success and creative competency. We should inculcate our graduates to strive to be at the forefront of innovation and advance new solutions.

To achieve this, we believe that the new department and the new School of Computing need to work closely together. One area where this collaboration is important is the NCAR Wyoming Supercomputer Center, NWSC, a resource that is severely underutilized by the university today. Wyoming has a significant financial interest in NWSC and an unmatched opportunity to develop new algorithms for data science and management. The current computer upgrades at NWSC will result in one of the existing supercomputers being retired. Why not have it designated as a stand-alone resource for UW to develop new data modeling programs, scientific research and the development of machine learning, heuristic programming?

In closing, we appreciate the challenges facing the university and we applaud the leadership in taking on these challenges and striving to make the university stronger. As a discipline and profession, Computer Science should be a major contributor to the University's mission. We strongly agree with the university's decision not to discontinue the department, and we request that the university spend the planning efforts necessary to ensure that the merger is successful.

Sincerely,

Jim Geringer
Chair, Advisory Board
Department of Computer Science

Cc: Dr. Edward Seidel

Advisory Board
Department of Computer Science
University of Wyoming

Henry Bauer, Ph.D. Stanford University, Computer Science
Professor Emeritus of Computer Science, Associate Dean of Arts & Sciences, University of Wyoming (Retired)

Even Brande, Founder and Chairman
Handel Information Technologies, Inc., developers of the RiteTrack software platform, a market leading case management solution used by county, state, and tribal governments nationally.

Tighe Fagan, Partner
Gannett Peak Technical Services, a software development and consulting firm that builds software systems that solve business problems.

Jim Geringer
Mechanical engineer, graduate studies in automatic control systems. Vice chair of the advisory board for the federal GPS satellite program. Former governor of Wyoming. Corporate officer for Esri, the premier developer of geospatial analytics that are widely used by state and national governments world-wide. Member of the oversight board for the NCAR Wyoming Supercomputer Center.

Richard McGinty
AB Princeton, MBA/DBA Harvard; UW President Emeritus; venture capitalist/angel investor; board member numerous public and private companies; Naval Aviator Vietnam '68-'71.

Sherrie Merrow
UW Computer Science undergraduate degree. Sohio Petroleum, Encana Natural Gas, Noble Energy, Energy Industry consultant focused on traditional and renewable natural gas applications (including recoverable methane).

Heather Shoemaker, Founder/CEO
Language I/O. Pearson/eCollege development team leader of learning management system used worldwide

September 24, 2021

Dear Provost Carman and Dean Wright:

The Electrical and Computer Engineering (ECE) Department Advisory Board is very gratified to learn the ECE department is no longer proposed for discontinuation. While the Board does not intend to micromanage the University, it does see three items essential to maintaining an excellent ECE program:

1. The ability to recruit and retain high-caliber faculty.
2. The ability to recruit and retain students.
3. Accreditation by ABET.

The earlier proposed discontinuation put all three of these in jeopardy. Why would high-caliber faculty come after tenure has been hollowed out and the faculty pay is already barely above the current ECE BS entry-level salaries? Why would students stay under these circumstances, as the long-term value of UW's stock could easily be dropping? Our student board members tell us the earlier proposal did cause many of our students to *immediately* begin shopping for other colleges. Hopefully not too much damage has been done, and this can be contained. Finally, the earlier proposal would have terminated *all* ECE faculty (with some potentially be rehired) so what would ABET be accrediting? The buildings?

We are worried the proposed merger with computer science will have more disadvantages than advantages. For instance, the savings are suspect as it may well be more expensive to operate the combined department. Furthermore, it is not clear that synergy will necessarily result-- merging could just as easily create new turf battles within one department. It seems the issue of combining COSE and ECE into one Department is now whether it is a "bad" or "good" move for either. The December 2020 report on "Proposed COSC-ECE Merger" from Cameron Wright to the Interim Provost (attached) made it clear that a merger was a "bad" idea. We agree with this report, and would like to know why the UW upper administration believes a merger could be beneficial enough to overcome all the potential negatives pointed out in it.

