Discover Day

ILLINOIS TECH

ILLINOIS TECH | Civil, Architectural, and Environmental Engineering

Introduction to CAEE

Academic Year 2024-2025

Dr. Brent Stephens
Professor and Department Chair
brent@iit.edu

Dr. Stephen Kleps
Associate Teaching Professor
Associate Chair of Undergraduate Affairs
klepste@iit.edu

Civil, Architectural, and Environmental Engineering

- Civil, Architectural, and Environmental engineers **create and maintain infrastructure**:
  - Transportation systems
  - Municipal water systems
  - Energy, communications, buildings, etc.

- **Infrastructure** should be designed to:
  - Protect human and environmental health
  - Use resources efficiently and sustainably
  - Improve people's quality of life

- We work in both the public and private sector

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Undergraduate degrees offered in CAEE @ IIT

- B.S. Civil Engineering
  All kinds of infrastructure

- B.S. Architectural Engineering
  Buildings, buildings, buildings

- B.S. Engineering Management
  Management of technical projects
  Specialize in different areas of engineering

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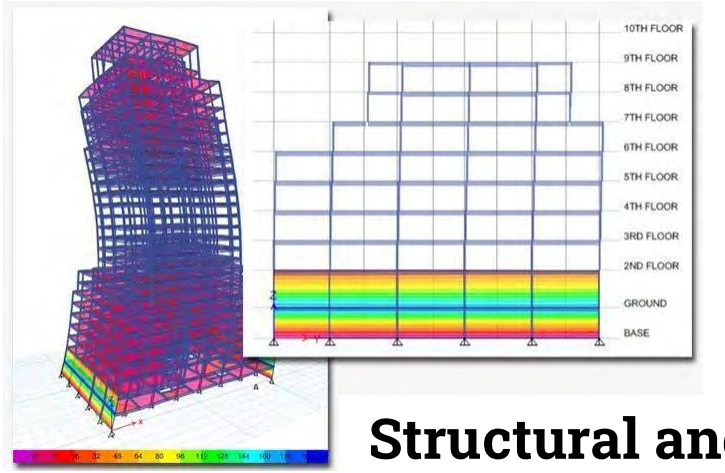
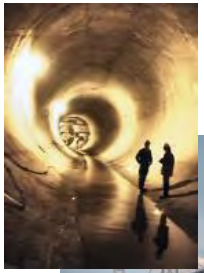
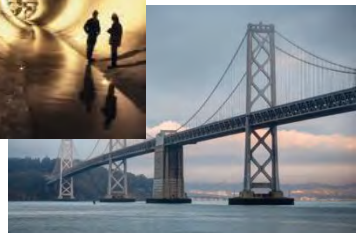
Civil Engineering includes…



Structural and Geotechnical Engineering





Structural and geotechnical engineers design steel, concrete, timber, and earthen structures:

- Buildings
- Towers
- Bridges
- Dams
- Retaining walls
- Foundations
- Stadiums

Boyoung Jeong

Steve Kleps

Matt Gombeda

Jamshid Mohammadi

Mehdi Modares

Gongkang Fu

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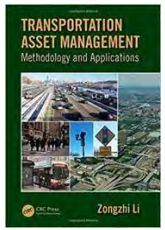
Civil Engineering includes…

Chicago Traffic Simulator

Transportation Engineering

Zongzhi Li

Mohammad Miralinaghi



Transportation engineers design and analyze:

- Highways
- Railways
- Airports
- Road networks
- Bike lanes
- Public transit systems
- Traffic control systems

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Civil Engineering includes…

Construction Engineering And Management

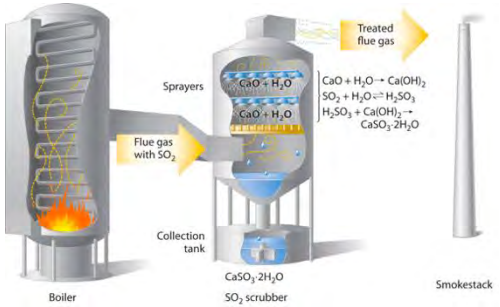
Construction engineers manage quality control and ensure a project is complete on time and on budget by:

- Reviewing contracts
- Ordering materials
- Hiring and scheduling sub-contractors

Ray Lemming

Ivan Mutis

Civil Engineering includes…



Environmental Engineering

Environmental engineers protect human health and the environment by providing:

- Drinking water treatment
- Wastewater treatment
- Air pollution control
- Water resources management
- Industrial waste treatment
- Soil remediation
- Indoor air quality management

Stickney, MWRD

David Lampert

Brent Stephens

Boyoung Jeong

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What is Architectural Engineering?

- **Architectural engineers** focus on buildings
- They collaborate with architects and civil engineers to design and build structures that consider:
  - Energy use
  - Environmental impacts
  - Human health
  - Economics
  - Sustainability

Brent Stephens

Edoarda Corradi

Mohammad Heidarinejad

Deborah Steimel-Clair

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Professional Engineers & Accreditation

Accreditation Board for Engineering and Technology (ABET)

ABET Leadership and Quality Assurance in Applied Science, Computing, Engineering, and Technology Education

- Accreditation is the start of your journey to becoming a registered **Professional Engineer (PE)**

- **Civil Engineering** and **Architectural Engineering** programs are ABET-accredited
    - Illinois Tech has 1 of only ~25 ABET-accredited Architectural Engineering programs in the U.S.

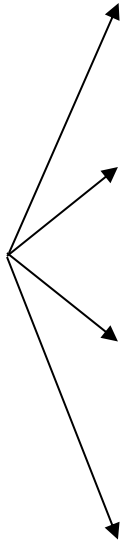
- **Engineering Management** is not ABET-accredited

https://www.iit.edu/engineering/about/abet-accreditation

Accelerated Master's Degrees (5-year BS+ME)

"Fast-track" (4+1) master's degrees – apply in your 3rd year

Bachelor of Science (BS)
Architectural Engineering
Civil Engineering
Engineering Management



Master's Degree
Architectural Engineering
Civil Engineering
Construction Engineering & Management
Energy Systems Engineering
Engineering Management (Project Management)
Environmental Engineering
High Performance Buildings (w/ Architecture)
Public Works
Structural Engineering
Transportation Engineering
Urban Systems Engineering

+ Or mix and match (select your own) … lots of options

The most valuable college majors in 2021, ranked

Bankrate

Most to least valuable college majors

RANK	DECLARED DEGREE	MEDIAN INCOME	UNEMPLOYMENT RATE	PERCENT WITH ADVANCED DEGREE
1	Architectural Engineering	$90,000	1.3%	29%
2	Construction Services	$80,000	1.0%	12%
3	Computer Engineering	$101,000	2.3%	40%
4	Aerospace Engineering	$100,000	1.9%	51%
4	Transportation Sciences and Technologies	$86,000	1.8%	21%
6	Electrical Engineering	$107,000	2.3%	46%
7	Materials Engineering and Materials Science	$97,500	2.0%	45%
8	Civil Engineering	$90,000	1.9%	38%
9	Mechanical Engineering	$96,000	2.2%	38%
10	Chemical Engineering	$100,000	2.3%	48%
11	Engineering Mechanics, Physics and Science	$93,000	1.3%	61%
12	Pharmacy, Pharmaceutical Sciences and Administration	$101,000	2.4%	53%

https://www.bankrate.com/loans/student-loans/most-valuable-college-majors/

Our fantastic students

Student highlights – Scholarships

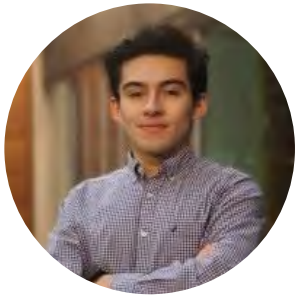
- IIT CAEE students won 4 2024 ASCE IL Section scholarships

