

Practices for Developing Inclusive Curriculum and Climate for the Civil Engineering Department

Department of Civil and Environmental Engineering



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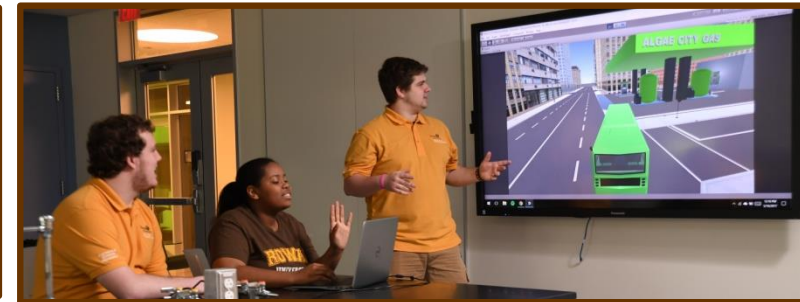
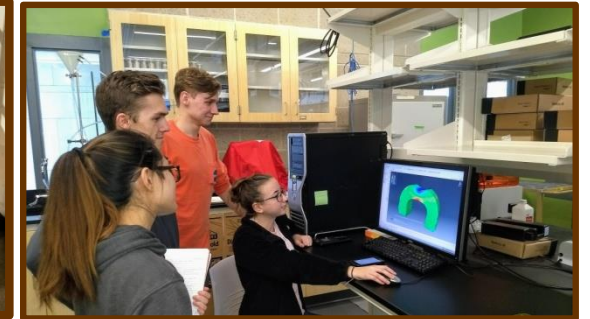
The CEE department at Rowan University emphasizes TLC: Teamwork, Leadership, & Community.

Our goal is to develop leaders with technical competence to build a sustainable world. We strive to prepare students who are poised to meet the challenges facing the world today and tomorrow.

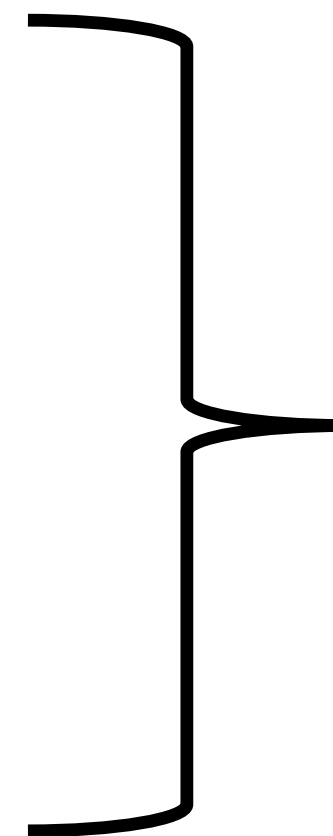
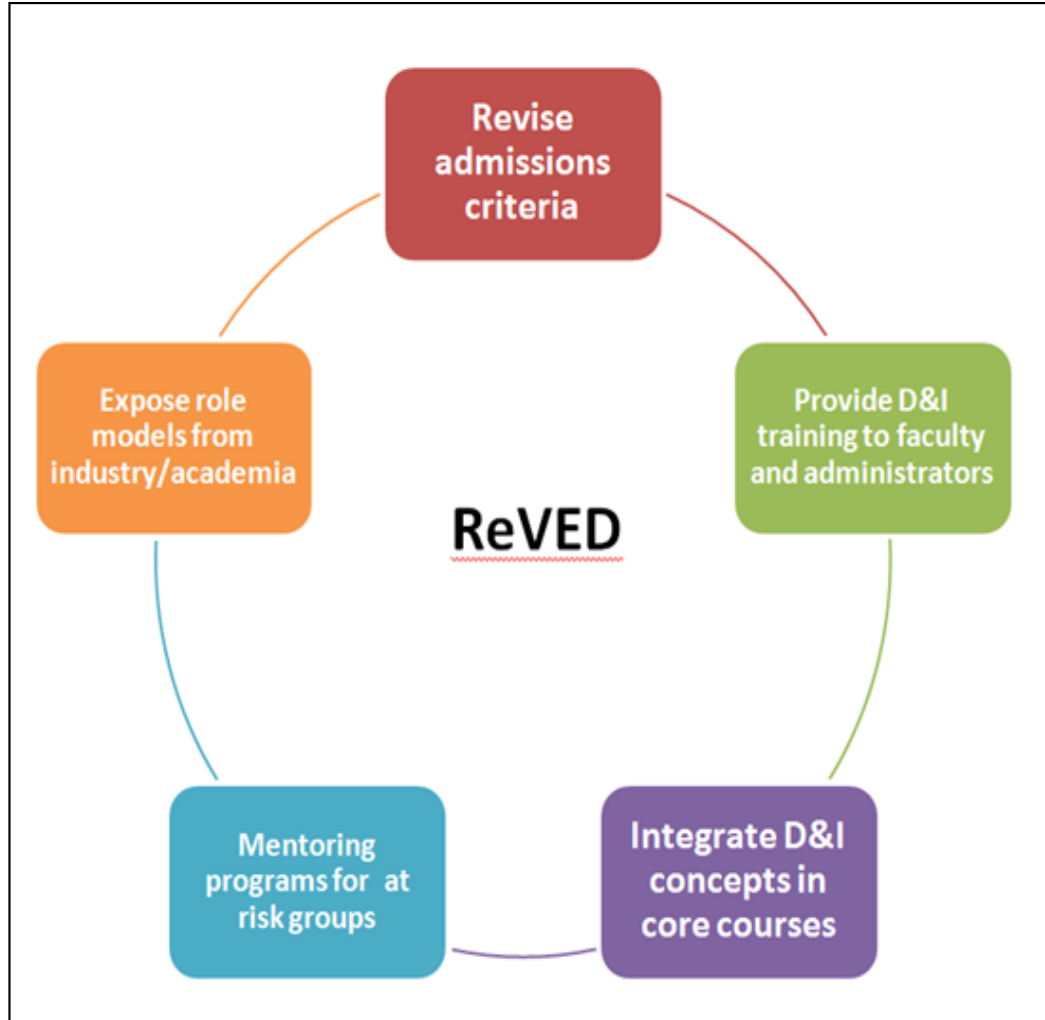
- Structural Engineering
- Transportation Engineering
- Geotechnical Engineering
- Mechanics and Materials
- Resiliency Planning for Communities
- Environmental Engineering
- Water Resources Engineering
- Sustainable Facilities
- **Innovative Curriculum**
- **STEM Outreach**

Total Research
Funding

Fall 2020
\$15 Million



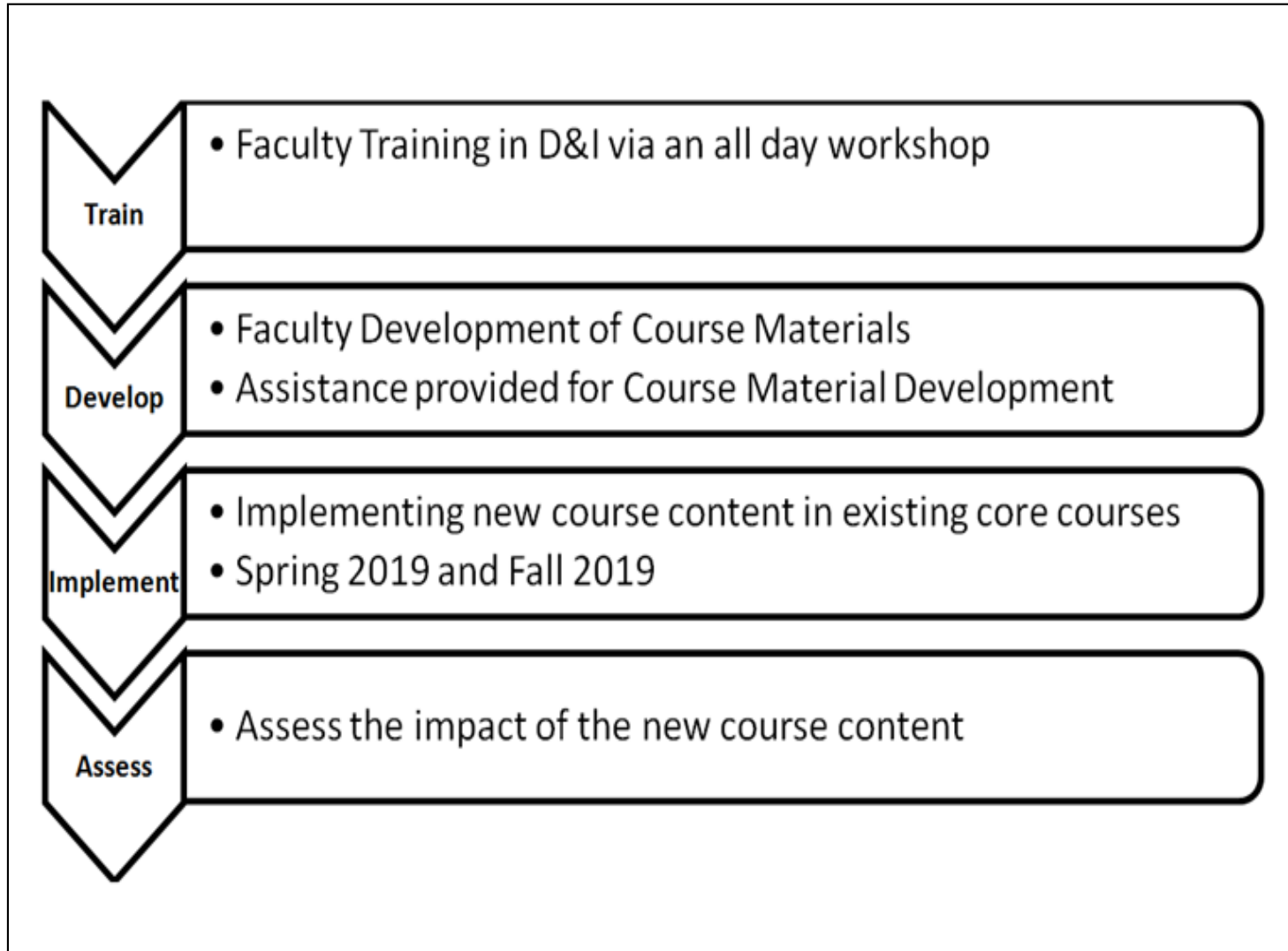
MULTI - PRONG APPROACH TO DEI (Diversity, Equity and Inclusivity)



