University of Colorado **Boulder**

2018 Program Review

Department of Civil, Environmental, and Architectural Engineering

Academic Review and Planning Advisory Committee Report

Approved

05/02/2019

Provost and Executive Vice Chancellor for Academic Affairs | Date

Contents

Process Overview

The Academic Review and Planning Advisory Committee (ARPAC) conducts and writes the final reviews of all Boulder campus academic units. The Department of Civil, Environmental, and Architectural Engineering (CEAE) completed a self-study in December 2017. An internal review committee composed of two CU Boulder faculty members from outside of the unit assessed the study and produced a list of questions asking CEAE to provide additional analyses or clarifications. The internal reviewers, working with ARPAC staff, also developed a survey that was administered to CEAE graduate and undergraduate students. In March 2017, the internal reviewers determined the self-study to be accurate and complete. An external review committee, consisting of two experts within the discipline from outside of the University of Colorado, visited the unit over April 5-6 2018, checked relevant documents, and met with faculty and staff members, students, and university administrators. The internal and external reviewers' comments and recommendations are cited at points throughout this report. This public document reflects the assessment of and recommendations for the Department of Civil, Environmental, and Architectural Engineering as approved by ARPAC.

Academic Review and Planning Advisory Committee (ARPAC)

Academic year 2018-19 voting members

Ken Bickers, Professor, Department of Political Science

Paul Campos, Professor, School of Law

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Erin Furtak, Professor, School of Education

Deborah Hollis, Associate Professor, University Libraries

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Non-voting members

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Bob Boswell, Vice Chancellor for Diversity, Equity, and Community Engagement and Professor of Molecular, Cellular, and Developmental Biology

Katherine Eggert, Vice Provost for Academic Planning and Assessment and Professor of English

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Michele Moses, Associate Vice Provost for Faculty Affairs and Professor of Education

Ann Schmiesing, Interim Senior Vice Provost for Academic Resource Management, Vice Provost for Graduate Affairs and Dean of the Graduate School and Professor of Germanic and Slavic Languages and Literatures

Staff

Andre Grothe, Office of Faculty Affairs

Emmanuel Melgoza Alfaro, Office of Faculty Affairs

Unit Overview

The campus's standardized description of the unit is available on the website of the Office of Data Analytics (ODA) at https://www.colorado.edu/oda/institutional-research/institutional-level-data/information-department/academic-review-and-planning.
ODA updates the profile annually in the fall semester. This report cites data posted in October 2017, reflecting the state of the Department of Civil, Environmental, and Architectural Engineering (CEAE) as of the academic year (AY) 2016-2017.

CEAE focuses its education and research on understanding interactions between the environment and human-made structures and o planning, designing, constructing, and managing the built environment. The department organizes its work into six areas: building systems engineering (BSP); construction engineering and management (CEM); environmental engineering (EVEN); geotechnical engineering and geomechanics (GEGM); hydrology, water resources and environmental fluid mechanics (HWREFM); and structural engineering and structural mechanics (SESM). A record of awards and multimillion-dollar externally funded grants attests to the CEAE faculty members' excellence. Additionally, the department's graduate and undergraduate programs rank nationally in the top 15 among public universities and top 20 among all ranked institutions.

Personnel and Governance

According to the Office of Data Analytics (ODA), CEAE rosters 40 tenured and tenure-track (TTT) faculty members, including 23 professors, seven associate professors, and ten assistant professors. CEAE also employs three senior instructors and two research faculty (a research professor and a research associate professor). Six CEAE faculty members have membership affiliations with campus research institutes, including with the Cooperative Institute for Research in Environmental Sciences

(three CEAE faculty affiliates), the Institute of Arctic and Alpine Research (two), and the Renewable and Sustainable Energy Institute (one). CEAE employs 15 full-time staff members.

The department bylaws conform to campus norms with regards to executive structure, voting rights, standing committees, and expectations for promotion and tenure. The faculty members elect a chair to serve as the department's chief administrative officer; two associate chairs to lead CEAE's undergraduate and graduate programs, respectively; and three faculty directors to lead civil engineering (CVEN), architectural engineering (AREN), and environmental engineering (EVEN), respectively.