Structural Engineering Institute

Samantha Muller
(BS ARCE)

Geo-Institute

Prasant Kafle
(BS CE, ME CM)



German Laiton Hernandez
(BS CE)

Transportation & Development Institute

Maritza Torres
(BS CE)

ASCE ILLINOIS SECTION

https://www.isasce.org/scholarships/

Student highlights – Scholarships

- IIT students won 5 of 5 2023 ASHRAE IL Chapter scholarships

Samantha Muller
(BS ARCE)

Aditya Singh
(PhD ENVE)

Saman Haratian
(PhD ARCE)

Jongki Lee
(PhD ARCE)

Saeed Farhoodi
(PhD ARCE)

https://illinoisashrae.org/Scholarship

Student highlights – Profiles

Living Your Values as an Engineer

Jonathan Ellison (CE ’24)

“I don’t just feel accepted as an older learner, I’m actually valued.”

Merging Architectural Engineering and Computer Science

Samantha Muller (ARCE ’26, CS Minor)

“There are not many colleges that offer an architectural engineering bachelor's degree, and Illinois Tech is consistently ranked one of the best.”

Intersecting Architectural Engineering and Public Health

Insung Kang (PhD ARCE ’22)
Assistant Professor, UT-Arlington

“I saw that a lot of students were given ample opportunities for hands-on projects, internships, and research that are crucial for understanding real-world applications of their studies.”

https://www.iit.edu/news/living-your-values-engineer
https://www.iit.edu/student-experience/student-and-alumni-stories/merging-architectural-engineering-and-computer-science
https://www.iit.edu/student-experience/student-and-alumni-stories/intersecting-architectural-engineering-and-public-health

Student highlights – Awards

Congratulations to the 2023 Service & Leadership Award Recipients!

Outstanding TA of the Year

Kurt Ordillas, PhD student, CAEE

- CAE 315, 307 (Steve Kleps)
- Advisor: Matt Gombeda

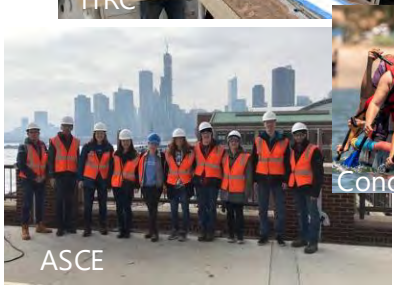
Stryker Distinguished Service Award

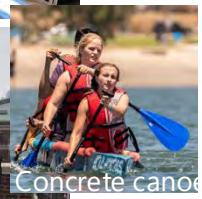
- Luiza Martines (ASCE)
- Estevan Rivera (ASCE)
- Greta Vasiliauskaite (SEES)

https://www.iit.edu/student-affairs/dean-students-office/student-recognition/clinton-e-stryker-awards

Student highlights – Student Organizations

- **Student organizations** involving CAEE students include:
  - American Society of Civil Engineering (ASCE)
  - Construction Management Association of America (CMAA)
  - Society for Environmental Engineers and Scientists (SEES)
  - Chi Epsilon - Civil Engineering Honor Society
  - Structural Engineers Association of Illinois (SEAOI)
  - American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
  - Architectural Engineering Institute (AEI)
  - Institute of Transportation Engineers (ITE)
  - Women in Transportation (WIT)
  - Engineers Without Borders (EWB)
  - Engineers for a Sustainable World (ESW)
  - Illinois Tech Railroad Club (ITRC)





Student highlights – Student Organizations

ASCE | STUDENT SYMPOSIUM

Western Great Lakes
April 4–6, 2024

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Student highlights - Competitions