The Board has observed directly a vital, growing department with a long tradition of excellence and a clear vision for the future. UW's ECE department plans to continue this long tradition to unleash the latest high-tech capabilities so Wyoming has the technology and workforce to grow and also diversify its industries. UW ECE graduates are essential to some aspects of process control, mining, and power industries in Wyoming. UW graduates are highly valued in these industries because they stay in Wyoming whereas imports from outside the state all too frequently leave shortly after they are trained. These roles are expected to grow with the anticipated growth in alternative energies such as wind and solar. But the department is also actively working to diversify Wyoming's economy and directly aid Wyoming's people and industries while maximally leveraging existing strengths. For instance, the new online Computer Engineering program will help Wyoming workers retrain and has already developed many courses in an online format. Note: this is not just lecturing over Zoom. They are comprehensive courses designed from the beginning to be online. They have radically changed

several undergraduate laboratories so they can be completed remotely. This required developing a new set of labs which would work on very low cost hardware. Thus students can complete them at home. These courses are required for all ECE majors, which will make it much easier for ECE students to participate in CO-OP opportunities because they will be able to take an essential course or two while away. The board has identified CO-OPs as a great way to improve the undergraduate experience, so this is a big improvement for UW's Laramie students while allowing anyone, anywhere to work on a UW ECE degree.

The ECE department has worked hard to make sure that the students get a very high quality education which will allow them to compete with anyone anywhere and succeed in the world's best graduate programs. A recent example is Richard Yang, a dual UW BS graduate in both computer engineering and computer science. He is currently in Stanford University's doctoral program and was recently awarded the top Master's Thesis by their extremely prestigious computer science department. He is not alone—another recent UW ECE graduate went to MIT. This spring, one of our graduating students was admitted to nine different graduate programs. Getting students into these very competitive institutes is not something to take for granted, and is based on a long tradition of excellent undergraduate programs built over many decades but easily destroyed.

In 2021, ECE faculty members received the two most prestigious awards given by UW, the **Ellbogen Meritorious Classroom Teaching Award** (Ferre-Pikal) and the **Humphrey Distinguished Faculty Award** (Muknahallipatna). This further indicates the program *quality*, whereas the earlier discontinuance decision seems to have been based largely on teaching/research *quantities*. Quantities are of course important, and here are some which were not included in earlier analysis. Since John McInroy became department head in 2013, the department has absorbed large cuts.

- The number of faculty in ECE has dropped by about 25%.
- The number of staff has dropped by 20%.
- The number of state teaching assistantships has also dropped significantly, and that number has varied year-to-year over the last several years. It is currently about a 25% drop from the 2013 level.

During this same time period, ECE has been conducting an aggressive enrollment campaign and it has yielded significant dividends. By 2019:

- The number of undergraduates majoring in computer engineering has risen by 140%, while the number of undergraduates majoring in electrical engineering has increased by 16%.
- Overall, we have seen an increase in enrollment of 49%.

The college enrollment during this time was essentially stagnant. <u>Given this situation, the board believes that ECE cannot sustain any more cuts in its budget</u>.

In addition to this growth within shrinking resources, ECE has continuously been improving its offerings. To retain existing students and attract new ones the department has been developing new courses to give lower-level students exciting experiences in the actual hands-on work that graduates do. For instance, they have developed a special section of the freshman

first year seminar, EE1101, which meets twice weekly. One of the classes each week covers the required material in the engineering first year seminar, while the other time period each week is used to perform laboratories in all of the different major fields of electrical and computer engineering. This gives our students an immediate chance to see what our graduates really do while working hands-on with real hardware. Since first-year seminars have no prerequisites, this same course can be taken by any undergraduate who has some interest in our field and would like to know more. For instance, it would be highly useful for students from other majors enrolled in the planned School of Computing. A similar but more detailed new sophomore course, ES 2800, is now taken by both ECE students and Mechanical Engineers. Computer Scientists are anticipated to join soon. ECE saw an opportunity to improve the efficiency of the University, so they created this new course which replaces three prior courses. Again, it is ideal for incorporation into many of the new plans for the School of Computing and its undergraduate offerings.