The CEAE bylaws do not include required annual merit review guidelines except to refer to a faculty handbook. The CEAE executive committee conducts annual merit reviews and fulfills multiple additional department functions. The executive committee consists of one faculty member from each of the six CEAE focus areas. The department faculty members elect executive committee members to serve three-year terms. The executive committee oversees and approves the budget, conducts annual merit and salary reviews, and appoints standing committee members (e.g., the curriculum committee, operations committee, graduate committee, etc.).

Research and Scholarship

As previously detailed, the department organizes its faculty personnel into six research groups. Each of the groups includes tenured and tenure-track (TTT) faculty members, research faculty, and instructors.

Numerous awards have gone to recognizing the accomplishments of CEAE faculty members, including six National Science Foundation Early Career awards, two Construction Industry Institute Outstanding Researcher awards,

and a Chinese-American Professors in Environmental Engineering and Science Frontiers research award. The National Academy of Engineers counts a number of CEAE faculty members among its fellows. Several CEAE faculty members hold editorial board positions or have formerly served journals in their field as editors. The department rosters three President's Teaching Scholars.

Among organizations bestowing CEAE faculty members with large grants in recent years are the National Science Foundation Air Water Gas Sustainability Research Network, focused on Colorado Front Range oil and gas extraction impacts; the Office of Naval Research Multidisciplinary Research Initiatives Program focused on soils and granular media explosive loading; and an Environmental Protection Agency-funded center on drinking water systems. Both the department's self-study and the external reviewers note that at 79%, CEAE's percentage of federal government-derived research funding exceeds that of comparable and aspirational peer departments, such as at the University of Illinois (58%), the University of Michigan (39%), Purdue (19%), and the University of California Berkeley (20%).

CEAE hosts the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES), a research center that focuses on improved natural resource systems management and the Mortenson Center in Engineering for Developing Communities that addresses global development challenges and provides students with pathways to work on development projects worldwide.

Undergraduate Education

CEAE offers the BS in architectural engineering (AREN) and in civil engineering (CVEN), both accredited along with the rest of the engineering departments by the Accreditation Board for

Engineering Technology (ABET). By the department's count, it had 581 majors in the fall of 2017 (ODA counted 585), with 138 AREN students and 243 CVEN students. According to ODA, the department's undergraduate enrollments decreased 14% in the five-year period ending in academic year (AY) 2016-2017.

The department requires students to select multiple proficiency courses so that they learn to apply interdisciplinarity to design in multiple contexts. CEAE lists articulated learning outcome goals and a review timeline as required for ABET accreditation. Following the 2011 ARPAC process, CEAE used the results of an outcomes assessment to revise its undergraduate program and to create additional enrichment experiences, including service learning opportunities through organizations such as Engineers Without Borders USA and Habitat for Humanity. The department encourages students to attend a career fair focused on internships, to participate in work facilitated by the Undergraduate Research Opportunities Program (UROP), and to participate in research and learning opportunities that have an international focus, including study abroad.

Relative to other CU Boulder engineering undergraduate degree programs, CVEN averages smaller class sizes (40 students). TTT faculty members teach the majority of these courses. ODA statistics show a 200% increase over the five-year period ending in AY 2016-2017 in student credit hours (SCH) generated by instructor taught courses (rising to 21% of total SCH), and an 85% decrease over the same time period in SCH generated by graduate part-time instructor or teaching assistant taught courses.

An internal review committee survey of CEAE undergraduate students returned an overall positive assessment. Thirty-two percent of CEAE undergraduates (167/526) participated, and for

each question posed, the vast proportion responded with answers of “satisfied” or “very satisfied,” including to prompts that asked the students to rate the proper sequencing and continuity of CEAE courses (92% “satisfied” or “very satisfied”), availability of electives (75%), and staff and faculty advising (80% and 84%, respectively). Scholarship support satisfaction ranked lower: 28% of the students indicated dissatisfaction.

Graduate Education

In fall 2017, CEAE enrolled 215 MS and PhD students as AREN or CVEN majors. Beginning in the fall of 2017, EVEN also began to offer MS and PhD degrees. At that time, MS students totaled 113 (AREN = 21; CVEN = 92) and PhD students totaled 102 (AREN = 22; CVEN = 80). These counts include professional MS students earning the MSCVE in either engineering for developing communities or water engineering and management. The department also counts 25 CVEN-focused and nine AREN-focused BS-MS students. The department allows students to earn the MS by coursework alone, by coursework including a three-unit independent study project, or by coursework plus writing and defending a thesis.