Eliminates many students from many groups

FACULTY DEVELOPMENT

DEPARTMENT



UNIVERSITY

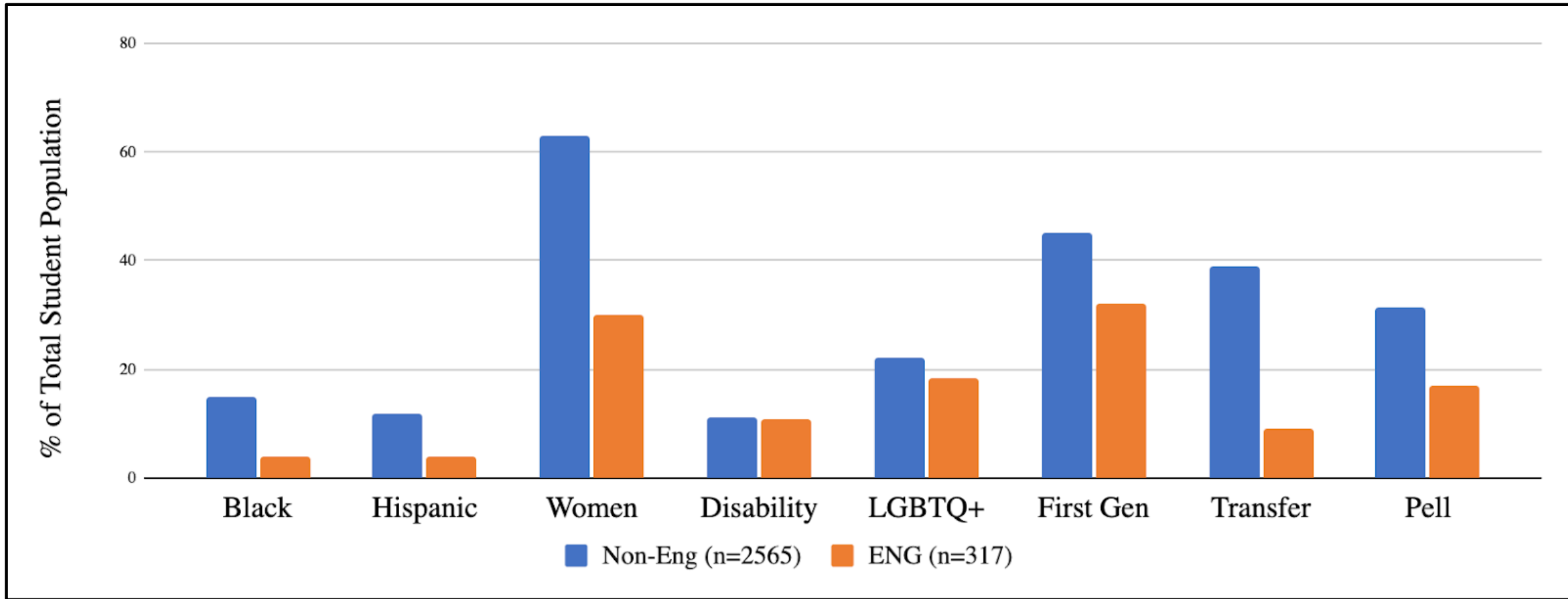
DEI OFFICE

**FACULTY
DEI
CERTIFICATE**

**FACULTY CENTER
INCLUSIVE PEDAGOGY
CERTIFICATE**

PIPER GRANTS

Rowan Student Baseline Demographics (SJICR Fall 2016)

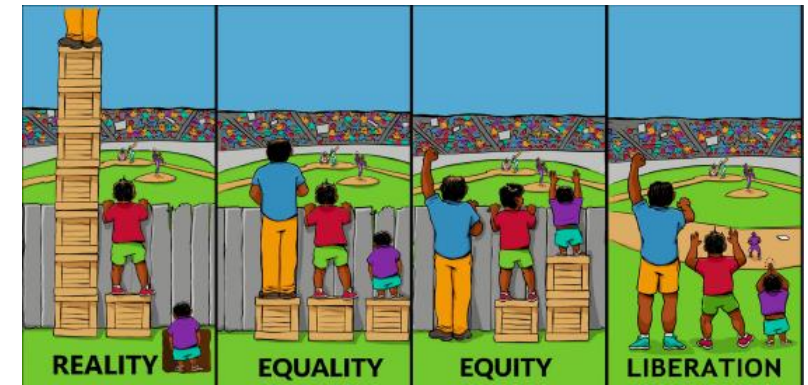


Different Experiences and Perceptions (Fall 2018)

	1 st Gen	Sexual minority	Women	Diff. Abled	Non-White
Participation in Engr-related activities	Less	More	--	Less	Less
Inclusive Classroom Experiences	--	Less	Less	Less	Less
Educational Experiences	Less	Less	--	Less	Less
Experiences with discrimination	More	More	More	More	More
Diversity Climate	--	Less	Less	Less	Less

CHANGE DEPARTMENT CLIMATE/CULTURE

- Faculty workshops on Diversity Equity Inclusivity (Checklist)
- Faculty required to get a DEI certificate and Inclusive Pedagogy certificate
- Provide faculty support to make their curricular changes-such as a paid student from department
- An agenda item at every department meeting and send of semester reflection
- Integrate DEI, ethics in all courses and try to distribute evenly across the semester
- Course evaluations-add questions on diversity
- Verbiage in tenure & promotion criteria
- Department webpages
- Value research that embraces teaching pedagogy, inclusivity, diversity
- Setup posters, brochures that embrace inclusivity and diversity
- Celebrate diversity & inclusivity by dedicating a time for celebration-global food dishes, posters
- Explain EQUITY via a visual
- Recruit students/faculty from diverse backgrounds



MORE: Mentoring Opportunities Reinforcing Excellence

First Year student paired with a Junior/Senior
ASCE Student Chapter

Students
Excluded from
ELC



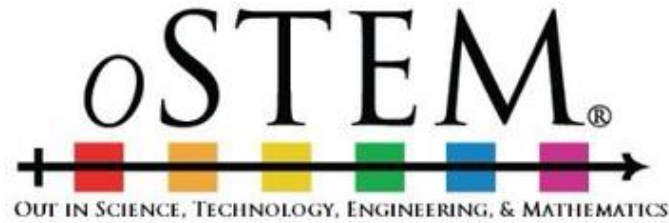
MEETS:



Monthly Meetings
Social Networking
Academic Progress
Registration
Jobs/Resume Writing

Mentor
Energize
Engage
Transfer
Students





BRIDGE - Building
a Resilient Inclusive,
& Diverse Graduate Environment



CURRICULAR CHANGES

1990-2010

- How do students learn?-
Visual, Sequential, Confluent
- Demonstrations/Hands-on
- Integrate
sustainable/green/DFE
engineering
- Global and societal context
- Ethics
- **Inclusivity & Diversity &Equity**
- **Biases- gender/racial/sexual
orientation**

- Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such **as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability**
- **(f) an understanding of professional and ethical responsibility**
- **(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context**
- **(i) a recognition of the need for, and an ability to engage in life-long learning**
- **(j) a knowledge of contemporary issues**

Employers recognize the value of inclusivity and diversity. All companies nowadays have policy and address ID.

Employers seek students from diverse backgrounds.

Employers see employees who value and understand need for ID.

INCLUSIVE STRATEGIES FOR COURSES

STRATEGY	
Syllabus Rewording	Required
Reword technical problem wording	Required
PowerPoint Presentations on case studies	Required
Assign a team project (report, presentation, video, brochure)	Required
Assign team names based on people of influence or the team adopts a country	Encouraged
Assign teams to watch a movie that focuses on diversity, social injustices, ethic violations, gender biases	Encouraged
Add questions on quizzes/exams	Encouraged
Test students in different ways (Take home, Team assignment, Open book)	Encouraged
Field Trip	Encouraged
Extra credit- Diversity and Equity issues	Encouraged
Extra Credit- Appreciation for the arts from various cultures	Encouraged

SIMPLE STEPS

Demonstrate that diversity and inclusivity is important to you by casually blending these topics in your day to day lectures instead of dedicating one lecture in the semester to the topics

- Syllabus
- Assign a team project
- Team names based on people of influence or the team adopts a country
- Assign movies that are relevant (not only technical aspects), gender/race issues
- Reword your questions
- Add questions on quizzes/exams
- Test students in different ways
- Extra credit- Diversity issues
- Reward – Diversity Awards



Vandana Shiva



Wangari Muta



Scott Pruitt

First Year Engineering Clinic Unit Conversion

3. Spirulina (a blue-green algae) is a remarkable source of nutrients, containing the highest natural source of complete proteins, omega fatty acids, iron, and antioxidants. The health applications of a superfood like spirulina can translate across countless circumstances, from saving lives in the Central African Republic to providing everyday nutrients to anyone around the world. The St. Joseph Health Centre in Bangui, a Central African Republic, grow their own algae as a supplement for malnourished children who have suffered the ravages of war since 2013.

The following information is available:

The protein content of Spirulina is 6 grams of protein/gram of Spirulina.

Daily Protein Needs: 1.5 g protein for every 2lbs of body weight for children aged 2-8 years.

Average weight of impoverished 2-8 year olds in Bangui ~ 17 lbs

of malnourished children in Bangui/year ~ 10,000

- a) How many tons of Spirulina will be needed annually to provide adequate protein to the children of Bangui?
- b) The protein content of peanut butter is 0.25 gram/ gram of peanut butter. A food manufacturing wants to enrich the protein content of its existing peanut butter bar weighing 50 g.
 1. What is the current protein content of the bar in grams?
 2. If 5 grams of spirulina to the existing bar, what will be the new protein content in grams per bar?



SYLLABUS



Make your syllabus fun and interactive.

STATEMENT ON DIVERSITY & INCLUSION

I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. If you feel that your contribution is not being valued for any reason, please speak with me privately. If you wish to communicate anonymously you may do so in writing or speak with the Office of Social Justice, Inclusion, Conflict Resolution (socialjustice@rowan.edu, 856-256-5496, Room 118, Robinson Hall).

