College of Engineering,
Design and Computing
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# Innovating Inclusion, Engineering for Equity and Developing Diversity

## Diversity, Equity and Inclusion Three-Year Strategic Plan for the College of Engineering Design and Computing

# I.    Context

The CU Denver College of Engineering, Design and Computing (CEDC) is composed of five departments—Bioengineering, Civil Engineering, Computer Science, Electrical Engineering, and Mechanical Engineering—serving 1,360 undergraduate students and 520 graduate students as of the Fall 2022 census. The College offers 24 degrees in nine fields, with a 25th/10th (BS in data science) starting in 2023. Additionally, the college offers 17 credentials including certificates, badges, and minors in the degree-granting departments. Faculty in the College are active in research and scholarship in addition to teaching. The College brings in approximately 45% of the external research funds to the entire CU Denver campus and has the largest external funding per faculty ratio of all colleges (over 3x that of the next highest college). We are committed to leveraging our strong research programs to provide important experiential learning opportunities for our students that contribute to their academic and professional success.

The CEDC is committed to educating engineers of the future and making engineering and technology careers available to students from all walks of life. In this context, the College has a strong and long-standing tradition of serving non-traditional students, first generation students, and military veterans. Part of the current CEDC Strategic Vision is to remold our curriculum to elevate computing and lead with design-oriented engineering education. Both of these initiatives not only coincide with current industry and workforce needs, but also invite individuals, personalities, and groups beyond those traditionally drawn to engineering degrees, to the modern world of technology. Specifically, innovation is well-known to be amplified through individuals with diverse perspectives collaborating on design teams and we are leveraging this in the evolution of both our curriculum and pedagogy – the strength of our conviction is reflected in the name of our college.

Engineering employers are increasingly seeking to diversify their workforce and the CEDC is the technology and research leader at CU Denver, which is Colorado's only

> **Key Highlights:**
>
> - Diversity and inclusivity in engineering is on a different plane than in other sectors of higher education
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> - Breaking down real and perceived barriers to engineering education is imperative for social, economic and national security reasons.
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> - Diversity has always been championed by CEDC, while we have much work to do, we are well positioned in Colorado's most diverse research university to bring equity to engineering as a national role model.

public urban research university. In 2021, CU Denver became a Hispanic Serving Institution (HSI) and Asian American and Native American Pacific Islander-Serving Institution (AANAPISI). Although this status briefly lapsed in 2022, CU Denver is poised to become the only four-year minority serving institution in Colorado that is also an R1 research institution; we expect this designation to occur based on our Fall 2022 demographics and are committed to living up to the responsibility that comes with this. Our plan highlights some of the ways we are doing and will do this.

In 2021 CU Denver completed its first ever strategic plan; its Goal 1 is an ambitious effort focused on DEI and our college efforts ladder into it and will be critical to CU Denver obtaining its institutional goal. To this end, in the 2023 Best Colleges rankings, U.S. News & World Report recognized CU Denver as No. 1 for social mobility in the state of Colorado for the second year in a row. As a vibrant, contemporary, growing engineering college is central for CU Denver to execute its strategic vision, our college will also play a leading role in Goal 3, for the institution to be internationally known for research and creative work and Goal 4, to serve as an anchor institution for an open innovation district in downtown Denver.

So, with the combination of our institutional emphasis and our college commitment to DEI, we are well positioned to champion inclusion and equity in engineering and break traditional stereotypes of what it means to be an engineer, a technology worker, an entrepreneur, or a STEM researcher. Being inclusive requires breaking real and perceived barriers to engineering education and careers in technology. In this context, equity requires that participants do not experience discrimination, and disadvantages based on background are mitigated as much as possible. Science, technology and engineering are not only economic drivers for the state and country but are also collectively a pillar of national security. The growing diversity of the country – and specifically Colorado for us - and particularly the student population, means that engineering education and training must be inclusive and move towards reflecting the diversity of our population.

