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Trends in Engineering Education

Dr. Lily M. Wang, Director

Durham School of Architectural Engineering and Construction

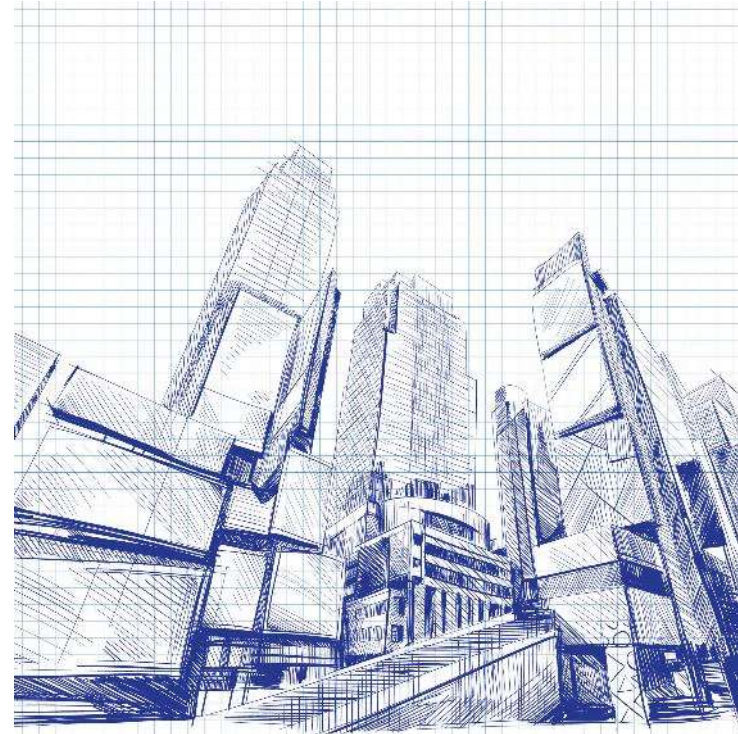
COLLEGE OF
ENGINEERING



About the Durham School

Three academic programs

- Architectural Engineering
- Construction Engineering
- Construction Management



We prepare students to be leaders in their selected profession within Architectural Engineering and Construction (AE&C), to improve **design, construction, and operation of buildings and other infrastructure**

About the Durham School



Quick Facts:

- Co-located in two cities, Lincoln and Omaha
- Strong ties with several world-class AE&C firms (many of which are headquartered in Nebraska)



- Approximately 30 faculty
- 500 undergraduate students
- 100 graduate students

Most Valuable College Majors

www.bankrate.com rated the **most valuable college majors** in 2021 from reviewing 159 different degrees...

Top two on that list :

- 1) **Architectural Engineering!**
- 2) **Construction!**



The most valuable college majors in 2021, ranked



Written by **Jeff Ostrowski**

Oct. 4, 2021 / 6 min read

Edited By **Chelsea Wing**



'Top 10 Degrees on the Rise' (Hanover Research 2021)



THE DURHAM SCHOOL

FASTEST GROWING DEGREE PROGRAMS

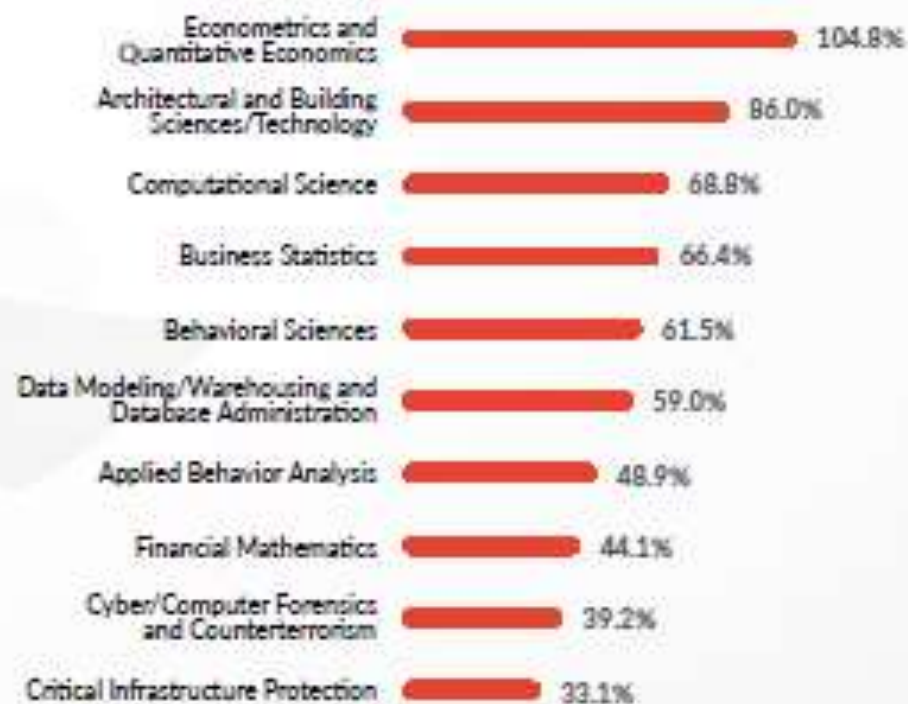
TOP 10 BACHELOR'S DEGREE PROGRAMS

Highest Annualized Growth Rate in Degree Completions
in the United States, 2015-2019



TOP 10 MASTER'S DEGREE PROGRAMS

Highest Annualized Growth Rate in Degree Completions
in the United States, 2015-2019



ENGINEERING



Trends in Engineering Education



1) Transforming the Teaching of Engineering

- Experiential learning in and out of the classroom

2) Changing Demographics

- Growing inclusive excellence

3) Industry Engagement

- Invitation to partner further

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UNL N2025 Strategic Plan



“Every person and every interaction matters.”