- Department of Energy's 2024 Solar Decathlon Design Challenge
  - 3 teams (mentored by Edoarda Corradi) made the finals: NREL, Golden, CO
  - IIT won a **Bonus Award** for **Addressing Environmental Justice**
  - One team also won an IPRO Innovation Day division award

https://www.solardecathlon.gov/2024/design/2024-design-challenge-results.html

Student highlights - Competitions

- Central States Water Environment Association (CSWEA) 2024 Student Design Competition
  - CSWEA competition winner in the Water Environment category for **“ChASM - Chatham Aqueous Stormwater Management”**
  - Also an IPRO Innovation Day Winner

Constantine Giattina (BARCH), Ryan Griepentrog (BS CE, ME STE), Judith Rackow (BARCH), Francis Gilleece (BS CPE), and Mathis Lucet (ME USYS)

https://cswea.org/student-yps/student-design-competition/

Student highlights - Competitions

- Kaplan Institute Pitch Tank Startup Competition
  - Overall winner: Radiator Revivers ($30,000)
    - Battery-Operated Radiator Controller

RADIATOR REVIVERS

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Our fantastic faculty

Faculty highlights - Expertise

Ivan Mutis

Four Failures Stunting the Adoption of Construction Robotics

James McCusker | August 7, 2024

BUILTWORLDS

https://builtworlds.com/news/four-failures-stunting-adoption-construction-robotics/

Mohammad Heidarinejad

Heat Study: Chicago Temperatures Vary As Much As 22 Degrees Between Neighborhoods

BORDERLESS

https://borderlessmag.org/2024/01/29/chicago-heat-map-campaign-heat-vulnerability-index-disaster-disrupters-northwestern-university/

Brent Stephens

Public Health Officials Should Urgently Prioritize Reducing Exposure to Indoor Fine Particulate Matter, New Report Recommends

News Release | January 19, 2024

NATIONAL ACADEMIES Sciences Engineering Medicine

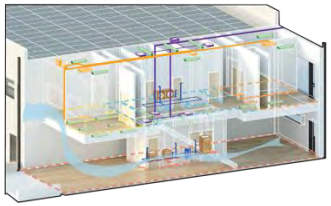
https://www.nationalacademies.org/news/2024/01/public-health-officials-should-urgently-prioritize-reducing-exposure-to-indoor-fine-particulate-matter-new-report-recommends

Faculty highlights - Awards

Edoarda Corradi
Associate Teaching Professor
2023 Outstanding Faculty Advisor Award
U.S. Department of Energy
Solar Decathlon Design Challenge

U.S. DEPARTMENT OF ENERGY
Solar Decathlon

https://www.solardecathlon.gov/richard-king-award.html



ZERO ENERGY DESIGN DESIGNATION
U.S. DEPARTMENT OF ENERGY
2022-2025

1 of 4 schools in inaugural cohort, 2 programs:
- Master of Architectural Engineering
- Master of High Performance Buildings

https://www.energy.gov/eere/buildings/zero-energy-design-designation

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Faculty highlights – Active research projects


VR/AR in 1st Year Engineering
Corradi and Mohammadi - $64k

Fly ash in precast concrete
Gombeda - $1M

Early strength tension-driven high strength concrete
Gombeda - $56k

IL-specific nonproprietary UPHC
Gombeda - $19k

Bridge element deterioration curves
Fu - $150k

Operationalizing transit signal priority
Miralinaghi - $37k

i-learn: empowering learning using mixed reality and machine learning
Mutis - $550k (NSF)

Mixed reality for eng. design interpretation in construction eng. mgmt.
Mutis - $300k (NSF)

LEAP: robot technology in construction industry
Mutis - $75k (NSF)

Louis Stokes STEM pathways
Mutis - $75k (NSF)

Over $5M in active research funding

Sorbent-amended caps for PFAS contaminated sediments
Lampert - $100k (Phase 2)

Forecasting harmful algal blooms with unmanned systems
Lampert - $80k ($250k total; PI OSU)

Transport of PFAS to surface waters
Lampert - $250k (IWRC)

North Branch Chicago River Nutrient Assessment & Reduction Plan
Lampert - $32k ($368k total; PI Geosyntec)

PFAS bioaccumulation in contaminated sediment
Lampert - $200k (NOAA)

