CIVIL ENGINEERING EDUCATION WITH STRAIGHT A'S— ASCE, ABET & AUBURN

Robert Barnes, PhD, PE
Professor
Chair, Undergraduate Program Committee
Department of Civil & Environmental Engineering

AUBURN UNIVERSITY
Samuel Ginn College of Engineering

CEE UNDERGRADUATE PROGRAM

BACHELOR OF CIVIL ENGINEERING PROGRAM

- Enrollment steady at approximately 550 students (127 women this year)
- 120 graduates per year (20th-25th in US)
- Eight specialization tracks

CHOICE OF SPECIALIZATION AREA

AUBURN UNIVERSITY ALUMNI VERSUS FIRST-YEAR STUDENTS

	Alumni Survey (%) n=220	ENGR 1110 (%) n=62
Construction	28	28
Transportation	20	13
Structural	17	31
Site Eng & Land Devel.	11	10
Water Resources	6	5
Environmental	4	5
Pavements & Matl	3	5
Geotechnical	3	3
Other	8	NA

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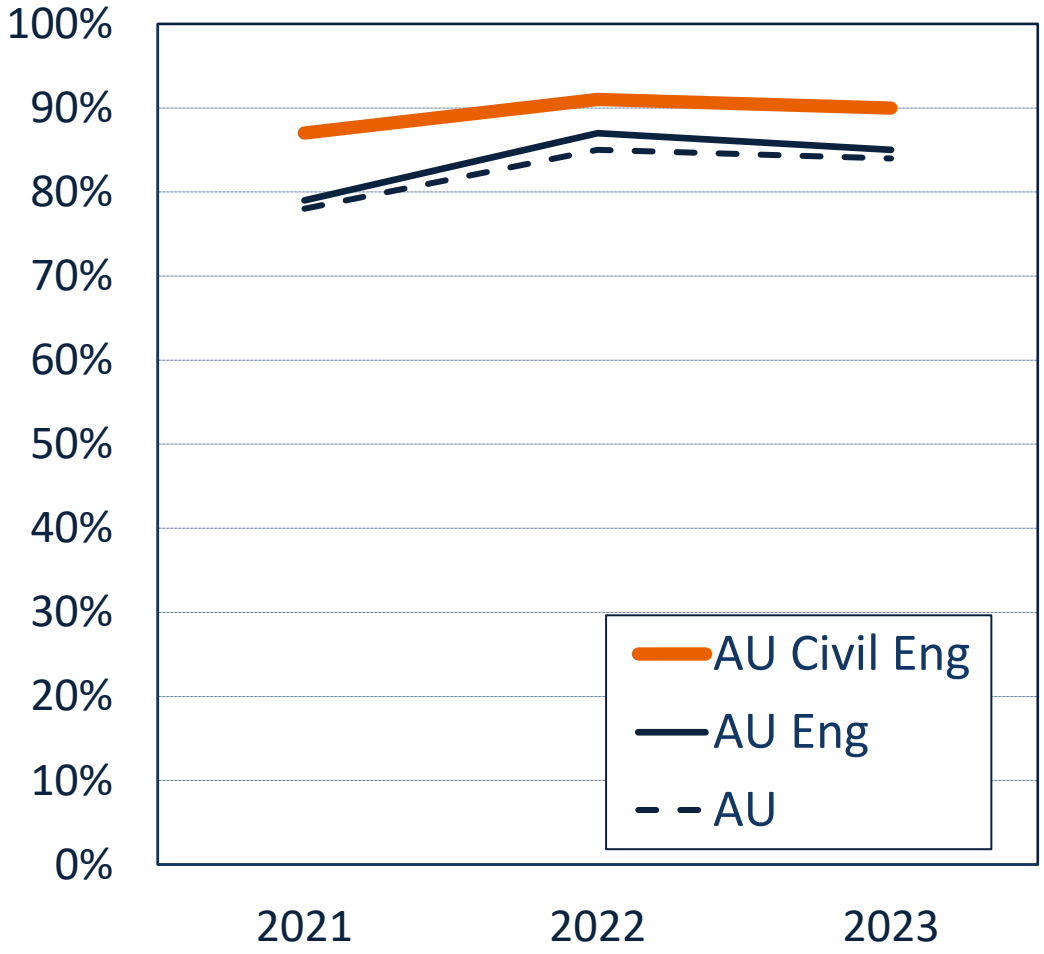
- 1st Place—2022 ASCE National Innovation Contest
- Hosted 2022 Gulf Coast ASCE Symposium—1st Place Overall
- 2023 Gulf Coast ASCE Symposium—1st Place in structural engineering, coastal engineering, and environmental engineering events
- 2024 Gulf Coast ASCE Symposium—1st Place in steel bridge and sustainable solutions; 2nd place surveying and geotechnical engineering
- At top of SGCOE in *Employment Success* and *Continuing Education Success*