Overall, the ECE Department Advisory Board sees a vital department which would be very difficult to recreate. This department has achieved multiple successes -- improved course offerings, development of a new online Computer Engineering degree, incorporation of remote learning laboratory experiences, award of University distinguished teaching and research, increased undergraduate enrollment – all while weathering significant faculty and financial cuts in recent history. For brevity this letter hasn't discussed research, but ECE also has made nationally recognized research contributions in several areas (esp. power, high performance computing, and robotics). The Board is very pleased to hear that the decision to discontinue this department has been overturned and strongly recommend not merging Computer Science and Electrical and Computer Engineering departments.

Sincerely,

Electrical and Computer Engineering Department Advisory Board members:

Alan Frost Xilinx	Bruce Pivic Infinity Power	Fred Benson Retired/Rockwell Collins
Jayden Vap EE Student Representative	Brady Wagstaff CPEN Student Representative	Jonathan James Jacobs
Dan Liggett Sinclair Refining Company		

UNIVERSITY OF WYOMING
College of Engineering and Applied Science

WORKING FOR WYOMING & THE WORLD

Cameron H. G. Wright, Ph.D., P.E. | **Dean**
Dept. 3295 | 1000 E. University Ave. | Laramie, WY 82071-2000
Tel. 307.766.6104 | Fax 307.766.4444 | www.uwyo.edu/ceas

December 4, 2020

TO: Anne Alexander, Interim Provost
SUBJ: Proposed COSC-ECE Merger

This report describes an investigation into the potential advantages and disadvantages of a proposed merger between the Computer Science Department and the Electrical and Computer Engineering Department in the College of Engineering and Applied Science. A summary follows below, with additional detail in the subsequent pages listing specific feedback from faculty members of the two departments.

After reviewing feedback from the faculty members and department heads of the two departments, reviewing models used at various other universities, and conferring with the college Director of Business Operations to identify any potential monetary savings, my conclusion is that ***a merger between the two departments in not recommended at this time***.

Both departments suffer from too few faculty members to reach "critical mass" in a variety of research and teaching areas. However, merging the two departments would not appear to alleviate this problem. The two departments have maintained regular communication over years and have done well at finding efficiencies with course offerings and administrative support. Research collaborations have occurred as mutual opportunities arose, and a merger likely would not increase such collaborations. Monetary savings appear to be essentially nonexistent, as the departments already share the single staff support person. Indeed, if the model used at a few universities, such as the University of Michigan, where an EECS Department has two divisions (a division of Electrical and Computer Engineering and a division of Computer Science) with two division chairs *and* a department head, a merger would end up costing more money than is currently expended for the two departments.

Therefore, I recommend that the proposed merger not be pursued at this time.

Respectfully submitted,

Cameron H. G. Wright, Ph.D., P.E.
Interim Dean and Professor

xc: Steven Barrett, AVP for Undergraduate Education
James Ahern, AVP for Graduate Education
Ruben Gamboa, COSC Dept Head
John McInroy, ECE Dept Head

Perspectives of the Computer Science Department (COSC)

The COSC faculty discussed a possible merger at the faculty meeting on October 26, 2020, and subsequently via email among the faculty. The faculty was overwhelmingly opposed to the idea, though with varying degrees of opposition.

A senior faculty member reminisced about the time when he was interviewing for a job. He was offered a position at another institution that had recently undergone a similar merger, and he found the atmosphere to be so depressing that he turned the job down.

Other faculty members spoke of personal experience with similar issues at prior institutions, and all tales were cautionary ones. A recurring theme was problems with hiring and promotion decisions. This was especially delicate, since many faculty members perceive that Computer Science would be easy to overlook next to an Electrical and Computer Engineering department. The fear is that having "Engineering" in their program names would give EE and ECE the majority culture in a merged department.