UNL College of Engineering Strategic Plan



VISION

THE COLLEGE OF ENGINEERING IMPROVES THE LIVES OF EVERY NEBRASKAN.

MISSION

TO DRIVE ECONOMIC DEVELOPMENT IN THE STATE AND REGION WHILE SOLVING PROBLEMS OF GLOBAL IMPORTANCE.



COMMUNITY

We believe in the individual, but know that inclusive communities result in better solutions.

IMPACT

Every student, staff member and faculty member in the college prioritizes actions and initiatives that actually make a difference.

INCLUSION

The college and its disciplines welcome all people and all rational ideas, because we know that diversity of people and ideas enhances impact.

Nebraska Engineering: The Complete Engineer® Initiative



College of Engineering

THE COMPLETE ENGINEER® PROGRAM



About

Undergraduate Student Resources

Graduate Student Resources

Connecting with Industry

Complete Engineer® Fellows



**INCLUSIVE
EXCELLENCE**

*Diverse. Empowered.
Connected.*



COMMUNICATION

*Collaborative. Positive.
Respectful.*



TEAMWORK

*Accountable.
Productive. Involved.*



**SELF-MANAGEMENT
& LEADERSHIP**

*Motivated. Open. Goal-
oriented.*



**CIVIC
RESPONSIBILITY**

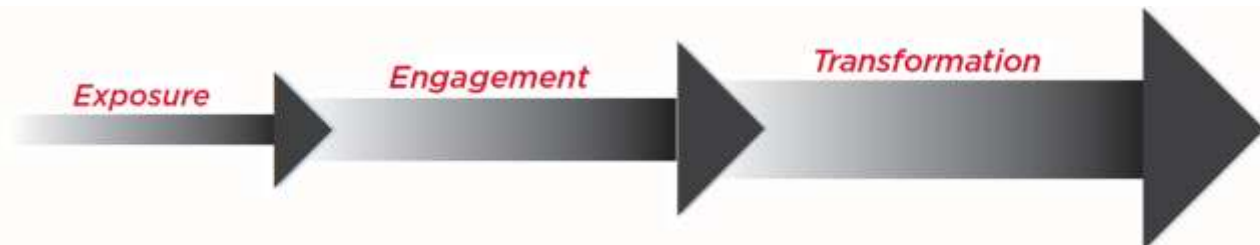
*Active. Engaged.
Connected.*



**PROFESSIONALISM
& ETHICS**

*Responsible.
Respectful. Equitable.*

ONLY AT NEBRASKA
DEVELOPING THE COMPLETE ENGINEER®



Nebraska Engineering: The Complete Engineer® Initiative



DISTINGUISHED LECTURE

"Building a Sustainable and Inclusive Future: Effective Practices for Collaboration Between Industry and Academia in Construction"

april 21

12:00 PM
Boxed lunches available
12:15 - 1:15 PM
Presentation

DR. DENISE
ASSOCIATE DEAN FOR WORK COLLEGE
UNIVERSITY

PKI 160 (OMAHA), NH 175 (LINCOLN), OR ZOOM
PLEASE REGISTER FOR LUNCH OR ZOOM LINK BY WED. APRIL 19: [HTTPS://GO.UNL.EDU/DSAEC-DL](https://go.unl.edu/dsaec-dl)

[WWW.ENGINEERING.UNL.EDU/DURHAM SCHOOL](https://www.engineering.unl.edu/durhamschool)

Construction Industry Perspectives

1. Communication skills
2. Ethics/responsibility
3. Professionalism
4. Critical thinking/problem solving
5. Big picture thinking
6. Ambition/drive
7. Self-awareness
8. Humility
9. Teamwork/collaboration/networking
10. People focus
11. Time management
12. Management
13. Adaptability
14. Quality Control
15. Computer skills
16. Safety and risk management
17. Assertiveness
18. Legal knowledge
19. Economic principles/trends

LEGEND:
Interpersonal Skills (black),
Intrapersonal Skills (blue),
Technical Knowledge (red)



1. Simmons, D. R., Groen-McCall, C. & Clegorne, N. A. (2020). Leadership Competencies for Construction Professionals as Identified by Construction Industry Executives. *Journal of Construction Engineering & Management*, 146(9). doi: 10.1061/(ASCE)CO.1943-7862.0001903
2. Clegorne, N. A., Simmons, D. R., & McCall, C. (2021). Leadership competencies for post- secondary engineering experiences: A Delphi study of industry perspectives. *Journal of Leadership Education*. doi:10.12806/V20/I1/R4

Nebraska Engineering: The Complete Engineer® Initiative



College of Engineering

ENGINEERING AND COMPUTING EDUCATION CORE (ECEC)