On average, only 20-25% of accepted CEAE PhD applicants enroll, indicating significant competition from other programs. The self-study indicates that in fall 2016 the unit funded 28 teaching assistants and 74 graduate research assistants. Several PhD students also secured outside funding, including fellowships from the National Science Foundation and the Environmental Protection Agency. Others received funding tied to the department’s national agency partnerships, including with the United States Geological Survey, the National Oceanic and Atmospheric Administration, and the National Center for Atmospheric Research. Some of the department’s international students received fellowship funding from abroad.

Participation in an internal review committee graduate student survey split evenly between MS and PhD students and generated replies from 50% of the addressed students (168/286). As with CEAE undergraduate responses, graduate students felt generally positive about the department, although 26% of students felt that CEAE program area requirement clarity left them feeling “dissatisfied” or “very dissatisfied.”

Space/Physical Infrastructure

CEAE occupies spaces in the Main Campus Engineering Center and in the East Campus Sustainability, Energy and Environment Community (SEEC) building. The SEEC spaces include environmental engineering and environmental fluid mechanics laboratories. In moving to SEEC, these labs gained more and higher-quality research group space and additional graduate student offices. The SEEC building also offers discussion rooms. CEAE administers one of only three geotechnical centrifuges in the US, and it is housed in the Center for Infrastructure, Energy, and Space Testing within the Engineering Center.

The self-study notes that despite making East Campus gains, CEAE has recently had to curtail the spaces it occupies in the Engineering Center, including those used by students and post-doctoral fellows. Other notable Engineering Center limitations and inadequacies include two laboratories (the Geotechnical Engineering Geo Mechanics Lab and the Structural Engineering Structural Mechanics Lab) that the department says require improvements to increase their usefulness. In addition, the department’s dual location has created logistical issues not yet ameliorated by a shuttle service designed to ferry students and faculty members between SEEC and the Engineering Center.

Inclusive Excellence

CEAE has not yet submitted an inclusive excellence narrative to the Office of Diversity, Equity and Community Engagement

(ODECE). An ODA census of CEAE undergraduate students indicates a higher degree of diversity than in other CU Bouder engineering departments, with 39% of students identifying as women and 22% identifying as belonging to an underrepresented minority population. An accounting of CEAE faculty member diversity also leads the college, with women faculty members counting as 23% of the total and faculty members who identify as belonging to an underrepresented minority representing 29%.

Contextual to an assessment of the department's inclusiveness are measures taken by the internal and external reviewers that indicate anxiety and concern among CEAE assistant professors surrounding tenure and promotion standards and expectations. Given that seven of the CEAE's 12 assistant professors identify as women, this uncertainty represents a potential threat to the scholars' inclusion and should be addressed by improving tenure-process transparency and through greater attention to mentoring.

Climate

The results of internal review committee surveys of CEAE undergraduate and graduate students suggest a climate that respects diversity. However, on each survey, 6-7% of students responded "disagree" or "strongly disagree" to this notion. Reasons for this are not apparent.

Both the internal and external reviewers noted significant CEAE staff member work climate challenges. The internal reviewers referred to stressful, inefficient, and dissatisfying circumstances, noting reports of negative interactions among the staff and between staff and faculty members. A September 2017 ARPAC-administered climate survey also identified gender-based incivilities between faculty members. The CEAE self-study noted that changes were already in progress to

address these concerns, including efforts to improve the climate by increasing awareness of incivilities, holding mandatory trainings, and enacting consequences for unacceptable behavior.

Budget

The FY 2016-2017 CEAE budget totaled $6.9 million. This total included $4.7 million allocated to faculty salaries (including $524,000 to pay senior instructors), $552,000 for staff salaries, $897,000 for student support, and $138,000 for operating expenses. Gift endowments of approximately $2.5 million contributed about $100,000 that year; these funds were used for educational equipment purchases and to fund student activities. The department's professional master's programs generate additional revenue through the campus's revenue-sharing model; the self-study does not specify a yearly amount for this revenue. The department returns its share of sponsored research indirect cost recovery (ICR) monies to faculty members at a rate of 30%, and the rest is used to augment the CEAE operating budget.

CEAE provides select laboratory groups about $15,000 in annual support. Course/program fees have historically provided over $100,000 for software purchases and other essentials; with their recent termination the department expects that the campus will provide it with block funding to cover the gap.