A challenge in tying our college plans into the broader university plans is that engineering, as an academic culture, is contending with different historical trends when considering diversity and inclusivity. For example, although female college graduates outnumber their male counterparts nationally, in the engineering disciplines, males outnumber females by a factor of around four to one. The same ratio holds for most faculty and instructor positions. Second, in many engineering departments, the majority of faculty are foreign born. While this is a welcome diversity in itself, it can mean that these individuals are less aware of aspects of American history and particular equity issues. Furthermore, in the past engineering pedagogy would pride itself on the inherent difficulty and "rigorous" workloads in a culture that intentionally sought to "weed out" those deemed unfit for an engineering degree. In other words, a culture of exclusion was championed. Finally, this past attitude and lack of diversity has been echoed within American popular culture, which amplifies stereotypes, presenting at best an unflattering caricature of a typical engineering or STEM student

identity. The way popular culture views engineering only compounds the challenge of making the discipline more inclusive and diverse.

Despite these challenges, we want to highlight that engineering disciplines, as well as the math and science that underpin them, are global and universal – truly human endeavors. And students who enter engineering careers have found and continue to find that these careers transform their social and material well-being, for themselves and their families.

We believe that the successful future of the College, the engineering disciplines, the state, and the nation require that engineering curriculum and pedagogy be based on an openness to diversity and a culture of equity. For the CEDC diversity means representation reflective of the communities and state we serve in terms of race, gender, ethnicity, nationality, sexual orientation, and socioeconomic status; it is a differentiator that we intend to leverage through our design-oriented pedagogy. Inclusiveness and an equity mindset mean recognizing that not all of our students, faculty, and staff start at the same position of knowledge, skills, and culture. **The CEDC desires to be a place for everyone and the first choice for Colorado Hispanic students seeking technical degrees**. Although we have made progress in many areas, there is still much work to be done. We seek to be at the forefront of these issues, actively work to close gaps in academic and career success and not resign to be a calcifying instrument of existing inequities. This present plan outlines a 3-year strategic effort toward these objectives.

## II.   Quantitative Information and Current State

DEI is an emphasis of *Impact 2024, our Strategic Vision*, the 2019 College-specific strategy, which focused on growing the culture to be more innovative, inclusive, and ambitious. We have made great strides over the last four years with regard to DEI in our college due to the efforts of our faculty, staff, and students and support from our administration. However, we have not developed detailed tactical plans. This plan, developed by an ad-hoc college DEI committee is our first effort to better institutionalize our practices and proceed more strategically. Over the coming year we will continually work with myriad college stakeholders to build understanding and buy-in to this plan. In the remainder of this section we provide an overview of the current

> "Our diversity and inclusiveness fuel us"
>
> -CEDC 2019 Strategic Plan

College of Engineering, Design and Computing
UNIVERSITY OF COLORADO **DENVER**

state of CEDC and recent initiatives in DEI.

## Demographics of Faculty Staff and Students

The CEDC has seen robust enrollment growth over the last decade and acceleration of growth in the last 5 years. The undergraduate population of CEDC doubled since 2011 and the percentage of Hispanic, African American, and Asian American students has steadily grown, as shown in Figure 1. The percentage of Hispanic students has nearly doubled over the last 5 years (undergraduates have more than doubled) and our undergraduate Hispanic population of 23% is over twice the national average of engineering and STEM enrollments. The current demographics for each CEDC department are summarized in Table 2. All departments are diverse, with a majority non-white enrollment. Ten years ago, the ratio of transfer students to first time in college (FTIC) students was 50-50, but last year 62% of our undergraduates were FTIC. The racial and ethnic demographics of CEDC students are similar to the CU Denver campus (see Table 2). The gender demographics are very different from the campus at large with only 26% women. We have made good strides here by growing our enrollment of women by 66% over the last four years and now it is above the national average for engineering enrollment (~20%).