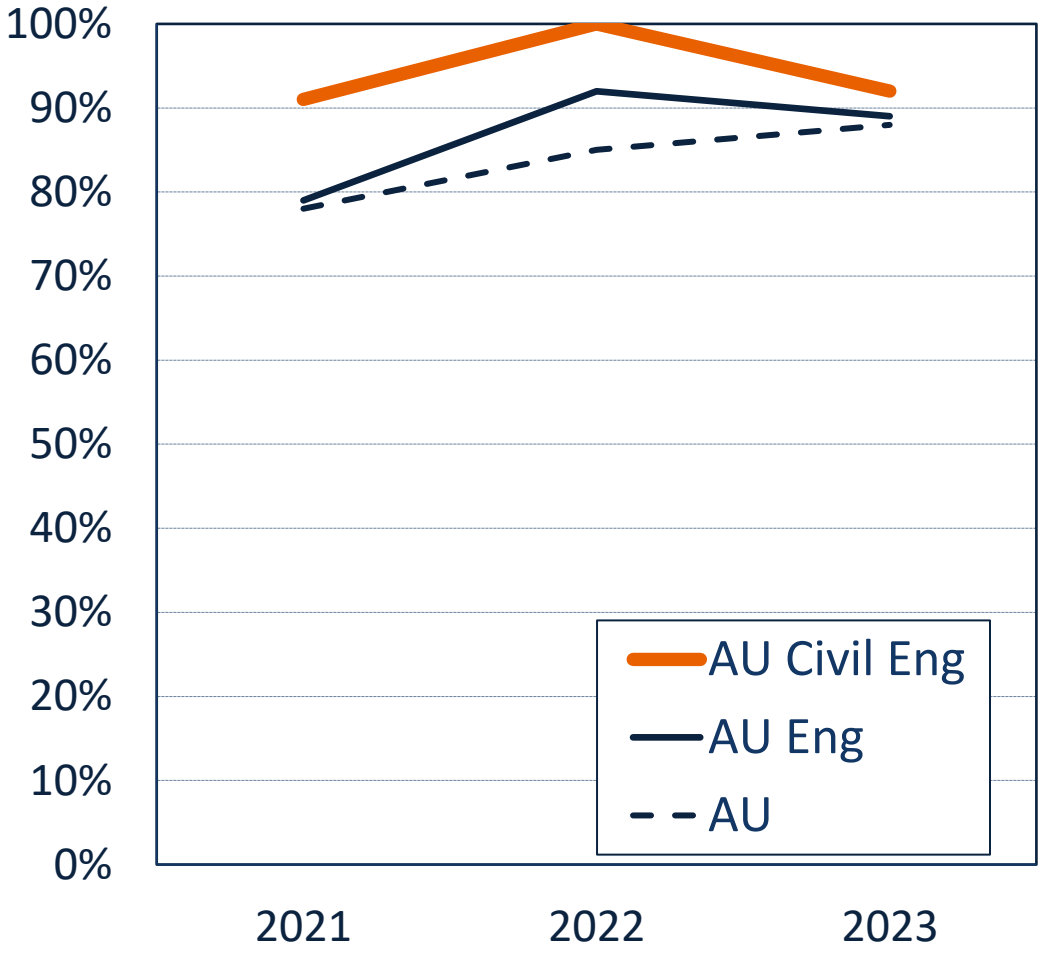
CEE UNDERGRADUATE PROGRAM

BACHELOR OF CIVIL ENGINEERING OUTCOMES

Employment Success



Continuing Education Success



HOW DOES ASCE INFLUENCE CE EDUCATION?

A FEW THINGS COME TO MIND

- Standards
- Guidance
- Support
- Growth

AUBURN

EDUCATION STANDARDS

ASCE, ABET, and Auburn

AU STUDENT OUTCOMES

(MANDATED BY **ABET** FOR ALL ENGINEERING DISCIPLINES)

Auburn University Bachelor of Civil Engineering graduates will have

1. an ability to **identify, formulate, and solve complex engineering problems** by applying principles of engineering, science, and mathematics;
2. an ability to **apply engineering design** to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
3. an ability to **communicate effectively** with a range of audiences;
4. an ability to **recognize ethical and professional responsibilities** in engineering situations and **make informed judgments**, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. an ability to **function effectively on a team** whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. an ability to **develop and conduct appropriate experimentation**, **analyze and interpret data**, and **use engineering judgment to draw conclusions**; and
7. an ability to **acquire and apply new knowledge** as needed, using appropriate learning strategies.