LIVED NAME POLICY

The name by which a person wishes to be known and to have appear in University systems and when conducting day-to-day University business because it affirms that individual's gender, culture and other aspects of social identity. The preferred name will consist of a preferred first name, and preferred middle name when provided. The preferred name does not affect the individual's last name, which must remain the person's legal name.

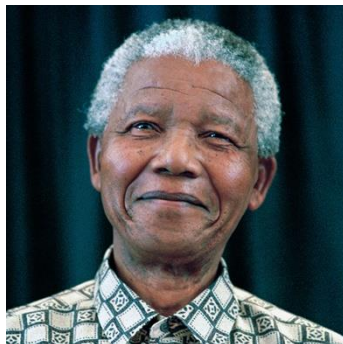
ACCOMODATION

Your academic success is important. If you have a documented disability that may have an impact upon your work in this class, please contact me. Students must provide documentation of their disability to the Academic Success Center to receive official University services and accommodations. The Academic Success Center can be reached at 856-256-4234. The Center is located on the 3rd floor of Savitz Hall. The staff is available to answer questions regarding accommodations or assist you in your pursuit of accommodations. We look forward to working with you to meet your learning goals.

Your job is not done if you just add language to the syllabus. Your contributions in the classroom need to influence students so they understand that these issues are important in engineering and also important to you. Actions speak louder than words!

TEAM NAMES

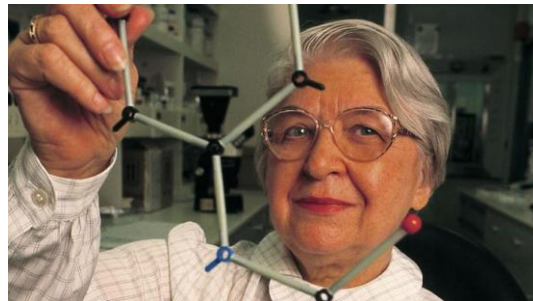
- Assign teams a name of a person of influence or the team adopts a country. Use examples that are global and a learning opportunity for the students. ***Not every person assigned has to be a scientist or engineer. Have the team use the name throughout the semester.*** Present for 2 minutes about the assigned person every other week.
- ***Example- Henrietta Lacks, Ruth Bader Ginsburg, Nelson Mandela, Queen Victoria (major scientific contributions made during her reign), Vandana Shiva, Arundhati Roy, F. R. Khan etc***



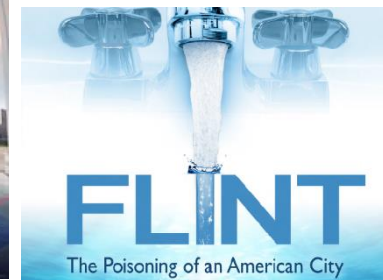
MOVIES AND DOCUMENTARIES

Assign teams to watch a movie/documentary-not all need to be on a technical contribution.

- **Legally Blonde- Good message- you can be blonde, beautiful and like pink and be smart!**
- **Whale Rider – Society wants women to prove themselves before they can be picked as a leader**
- **Rosalind Franklin: The Dark Lady of DNA- struggled with lack of confidence-a very human trait in our students**
- **Stephanie Kwolek – Confident about her knowledge**
- **Bhopal Express – How India forced Union Carbide to change laws in the USA for People Right to Know !**
- **Erin Brockovich – Her curiosity and compassion led to justice and the target class action law suit. Still an activist to this day**
- **A Civil Action – John Travolta; movie based on real case**
- **The Imitation Game- Life of Alan Turing**



Stephanie Kwolek



CHANGE LECTURE SLIDES

If you use lecture slides in your classes, add something that focuses on diversity and inclusivity

- Someone's major contribution that is not acknowledged much in literature
- An example from another part of the world or a contribution made by some civilization

Disinfection
Harriet Chick
Chick's Law



Activated Carbon Structure
Rosalind Franklin



Traffic Signal
Garrett Morgan



Brooklyn Bridge
Emily Roebling



REWORD QUESTIONS

- **Design a batch reactor with ...** > *A developing community needs to have access to safe drinking water. A batch reactor will serve their needs.*
- **A steel beam needs to be designed.....** > *The city of XX lost their “yy” structure due to Hurricane Sandy.*
- **Determine the sheer force ...** > *Bamboo was used for xx member. This was to address sustainable green engineering. Determine the sheer force*
- **Calculate the alum dose** > *Alum is an universal coagulant and is used extensively in poor and developing communities. Calculate the alum dose*

REWARD STUDENTS AND FACULTY

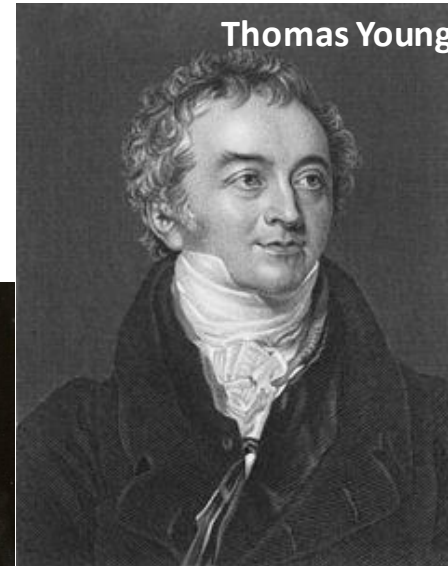


Introduce awards to recognize initiatives taken by faculty and students

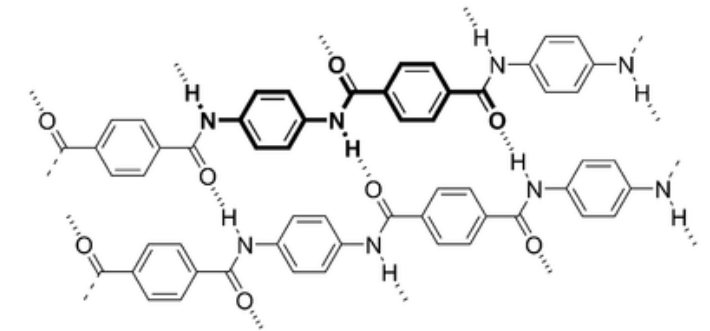
- **Outstanding mentor award**- A CEE student who is active in mentoring others to be successful in STEM
- CEE Humanitarian award** – A CEE student involved in outstanding humanitarian work
- Diversity Champion Award** – A CEE student/faculty who champions diversity
- Outstanding service to the CEE department award** – A CEE student (s) who demonstrate (s) outstanding service to the CEE department
- Outstanding service to the community award** - A CEE student who provides outstanding service to a community (local, national or international)
- **Outstanding CEE Alumni Award** – A CEE alumni who has made outstanding contributions to the profession and to the community

STRENGTH OF MATERIALS

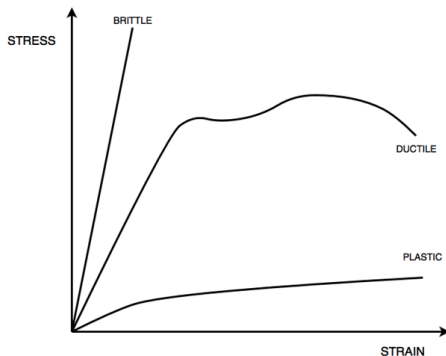
- Compression and Tension
- Stress & Strain
- Hooke's Law
- Young's Modulus
- **ADD KWOLEK to your lecture. Her persistence and confidence. Show video clip.**



STEPHANIE KWOLEK

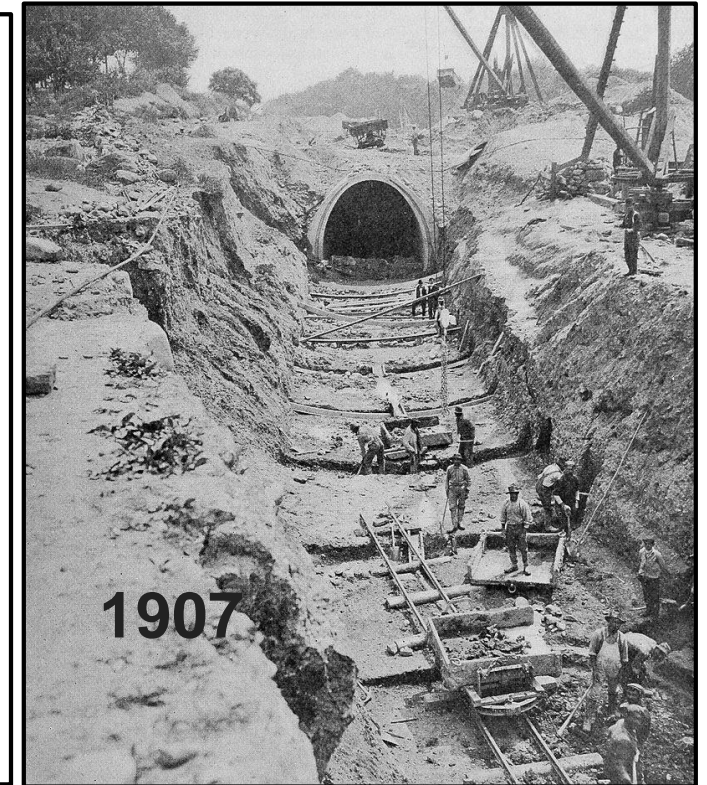
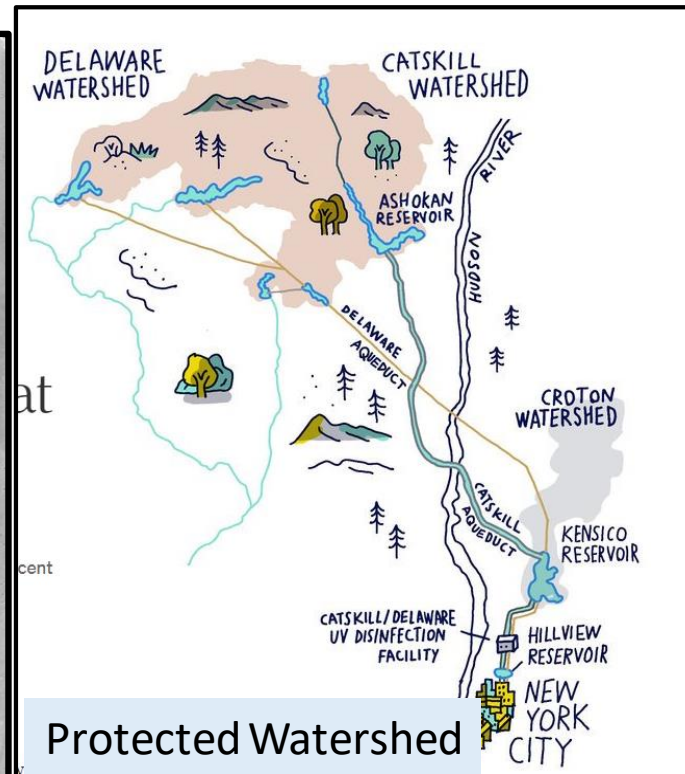