[ECEC Home](#)

[Faculty Programs](#)

[Faculty Resources](#)

[Assessment & Data Analytics](#)

[Instructional Design](#)

[Graduate Student Teaching Fellows](#)



Engineering and Computing Education Core

[Course and Syllabus review](#)

[Graduate Student Teaching Fellow Program](#)



Student Experiences in the Durham School

Study Abroad



Summer 2023 - Engineering in Brazil

This faculty-led program includes an 8-week spring 2023 virtual course followed by an in-person 18-day abroad component. Students will study the history of engineering and construction in Brazil. During the program, students will:

- Compare construction materials, means, and methods between the U.S. and Brazil.
- Tour local construction sites.
- Interview local project managers and superintendents.
- Visit Brazilian universities and interact with local students.

Program Link: [Click Here](#)

Faculty: Professor Emmeline Lemos Watson and Professor Matthew Barrows



Student Experiences in the Durham School



Undergraduate Research



2023 '[Jump Into STEM](#)' program competition



Student Experiences in the Durham School

- Race to Build in Bristol, TN (Sept 2022)



THE DURHAM SCHOOL



Student Experiences in the Durham School



THE DURHAM SCHOOL

OPPD Safety Demonstration



Concrete Bowling Ball Competition



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Student Experiences in the Durham School



Lyman Ritchie Tour



Tour of **Luminarium Construction Site** with HDR + Kiewit



Student Experiences in the Durham School



Chicago – Tour (2022 Vertical Construction class)



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Student Experiences in the Durham School

- ‘Crucial Conversations’ training
 - Integrated into Durham School Senior Seminar courses
 - Annual May training session at Carol Joy Holling Center



Crucial Conversations.
FOR MASTERING DIALOGUE

Student Experiences in the Durham School

- Improvisation Skills for the Complete Engineer



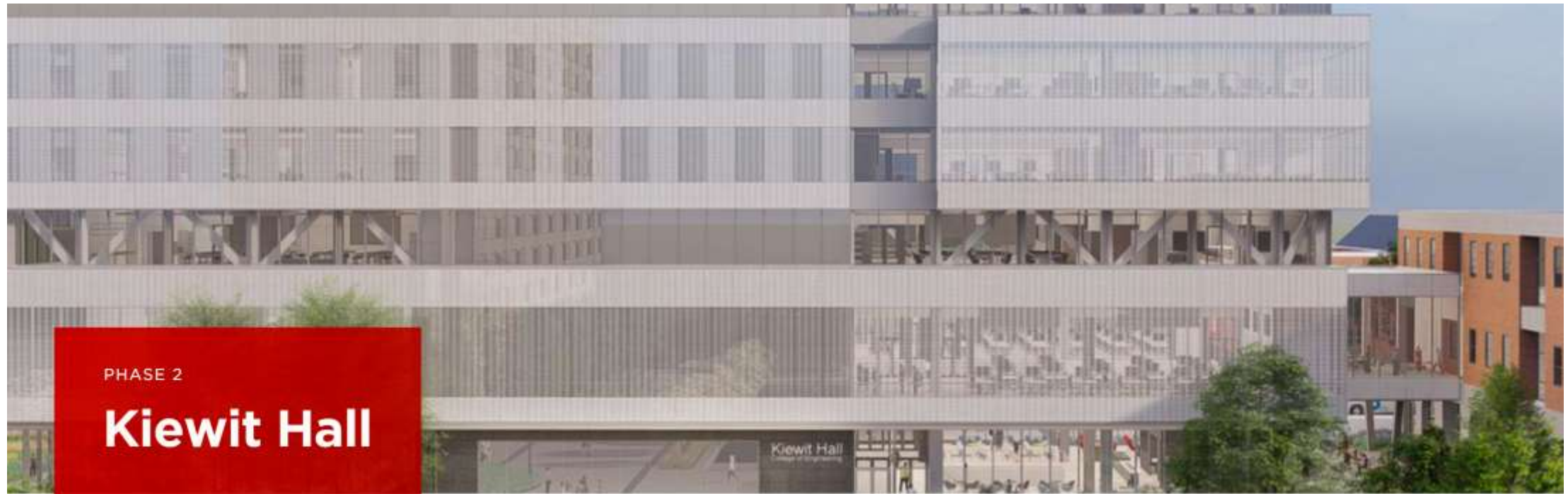
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<https://durhamschool.link/improv>