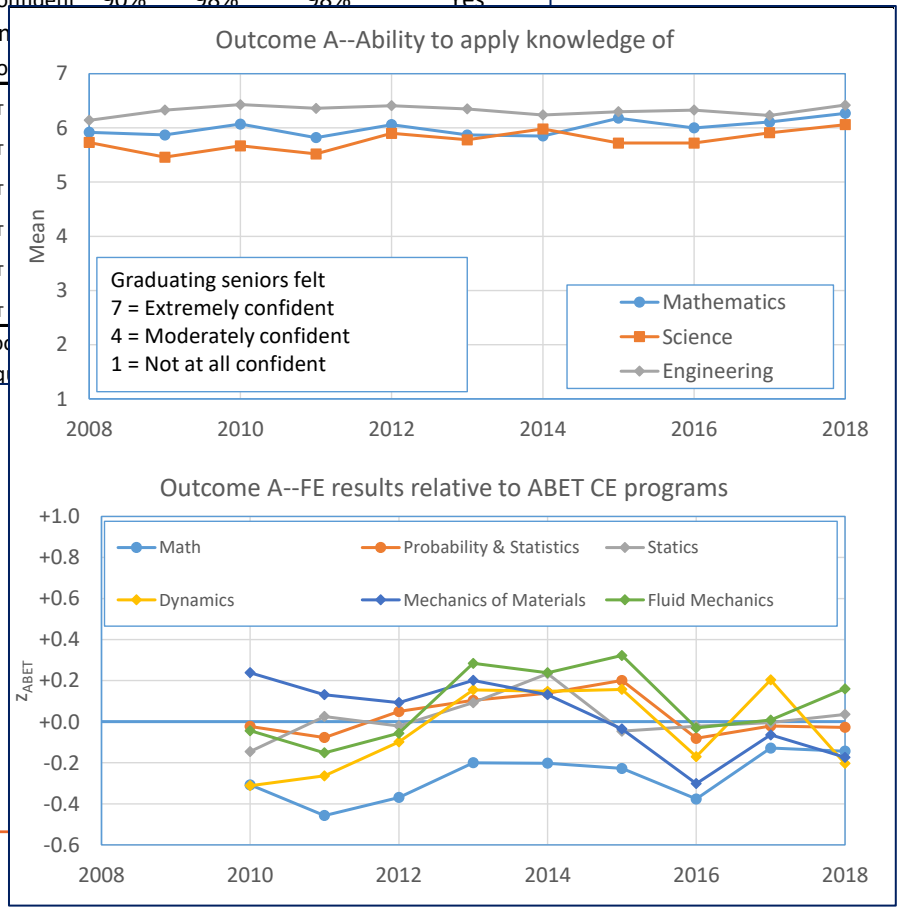
PROGRAM ASSESSMENT—STUDENT OUTCOMES

1. Course-embedded measures
2. FE Exam scores
3. Graduating senior exit surveys
4. Alumni surveys

- Annual Process
- Action Plan if needed

Outcome A--2019 Assessment Results

Instrument	Scale	n	Metric	Goal	Previous	Current	Goal Met?
C_A1 (CIVL 3010)	0-7	40	% ≥ 5	70%	77%	65%	No
C_A2 (CIVL 3110)	0-7	52	% ≥ 5	70%	67%	46%	No
C_A3 (CIVL 3310)	0-4	57	% ≥ 3	70%	71%	84%	Yes
GS_A1 (Math)	1-7	94	Mean	5	6.11	6.27	Yes
			% ≥ Mod. Confident	90%	98%	99%	Yes
GS_A2 (Science)	1-7	94	Mean	5	5.91	6.06	Yes
			% ≥ Mod. Confident	90%	98%	98%	Yes
GS_A3 (Engineering)	1-7	94	Mean				
			% ≥ Mod. Co				
FE_Math		65	z_{ABET}				
FE_Prob&Stat		65	z_{ABET}				
FE_Statics		65	z_{ABET}				
FE_Dynamics		65	z_{ABET}				
FE_MechMatls		65	z_{ABET}				
FE_FluidMech		65	z_{ABET}				
AS_A (2010-14 grads)	0-4	32	% ≥ Goo				
			% ≥ Adeq				



ABET *CIVIL ENGINEERING* PROGRAM CRITERIA

CIVIL ENGINEERING **FACULTY** REQUIREMENTS (DEVELOPED BY **ASCE**)

- The program must demonstrate that **faculty teaching courses that are primarily design in content** are qualified to teach the subject matter by virtue of **professional licensure, or by education and design experience**.

DRAFT ABET *CIVIL ENGINEERING* PROGRAM CRITERIA

CIVIL ENGINEERING **CURRICULUM** REQUIREMENTS (DEVELOPED BY **ASCE**)

The curriculum must include:

a) Application of:

i) mathematics through differential equations, probability and statistics, calculus-based physics, chemistry, and either computer science, data science, or an additional area of basic science

ii) engineering mechanics, materials science, and numerical methods relevant to civil engineering

iii) principles of sustainability, risk, resilience, diversity, equity, and inclusion to civil engineering problems

iv) the engineering design process in at least two civil engineering contexts

v) an engineering code of ethics to ethical dilemmas

DRAFT ABET *CIVIL ENGINEERING* PROGRAM CRITERIA

CIVIL ENGINEERING **CURRICULUM** REQUIREMENTS (DEVELOPED BY ASCE)

The curriculum must include:

b) **Solution** of complex engineering problems in at least four specialty areas appropriate to civil engineering

c) **Conduct** of experiments in at least two civil engineering contexts and **reporting** of results

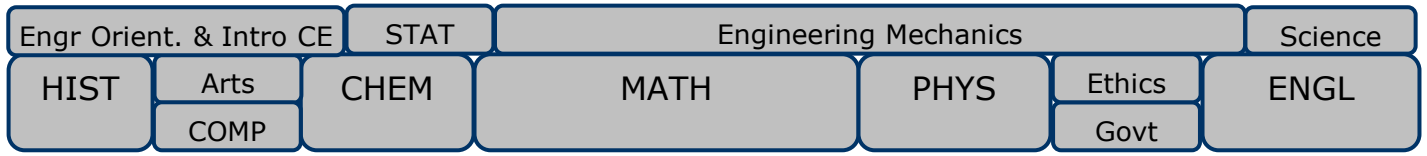
d) **Explanation** of:

b) i) concepts and principles in project management and engineering economics

c) ii) professional attitudes and responsibilities of a civil engineer, including licensure and safety

AUBURN BCE CURRICULUM STRUCTURE (128 CREDIT HOURS)

SPECIALIZATION EXAMPLE—STRUCTURAL ENGINEERING

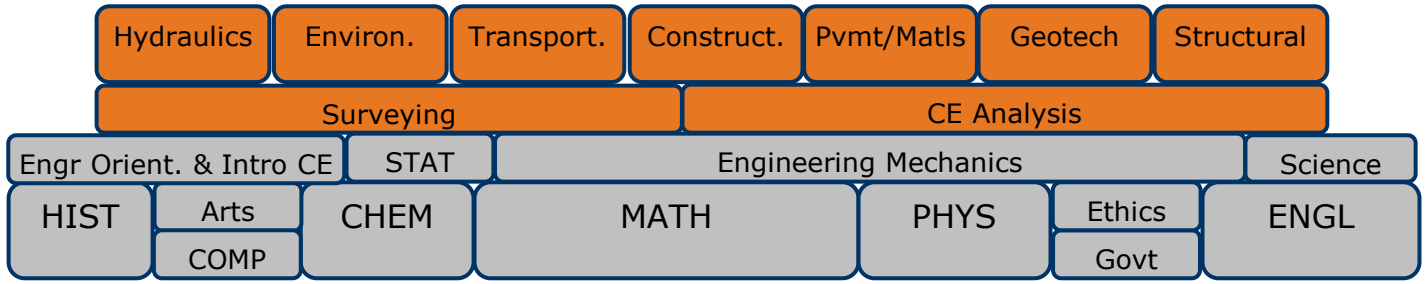


Core and Pre-Engineering

BREADTH

AUBURN BCE CURRICULUM STRUCTURE (128 CREDIT HOURS)