The growth of CEDC in student enrollment and student diversity has been a result of two strategic moves (1. the creation of new degree programs that are aligned with industry needs and have broadened what it means to be an engineer in the 21st century; and 2. an emphasis on new programming directed toward improving retention, especially first-year students). The former includes the following programs:

- BS in Bioengineering
- BA in Computer Science
- BS in Construction Management
- BS in Construction Engineering and Management
- BS in Cybersecurity
- BS in Data Science (Cross college program CEDC/BUS/CLAS)

**Table 1.** CU Denver campus and College of Engineering, Design and Computing (CEDC)

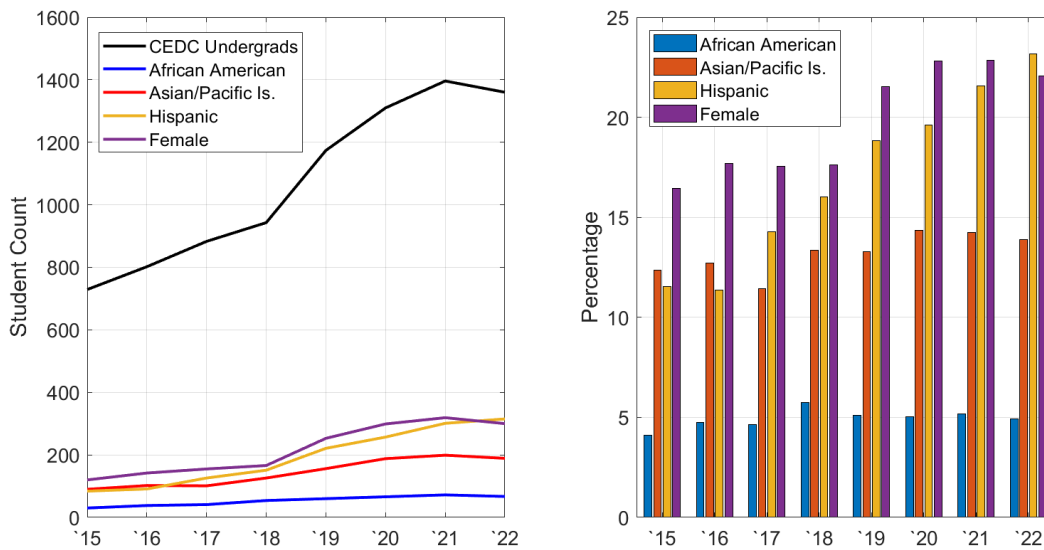| Race/Ethnicity | Bio. Eng. | Civ. Eng. | Comp. Sci. | Elec. Eng. | Mech. Eng. |
|---|---|---|---|---|---|
| African American | 5% | 4% | 10% | 4% | 6% |
| Asian American | 15% | 7% | 26% | 12% | 16% |
| Hispanic | 27% | 16% | 16% | 17% | 28% |
| International | 3% | 34% | 3% | 32% | 3% |
| Native American | 4% | 1% | 1% | 2% | 1% |
| Pacific Islander | 1% | - | 1% | 1% | 2% |
| Unknown | 1% | 1% | 2% | 2% | 1% |
| White | 45% | 39% | 43% | 31% | 43% |
| Total Student Count | 115 | 235 | 485 | 178 | 232 |

**Figure 1.** Growth of CEDC undergraduate population and associated demographics.

**Table 2.** Undergraduate demographics of the five CEDC departments as of Spring 2022 (103 students are undeclared).

| Race/Ethnicity | CU Denver | | CEDC | |
|---|---|---|---|---|
| African American | 750 | 8% | 90 | 7% |
| Asian American | 1,328 | 14% | 232 | 17% |
| Hispanic | 2,479 | 27% | 294 | 22% |
| International | 404 | 4% | 151 | 11% |
| Native American | 137 | 1% | 18 | 1% |
| Pacific Islander | 68 | 1% | 11 | 1% |
| Unspecified | 88 | 1% | 13 | 1% |
| White | 4,051 | 44% | 539 | 40% |

Our faculty and staff are less diverse than our student body and this is an area we plan to improve via this plan. The full-time instructional faculty, which includes tenured and tenure track faculty as well as full-time instructional faculty is 65 individuals in 2022. It has one Hispanic professor, one African American professor, and is divided about 63% white and 30% Asian. We have done well at increasing the gender diversity of our faculty – the percentage of women is 29% and this includes growth of 50% over the last three years for tenure-line faculty and 71% for all full-time faculty.