Student Experiences in the Durham School

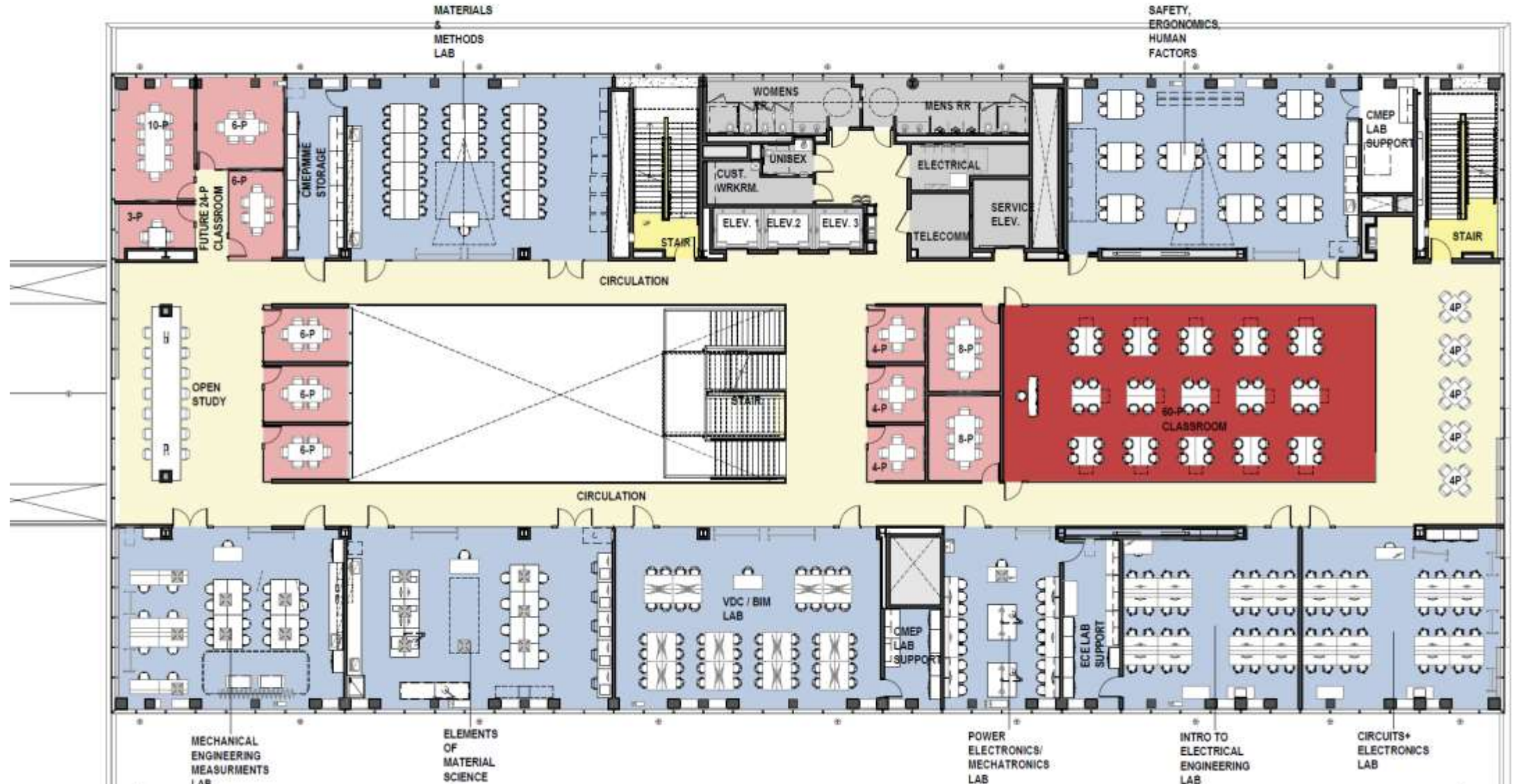
- [Kiewit Hall](#) (City Campus), opening Spring 2024



Student Experiences in the Durham School



- [Kiewit Hall](#) (City Campus), opening Spring 2024



Student Experiences in the Durham School



- [Kiewit Hall](#) (City Campus), opening Spring 2024



Trends in Engineering Education



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At a Glance:

Considered myself as a shining example for diversity, equity and inclusion (DEI)!

... until 2018, when I shifted to be Associate Dean for Faculty and Inclusion and learned more about DEI

=> NO, **not** a champion of DEI just by existing and persisting

Growing Dismay: State of the College 2017

Facing reality of DEI in UNL College of Engineering (COE)

- Only woman faculty member on the UNL COE leadership team (since 2013)
- Most senior woman faculty member
- No women ever selected for named chaired professorships in 110 year COE history
- Other men and women faculty told me: I was the token woman – just the nicest one who could take it



