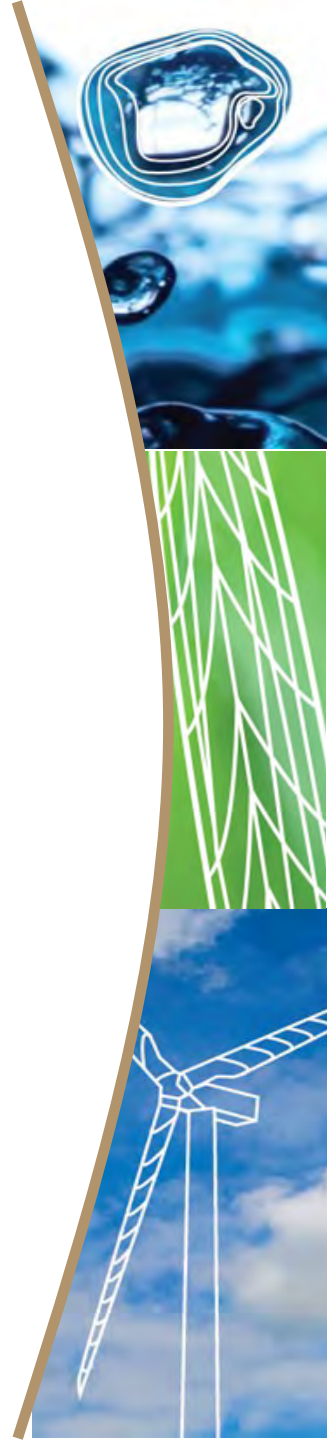


Partners for Pollution Prevention Quarterly Meeting

Hosted by
Environmental and Ecological Engineering
at Purdue University

June 2013



Welcome to Purdue!

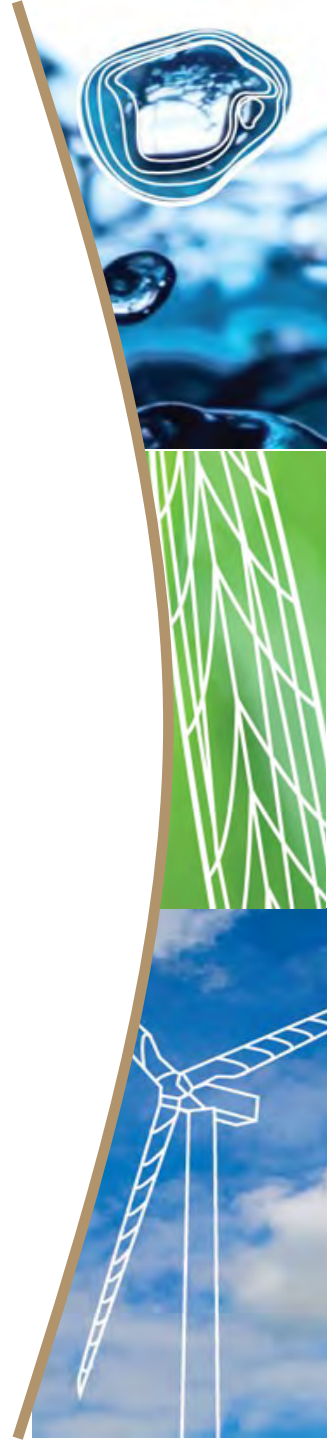


You are here!



Environmental and Ecological Engineering (EEE)

- ◆ **Dr. John Sutherland**
 - **Fehsenfeld Family Head of Environmental and Ecological Engineering**
- ◆ **Nate Engelberth**
 - **Associate Director of Advising / Student Services Coordinator**