## Externally Funded Initiatives to Strengthen Diversity, Equity and Inclusion

As part of our college strategic plan we have supported faculty groups to secure extramural funding for DEI activities and they have had good success. CEDC faculty have been awarded five major grants for DEI work in the last five years totaling over $4 million. These awards include three prestigious National Science Foundation (NSF) grants, a Department of Defense (DOD) grant, and a National Institutes of Health (NIH) grant:

College of Engineering,
Design and Computing
UNIVERSITY OF COLORADO **DENVER**

**1. Engineering is Not Neutral: Transforming Instruction via Collaboration and Engagement (ENNTICE) (NSF):** ENNTICE is a three-year faculty learning community (FLC) with participants from all five departments in CEDC. Two participants are nominated by each department each year to join the learning community; each participant receives a $1,000 stipend and the honorary designation diversity equity inclusion (DEI) STEM Fellow. These faculty come together monthly workshops designed to integrate DEI into all aspects of teaching, research, and service. Faculty who cannot make a multi-year commitment can also choose to participate in the CU Denver Inclusive Pedagogy Academy, an initiative supported by an HHMI grant to educate faculty across disciplines on how to teach inclusively.

**2. STEM learning communities in CEDC (NSF):** which was motivated by data showing that first-year retention for engineering and pre-engineering students in CEDC was 10% lower than for students in other disciplines at CU Denver. Unfortunately, this trend appears to be present at many U.S. institutions of higher education. To address this critical issue, CEDC launched a program for a subset of incoming first-year engineering students, called the Engineering Learning Community (ELC). The ELC was first implemented in the fall 2016 semester, prior to NSF support. Since then, it has been iterated each academic year based on student feedback, best practices, and, beginning in the fall 2019 semester, support from the NSF in the form of S-STEM scholarships for financially qualified students.

**3. Building a Network for Education and Employment in Environmental Stewardship of Indigenous Lands: (NSF)** which fosters recruitment, training, and employment for indigenous STEM students. This program led to the creation of a special certificate program in civil engineering.

**4. The Denver Metro Engineering Consortium (DMEC) Cooperative Agreement** is funded by the Department of Defense. DMEC will create a new consortium comprised of local community colleges and four-year institutions, and industry partners, as well as minority-serving student societies, to significantly increase the number of engineering professionals from underrepresented (UR) groups. Both the University of Colorado Boulder (UCB)—the lead organization (LO)—and the University of Colorado Denver (UCD), serve as four-year engineering transfer destinations. Two-year partners are the Community College of Aurora (CCA) and the Community College of Denver (CCD)—both Hispanic Serving Institutions. DMEC proposes to address our nation's STEM participation challenge through an intense focus on historically underrepresented groups—women, Hispanic, African American, and veteran students—and link economically disadvantaged students with paid internships to provide the financial support they need to pursue full-time enrollment and subsequent STEM pursuit.

**5. Enhancing Science, Technology, EnginEering, and Math Educational Diversity (ESTEEMED) Research Education Experiences (NIH)** this program, focused in the Bioengineering department, is currently recruiting its first cohort. It will draw students from the Community College of Denver and provide early advising, multi-level mentoring, rigorous research experience, and preparation for post-graduate degrees.

College of Engineering,
Design and Computing
UNIVERSITY OF COLORADO **DENVER**

## Student Affinity Groups

Student chapters of national professional organizations are very active in CEDC and supported by departments and the dean's office. Active groups currently include:

- American Indian Science and Engineering Society, chapter president Cynthia Rice (cynthia.rice@ucdenver.edu), faculty advisor biology professor Timberley Roane (timberley.roane@ucdenver.edu). We do not have a current count of how many engineering students are active.

- National Society of Black Engineers, faculty advisor civil engineering professor Kevin Rens (kevin.rens@ucdenver.edu). This chapter was reactivated in 2019 after a long hiatus with strong support from alumni in industry.

- Society of Hispanic Professional Engineers, faculty advisor Fernando Mancilla-David (fernando.mancilla-david@ucdenver.edu). This chapter has been active continuously for many years, and they hosted a regional conference several years ago.

- Society of Women Engineers, faculty advisor Maryam Darbeheshti (maryam.darbeheshti@ucdenver.edu). This chapter has also been active continuously for many years.

- Tau Beta Pi, the engineering honor society, faculty advisor Dana Carpenter (dana.carpenter@ucdenver.edu). Although this is not an identity-focused group it has a diverse group of students.