NSF Innovation Engine: Great Lakes ReNEW
Lampert - $200k Y1-2 (up to $160M total, 50+ orgs)

NSF SAI: Stormwater Resilience in Urban Areas
Lampert - $750k (Senior Personnel: Stephens)

Sources and sinks of oxidative PM
Stephens & Heidarinejad & - $249k (NSF)

Low-cost stream trap failure detection and radiator control
Heidarinejad & Stephens - $100k+

Swamp cooler filtration solutions for wildfire smoke
Stephens & Heidarinejad - $200k
($1M total, PI: Public Health Institute)

Air filtration for military veterans with COPD
Stephens & Heidarinejad - $1M + $300k suppl
(with Jesse Brown VA Medical Center)

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Faculty highlights – Active research projects

NSF establishes 10 inaugural Regional Innovation Engines across the country

Each NSF Engine will transform its region into a self-sustaining, technology-and innovation-driven hub of economic activity

January 29, 2024

Great Lakes Water Innovation Engine (Illinois, Ohio and Wisconsin), led by Current Innovation NFP, aims to discover, develop and deploy innovative key technologies that attract water-intensive manufacturers to the region, recover valuable energy and mineral resources from wastewater streams, and foster workforce opportunities, all while maintaining environmental health.

David Lampert

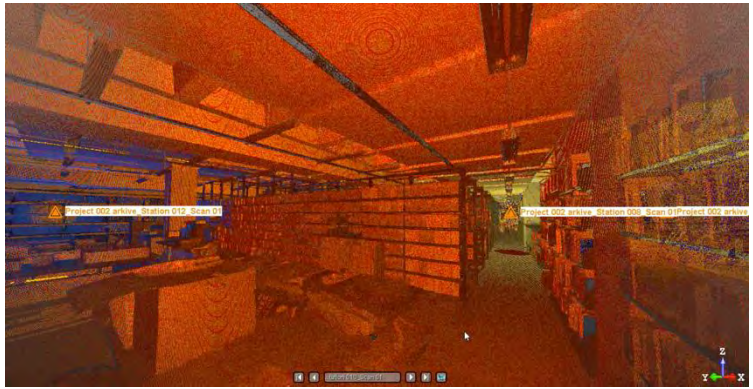
- Over 50 participating organizations
- Up to $160M over 10 years
  Lampert - $200k in Y1-2

https://greatlakesrenew.org/

A big new addition – Trimble Technology Lab

Ivan Mutis

Trimble, Illinois Tech Partner to Establish Trimble Technology Lab



Trimble TECHNOLOGY LAB at Illinois Institute of Technology

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A big new renovation – Structures Laboratories

Matt Gombeda

Lab Renovations Include Unique All-In-One Concrete Testing

https://www.iit.edu/news/lab-renovations-include-unique-all-one-concrete-testing

CAEE @ IIT: Adjunct faculty (20+)

Paul Anderson, PhD
Retired, IIT Associate Professor

Steven Barrett, PE
Fire Protection Engineer III, SmithGroup

Julide Bozoglu, PhD
Director of Digital Practice, Goettsch Partners

William (Bill) Briggs, EdD
President, Dr. Elzie Young Community Center

Michael Desch, PhD
Staff Engineer, AISC

Ferdinand Dimailig
Principal, BOX Studios

Mojtaba Dirbaz, PhD, PE
Discipline Manager, L&T Technology Services

Abbas Divani, PhD, PE
Civil Engineer, Illinois DOT

August (Gus) Domel, PhD, SE, PE
Principal, Engineering Systems, Inc.