Kevlar has many applications, ranging from bicycle [tires](#) and [racing sails](#) to [body armor](#), because of its high [tensile strength-to-weight ratio](#); by this measure it is 5 times stronger than steel



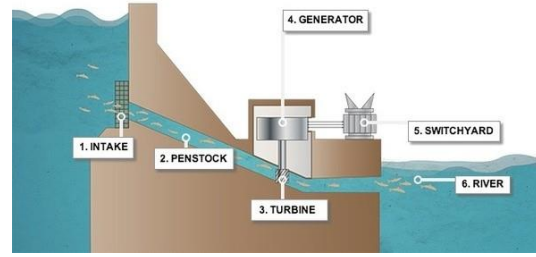
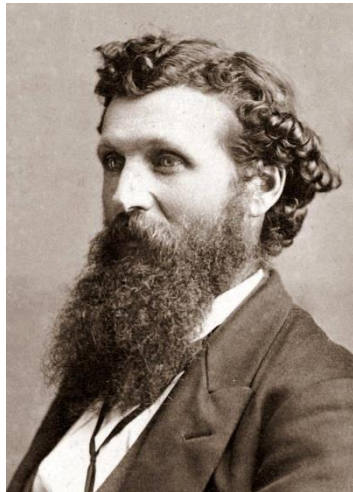
FLOW THROUGH PIPES

- Drinking water for New York City
- Pristine water quality
- Engineering marvel
- **Water distribution impacts gender in poor communities**



HYDRAULICS (DAMS)

- ELWHA DAM
- HETCH HETCHY



- Ethics
- Social Injustices
- Racial Injustices
- Ecosystem
- Fighting for a Cause
 - John Muir



**Klallam Tribe
Chinook Salmon**



HOW DO THE FOUNTAINS WORK IN THE TAJ MAHAL?

For the fountains in the north-south canal and the lotus pond and its canal, copper pipes were used. To ensure uniform and undiminished water pressure in the fountains, a copper pot was provided under each fountain pipe. The water supply came first into the pot only and from there, rose simultaneously in the fountains, which means that the fountains were controlled by the pressure in the pots rather than pressure in the pipes. The main supply of the water in these pots came through earthenware pipes, some of which were replaced with cast iron back in 1903.



Water for the Alhambra Palace Granada, Spain The Nasrid Scholars

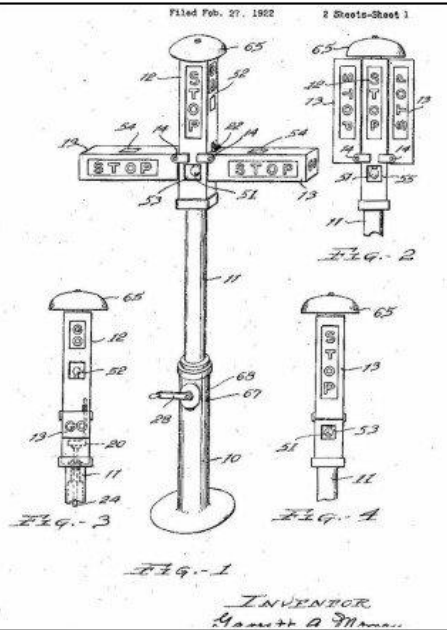
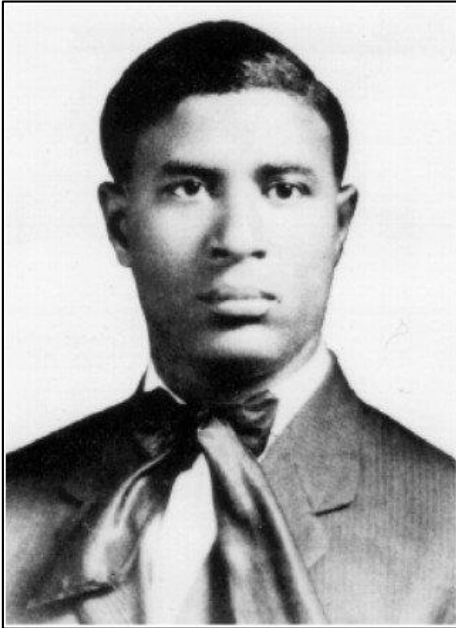
“A supply was established by building a dam and aqueduct from the River Darro over six kilometers away. This channel, the Acequia Real, was the first to bring water to the palace and the beginning of a complex water network for the growing palace-city. Subsequent improvements included reverse qanāts, an ingenious irrigation system that takes river, run-off and subterranean water and channels it underground towards the hill, where it pools in a cistern beneath the complex. Recent discoveries suggest that [complex hydraulic devices](https://omrania.com/inspiration/water-management-why-the-alhambra-palace-was-ahead-of-its-time/) were then used to draw water up to the palace.”

<https://omrania.com/inspiration/water-management-why-the-alhambra-palace-was-ahead-of-its-time/>



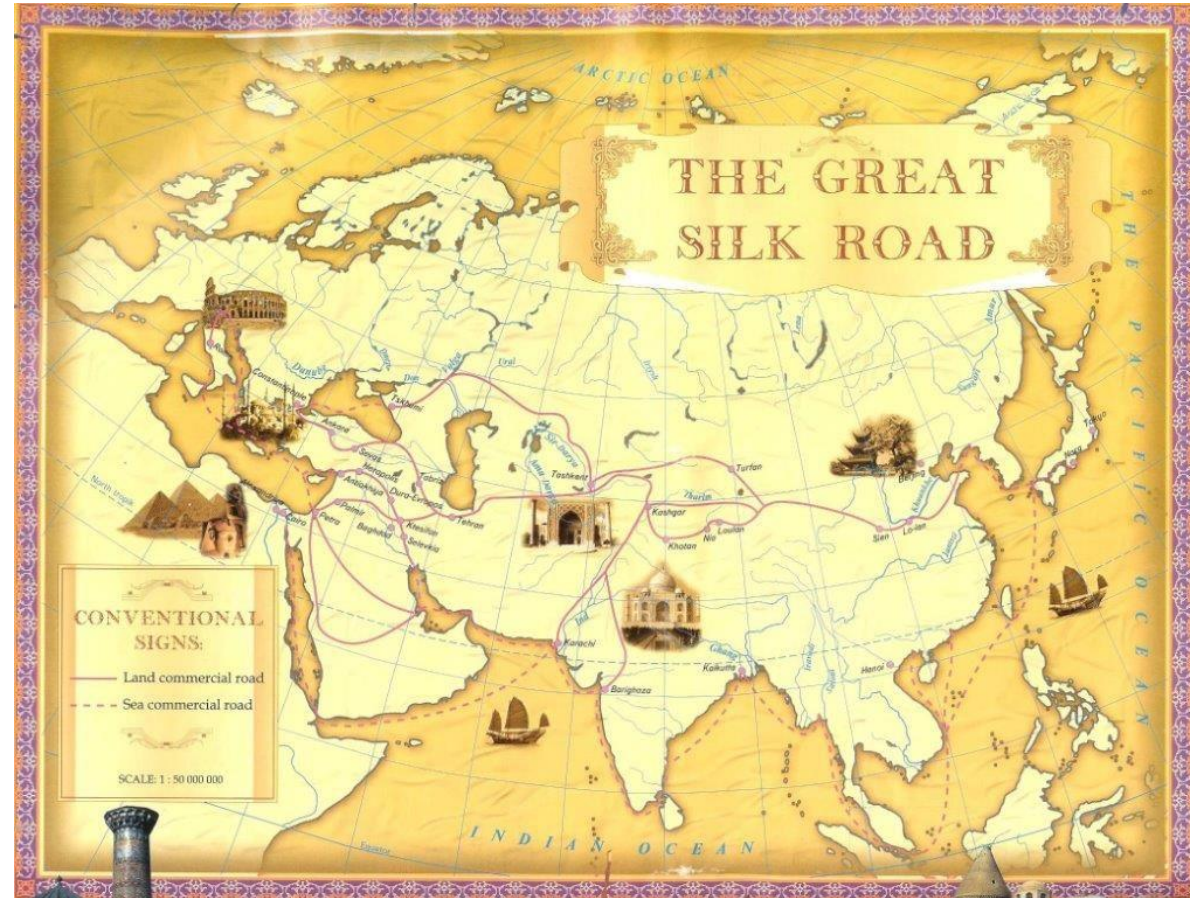
TRANSPORTATION ENGINEERING

The GREAT SILK ROAD



Garrett Morgan Traffic Signal System

CEE Materials: This project asks students to explain at least three differences in the AASHTO standards of USA and any selected country from Asia, Central America, South America or Africa.



Video presentations; Team projects;

TRANSPORTATION EQUITY

WHEN THE INFRASTRUCTURE IS ONLY COMFORTABLE FOR A SMALL GROUP OF PEOPLE...

THIS ISN'T SO BAD.

NOPE.
NOT A CHANCE!

ONLY A FEW WILL USE IT.

WITH INFRASTRUCTURE THAT IS COMFORTABLE AND SAFE FOR MOST PEOPLE...

HMM,
THIS ISN'T SO BAD,
EITHER

AHH, MUCH BETTER...

FEWER PEOPLE ARE EXCLUDED FROM USING IT.

TRANSPORTATION EQUITY

- Transportation planning and policy can affect both racial and social equity.
- Build healthy, equitable communities through **transportation** funding, policy, and projects.