Past Reviews

ARPAC last reviewed CEAE in 2011. Recommendations to CEAE resulting from that review included improving the department's strategic planning process, freeing up research and teaching initiative resources by streamlining the undergraduate and graduate curricula, increasing graduate program selectivity, improving student communications, developing undergraduate program outcomes assessments, reactivating the professional advisory board, developing a junior and mid-level faculty retention strategy, increasing faculty and student diversity, and developing an efficiency-focused space use plan.

According to the self-study, CEAE answered the 2011 review by creating a strategic plan and by lowering its graduate admissions rate. In response to the previous review, CEAE also points to its diversity vis-à-vis other College of Engineering and Applied Science departments, with the highest percentages of women faculty members and faculty from underrepresented minority populations.

Campus Context

CEAE faculty members' interests in examining the interface between the natural and built environments bring them into many interdisciplinary collaborations, including with other engineering units and with groups outside of the college. These collaborations address building systems, structures, fluids, and engineering science. Prominent collaborations include projects underway work includes projects underway with the Cooperative Institute for Research in Environmental Sciences (CIRES), the Institute for Arctic and Alpine Research (INSTAAR), and departments such as Applied Mathematics, Chemical and Biological Engineering, Computer Science, and Mechanical Engineering.

Disciplinary Context

CEAE reseach contributes to national and international work focused on a broad range of problems, ranging in scale from the imolecular (environmental chemistry) to the granular (materials science and soils), continuum (mechanics), single-structure, infrastructure, and global levels. According to the external reviewers, CEAE has the potential to rank among the best organizations in the country exploring these areas. The department's faculty members produce high-quality research and serve as custodians of world-class facilities that advance geotechnical, structural, and fluid/environmental engineering. The department has a reputation recently bolstered by strategic assistant professor hires. The undergraduate and graduate programs have earned national respect, as indicated by their highUS News and World Report and the National Resarch Council rankings.

Analysis

Proposals to split the department into separate environmental engineering and civil and architectural engineering units have raised questions about the sustainabilty of the department's collective past successes. The external reviewers caution that the nature of current societal challenges will require interdisciplinary research. They suggest that splitting environmental engineering from civil and architectural engineering would negatively impact both programs, rather than strengthening the quality of either. A sustained strategic visioning process should help to guide the department's next steps. The department also has work to do to address communication and climate shortfalls, particularly with respect to junior faculty members, and to sort out logistical challenges related to its Main/East Campus dual location.

Strategic Vision

The 2011 ARPAC review included several recommendations related to strategic planning. The 2018 CEAE self-study describes the department's current strategic vision as focused on developing large, multi-investigator grants. The external reviewers did not consider this approach sufficient, saying that ongoing conversations about whether to separate into two departments of environmental engineering and civil and architectural engineering had diverted the unit's attention from a more significant planning opportunity—a chance to create a vision for a single department.

In a reply to the internal reviewers, the CEAE chair noted that a recent straw poll indicated only one-third of environmental engineering faculty members favored secession, and said that further deliberations were ongoing within that group to evaluate the level of support for such a move. The chair's reply went on to say, "We do not believe the CEAE department needs to formally weigh in on this issue at this stage." That response is noteworthy in that it seems to already treat the environmental

engineering faculty as separate and as possessing the unilateral agency to leave. ARPAC asks, shouldn't the whole department collectively determine whether to split up?

As mentioned, the external reviewers unequivocally advised against a split and supported their argument with disciplinary and historical precedents. They gave as examples peer departments that had split up and argued that in the wake of such disaggregation program quality and rankings declined. They also argued that the future of the field is interdisciplinary. It was unclear to the reviewers where the impetus for the proposed split lay. They suggested the dean believes a split would be beneficial, but the dean has denied this.

ARPAC finds the external reviewers' arguments for keeping the department intact convincing. Reports of negative outcomes experienced after similar departments disaggregated, and a consideration for future interdisciplinary opportunities, argue for caution. ARPAC encourages CEAE to follow the external reviewers' advice and to convene a strategic visioning process directed at establishing a department vision, including to identify more interdisciplinary research opportunities. Such a strategic analysis should also focus on exploring the cases of departments that decided to split. Strategic planning should carefully consider the views of junior faculty members', since a split might impact them the most, as well as the views of CEAE-affiliated research and teaching faculty. According to the external reviewers, future faculty recruitment also hinges on these strategic determinations, with opportunities for CU Boulder to lead in cross-cutting research areas such as transportation systems hanging in the balance.