Larry Dorn, MS
Architecture/Construction Consultant

Bill Franek, PhD, PE
Retired, IL EPA

Don Grabowski, PE
VP Rail Services, GSG Consultants

Christopher Haite
Senior PMIS Implementation Specialist, AECOM

Soliman Khudeira, PhD, PE, SE
Section Chief, City of Chicago

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CAEE @ IIT: Adjunct faculty (20+)

Anatol Longinow, PhD, PE
Retired Consultant, WJE

Ajit Naik, PE
Director of Building Performance Analytics
Baumann Consulting

Ibrahim Osman, PhD
Asst Vice President, Bowman Consulting

Juan Quiroz, PhD
Principal Structural Engineer, Stantec

Laurence Rohter, MS, PE
Senior Science Advisor, IITRI (retired)

Rich Schultz, PhD, GISP, CPG
Assoc Res Scientist, Prairie Research Inst
President, IL GIS Association

Sania Seilabi
Postdoctoral Fellow, University of Buffalo

PS Sriraj, PhD
Director, UIC Urban Transportation Center

Lipika Swarup, PhD
Project Controls Specialist III, Fermilab

Jennifer Wilkie, PhD, PE
Principal Engineer, Jacobs Engineering

Rebecca Wingate
Associate, Cambridge Systematics

Chris Winnie, PE
Mechanical Engineer III, SmithGroup

Tommy Zakrzewski, PhD
Principal, Director of Building Eng. Physics, HKS

Where do our graduates work?

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Hands-on experiences are integral to CAEE majors

CAE 105 Surveying

CAE 110 ITP

Discover Day

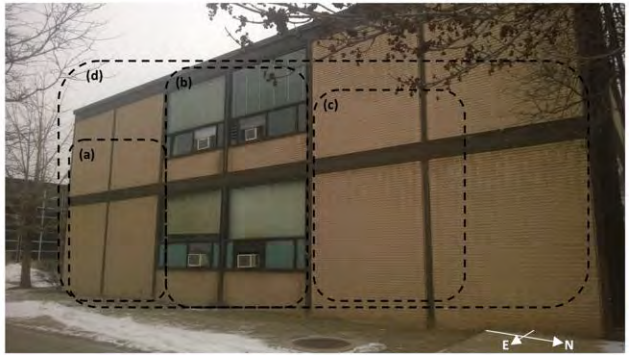
Hands-on experiences are integral to CAEE majors

CAE 307 Concrete Design

Discover Day

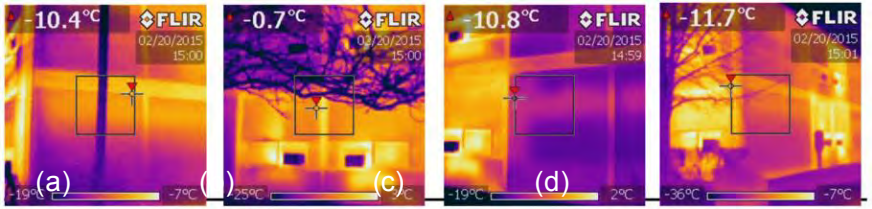
Hands-on experiences are integral to CAEE majors

CAE 463 Building Enclosure Design

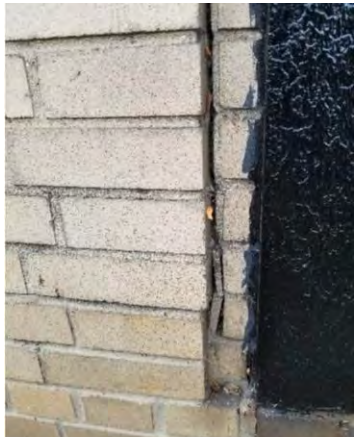


FAÇADE INSPECTION REPORT

Fall 2018

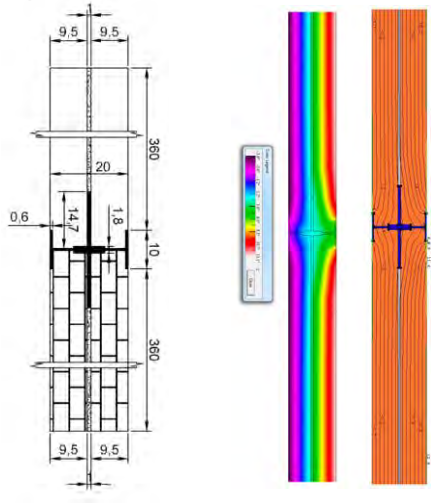


CAE 506 Building Envelope Rehab



25) Vertical debonding of mortar at column.