SPECIALIZATION EXAMPLE—STRUCTURAL ENGINEERING



Required CIVL

Core and Pre-Engineering

DEPTH

BREADTH

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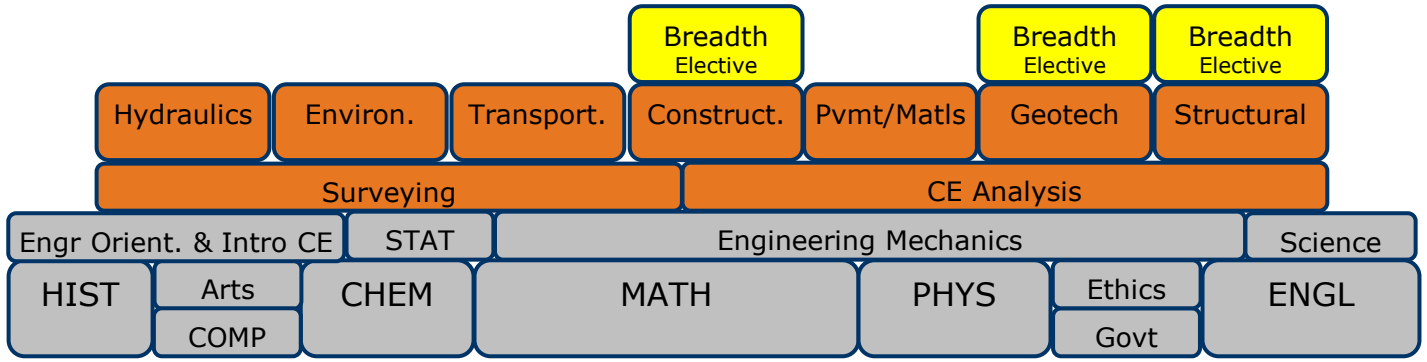

CIVL Electives

Required CIVL

Core and Pre-Engineering

DEPTH

BREADTH

AUBURN BCE CURRICULUM STRUCTURE (128 CREDIT HOURS)

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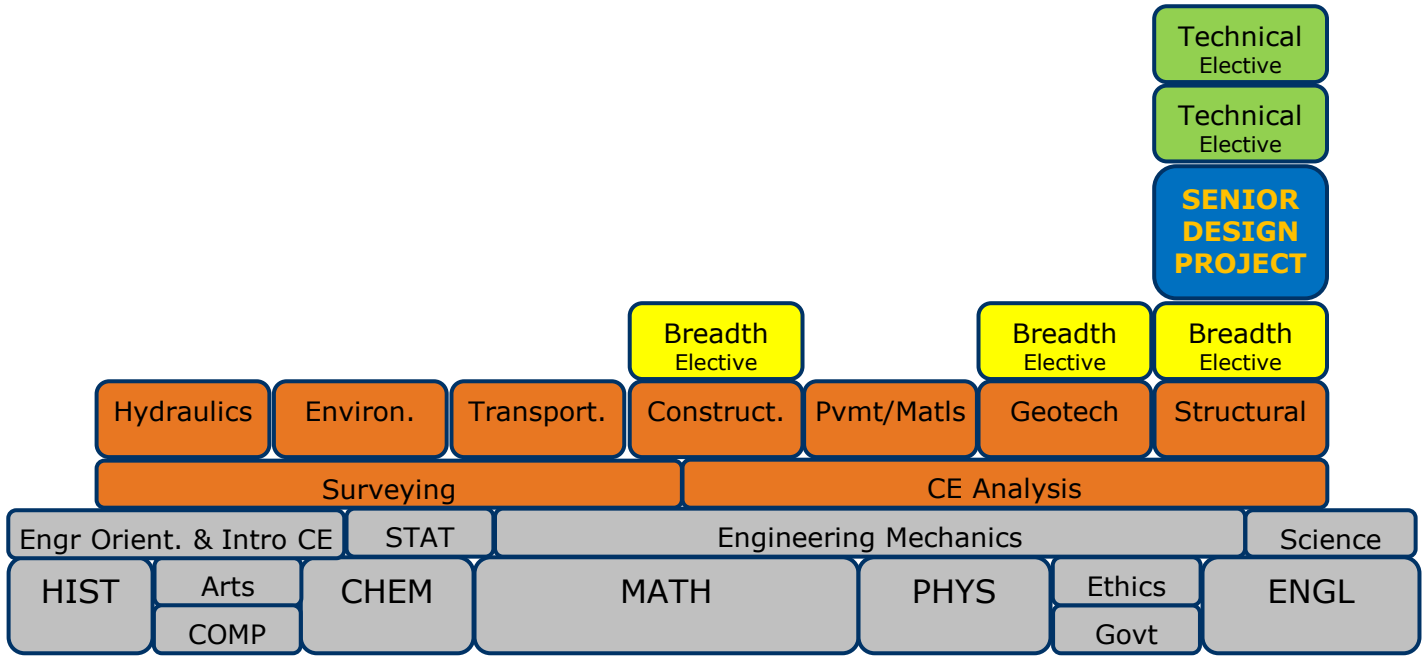