Undergraduate Education

A downward trend in CEAE undergraduate enrollment appears at odds with the increasing importance and impact that learning

in the fields encompassed by the department might suggest. The self-study identified several reasons for the decline, including the impact of the national discourse around environmental protections, the loss of students interested in architectural engineering due to overlaps with the mechanical engineering program, and other student retention difficulties.

The department's strategy to grow enrollments includes encouraging students who apply to the mechanical engineering program to indicate architectural engineering as an alternative major, and sending CEAE faculty members to visit Colorado high schools to recruit students. The department's self-study also notes that curricular changes made in 2013 in response to the ABET accreditation, including allowing students to more easily enter the CEAE degree path from the open-option engineering major, should help attract students. The self-study also refers to educational research on student autonomy and motivation (self-determination theory) that informed these modifications in the curriculum; however, it is not clear what aspects of this theory led to these changes. ARPAC encourages the department to continue to think broadly and creatively about student recruitment.

CEAE might also benefit from understanding attrition patterns: while nearly three-fourths of students remain in the major, collecting more data on students who leave could inform future curricular changes that might aid student retention. Furthermore, examining student perceptions of the major's flexibility (or inflexibility) could provide an opening for the department to offer students better course options.

Finally, the internal reviewers' student survey suggests that CEAE undergraduates would appreciate better scholarship support. Perhaps the department could work with college

advancement personnel and the CEAE executive advisory board to improve undergraduate student scholarship funding. Closer ties to local companies and pre-collegiate outreach programs might also help with nurturing student loyalty.

Graduate Education

Following the 2011 ARPAC review, CEAE increased the selectivity of its graduate admissions processes. Despite applying more stringent standards, the CEAE MS and PhD programs have maintained a relatively constant size over the intervening years. Sufficient MS enrollments have financially sustained the engineering for developing communities and water engineering and management degree programs. The self-study states that the architectural engineering group also planned to initiate a professional masters' degree program in 2019; however, this plan has not yet been fleshed out, and no degree proposal has yet been reviewed. The self-study notes that the American Society of Civil Engineers suggests a 30-credit master's degree as a future qualification for a professional engineering license. The department's graduate program could emerge stronger from this development and from exploring a nexus of interdisciplinary opportunities emerging from CU Boulder campus initiatives such as Academic Futures.

The internal and external reviewers alike noted a problematic lack of graduate student funding. While CEAE graduate students have had success winning campus-wide fellowship competitions, more is needed. Earlier initiatives to provide fully funded fellowships and standard packages proved unsustainable, and the current merit-based system provides only two-year guaranteed funding packages. According to the reviewers, CEAE does not offer funding sufficient to lure the field's top graduate students.

ARPAC encourages CEAE to work with college advancement personnel and with the dean to identify better graduate student recruitment incentives. Full funding offers upon admission would help CEAE to compete with peer graduate programs for the best students.

Finally, the results of the internal review graduate student survey that showed that 26% of students found a lack of clarity in CEAE program area requirements suggesting that CEAE should examine these requirements to determine if coursework or curriculum modifications might better meet student needs.

Decision-Making Transparency

A meeting between the internal reviewers and CEAE assistant professors revealed that they are not represnted on the department's executive committee despite the committee controlling the budget, annual merit reviews, and subcommittee appointments. The department's bylaws do not limit executive committee membership by faculty rank, and CEAE may wish to consider how to broaden executive committee membership; for example, by having the bylaws require a membership balanced among faculty ranks (e.g., always including at least two non-tenured faculty members) and among subdisciplines.

The internal reviewers also noted a perception that the executive committee's proceedings were opaque and its decisions not clearly communicated. Circulating executive committee minutes, summaries, or other communications might help to lower anxiety and increase department communication. CEAE might also wish to consider assigning annual merit process work to a group other than the executive committee.

Faculty Mentoring

The quality of the department's assistant professor mentoring struck both the internal and external reviewers as a critical concern. While CEAE has a mentoring program, the self-study

acknowledged that regular program meetings no longer occur. The program's informality has made CEAE assistant professors feel uncertain about how to meet the department's reappointment and tenure standards and expectations.

The CEAE self-study indicates that the department website has tenure and promotion standards posted. Also, in response to the internal review, the chair explained that CEAE works to ensure mentor matches between senior and junior faculty and that the department has an ad hoc mentor group to review junior faculty research proposals and publications. However, despite such assurances, a problem of CEAE junior faculty perceiving opacity regarding expectations persists.