More directly, the faculty was skeptical of any proposed savings. The two departments are already sharing the only staff member, so the savings are probably minimal.

From an emotional, as opposed to a rational perspective, a few faculty members expressed sadness that this coincides with the department's 50th anniversary. Some raised the issue as to whether this would affect fundraising.

Many made the point that the disciplines are sufficiently distinct that a merged department would feel artificial. Worse, it could sow the seeds for protracted infighting between different factions. In fact, some recounted memories of working on a divided departments and contrasted that with the more collegial atmosphere our department has today.

The merger was also discussed at the Advisory Board Meeting on November 30, 2020. The Board was unanimous in its opposition to the idea, mainly because it did not see any major positives from the merger, and only a small cost savings. The board did encourage the departments to pursue closer cooperation, in order to foster cross-disciplinary projects.

On a more positive note, some faculty did point out that research collaborations may be easier to establish if the faculty in the two departments were to spend more time together, so that is a plus for a merger. More generally, cooperation between the departments was seen as a definite plus. One area where that cooperation should begin is in the degree programs. It should be easier for students to switch between Computer Science and Computer Engineering, for example. Also, students in one discipline should be able to take technical electives from the other discipline for their degree. We plan to pursue such a collaboration in the future, regardless of the merger status.

Perspectives of the Electrical and Computer Engineering Department (ECE)

The ECE faculty and staff met the same week that the merger was first proposed. At that time, many points were made, and some items were identified which needed further study. Some further study has been done since then. A summary of the findings is given below.

Cost Savings:

- ECE and COSC already share the one and only office associate, so no savings there.
- There may be a slight savings because only one department head could handle both departments. But that head's research will plummet, so the savings are limited. Furthermore, the extremely broad range of fields across the two departments means that an Associate Department Head from the opposite department is needed, reducing the savings to nil.
- There are no courses that are redundantly taught by both departments. The two departments have a good relationship and have split the courses carefully, so no savings are expected in course offerings.
- ECE has lost several faculty over the past few years and the faculty are now spread extremely thin. Faculty cannot be reduced further without major impact.
- No cost savings are anticipated in the facilities, equipment, or laboratory space.

Potential Disadvantages of Merging:

- Most other universities have separate departments for ECE and COSC. Remaining separate departments allows us to more easily fit other University models and work more easily with those other Universities. A brief study of surrounding University models is in the Appendix.
- It makes our university seem very small to outside entities, as if we don't have enough students to justify separate ECE and COSC departments. For MIT and Berkeley this isn't a problem, but does pose a perception and public relations issue for UW.
- Degrees originating from just one department across this broad area are not the standard, and may put our graduates at a disadvantage when seeking employment or graduate school admittance.
- The hearts of the programs are completely different. The trainings between ECE Engineers and Computer Science degrees are very different.
- Mergers can have unintended consequences and be problematic.
    - At UW, plant science, animal science, and entomology were merged into one dept. They had infighting, tough situations with RTP, and tough situations with hiring.
    - At UW, Petroleum Engineering was combined with Chemical Engineering only to again split a few years later at great cost.
    - Montana State University merged COSC and ECE: it was the largest department at MSU, and then later split after finding the merger was a bad idea.
- Both departments have Computer in the name, but the disciplines are incredibly diverse. In fact, electrical engineering alone is incredibly broad. There are 36 sub-societies in the IEEE, of which only two have "Computer" in the title.

- Research collaboration w/ COSC has happened in the past, and has yield successful outcomes. However, if we start having issues within the merged department this could have a negative impact on these relationships we have built. One example is provided by Dr. Diksha Shukla. She interviewed for a position in ECE but ended up in COSC thanks to the existing good relationship between the departments.
- Much of UW's COSC research is closer to the Math department than ECE
- RTP voting would be difficult. Is there a way to have the separate department personnel vote on only their half of the cases within the UW system?
- Significant time would be spent reinventing every department policy, etc.
- Combination of the department financial accounts would be problematic. For instance, thanks to a strong donor base and careful spending, ECE has substantial discretionary funds donated privately. These funds would need to be very carefully managed to make sure they were used to maximize the benefit to UW, Wyoming and as specified by the donors.