## Current Initiatives and Success

The following initiatives have been undertaken in the last three years to increase diversity of CEDC faculty.

- First year retention (which has become increasingly important as our FTIC students have significantly grown) has steadily improved over the last 5 years and last year was at 82%, above the campus average of 71% despite the rigorous and rigid curriculum of our degrees. This has been supported through an effort focused on the first-year experience with multiple programs:
    - Cross disciplinary first-year design course (ENGR 1200)
    - First year experience seminars (UNIV 1110)
    - Targeted supplemental learning support for high DFW courses
    - Student – student mentoring facilitated by Mentor Collective
    - Mandatory advising and pre-engineering inclusion (previously pre-engineering students were enrolled in and advised by the College of Liberal Arts and Sciences)

- All members of faculty recruiting committees now receive diversity training, including content on implicit bias and developing more diverse applicant pools.

Faculty hiring processes have been changed so the Dean reviews all shortlists to ensure a diverse pool has been obtained.

- CU Denver does not provide support to hire faculty who increase diversity but the CEDC Dean has prioritized internal resources to strengthen startup packages for any faculty hire (tenure line or instructional) who contribute to increasing the diversity of our faculty.

- Over the last three years we have increased gender diversity significantly with tenure-line women faculty growing by 33% and total women faculty growing by 50%. However, we have not made inroads into increasing racial diversity.

- All new faculty hires are required to participate in the CU Denver Inclusive Pedagogy Academy and the Dean provides the financial support for this training.

# III.   Objectives

The current plan consists of specific annual goals and actions over the next three years across eight focus areas.

## 1. Awareness and Policy Review

Many in our community lack an awareness of diversity, equity, inclusion or have an incomplete view of what these concepts mean for their work in CEDC. There are a number of policies governing student and faculty relations that will be revisited and updated.

**Year 1 (2023) Goals:**
1. Continually socialize the DEI plan to faculty, staff, and students and obtain feedback and input allowing to revise the plan as needed.
2. Update CEDC grievance policy to include student representation on grievance adjudication committees.
3. Update CEDC Honor Code to more clearly describe roles of students, instructors, department chairs and associate deans in the process.
4. Develop a forum to aggregate findings of existing CEDC DEI programs and disseminate across the college.

**Year 2 (2024) Goals**
1. Create a uniform student petition process for all departments in CEDC which allows students to request exceptions to rules and policy and to for those requests to get a formal review.
2. Update current DEI plan based on feedback received in Year 1.

3. Develop plans for each department to contribute to the college DEI plan as well as develop department-specific programming.
4. Develop a training plan consisting of appropriate workshops on issues such as unconscious bias, intercultural engagement, and conflict resolution.

**Year 3 (2025) Goals**

1. Implement workshops as part of the DEI training program.
2. Develop DEI plans for each department/unit.

## 2. Data and Metrics

Understanding and influencing DEI requires quantitative and qualitative assessment of key metrics. Our plans involve identifying and continually collecting data and determining its usefulness and impact on our programming. Initial data will include: student enrollment, faculty and staff diversity, retention and graduation rates, DFW rates, and sense of community and belonging.

**Year 1 (2023) Goals:**
1. Develop procedures for collecting and presenting student and faculty/staff demographics data in the college.
2. Develop a climate survey for students and staff that will be used to annually assess feelings of community and belonging across all demographics. This survey will also be used to identify specific and broad issues of equity and discrimination that need to be addressed.
3. Establish regular meetings of college leadership where DEI metrics will be discussed.

**Year 2 (2024) Goals:**

1. Develop an automated approach for presenting CEDC data and make it available to faculty, staff, and students; solicit their input on the effectiveness of these representations.
2. Make retention and graduation rates, and the impact on different demographics, part of annual review of each department.

**Year 3 (2025) Goals:**

1. Review three-year data trends to assess effectiveness of all initiatives in this plan and update as appropriate.

## 3. Physical Space

CEDC is in the process of designing a new engineering building that will be built in a highly visible part of campus in downtown Denver. The building offers a unique opportunity to design and outfit physical space to support inclusivity and equity goals. In summer 2022, we participated in a survey about physical space in the context of DEI and the following insights were gained.