Growing Dismay: State of the College 2017

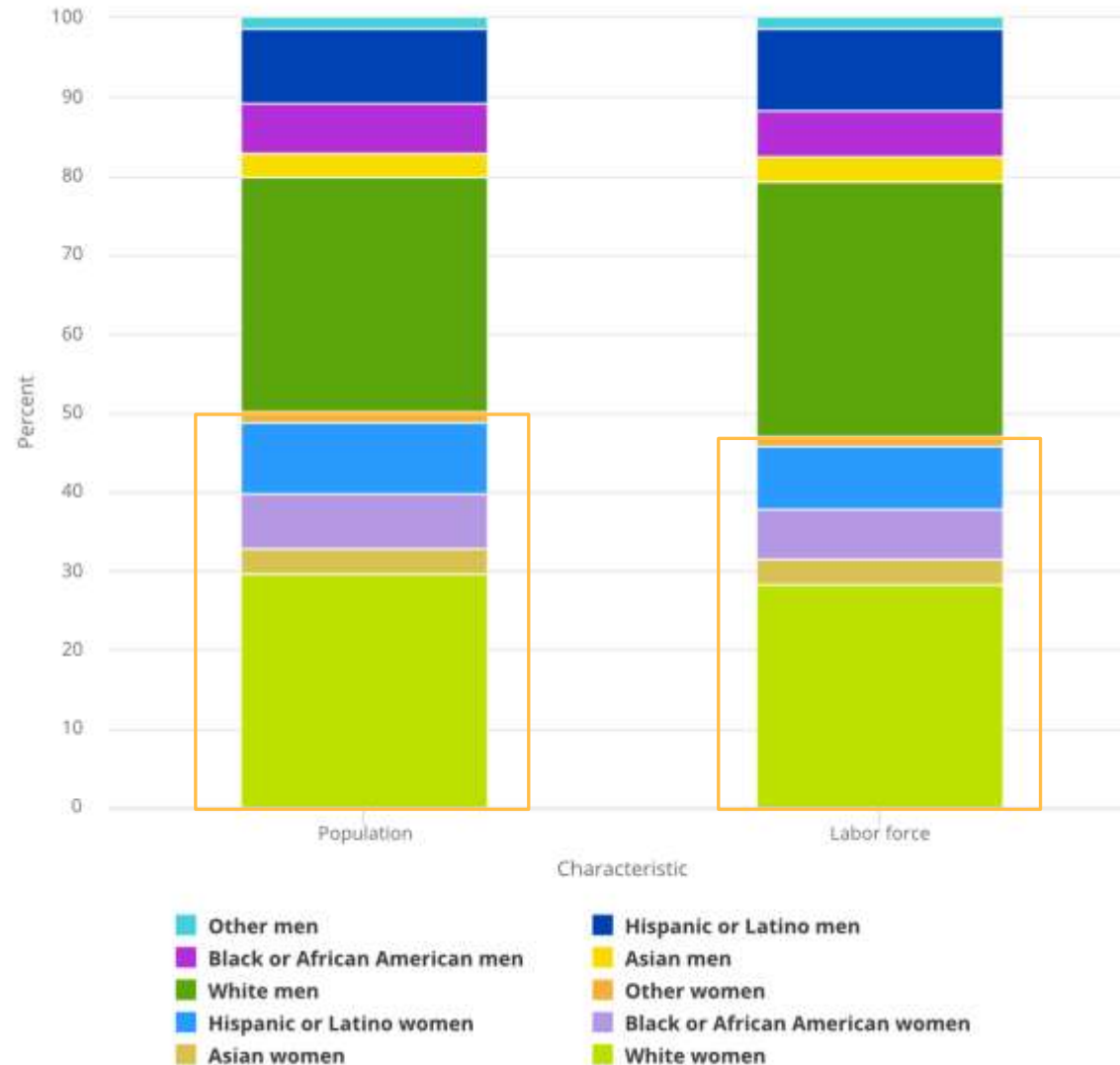
Facing reality of DEI in UNL College of Engineering (COE)

- From mentoring younger women faculty, felt like progress had been so limited
- Same stories, same issues
- Just a problem at Nebraska? No – systemic in science and engineering



“Women, Minorities, and Persons with Disabilities in Science and Engineering”

Noninstitutionalized resident population of the United States and civilian labor force of the United States, ages 18–64, by ethnicity, race, and sex: 2019



2019 USA Population Data

Women = **50.75%**

Hispanics = **18%**

Black or African American = **12.5%**

Asian = **5.8%**

Other = **3%**

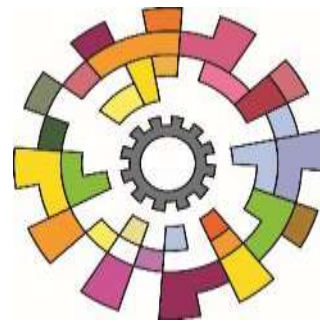
Interactive Activity Time!



*Go to [menti.com](https://www.menti.com)
and enter code:
65 37 33 8*

ASEE ‘Year of Action in Diversity’

- ASEE declared 2014-15 to be the ‘Year of Action in Diversity’



ENGINEERING DEANS
DIVERSITY INITIATIVE

- Dean’s Diversity Pledge

“... committing, through specific actions, to provide increased opportunity to pursue meaningful engineering careers to women and other underrepresented demographic groups. Specifically they commit to ensuring that our institutions provide educational experiences that are inclusive and prevent marginalization of any groups of people because of visible or invisible differences.”

ASEE Dean's Diversity Pledge

“[M]easure of success will be a notable increase in diversity in enrollments, retention and graduation rates of engineering and engineering technology students, and increased diversity in our faculty and in the engineering workforce, over the next decade.”

- At Fall 2018 Deans Council meeting, data continued to show underrepresentation of visible and invisible minority groups (in some cases worsening)
- To accelerate achievement of Diversity Pledge goals, ASEE developed a public recognition and accountability program

ASEE Dean's Diversity Recognition Program

- ASEE Diversity Recognition Program = UNL COE one of 74 inaugural institutions to receive Bronze Award, one of **3** this year to receive Silver!