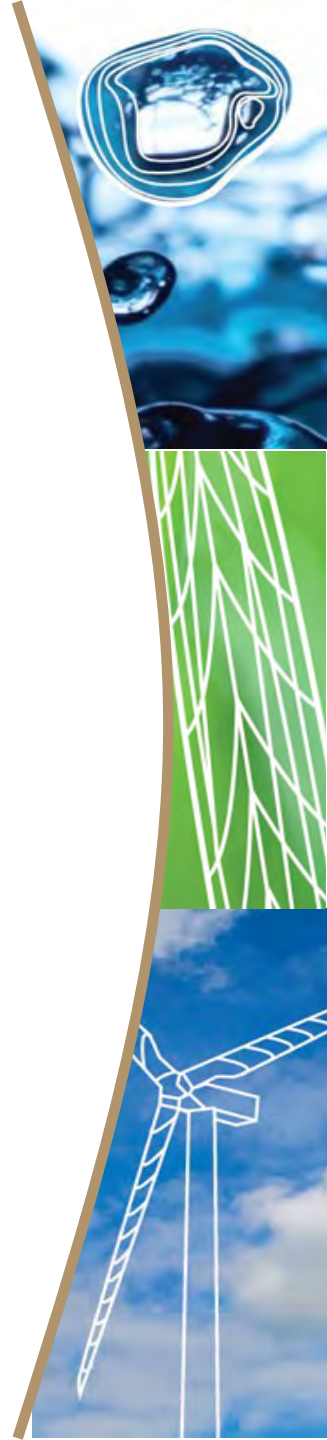
Armstrong Hall



Armstrong Hall

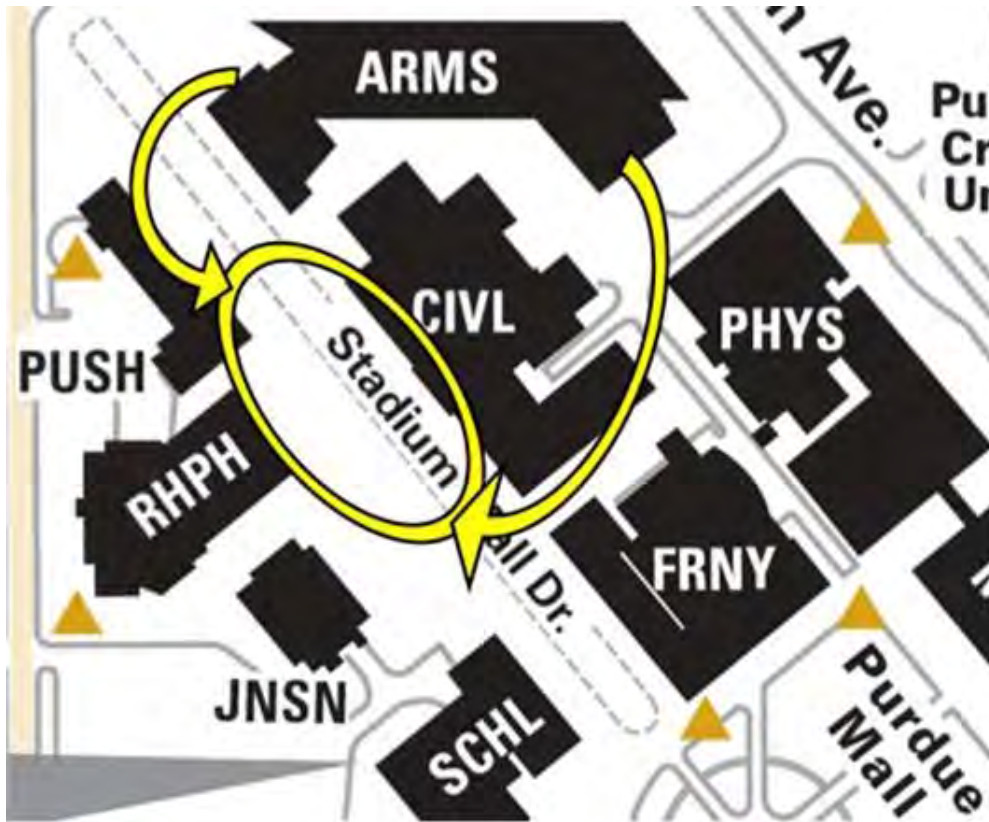
◆ Flagship of the College of Engineering

- **First Year Engineering**
- **Engineering Education**
- **Labs**
 - **Drop Tower**
 - **Structural Dynamics**
 - **Fatigue and Fracture**
 - **Aerodynamics**
 - **Control Systems**
 - **Propulsion**