Moreover, the annual merit review process appears to compound this problem. As mentioned, the CEAE executive committee conducts annual merit and salary reviews. However, as the external reviewers noted, the committee provides no written feedback to assistant professors, generating anxiety around whether these faculty are making adequate progress toward tenure. CEAE needs to develop a clearer and better communicated merit review process.

In light of the external reviewers' labeling CEAE mentoring program inadequacies as 'urgent' and a threat to retaining junior faculty, ARPAC recommends that the department take immediate steps to address mentoring.

First, ARPAC asks CEAE to establish a formal mentoring program, following models in other departments (e.g., History). The department chair should ensure appropriate leadership and accountability for the program, for example, by appointing a full professor to oversee and coordinate its proceedings (perhaps in lieu of other service work). The mentoring program leader

should take responsibility for regularly convening a mentoring group attended by junior faculty and their assigned mentors.

Second, a reconstituted CEAE mentoring program should establish routines and standardized processes for mentor/mentee meetings, including how often such meetings should occur, and the goal-setting work they should accomplish.

Third, the department must comply with university merit evaluation policy, which requires annual prompts for written feedback and improvement guidance. ARPAC encourages the department chair to consider following up on merit reviews with input individualized for each faculty member such as in the form of a letter and a one-on-one meeting to discuss progress and next steps. CEAE also should have policies in place to mentor instructors and post-doctoral fellows.

CEAE associate professors expressed concerns, too: namely, that the department could do more to define a clear pathway or timeline for their promotion to full professor. ARPAC urges the department to take advantage of resources available within the college and the Office of Faculty Affairs to organize associate professor workshops designed to clarify the promotion process. Additionally, the unit also should create opportunities for full professors to debrief associate professors on navigating promotion requirements like dossier preparation.

Space and Infrastructure

While the move of the environmental engineering and fluid mechanics laboratories to the Sustainability, Energy and Environment Community (SEEC) building has expanded research, education, and collaboration opportunities for some, the space needs for those left in the Engineering Center remain pressing. The department requests funds to implement

practical updates there such as improved laboratory spaces and changes aimed at accommodating department collaborations and student recruitment efforts.

The reviewers noted multiple requests for better graduate student collaborative spaces. The desired improvements address a range of purposes including meeting the requirements of students participating in conference calls and working on course projects or engaging in discussions of related methods.

Concerns regarding the department's dual-location in SEEC and the Engineering Center also receive prominent mention. CEAE personnel and students obligated to travel between the locations noted that the established shuttle service runs on a 7-minute interval, a rate deemed sub-optimal. A lack of short-term parking also contributes to the transportation challenge and makes collaboration difficult. ARPAC agrees with the external reviewers that campus space planners should attempt to better unify co-located departments.

In the nearer term, the Office of Parking and Transportation Services should make changes in the vicinity of SEEC to make more short-term parking available and to designate spaces for attendees of meetings associated with co-located departments.

Staff

Since the 2011 review, the CEAE staff roster has grown by 5.5 full-time equivalent positions. The department self-study argues for an additional administrative assistant, citing the burdens of separate AREN and EVEN degree programs.

Climate and Inclusive Excellence

The Department of Civil, Environmental, and Architectural Engineering must complete an inclusive excellence narrative

and submit a copy to the Office of Diversity, Equity and Community Engagement.

A climate survey conducted by ARPAC staff in September 2017 found that that 59% of CEAE women faculty members “agreed” or “strongly agreed” that the department had a positive climate. Only 26% of faculty of color offered the same responses. Overall, 31% of faculty members “agreed” or “strongly agreed” that incivility was having a disruptive effect on departmental functioning. The 2018 review suggests that, while CEAE has recruited and retained the most diverse faculty member contingent in the College of Engineering and Applied Science, and has insights to contribute in this regard, work remains to create an inclusive climate.

The internal reviewers’ surveys found that 6% of undergraduate and 7% of graduate student respondents found the department not tolerant and respectful of diversity, although their responses to other aspects of the department and its programs were positive.