*Space Survey Overall Positives*
- Modern buildings like the Student Commons building with self-opening doors, wide doors, and multiple entrances.
- Flexible spaces that can be rearranged, with multiple technology options. Comfortable seats not attached to tables.
- No hierarchy in seating or instructor position for teaching spaces.
- Natural lighting.
- Decorated walls, murals. Space dedicated to students and student affinity groups.
- Gender neutral bathrooms.
- Pictures of diverse researchers in the hallways

*Space Survey Overall Negatives*
- Tiered (stadium/theater) seating
- Outdated spaces, inadequate technology, writing spaces attached to chairs.
- Spaces where furniture cannot be rearranged
- Small desks (body shaming, back pain causing), spaces with too many rules or restrictions, spaces where badges need to be displayed.
- Too much white wall space, not welcoming.
- Parking is expensive and distant.
- Limited affordable food options.
- Lack of shaded spaces outdoors.
- Spaces that do not feel safe or are easily disrupted.

At the time of this writing the final design of the new building is being finalized and many core elements reflect needs expressed in the campus survey. In particular, the new building includes student lounges, a student success center, dedicated spaces for student organizations, and active learning classrooms and laboratories. The university is expected to break ground on the building in April 2023 with a grand opening in the Spring 2025 semester. After that, some of our existing spaces in adjacent buildings (the North Classroom) will be renovated. The next three years give us an opportunity to affect the building interior design and outfitting of space.

**Year 1 (2023) Goals:**

1. Work with building architects to ensure that teaching and learning spaces are outfitted in nonhierarchical and reconfigurable fashion emphasizing equity between teachers and students.

2. Work with building architects to ensure student centered space is outfitted and organized to address all student needs including needs for interfaith worship, study spaces, personal health spaces. Drive this with multiple channels of student input including student surveys, focus groups, and interactions with student leaders.

3. Create a CEDC task force for suggesting artwork and decorations in the new building and North Classroom. This task force will seek appropriate artwork and/or images highlighting different identities, races, cultures, and physical disabilities and diverse contributions to engineering and STEM.

**Year 2 (2024) Goals:**
1. Develop access protocols for new building spaces that promote maximum access for students and staff but are also cognizant of physical and psychological safety needs.

**Year 3 (2025) Goals:**
1. Review new building and North Classroom renovations for effectiveness in meeting DEI goals.

2. Based on completed reviews make plans to renovate and improve legacy space as well as revamp new space if needed. Use knowledge gained from new facilities to serve as a benchmark to leverage a campus-level network of spaces where students feel safe, both physically and mentally.


## 4. Partnerships with Industry

An Engineering or STEM education offers a unique opportunity for social advancement and financial stability. This potential can only be met if students complete their degrees and are able to find gainful employment aligned with their ambitions. It is the responsibility of the CEDC to prepare students for the workforce and connect them to employers. CEDC also has a role to play in helping the current workforce upskill or reskill. This has been an area of past strength and goes hand-in-hand with the education of new workers. Strengthening sustained partnerships with local, regional and even national industrial partners is important for our DEI goals as companies increasingly look to CU Denver as a key provider of its diverse technical talent pipeline.

**Year 1 (2023) Goals:**

1. Increase number of sponsors of interdisciplinary Capstone design projects.

2. Hire a fulltime coordinator of Capstone Design that will build and manage portfolio of corporate sponsors, making sure to recruit companies who have DEI values aligned with ours.

3. Ensure that College and Department advisory boards are diverse in demographics, industry and seniority of members.

**Year 2 (2024) Goals:**

1. Improve internship opportunities of students, work toward goal of every undergraduate student completing a paid internship during their course of study.

2. Improve opportunities for working professionals to obtain undergraduate and graduate degrees as well as microcredentials by finding appropriate mix of hybrid and in-person offerings and strategically scheduling courses.

**Year 3 (2025) Goals:**

1. Launch topical professional Master of Engineering degrees catering to industry needs where they are looking to diversify their technical workforce, e.g., robotics, artificial intelligence, aerospace, and electric vehicles.