CIVL Electives

Required CIVL

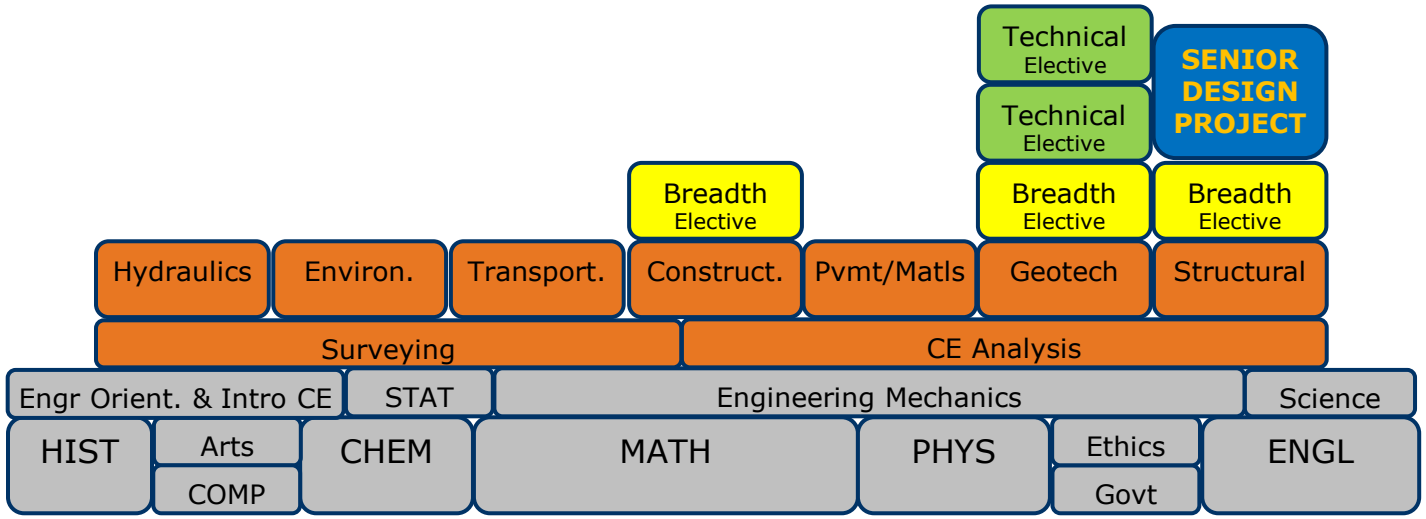
Core and Pre-Engineering

DEPTH

BREADTH

AUBURN BCE CURRICULUM STRUCTURE (128 CREDIT HOURS)

SPECIALIZATION EXAMPLE—GEOTECHNICAL ENGINEERING



CIVL Electives

Required CIVL

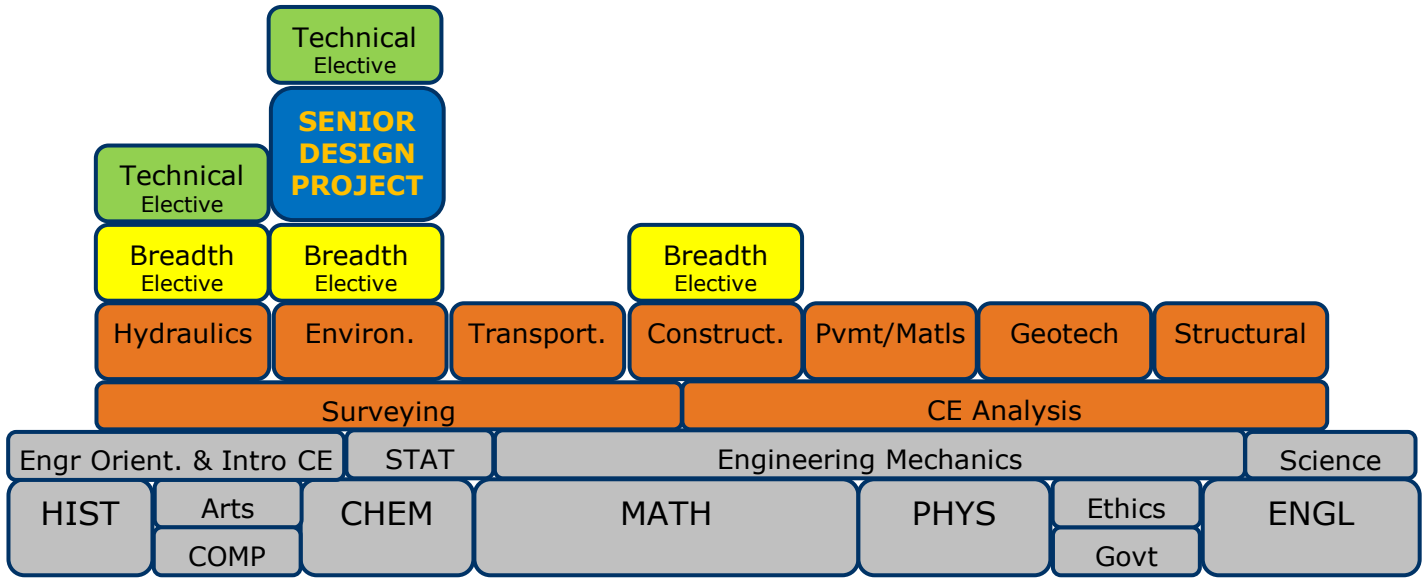
Core and Pre-Engineering

DEPTH

BREADTH

AUBURN BCE CURRICULUM STRUCTURE (128 CREDIT HOURS)

SPECIALIZATION EXAMPLE—ENVIRONMENTAL OR WATER RESOURCES ENGINEERING



CIVL Electives

Required CIVL

Core and Pre-Engineering

DEPTH

BREADTH

BREADTH VERSUS DEPTH

THE PERENNIAL ISSUE

- How much **breadth** should be required?
  - AU→first course in all areas, second course (with design aspects) in three areas
- Can we achieve the appropriate level of **depth** for an undergraduate degree?
  - AU→typically 4-5 courses within specialization area plus one or two in closely aligned areas (e.g., Structures and Geotech; Environmental and Water Resources)
- How do we balance flexibility with meaningful course selection?
  - AU→Many students still choose expediency (effort, GPA considerations) over specialization/focus.