The internal and external reviewers also noted more general climate concerns within and between CEAE faculty and staff groups. Documentation from the internal review indicates that steps to address staff climate concerns were underway, with the department setting expectations for mandatory training and consequences for inappropriate behavior. Less clear was if these expectations also encompassed the faculty. Given that the concerns surfaced in the review included both faculty and staff behavior, ARPAC encourages CEAE to consider involving staff and faculty members in trainings together, as other departments have done.

CEAE should collect additional data to better understand the climate experienced by its community members.

Recommendations

The members of ARPAC address the following recommendations to the Department of Civil, Environmental, and Architectural Engineering (CEAE) and to the offices of responsible administrators:

To the Unit:

1. Before holding further discussions to split the department, or taking other steps in that direction, follow the guidance of the external reviewers and conduct a strategic visioning process:

    a. Research and consult successful departments to explore whether maintaining a unified department or splitting into multiple departments is the best path forward. In doing so, consider whether a collective, collaborative department is better positioned to address future directions in the field.
    b. Examine concomitant effects of a possible split on departmental ranking, faculty recruitment, and student preparation.
    c. Consider how a split would affect other units (not just within the college).
    d. Consider how the decision—whether to stay unified or split—would inform future steps and affect future growth.

2. In cooperation with the college, establish and implement tenure and promotion and merit evaluation guidelines that conform to regent law.

3. Consider forming a separate annual merit review committee.

4. Create and implement a formal pre-tenure faculty mentoring program.

    a. Ensure that there is effective leadership for the program.
    b. Convene meetings of pre-tenure faculty members and their mentors more than once per semester.
    c. Identify routines and processes to support relationships between pre-tenure faculty members and their mentors.

    d. Provide each junior faculty member with detailed feedback at least once per academic year regarding their progress toward reappointment and tenure.

4. Provide associate professors with clear guidance and greater transparency around pathways for promotion to full professor. Draw on resources from the college and the Office of Faculty Affairs. Convene the associate professors to disseminate this information and to provide disciplinary benchmarks matching CEAE and college standards,

5. Create and implement a process of instructor and postdoctoral fellow mentoring.

6. Work with the college administrators and advancement personnel to improve and increase graduate student recruitment packages.

7. Continue efforts to improve climate among all department constituents. Implement a process for students who have negative climate experiences to report these as well as a system of supporting the students.

8. Work with the College of Engineering and Applied Science to increase undergraduate recruitment efforts pitched to Colorado high school and community college students.

9. Work with the college to make the BS architectural engineering major an associated option for students choosing to major in mechanical engineering.

10. Work with the Office of Data Analytics to understand students who leave the major including to understand where they go within the college or elsewhere. Apply this

understanding to improving the CEAE undergraduate program.

11. Continue to partner with advancement personnel on a fund-raising plan. Use the outcomes of a strategic visioning process to understand needs such as better undergraduate scholarship support, increased graduate student funding, and Engineering Center infrastructure improvements.

12. Ensure transparent decision making by the CEAE executive committee. Consider revising the composition of the committee to include representation by faculty member rank (e.g., tenured and pre-tenured faculty members and instructors) and by discipline.

13. Complete and submit an inclusive excellence narrative to the Office of Diversity, Equity and Community Engagement.

To the Dean:

14. Support CEAE with strategic visioning work. Help the unit identify strategic challenges in the areas of civil, architectural, and environmental engineering that could lead to growth opportunities.

15. Work with CEAE to aid graduate student recruitment and retention.

16. Support CEAE to increase undergraduate recruitment and enrollment.

17. Work with CEAE and advancement personnel on a fund-raising plan predicated on goals defined and enunciated by a strategic visioning process.

18. Work with CEAE and the senior vice provost for academic resource management to address space issues, including revamping laboratories and increasing graduate student office and collaborative meeting spaces. Support CEAE's efforts to employ meeting spaces to promote community.

To the Provost:

19. Recommend to the Office of Parking and Transportation Services that it provide short-term parking options for CEAE personnel with dual location obligations on the Main and East campuses.

Required Follow-Up

The Department of Civil, Environmental, and Architectural Engineering chair shall report annually on the first of April for a period of three years following the year of the receipt of this report (i.e., April 1st of 2020, 2021, and 2022) to the dean of the College of Engineering and Applied Science and to the provost on the implementation of these recommendations. Likewise, the dean shall report annually on the first of May to the provost on the implementation of recommendations addressed to the college. The provost, as part of the review reforms, has agreed to respond annually to all outstanding matters under their purview arising from this review year. All official responses will be posted online.