## 5. Recruitment of Students
**Year 1 (2023) Goals:**

1. Coordinate efforts with CU Denver science and math departments' existing outreach and with offices such as the Pre-Collegiate Program, which recruits first generation students, to introduce CEDC majors as possibilities for those populations.

2. Develop relationships with counselors, and math & science teachers at targeted high schools; interview them about how to reach their underrepresented minority (URM) populations and sign guaranteed admissions MOUs where appropriate.

3. Develop templates that allow faculty to quickly add URM outreach to high schools as a component of research grants; streamline supports to then do the outreach once grants are awarded.

**Year 2 (2024) Goals:**

College of Engineering,
Design and Computing
UNIVERSITY OF COLORADO **DENVER**

1.  Increase CEDC presence at K-12 events held at CU Denver, which include the regional science fair, robotics competitions, and summer camps. This could include having CEDC students act as volunteers, giving tours of CEDC labs as part of the event, or faculty serving as judges. Normalize and incentivize this participation with recognition that is as prominent as the recognition for research awards.

2.  Provide incentives to faculty to sponsor/ mentor student groups and at the Dean's office level, provide financial support for extra activities by those groups

3.  Develop marketing materials that showcase a cross section of recent alumni, including those who are from URM populations, and use social media prominently.

**Year 3 (2025) Goals:**

1.  Recruit graduate students at Hispanic Serving Institutions and Historically Black Colleges and Universities.

## 6. Recruitment and Training of Faculty and Staff

Increasing the diversity of faculty and staff is longstanding and challenging goal not only in CEDC but in engineering colleges nationwide. We have increased gender diversity significantly with tenure-line women faculty growing by 33% and total women faculty growing by 50% from 2018 - 2022. However, we have not made inroads into increasing racial diversity. We will continue to strive to increase diversity of faculty in the next three years. Since the diversity increase from new hires will likely be incremental, the training of current faculty and staff is important in improving the culture of the institution. The training goals build upon recent initiatives by our faculty that are supported by the National Science Foundation.

**Year 1 (2023) Goals:**
1.  Focus commitment to offerings like the ENNTICE Faculty Learning Community (FLC) and the Inclusive Pedagogy Academy (IPA) by incentivizing each department to reach a certain level of participation for all rostered faculty AND create a pool of funds that can pay part time faculty to participate.

2.  Continue to iterate and improve the New Faculty Orientation that since Fall 2022 has included 3 hours focused on DEI.

3.  CU Denver does not provide support to hire faculty who increase diversity but the CEDC Dean has prioritized internal resources to strengthen startup packages for any faculty hire (tenure line or instructional) who contribute to increasing the diversity of our faculty – we will increase this support and lobby the campus to provide such support as well.

CU
College of Engineering,
Design and Computing
UNIVERSITY OF COLORADO **DENVER**

**Year 2 (2024) Goals:**
1. Redesign recruitment strategies for new faculty by focusing advertising at HBCUs, HSIs, and other minority serving institutions and in publications with targeted audiences, such as those for SHPE and SWE.

2. Create uniform policies for promotion and retention of Clinical Teaching Track Faculty and senior instructors across department based on best practices.

**Year 3 (2025) Goals:**
1. Reach 100% participation by faculty in ENNTICE Faculty Learning Community (FLC), Inclusive Pedagogy Academy (IPA), or similar professional development experience related to DEI.

2. Provide required training for all staff on the population and needs of CU Denver's students, parallel to the New Faculty Orientation DEI training, referenced above.

## 7. Pedagogy

Pedagogy is core to the mission of CEDC. The advantage of teaching STEM and technical topics in an equity context is that the content tends to be universal and global. The challenge is that mastery of technical disciplines requires a layered and base building approach with long strings of prerequisites and a required foundation of advanced mathematics. This makes the mathematical preparation and continued motivation of students key parameters in their ultimate success. The traditional "weed out" culture of STEM pedagogy was detrimental to students who came with other life experiences not aligned with conventional mathematics preparation. An inclusive approach requires providing flexible opportunities for students to gain the knowledge and skills expected for certain technical courses. This approach strengthens students' efforts and motivation while meeting the technical demands of the various engineering disciplines.