STANDARDS—ENFORCEMENT

BECOME AN **ASCE**/ABET PROGRAM EVALUATOR (PEV)

- PEVs evaluate Civil Engineering programs for compliance with ABET criteria
- Qualifications
  - ASCE Member (or higher) grade
  - PE with 10 years experience
- Training (online) follows your selection by ASCE
- Review activities begin with report review in summer and conclude with campus visit in fall
- Travel expenses are covered
- You set your availability each year
- Great way to travel, interact with other engineers, and learn new things!

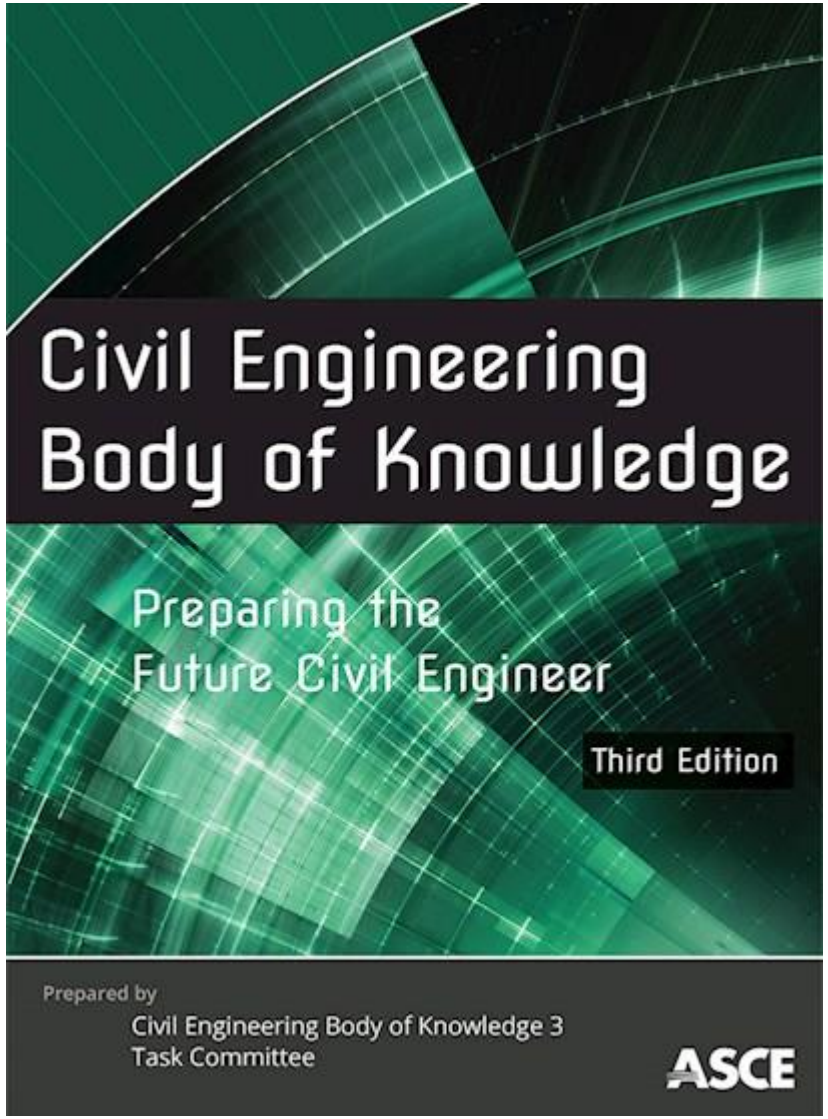
AUBURN

EDUCATION GUIDANCE

ASCE

FORWARD-THINKING KNOWLEDGE BUILDING

ASCE CIVIL ENGINEERING BODY OF KNOWLEDGE



- Specific levels of outcome achievement are assigned to four types of education:
  - Undergraduate
  - Postgraduate
  - Mentored experience
  - Self-developed