- 1) Dean's Diversity Pledge
- 2) K-12 Pipeline Activities
- 3) Partnership with a non-PhD granting engineering school serving populations underrepresented in engineering (Navajo Tech)
- 4) Commit to diversifying faculty

Growing Diversity and Inclusion in Pipeline



UNL COE Inclusion Scholars Program (cohort based)

- Women in Engineering (WIE) Program
- Multicultural Engineering Program (MEP)

Q&A with Izzi Bryant

Freshman, Architectural Engineering

"I did not know when I first applied for MEP that it would introduce me to some of the best people I have ever met. The program fills me with a purpose that I would not have without it."

[Q&A with Izzi](#)

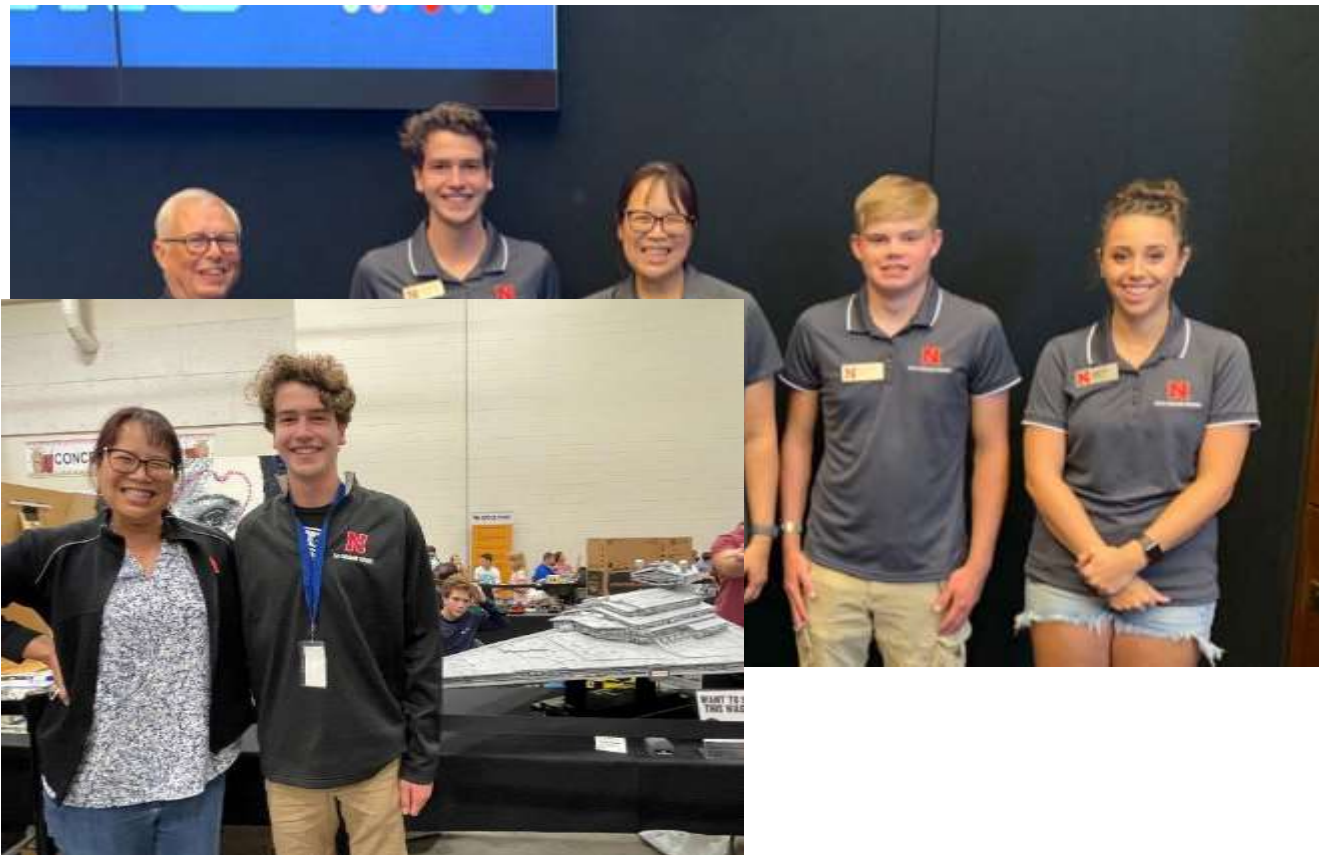


Growing Diversity and Inclusion in Pipeline



Kiewit Scholars Program

- 10 in each year's cohort



<http://durhamschool.link/mjfeldy-lego>

Growing Diversity and Inclusion in Pipeline



Peter Kiewit Foundation Engineering Academy

- Inaugural class of 40
- 32.5% first gen, 77.5% women, 50% from diverse backgrounds, all demonstrate financial need



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Growing Diversity and Inclusion in Pipeline



WOMEN IN CONSTRUCTION WEEK:

MARCH 5-11

- The Mayor of Omaha, Mayor of Lincoln, and Governor Pillen have issued Proclamations, dedicating March 5-11 as Women in Construction Week!
- Strengthening ties to the local National Association of Women in Construction (NAWIC) group



Growing Diversity and Inclusion in Pipeline

UNL-NSBE at National Convention in Kansas City, MO



THE DURHAM SCHOOL



Growing Diversity and Inclusion in Pipeline

Lucy's Engineering Adventure

- Written by MAE '17 alum Danielle Passaglia, published through ASHRAE
- HDR Foundation sponsored E-Week local readings at elementary schools!