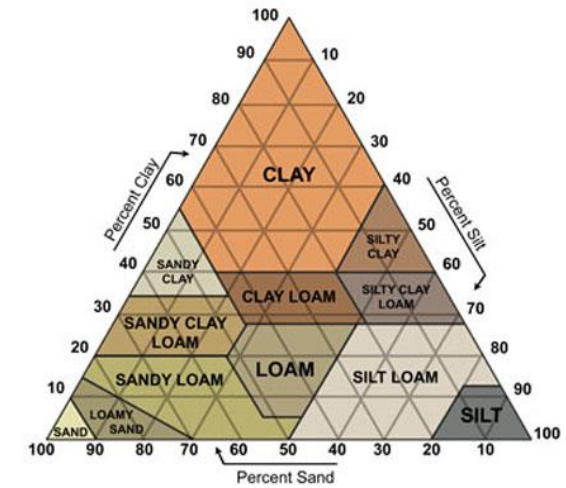
Transportation Planning Equity Impacts:

- The quality of transportation available affects people's economic and social opportunities.
- Transport facilities, activities and services impose various indirect and external costs, such as congestion delay and accident risk imposed on other road users, infrastructure costs not funded through user fees, pollution, and undesirable land use impacts.
- Transport expenditures represent a major share of household, business and government expenditures.
- Transport facilities require significant public resources (tax funding and road rights of way), the allocation of which can favor some people over others.
- Transport planning decisions can affect development location and type, and therefore housing accessibility, land values and local economic activity.
- Transport planning decisions can affect employment and economic development which have distributional impacts.

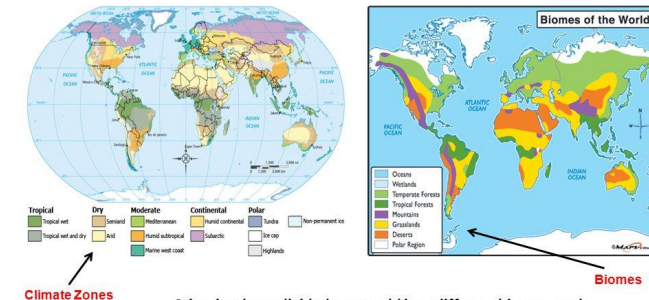


GEOTECHNICAL ENGINEERING

- Mexico city clays amplify earthquake vibrations causing tremendous damage as seen during the recent September 19, 2017 earthquake. To complete this assignment, please research the type of soil deposits found in Mexico City
- From a humanitarian standpoint, what was the human loss of life during the recent earthquake? What is the estimated damage? Please provide references.
- What do research articles state about why the damage you see in Mexico City is more than you see in other parts of the world for a similar magnitude earthquake?
- What characteristics of these deposits cause the amplification of earthquake vibrations?
- Do the current building codes in Mexico City take into account these site conditions? If not, how can they?
- What are some of the construction strategies that future civil engineers can employ so that damage can be minimized and human life preserved?



Climate Zones, Vegetation Regions, Biomes, and Ecosystems



Scientists have divided our world into different biomes, such as, grasslands, deserts, rainforests, deciduous forests, and marine environments. A biome is a large geographical region with plants and animals that are able to live in that location with its particular climate because they have adapted in different ways to the amounts of water, heat, and soil in that area.



FOOD & HUNGER

The Key to Ending World Hunger? Healthy Soil, UN Says

It's a dirty job, but somebody has to do it.

GEOTECHNICAL ENGINEERING

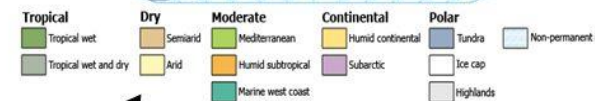
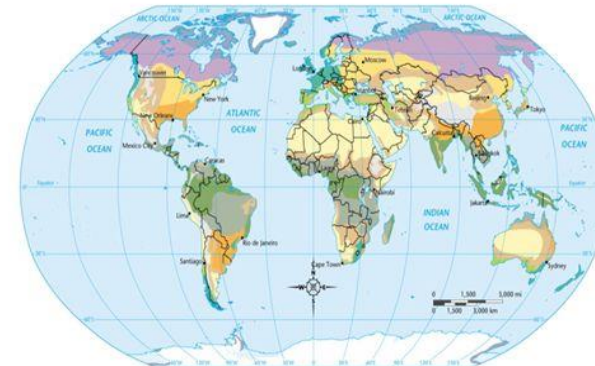
You can emphasize that soils are not only required for building foundations but they are intimately related to world hunger.

Soils are also a major player in the growth of civilizations and the arts through pottery.

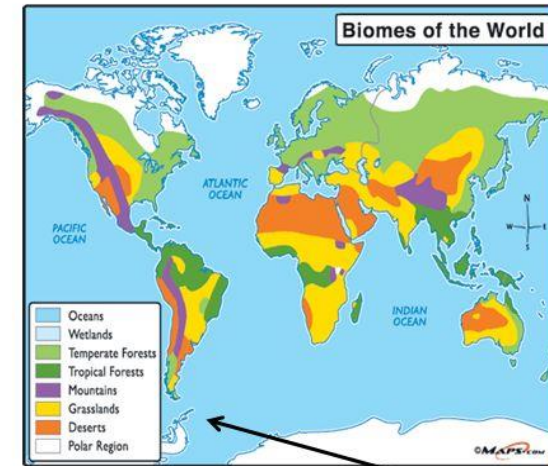
Mud Hut Design and Strength



Climate Zones, Vegetation Regions, Biomes, and Ecosystems



Climate Zones



Biomes

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Terzaghi, the father of geotechnical engineering struggled with a dark side.

Professional Jealousy

Karl Terzaghi



The Engineer as Artist

Richard E. Goodman
Foreword by Ralph Peck

ASCE PRESS



HISTORY

- Pinch pots are some of the oldest ceramic artifacts found around the world.
- Before the invention of the Potter's Wheel and Kiln, pottery was strictly hand built and mostly valued for function.

ELECTRICAL ENGINEERING



Hertha Ayrton

First female member of the IEEE, and her work on the electric arc and the Ayrton Flapper Fan used to clear the trenches of poisonous gas.




Hedy Lamar

developed a radio guidance system for [Alliedtorpedoes](#) that used spread spectrum and frequency hopping technology to defeat the threat of jamming. The principles of this work are incorporated into Bluetooth technology and are similar to methods used in legacy versions of CDMA and Wi-Fi.

ADA LOVELACE


FIRST COMPUTER PROGRAMMER

 **The Analytical Engine**

Lovelace's program turned a complex formula into simple calculations that could be encoded on punched cards and fed into Charles Babbage's Analytical Engine, a mechanical computer that he designed but never built. She published it in 1843, a century before the modern computer age.

"I want to put in something about Bernoulli's Number, in one of my Notes, as an example of how an explicit function may be worked out by the engine, without having been worked out by human head and hands first."


$$\frac{x}{e^x - 1} = \frac{1}{1 + \frac{x}{2} + \frac{x^2}{2 \cdot 3} + \frac{x^3}{2 \cdot 3 \cdot 4} + \&c.}$$


 **A Universal Computer**

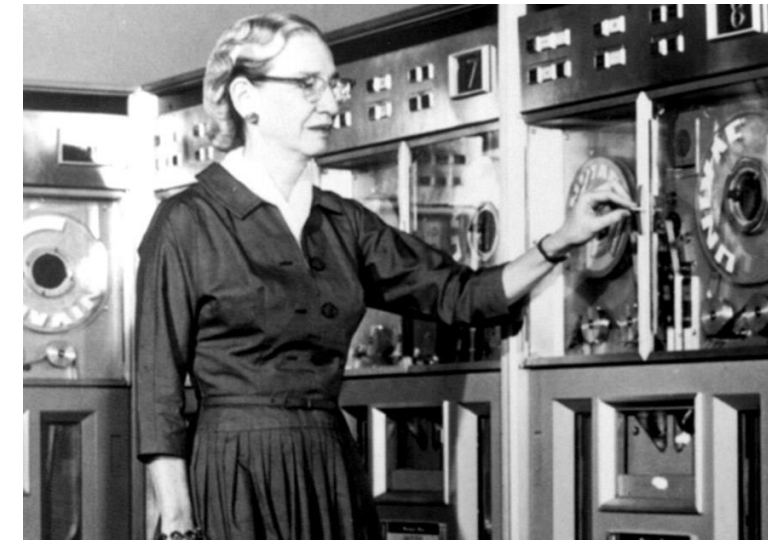
Lovelace did more than write the first computer program. She was also the first person to realise that a general purpose computer could do anything, given the right data and instructions.

"The Analytical Engine weaves algebraic patterns just as the Jacquard loom weaves flowers and leaves."

"Supposing, for instance, that the fundamental relations of pitched sounds in the science of harmony and of musical composition were susceptible of such expression and adaptations, the engine might compose elaborate and scientific pieces of music of any degree of complexity or extent."

 **Augusta Ada King, Countess of Lovelace**
Born: 10 December 1815
Died: 27 November 1852


Ada Lovelace Day
FindingAda.com



Grace Hopper

Hopper was a pioneer in computer science, who helped to invent the compiler and COBOL (and even the word 'bug') at a time when few women had access to the male-dominated world of math and physics.

YALE-GRACE HOPPER COLLEGE

COMPUTER PROGRAMMING

Advertisements depicting women not knowing how to use technology became ubiquitous, stereotypes of the male nerd or hacker emerged, gaming aimed at men also started gaining prominence, and these were reinforced by the growth of popular computing companies run by 'male geniuses'

“ My methods [of algebra] are really methods of working and thinking; this is why they have crept in everywhere anonymously. ”



Emmy Noether



Alan Turing

FATHER OF MODERN COMPUTING
CASUALTY OF BIGOTRY & IGNORANCE

In addition to basically saving the world during World War II by helping crack the 'impenetrable' Enigma code used by the Nazis, Alan Turing's elaborate thought experiments became the precursor on which modern computers were built.

Despite his invaluable contributions to science, Turing was also a homosexual male, which was still a crime in the UK in the 1950's. Given the choice between chemical castration and imprisonment, he chose the former.