Armstrong - Safety

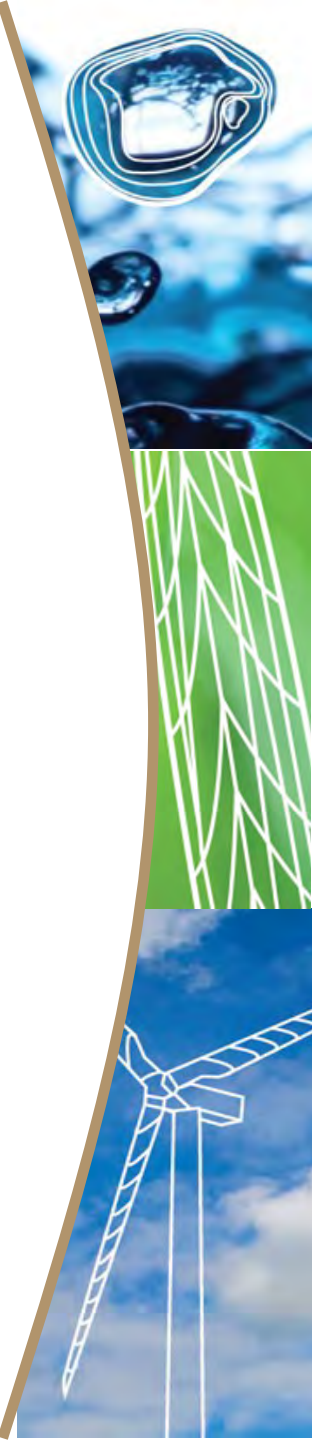
◆ Emergency Assembly Area



Armstrong - Safety

◆ Emergency Procedures

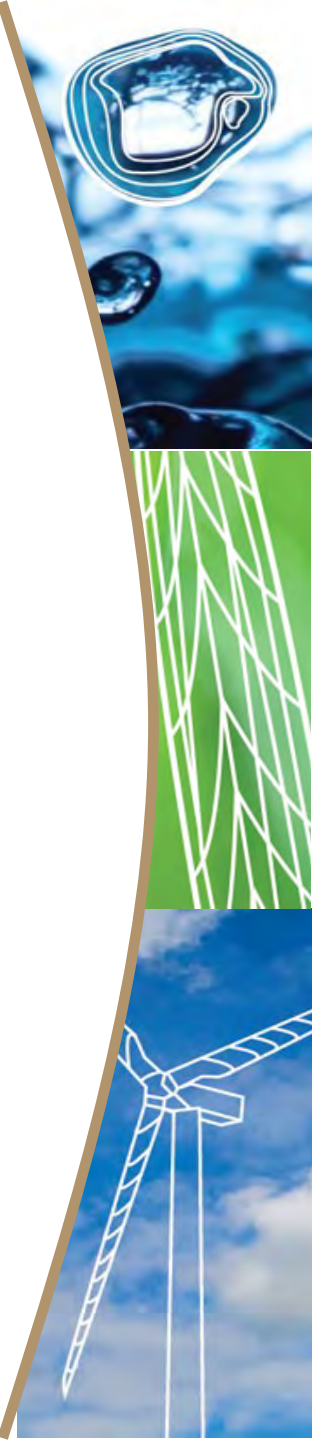
- **Siren (All-hazard emergency warning)**
 - Shelter in-place
- **Fire Alarm**
 - Immediately evacuate the building to
Emergency Assembly Area



Armstrong – Safety

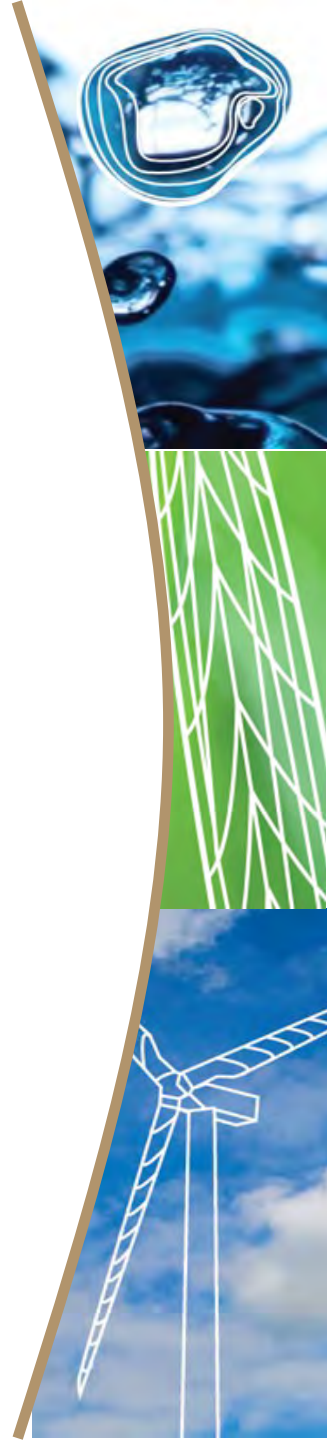
◆ Lab Awareness

- Many labs, most located on 2nd and 3rd floors
- There may be students, staff, or faculty carrying covered liquids or parts of experiments