The screenshot shows the ASHRAE Bookstore website. At the top left is the ASHRAE logo, a blue hexagon with the word 'ASHRAE' in white. To its right is the text 'Bookstore' in blue, and below that, 'In Partnership with TECHSTREET'. A blue navigation bar contains the following links: 'Store Home', 'Standards / Guidelines', 'Books', 'ASHRAE Handbook', and 'Software / CDs / DVDs'. Below the navigation bar, the product page for 'Lucy's Engineering Adventure' is displayed. On the left is a small version of the book cover. To the right, the title 'LUCY'S ENGINEERING ADVENTURE' is in large blue letters. Below the title, it says 'BOOK by ASHRAE, 2021' and 'Danielle Passaglia'. At the bottom right of the product information, there is a link that says 'View all product details'.

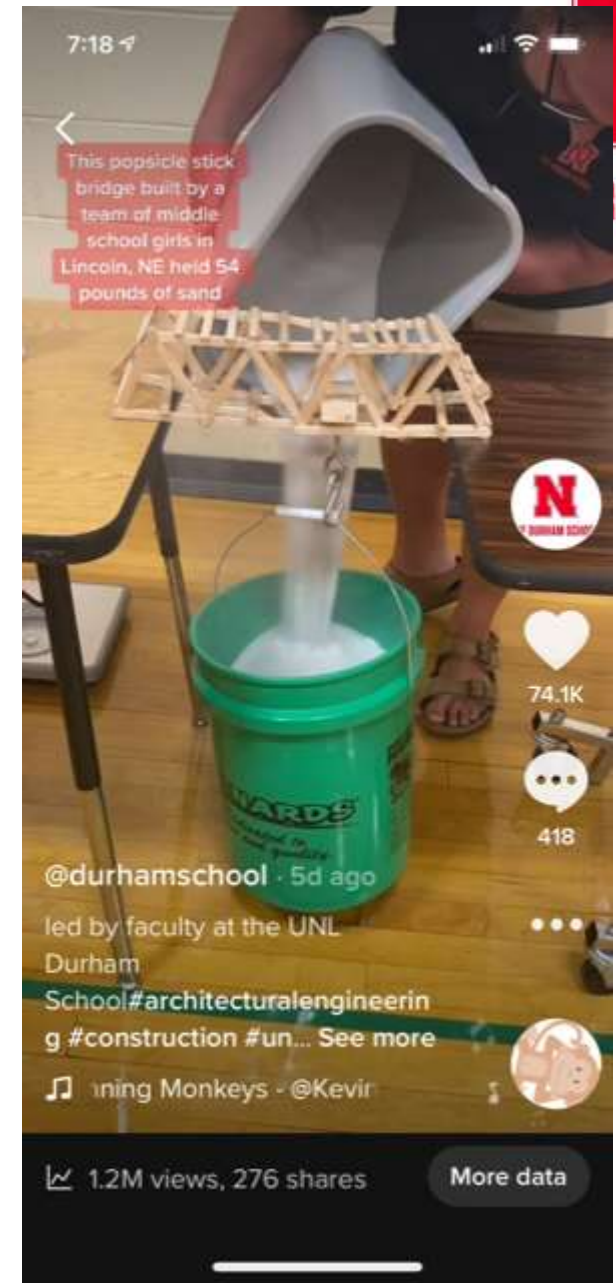


Growing Diversity and Inclusion in Pipeline



- **Build-A-Hut** event, sponsored by [Partnership 4 Kids!](#)
- Served 78 middle-school youth through 28 hours of STEM programming in summer 2022

Growing Diversity and Inclusion in Pipeline



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Growing Diversity and Inclusion in Pipeline



Ouch! Training – to interrupt implicit bias
(Complete Engineer Inclusive Excellence competency)

1. Assume good Intent and explain impact
2. Ask a question
3. Interrupt and redirect
4. Broaden to universal human behavior
5. Make it individual
6. Say **OUCH!**

'Ouch! That Stereotype Hurts'

<https://www.diversityinclusioncenter.com/ouch-series/ouch-stereotype-hurts/>



Trends in Engineering Education



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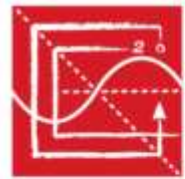
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NCEES

advancing licensure for
engineers and surveyors

home about engineering

University of Nebraska–Lincoln wins 2022 NCEES Engineering Education Award

Charles W. Durham School of Architectural Engineering and Construction receives \$25,000 grand prize for community enhancement

NCEES is pleased to announce that the University of Nebraska–Lincoln is the recipient of the 2022 NCEES Engineering Education Award. The university received the award for the Charles W. Durham School of Architectural Engineering and Construction. The award is given annually to select the \$25,000 grand prize winner.

For the school's project, *Tarrant County College Student Success Center*, a team of students and faculty completed a design for a student success center on the Tarrant County College campus. The team faced many design challenges, including providing resiliency to handle future climate change, planning utilities, and overall building performance enhancements. The jury praised the project for its



DSAEC Industry Engagement: Industry Fellows Program



Industry Fellows

Patrick Cuddigan

INDUSTRY FELLOW OF PROJECT
MANAGEMENT

pcuddigan2@unl.edu



Todd Feldman

INDUSTRY FELLOW OF STRUCTURAL
DESIGN
HDR, INC.

tfeldman3@unl.edu



Bruce Gerhardt

INDUSTRY FELLOW OF CONSTRUCTION
LAW
HDR, INC.