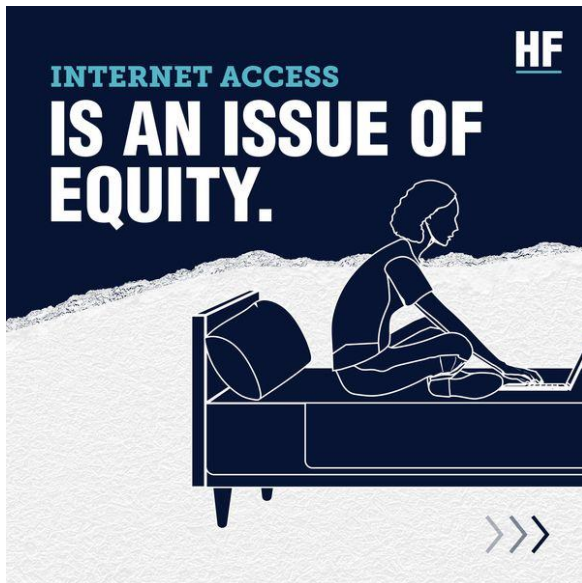
He killed himself 2 years later.

It is harder to crack a prejudice than an atom.

A portrait of Alan Turing, a young man with short hair, wearing a brown jacket and a patterned tie.

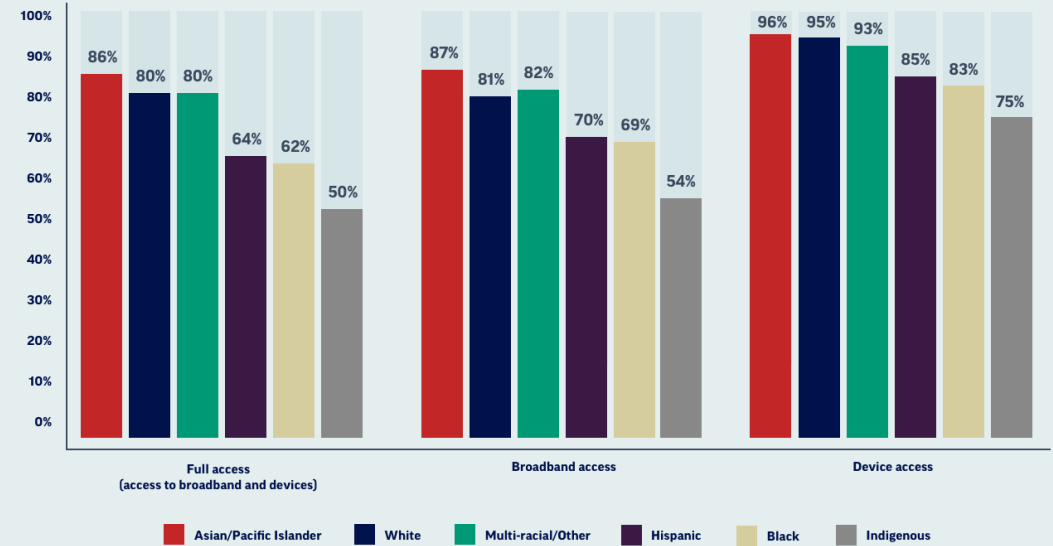
“ ...Fearing the ridicule attached to a female scientist, I have previously taken the name of M. LeBlanc in communicating to you those notes that, no doubt, do not deserve the indulgence with which you have responded. ”
Sophie Germain





DIGITAL EQUITY

Students of color do not have the same access to devices or to broadband



EVOLVING SCALE OF DIGITAL EQUITY

In many ways, the connectivity and access to the internet has transformed education at all levels. The ability for students to access learning materials online as well as for instructors to share lessons and collaborate has revolutionized teaching and learning. Where education used to be concentrated in school buildings, it can now be accessed by millions of people (almost) anywhere.

Stage 1: Wired Only

- Classroom or lab-centric
- Slow downloads with mass users
- Typically inhibited media access to small files/PDFs
- Limited based on # of users
- Some network crashes
- "Big pipe" focus (T-1 lines, etc.)
- Wired or dial-up

Stage 2: Wireless Access Points

- All Access / "First-In" faster
- Teacher-centric classrooms only
- Limits on surfing and streaming (Filter blocks on YouTube/videos)
- Interactive E-Books
- Links with flat content
- Simple downloads
- Google Docs/Office 365
- Wi-Fi at 2.4 GHz on 802.11b/g
- Unreliable/lots of network crashes

Stage 3: Institution-wide Wireless/Remote

- Teacher-centric & common areas
- Some streaming
- More Courseware & denser files
- Supplemental learning objects used
- Remote access
- Videos/everyone streaming
- Multi-devices
- Digital Collections, Skype, any gaming learning
- Wi-Fi 2.4 GHz on 802.11b/g/n
- More access points

Stage 4: Social/Community Wide

- Access supports beyond institution to social community. Greater density comes into play
- Parental and industry access
- Infrequent multi-modal and remote users
- Uninterrupted video streaming and conferencing
- Remote collaborators in other schools and regions
- Wi-Fi at 5 GHz on 802.11n/ac Wave 1

Stage 5: High Density Net Ecosystem

- Web 3.0: Internet of Things. Access supports virtual teaching—special subjects and many devices/objects
- Always-on high frequency multi-modal video streaming
- Dense courseware and animation graphics creation
- "Binge-On" Invisible Net Ecosystem
- Extra-Limital Learning
- Sophisticated internal and visitor access
- Ultra connectivity—multi-device/objects
- Wi-Fi at 5 GHz on 802.11ac Wave 2

80% Of schools cite they can deliver common area access. This is where most schools stand today

5 Billion Households with school-aged children do not have access to the internet

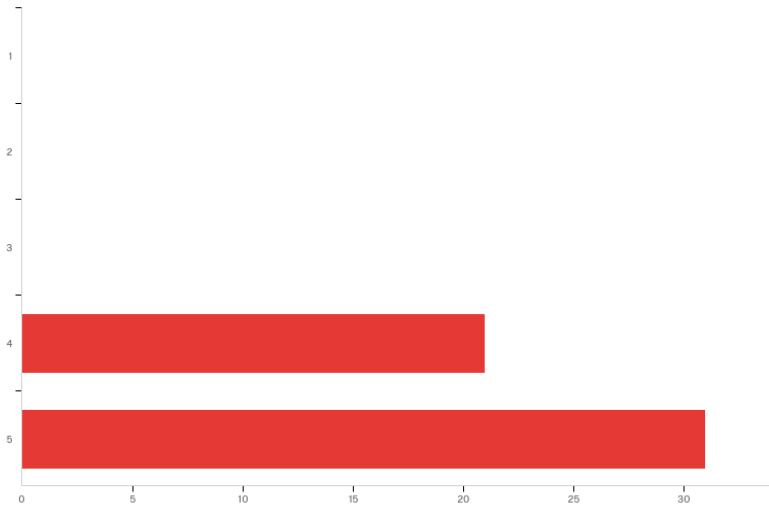
80% Of schools cite institution-wide network but it is inadequate for burgeoning use of digital curriculum

75% Of school systems surveyed do not have any off-campus strategies for providing connectivity to students at home and after school

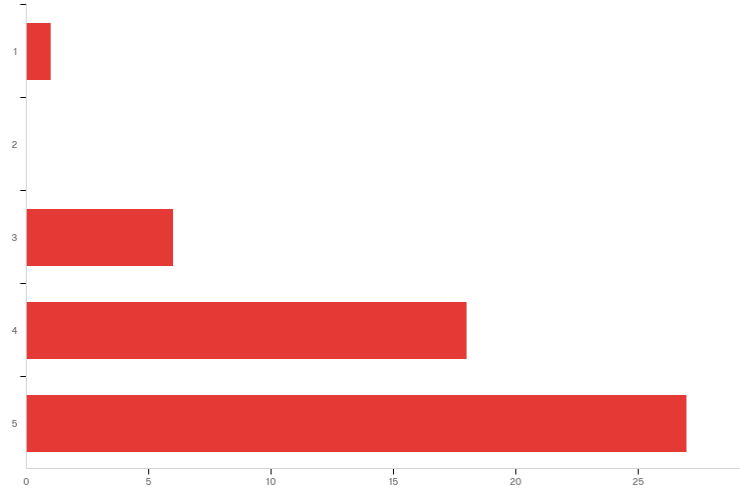
"Unreliable" Opinion of most instructors surveyed about their Networks

SENIOR EXIT SURVEY

Q3 - Were you treated fairly and with respect by the engineering faculty at Rowan? 1=Poor 5= Excellent



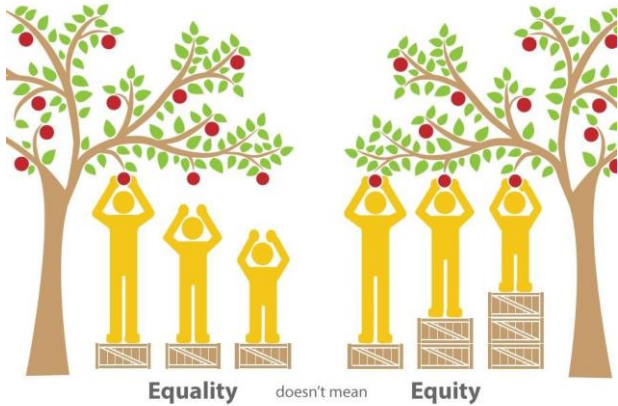
Q6 - Were you treated fairly and with respect by the non-engineering students at Rowan? 1=Poor 5 Excellent



Q7 - How was the climate of diversity in the department/college/university (in classrooms, outside of classrooms) ?

- There was a shocking lack of people of color.
- As a gay Male, I felt the climate for diversity was great and inclusive.
- Stop pushing so hard for student and faculty diversity. I'd rather see a push for more class sections, better resources, etc.

CEE RevED CURRICULUM SURVEY



CEE RevED CURRICULUM SURVEY

Question 1: Do you think the course adequately covered the following topics?