On the individual instructor level, we need to answer the question - How do I incorporate an equity and inclusion mindset into my course? This is a nontrivial question for those of us teaching courses that are mostly based on equations—the same equations used around the world. We do not need to change what we teach, but we need to reexamine how we teach. Research shows that active learning and targeted experiential learning improves retention, especially among women, URMs and first-generation students in engineering. Active learning allows students to make their own sense of ideas they are encountering and to integrate ideas with what they already know. Active learning strategies are seen as an important component of inclusive teaching because they encourage multiple modes of engagement to reach all students

-- including historically underrepresented groups. Active learning, and its connection to design-based learning - which emphasizes diverse teams, creativity, and innovation - and a focus and are integral parts of the CEDC strategic plan.

**Year 1 (2023) Goals:**

1. Work with The Center for Excellence in Teaching and Learning (CETL) to provide a series of very short talks at department faculty meetings to introduce active learning techniques to more faculty, demonstrating the simplest techniques to introduce.

2. Ensure videos used in teaching are captioned to support hard of hearing and English language learners.

3. Invite guest speakers who are from URMs to share their professional experiences in classes.

4. Facilitate computing experiences that deliberately build from course to course, by having instructors coordinate curriculum to have explicit linkage.

5. Encourage instructors to develop projects that are design- and team- based. Include training for instructors on DEI-related aspects, such as how to not strand URMs or women on teams, and deal with micro-aggressions between teammates.

**Year 2 (2024) Goals:**

1. Create a system of incentives and assessments for introducing active learning, flipped classroom approaches, and continual improvement to pedagogy to realize our design-based learning aspirations.

2. Encourage a "See it, Be it" strategy by providing resources to faculty that make it easy for them to include examples of successful engineers of all backgrounds and/or show examples of great engineering from multiple cultures.

3. Create low-cost boot camps and summer courses to strengthen math and technical skills for struggling students.

**Year 3 (2025) Goals:**

1. Create a cycle of class observation and review of all faculty that provides suggestions for implementing active learning techniques, with follow up to help iterate on these practices

> "The same equations are used all around the world. We do not need to change what we teach, but we do need to reexamine how we teach."

## 8. Resources

The CEDC has already committed significant resources to myriad DEI initiatives. Specific financial investments include the commitment to additional faculty startup funds for diversifying new hires, Inclusive Pedagogy Academy workshops for new faculty hires, travel funds for student affinity groups to national conferences, and supporting funds for NSF projects of the S-STEM Scholars and the ENNTICE faculty learning community. Our goals going forward are to continue this financial support and also grow our human resources in DEI.

**Year 1 (2023) Goals:**

1. Designate a College DEI faculty fellow to lead and evaluate DEI efforts
2. Create a dedicated line Item in the CEDC Budget for DEI Activities
3. Support CEDC-wide grant writing efforts for National Science Foundation S-STEM, ITEST or similar programs that provide for URM outreach, scholarships or both, with cross-departmental involvement.
4. Expand the existing ad-hoc DEI committee to work with departments to find ways to best contribute to college DEI plans.

**Year 2 (2024) Goals:**

1. Increase funding for the dedicated line Item in the CEDC Budget for DEI Activities

**Year 3 (2025) Goals:**

1. Create a CEDC Standing Committee on DEI and a Chief DEI Officer

# Engagement

We will communicate information about our DEI initiatives broadly through outreach sessions and via our website. Feedback from all levels of the College will be used to adjust goals and milestones as necessary. Due to the relatively small size of the college and departments, we will have a single college DEI plan and then tactical DEI plans for the specific topics of student recruitment, student success, and faculty hiring.

## Closing Thoughts

Diversity, equity, and inclusion concepts in engineering and STEM are on a unique plane and these concepts need to be selectively and optimally engaged by CEDC. At the same time, the initial lower levels of awareness and familiarity do not need to be an impediment to equity and inclusion goals. Student diversity and success have always been championed by CEDC. While we have much work to do, we are well positioned in Colorado's most diverse research university to bring equity to engineering and be a model for doing so.

# Appendices

Data provided on the following pages:
- Employee Demographic Data, 2020-2022
- Student Enrollment Demographic Data, 2020-2022
- Degree Attainment Data, Fall 2019- Summer 2022