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Greg Hall

INDUSTRY FELLOW OF PROJECT
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KIEWIT

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John Hoodjer

INDUSTRY FELLOW OF CONSTRUCTION
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Ericka Nienhueser

INDUSTRY FELLOW OF ELECTRICAL
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FARRIS ENGINEERING

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Todd Shackelford

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HDR, INC.

tshackelford3@unl.edu



Pete Uhing

INDUSTRY FELLOW OF MECHANICAL
DESIGN
CLARK & ENERSEN

uhing2@unl.edu



DSAEC Industry Engagement: Career Fair (October annually)

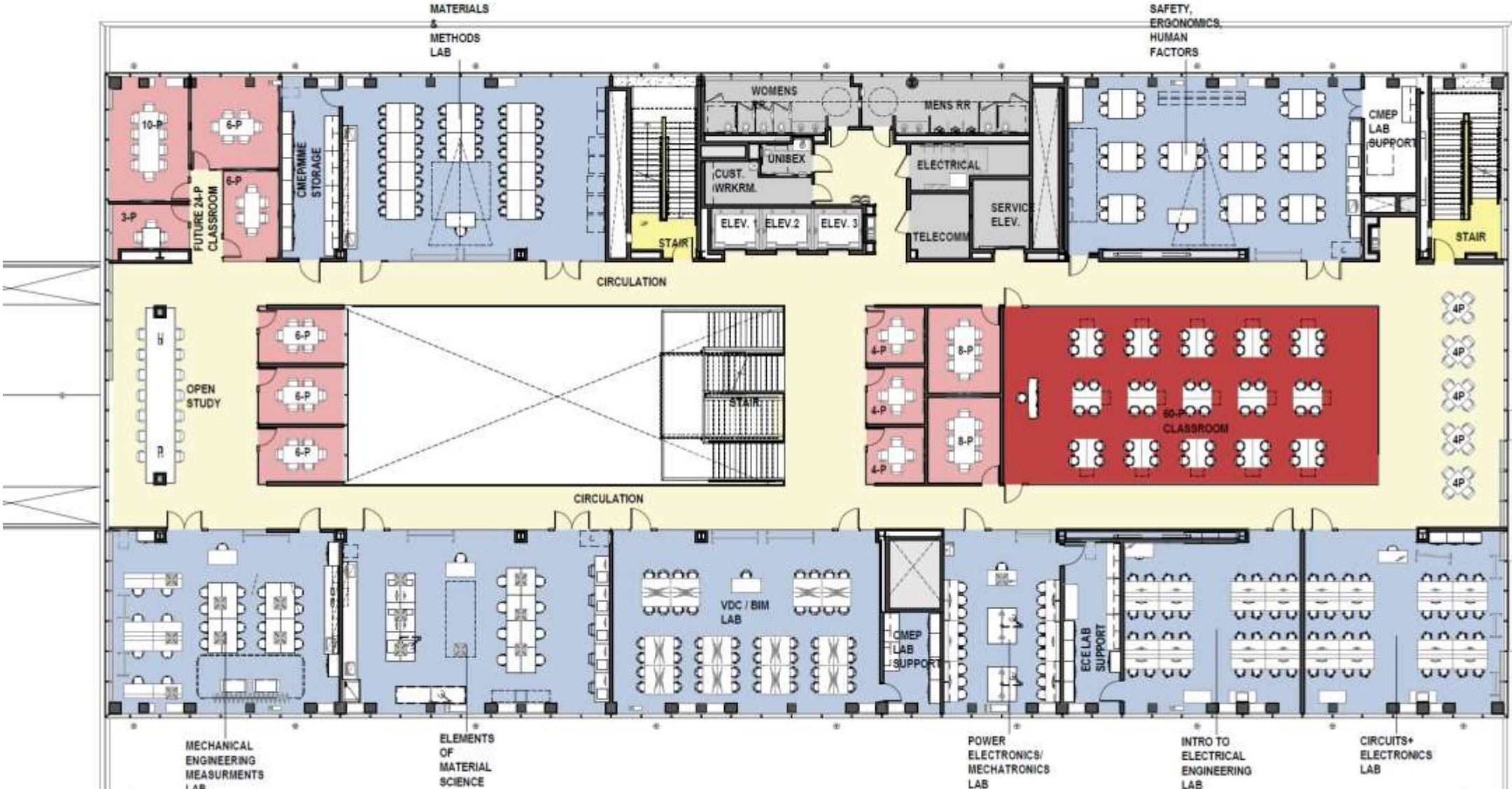


<https://durhamschool.link/career-fair>

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DSAEC Industry Engagement: Kiewit Hall Crucial Needs



ENGINEERING



DSAEC Industry Engagement

How can industry partner further with UNL COE + DSAEC?

- Experiential learning
- Growing inclusive excellence



Thank you for your attention!



Please partner further with us~

Follow us on social media:

@TheDurhamSchool



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