Potential Advantages of Merging:

After considerable discussion, none of the ECE faculty and staff had mentioned any advantages of merging, so John McInroy (ECE Head) encouraged them to name advantages. None were offered, so he offered the following potential advantages of merging:

- The department names are so similar that it is confusing for many people, so sometimes opportunities that should be jointly explored or even belong in the other department are missed.
- Sometimes we see new first year students who have an interest in computers so they sign up with ECE or sign up for COSC, and then halfway through their studies they realize they should be in the other department. Merging may help improve communication and ease degree changes for these students. ECE students have an easier time switching to a COSC degree, but COSC students have an issue going into ECE because the prerequisites don't match unless carefully chosen.
- Just having the personnel from both departments in both rooms, having joint seminars, and rubbing elbows may keep us more aware of our COSC colleagues. This may lead to improved research and curricula.

John McInroy then again encouraged the faculty and staff to think of advantages. None were offered.

Alternatives to Merging:

- Could we benefit from having more adjunct faculty b/w the departments? Perhaps have Dr. Diksha Shukla become an adjunct faculty member in ECE in addition to her COSC appointment?
- Host joint seminars and one joint meeting each semester across both departments aimed at increasing collaboration.
- Create some other administrative structure to facilitate collaboration. For example, create a "computing group" consisting of the faculty and staff working at the interface between ECE and COSC. Alternatively, both departments could be housed under the school of computing or another similar organization.

Recommendation from the ECE Head:

Several years ago I toured both Berkley and MIT's combined Electrical Engineering and Computer Science (EECS) departments. The departments are gigantic (at MIT, EECS comprises 40% of the total undergraduate enrollment!). These departments are stunning, and since that time I have been very intrigued with the possibilities of forming an EECS department at UW. I still think this is something that merits more serious consideration. However, I don't think it is something that should be rushed into, as there don't appear to be huge advantages that can't be gained other ways, and there are certainly disadvantages.

APPENDIX
A Brief Study of Surrounding University Models

As a supplement to the feedback on the proposed merger of the Electrical & Computer Engineering Department and the Computer Science Department. A survey was completed of Mountain West Conference Schools, and engineering schools in neighboring states.

- The survey of schools in the Mountain West Conference shows the following.
    - Not a single school in the conference has a combined Electrical Engineering and Computer Science Department.
    - 8 schools (Wyoming, Colorado State, Boise State, University of New Mexico, Fresno State, UNLV, San Diego State and Utah State) all have two departments: an Electrical & Computer Engineering Department and a separate Computer Science Department.
    - The Air Force Academy has two separate departments: Electrical & Computer Engineering Department and a separate Computer and Cyber Science Department.
    - University of Hawaii has two separate departments: Electrical Engineering Department and a separate Computer Science Department.
    - San Jose State has 3 separate departments: Electrical Engineering Department, Computer Engineering Department, and Computer Science Department.
    - University of Nevada Reno has 2 separate departments: Electrical & Bioengineering Department and a separate Computer Science Department.
- A survey of engineering universities in neighboring states shows the following:
    - Only one university (South Dakota State University) has a combined Department of Electrical Engineering and Computer Science.
    - University of Nebraska and the University of Idaho both have 2 separate departments: Department of Electrical & Computer Engineering and a separate Computer Science Department.
    - Montana State University and the University of Utah both have 2 separate departments: Department of Electrical & Computer Engineering and a separate School of Computing.
    - The University of Colorado has two separate Departments: Department of Electrical, Computer, and Energy Engineering and a separate Computer Science Department.

In total, of 18 universities surveyed, only one did not have separate departments. It was probably the smallest and least distinguished.