AUBURN

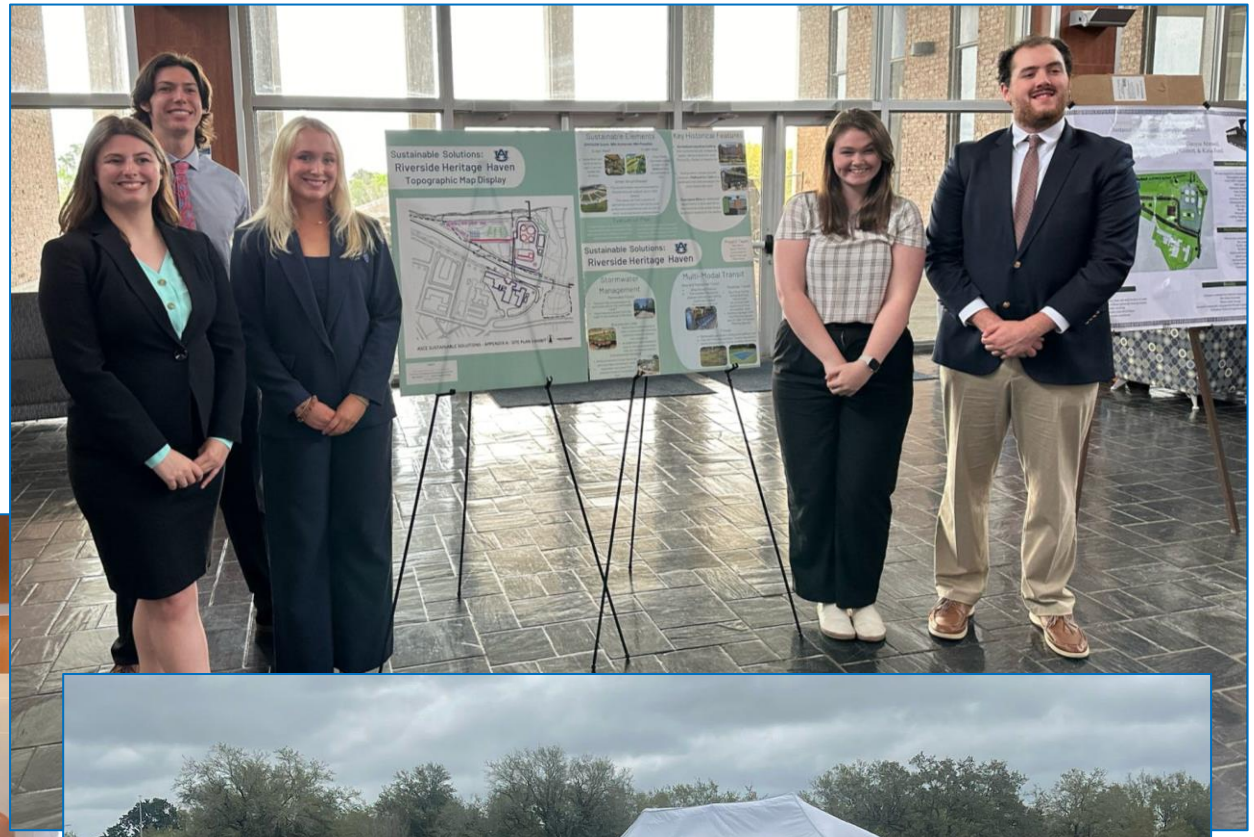
SUPPORT

ASCE

EDUCATIONAL SUPPORT

ASCE AND AUBURN

- Mentorship
- Activities and Competitions
- Sponsorship, Scholarships, and Awards