(1=Not Covered

5=Adequately Covered)

- a) Global Issues
- b) Societal Issues
- c) Ethical Issues
- d) Problem Solving Techniques
- e) Engineering Design
- f) Diversity & Inclusivity

Question 2: The course

(1= Strongly Agree

5= Strongly Disagree)

- A) Included socially relevant examples of engineering work
- B) Increased my interdisciplinary knowledge
- C) Exposed me to the arts, social sciences and humanities as relevant

Question 3: The course

(1= Strongly Agree

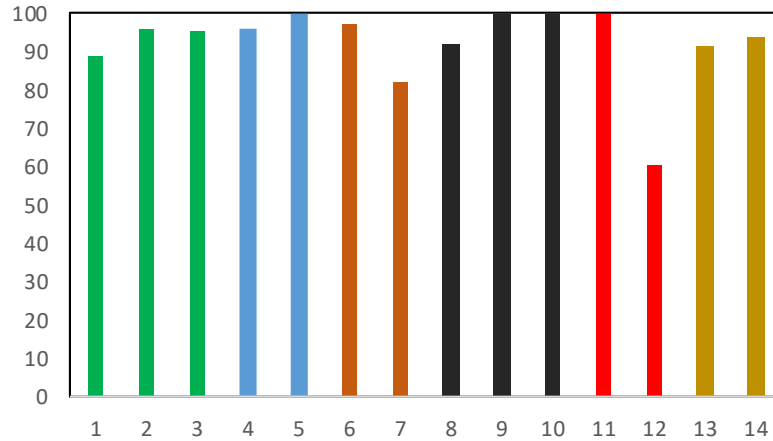
5= Strongly Disagree)

- a) Used various types of graded work
- b) Used open-ended problems
- c) Provided opportunities for collaborative work

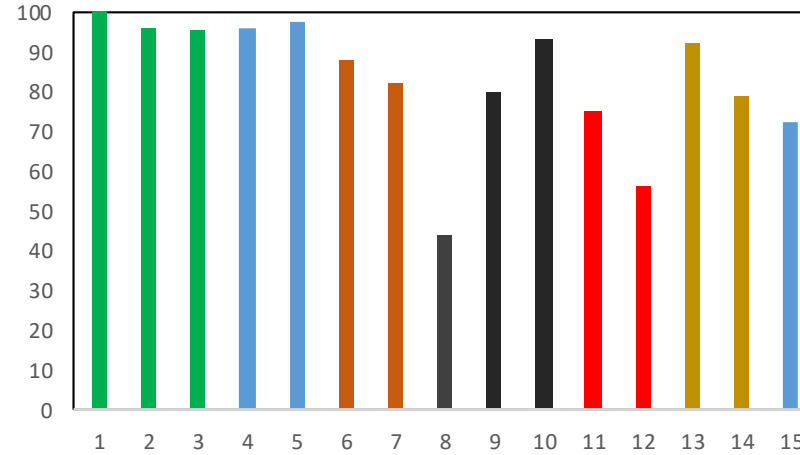
COURSE EVALUATIONS

14 Courses

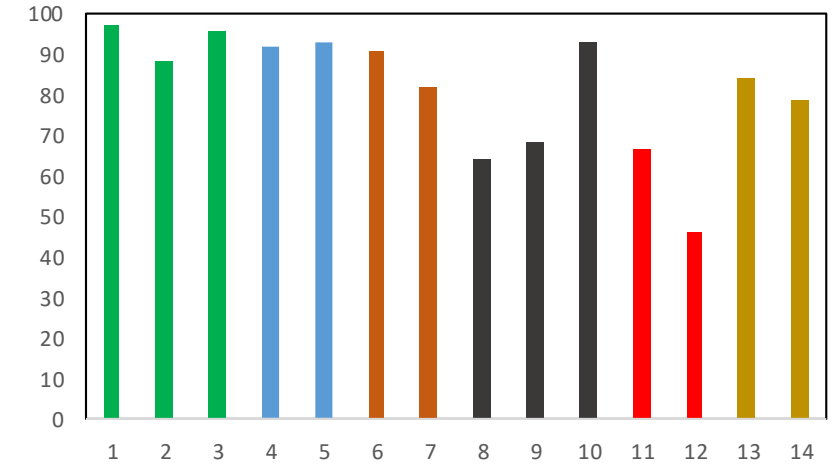
Engineering Design



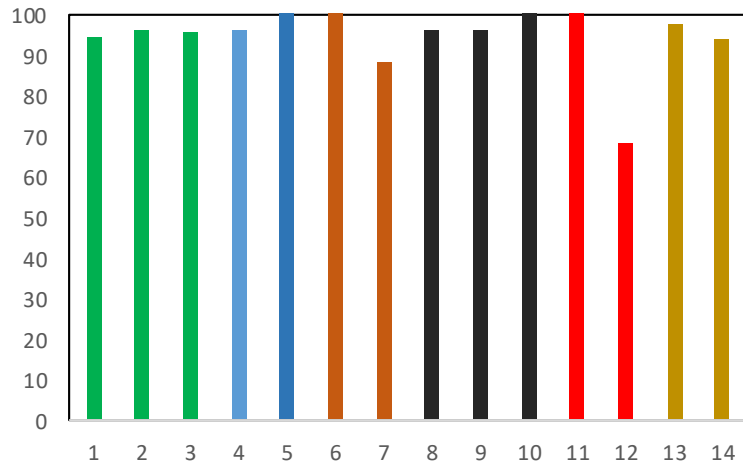
Global Issues



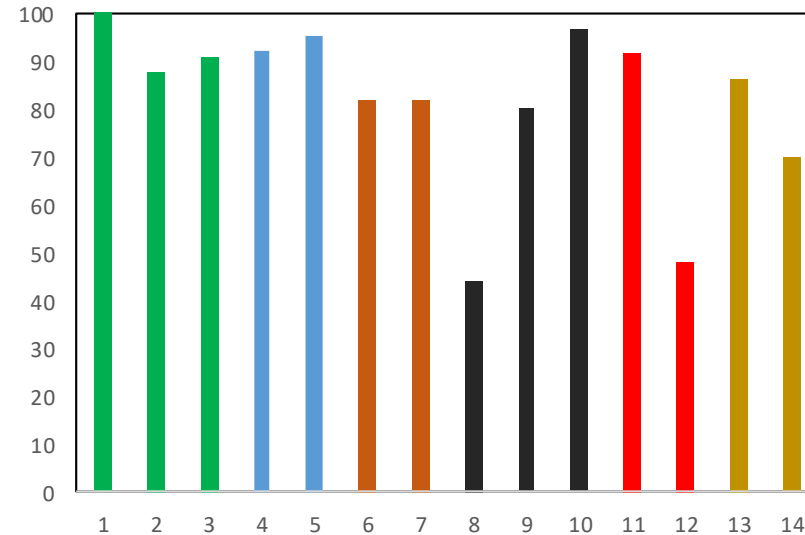
Diversity Inclusivity



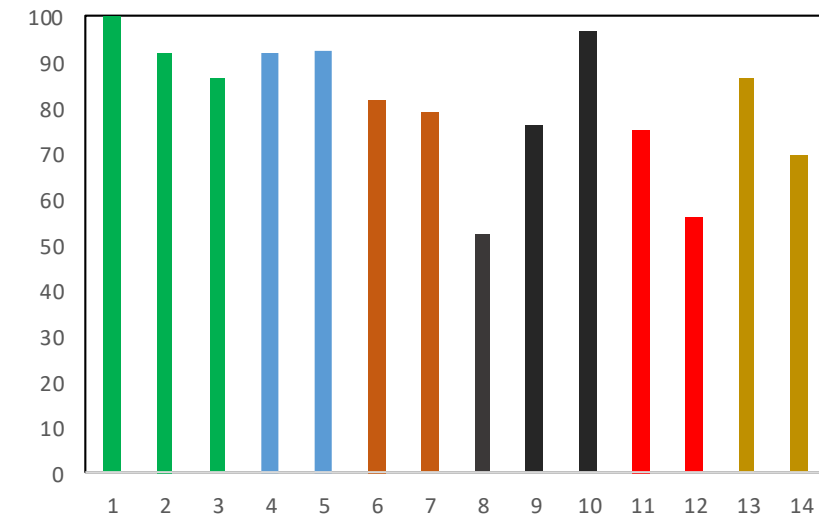
Problem Solving



Societal Issues



Ethical Issues



MEET OUR CEE FACULTY!