26) Vertical foundation crack.



Hands-on experiences are integral to CAEE majors

Professional Development & Networking

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For more information on our department, programs, and people:
https://www.iit.edu/caee

Undergraduate advising:
https://www.iit.edu/caee/student-resources/undergraduate-academic-advising

People:
https://www.iit.edu/caee/people

Dr. Brent Stephens
Professor and Department Chair
brent@iit.edu

Dr. Stephen Kleps
Associate Teaching Professor
Associate Chair of Undergraduate Affairs
klepste@iit.edu

Bachelor of Science in Architectural Engineering

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Last updated Sept 2023 for Spring 2024

Semester 1 – Fall (17 hours)

- CAE 100 (2) Engineering Drawing
- CAE 105 (2) Surveying
- MATH 151 (5) Calculus I
- CHEM 124 (4) Chemistry I or CHEM 122+123
- CAE 110 (1) Intro to Prof I
- 200 Level HUM (3)

Pre-requisite; Co-requisite

Semester 2 – Spring (17 hours)

- CAE 101 (2) AutoCAD
- MATH 152 (5) Calculus II
- PHYS 123 (4) Physics I
- CS 104 (2) Computer Programming
- CAE 111 (1) Intro to Prof II
- AAH 119 or AAH 120 (3) Arch. History

Semester 3 – Fall (17 hours)

- PHYS 221 (4) Physics II
- CAE 286 (3) Structural Mechanics
- MATH 251 (4) Calculus III
- CAE 208 (3) Thermo-dynamics
- Human Sciences Course (3)

Semester 4 – Spring (16 hours)

- CAE 312 (3) Engineering Systems
- CAE 287 (3) Mechanics of Materials
- MATH 252 (4) Differential Equations
- CAE 302 (3) Fluid Mechanics
- Human Sciences Course (3)

Semester 5 – Fall (15 hours)

- CAE 383 (3) Electrical Circuits
- CAE 304 (3) Structural Analysis I
- CAE 315 (3) Construction Materials
- CAE 331 (3) Building Science
- IPRO 397/497 (3)

Semester 6 – Spring (18 hours)

- Human Sciences Course (3)
- CAE 303 (3) Steel Structures I
- CAE 466 (3) Electric/Ltg Design [a]
- CAE 307 (3) Concrete Structures I
- CAE 464 (3) HVAC Design
- IPRO 397/497 (3)

[a] **Or** CAE 323 (w/ CAE 302 co-req) if structures-focused

Semester 7 – Fall (15 hours)

- CAE 468 (3) Architectural Design
- CAE 470 (3) Construction Estimating
- CAE 461 (3) Plumbing and Fire Protect.
- CAE 4xx (3) Technical Elective I
- Human Sciences Course (3)

Semester 8 – Spring (15 hours)

- CAE 496 (0) FE Exam Prep *Register for FE*
- CAE 495 (3) Senior Capstone
- CAE 471 (3) Construction Planning
- CAE 4xx (3) Technical Elective 2
- CAE 4xx (3) Technical Elective 3
- Human Sciences Course (3)

NEW! CAE 495 is now Spring-only; December graduates take in their last Spring semester

Total credit hours required: 130 (ABET accredited)

Legend:

- General education
- Math and science
- CAEE
- IPRO
- Co-requisite/ can be taken at the same time
- Pre-requisite
- Offered in the semester shown
- Offered Fall/Spring

- MMAE 320 can replace CAE 208; MMAE 313/CAE 209 can replace CAE 302
- MMAE 200 and 202 no longer count for CAE 286 and 287 after Fall 2022
- Technical electives must be CAE, ENVE, EG, or EMGT 400- or 500-level
  - Tech Electives, IPROs, & H/SS as they fit; Max. 1 EG or EMGT elective