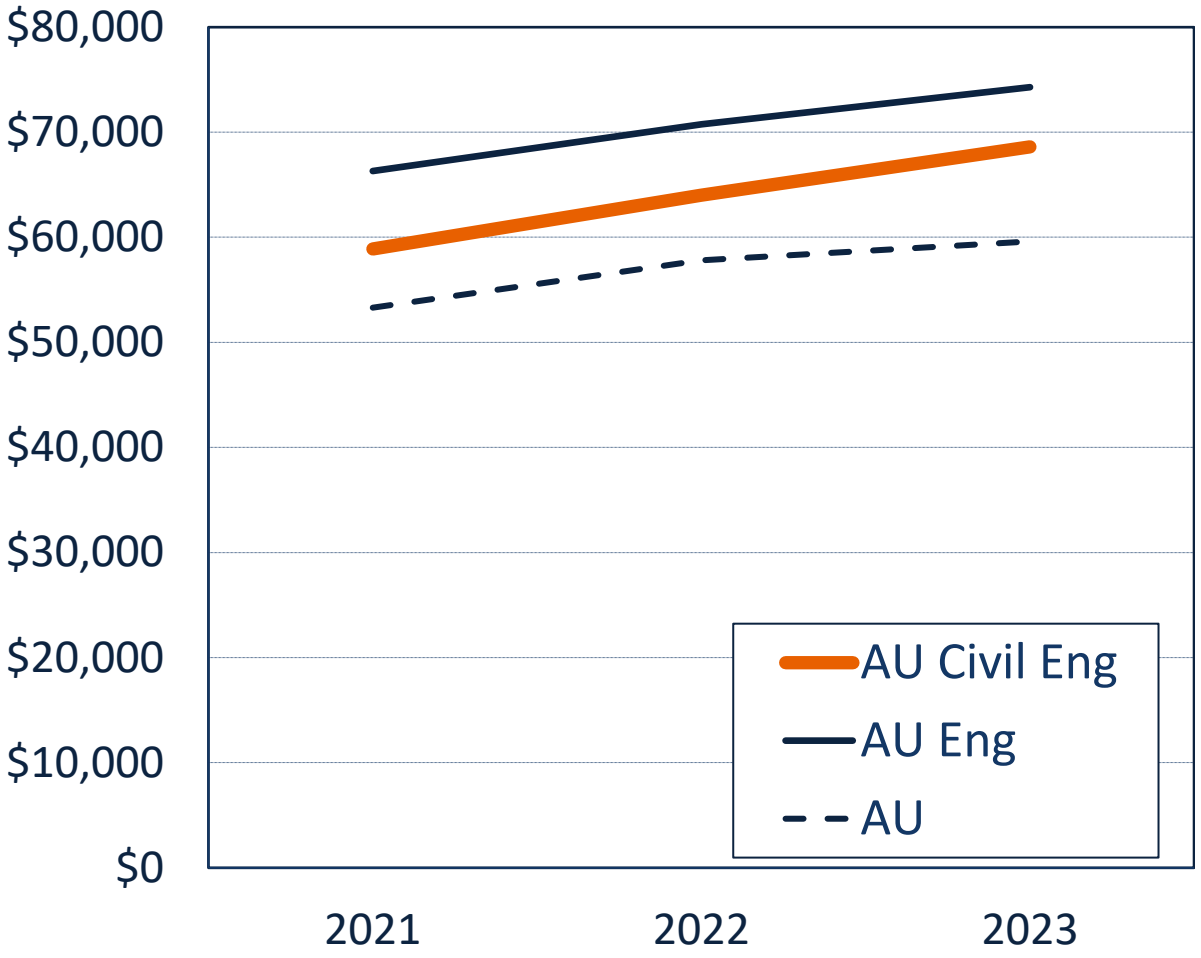
AUBURN

GROWTH OF OUR PROFESSION

DEMAND FOR CIVIL ENGINEERS

SOME STATISTICS—2022

Avg. Starting Salary—AU Bachelors



- Alabama has approx. 1.5% of CE jobs in US (*BLS*)
- IIJA will **create** 82,000 engineering/design jobs (*ASCE*)
- 21,200 CE job **openings** per year over next decade in US (*BLS*)
- 15,700 Bach. of CE or EnvE graduates per year in US (*ASEE*)—**not growing in US or at Auburn**
- 2022 mean CE salary in Alabama—$92,500 (*BLS*)
- Average **starting** salary for Auburn BCE graduate in 2022 ($64,000) equaled the 25th percentile salary for all CEs in Alabama! (*BLS*)
- We need more young people interested in civil and environmental engineering!
- Else (offshoring, AI)?

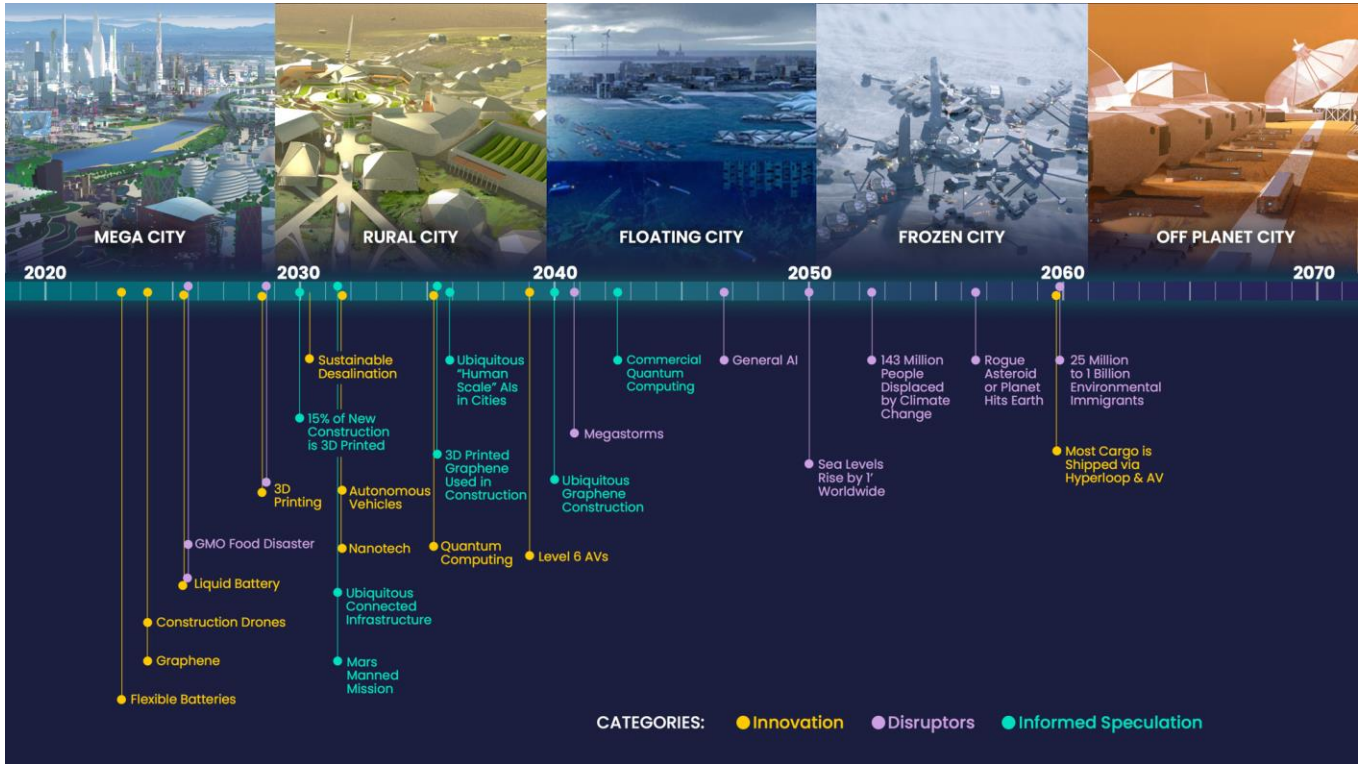
RECRUITING YOUTH TO CIVIL ENGINEERING

ASCE'S MOST URGENT TASK?

- None of this is new, but more urgent than ever?
- Must capture the attention of young people and school programs
- Universities are doing a better job than ever, but **CE** recruiting is not simple.
- What can ASCE sections, branches, or groups do?
  - Does your branch have a group focused on K-12 outreach/inspiration?
  - How do we get into **civil** engineering exposure into schools, youth organizations?
  - How do we get to underrepresented groups?

FUTURE WORLD VISION RESOURCES

- What can ASCE sections, branches, or groups do?
  - *Future World Vision*
  - Competitions
  - Site visits



futureworldvision.org

CITIES OF THE FUTURE

- *Cities of the Future*
  - IMAX film (McWane Center, now; Fernbank, TBD)
  - $1500 grants to take groups to the film: application deadline April 19!

QR Code for film trailer

AUBURN

THANK YOU!

barnerw@auburn.edu or *robert.barnes@auburn.edu*