Ralph Dusseau
Bridges



Kauser Jahan
Water/Wastewater



Douglas Cleary
Concrete



Adriana Trias Blanco
Bridge Engineering



Yusuf Mehta
Transportation



William Riddell
Materials



Jagadish Torlapati
Water resources



Mohammad Jalayer
Transportation



Sarah Bauer
Pollution prevention



Jess Everett
Renewable energy



Gilson Lomboy
Concrete



Cheng Zhu
Geotechnical

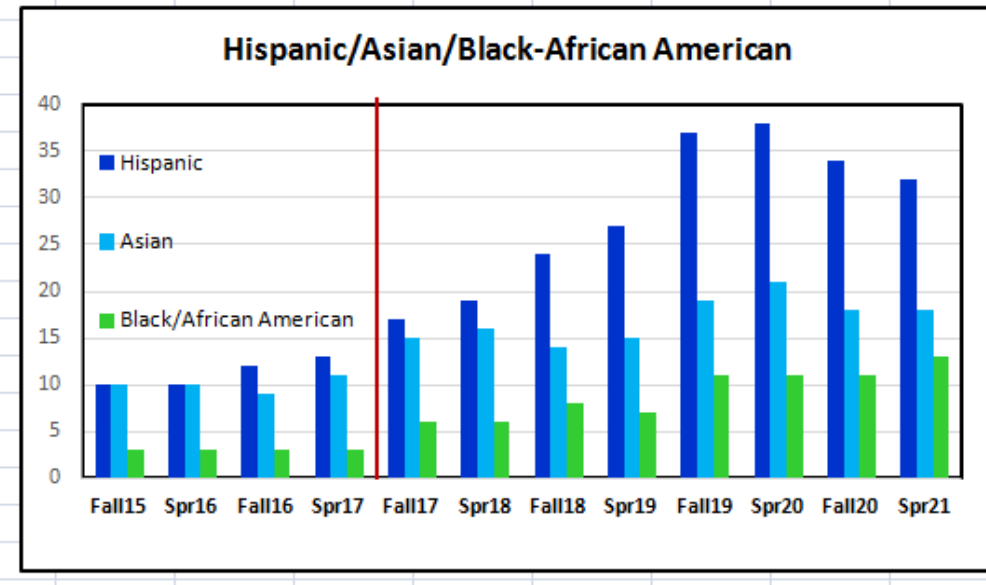
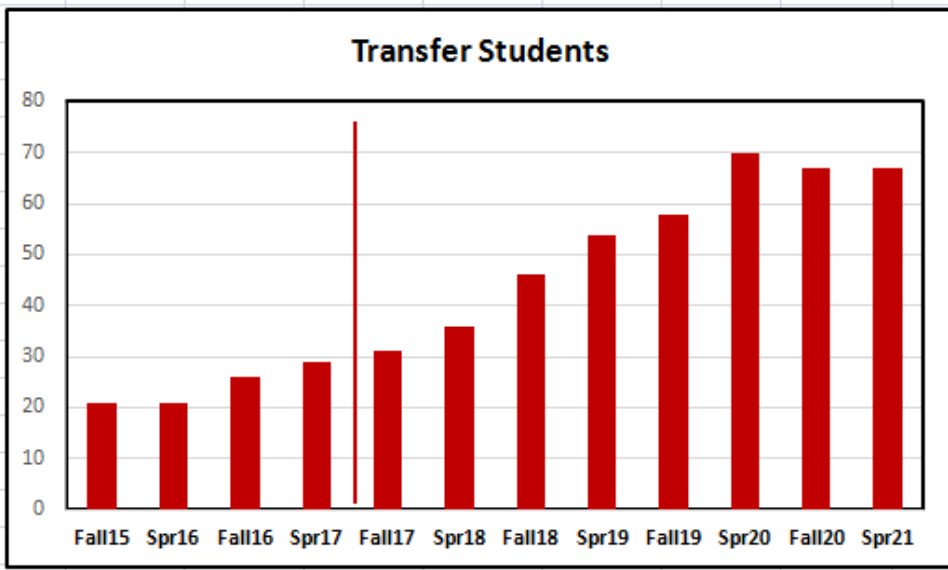
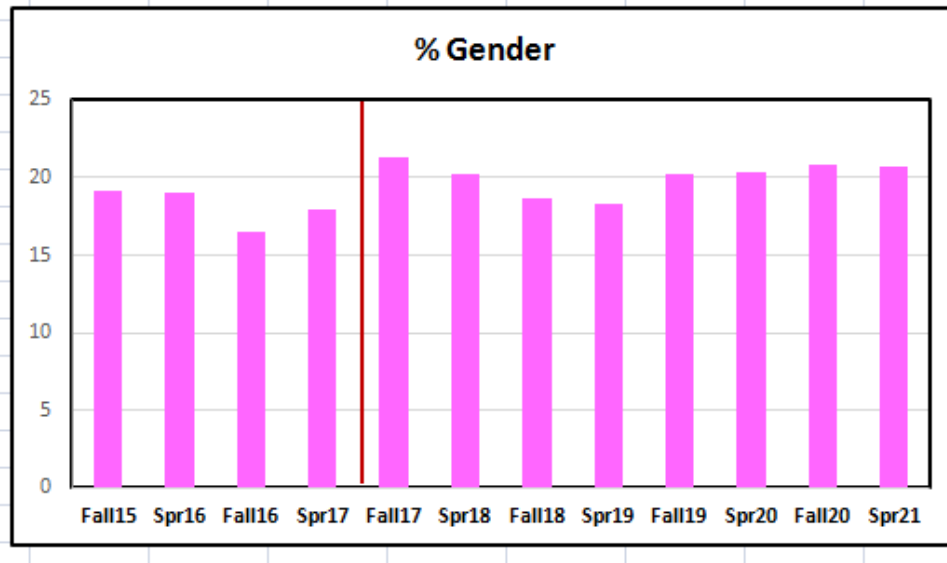
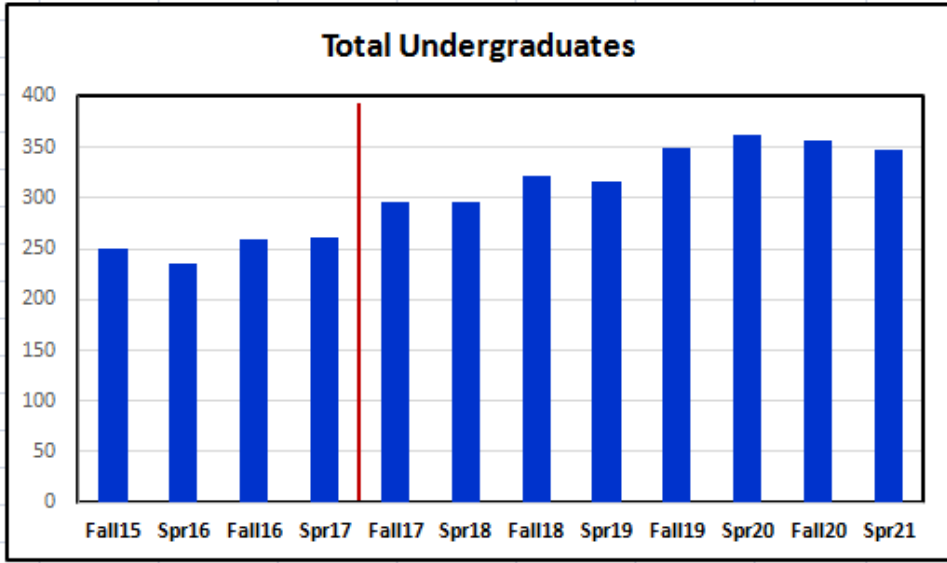


Jeong Ahn
*Remote sensing &
climate change*



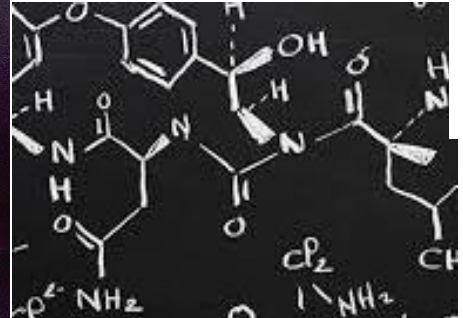
Hooman Ghasemi
*Structural
Rehabilitation*

CEE DEPARTMENT NUMBERS

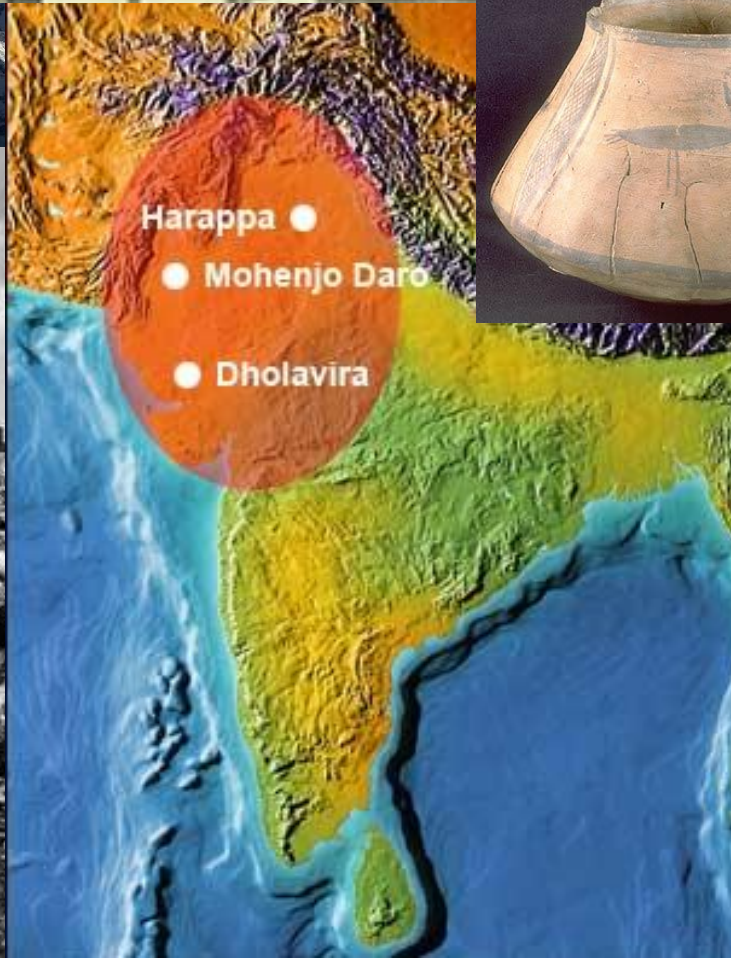


Make engineering come alive by adding/integrating engineering feats with the human experience of gender biases, discrimination, marginalization, suffering, ethical violations and shortcomings of leaders that may appear to be perfect in their theories and contributions.

شکرا বাংলা
خوش آمدید
 English
 Nepali
 Hindi



Ancient Indus Civilization



$$y_0 = \lim_{x \rightarrow 0} \frac{\tan(x^2 + x \cdot \sin \frac{x}{x})}{x}$$

$$\lim_{x \rightarrow 0} \frac{\Delta y}{\Delta x} = \lim_{x \rightarrow 0} \frac{f(x_1) - f(x)}{\Delta x}$$

$$\lim_{x \rightarrow 0} \frac{x^3 + x^2 \cdot \sin \frac{2}{x}}{x} \sim x^3 + x^2 \cdot \sin \frac{2}{x}$$

$$\lim_{x \rightarrow 0} \frac{x^3 + x^2 \cdot \sin \frac{2}{x}}{x} = \lim_{x \rightarrow 0} (x^2 + x \cdot \sin \frac{2}{x})$$

$$y' = \lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x} = \lim_{x \rightarrow 0} (2x + \Delta x)$$

$$\lim_{x \rightarrow 0} \frac{\Delta f}{\Delta x} = +\infty$$

$$\lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x} = \frac{dy}{dx}$$

$$\lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x} = \frac{dy}{dx}$$

Acknowledgements



**NSF (IUSE 1610164)
Algae Grows the Future**

**NSF (IUSE/PFE:RED- 1623053)
Rethinking Engineering Diversity,
Transforming Engineering Diversity
(REDTED)**