Human Sciences requirements:

- 3 hrs of HUM 200 level
- 6 hrs of 300/400 level **(H)**umanities (AAH, COM, HIST, HUM, LIT or PHIL)
- 9 hrs of **(S)**ocial Sciences (ECON, PS, PSYC, SOC or SSCI):
  - 6 hrs @ 300/400 level & courses from at least 2 different fields

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Semester 1 – Fall (17 hours)

- CAE 100 (2) Engineering Drawing
- CAE 105 (2) Surveying
- MATH 151 (5) Calculus I
- CHEM 124 (4) Chemistry I or CHEM 122+123
- CAE 110 (1) Intro to Prof I
- 200 level HUM (3)

Pre-requisite; Co-requisite

Semester 2 – Spring (17 hours)

- CAE 101 (2) AutoCAD
- MATH 152 (5) Calculus II
- PHYS 123 (4) Physics I
- CS 104 (2) Computer Programming
- CAE 111 (1) Intro to Prof II
- Human Sciences Course (3)

Semester 3 – Fall (17 hours)

- PHYS 221 (4) Physics II
- CAE 286 (3) Structural Mechanics
- MATH 251 (4) Calculus III
- ENVE 201 (3) Earth Environ Science [a]
- Human Sciences Course (3)

[a] **Or** PHYS 360, BIOL 105, or CAE 221

Semester 4 – Spring (16 hours)

- MATH 252 (4) Differential Equations
- CAE 302 (3) Fluid Mechanics
- CAE 287 (3) Mechanics of Materials
- CAE 312 (3) Engineering Systems
- Human Sciences Course (3)

Semester 5 – Fall (15 hours)

- MMAE 305 (3) Dynamics
- ENVE 401 (3) Intro to Water Resources
- CAE 304 (3) Structural Analysis I
- CAE 315 (3) Construction Materials
- Human Sciences Course (3)

Semester 6 – Spring (15 hours)

- CAE 323 (3) Geotechnical Engineering
- CAE 303 (3) Steel Structures I
- CAE 307 (3) Concrete Structures I
- Human Sciences Course (3)
- IPRO 397/497 (3)

Semester 7 – Fall (18 hours)

- CAE 4xx (3) Technical Elective 1
- CAE 457 (3) Geotechnical Foundation
- CAE 431 (3) Steel Structures II
- CAE 432 (3) Concrete Structures II
- CAE 419 (3) Transportation Engineering
- CAE 470 (3) Construction Estimating

Semester 8 – Spring (15 hours)

- CAE 495 (3) Senior Capstone
- CAE 4xx (3) Technical Elective 2
- CAE 4xx (3) Technical Elective 3
- CAE 496 (0) FE Exam Prep *Register for FE*
- IPRO 397/497 (3)
- Human Sciences Course (3)

NEW! CAE 495 is now Spring-only; December graduates take in their last Spring semester

Total credit hours required: 130 (ABET accredited)

Legend:

- General education
- Math and science
- CAEE
- IPRO
- Co-requisite/ can be taken at the same time
- Pre-requisite
- Offered in the semester shown
- Offered Fall+Spring

- Technical electives must be CAE, ENVE, EG, or EMGT 400- or 500-level
  - Tech Electives, IPROs, & H/SS as they fit; Max. 1 EG or EMGT elective
- MMAE 200 and 202 no longer count for CAE 286 and 287 after Fall 2022

Human Sciences requirements:

- 3 hrs of HUM 200 level
- 6 hrs of 300/400 level **(H)**umanities (AAH, COM, HIST, HUM, LIT or PHIL)
- 9 hrs of **(S)**ocial Sciences (ECON, PS, PSYC, SOC or SSCI):
  - 6 hrs @ 300/400 level & courses from at least 2 different fields
- 3 hrs of any level either (H) umanities or (S)ocial/behavioral sciences