Synergies Between EEE & P2

- ◆ **Pollution Prevention**
 - Core focus of EEE & P2
- ◆ **EEE Student Placement**
- ◆ **EEE Research/Faculty Expertise**
- ◆ **How can we help one another?**



Some Global Issues

Built environment



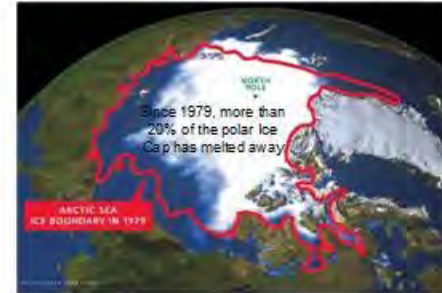
Energy



Material Resources



Climate Change



Developing World



Clean Air



Water Resources

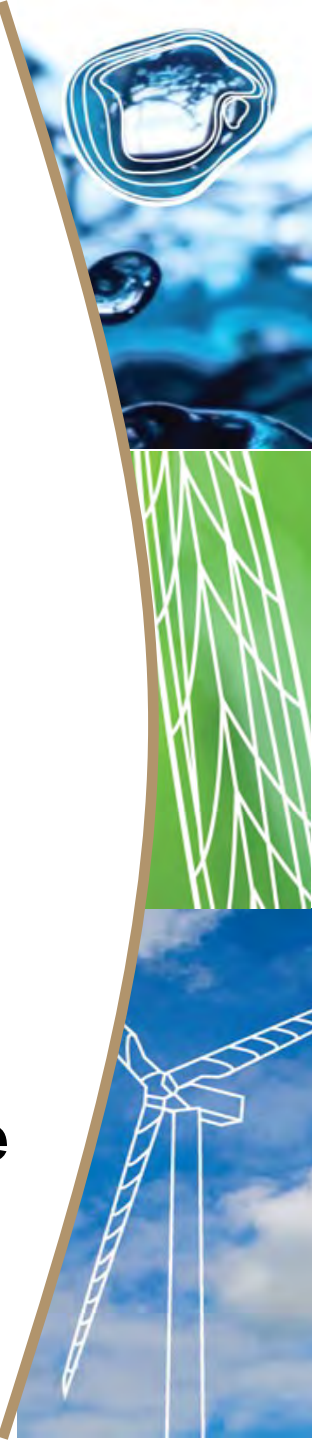


Solid Waste



Purdue's Response

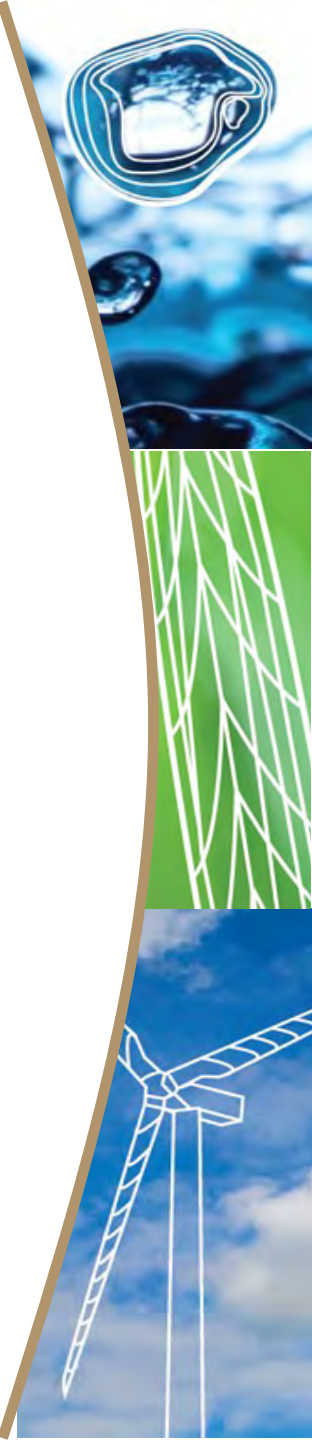
- ◆ In 2006, the College of Engineering established a new academic unit:
Division of Environmental and Ecological Engineering
- ◆ Its charge:
 - Develop undergraduate and graduate programs in EEE
 - Catalyze research activities within and external to the college to address complex environmental challenges through multidisciplinary collaboration
 - Pursue excellence in all endeavors and raise visibility of environmental activities



EEE Vision

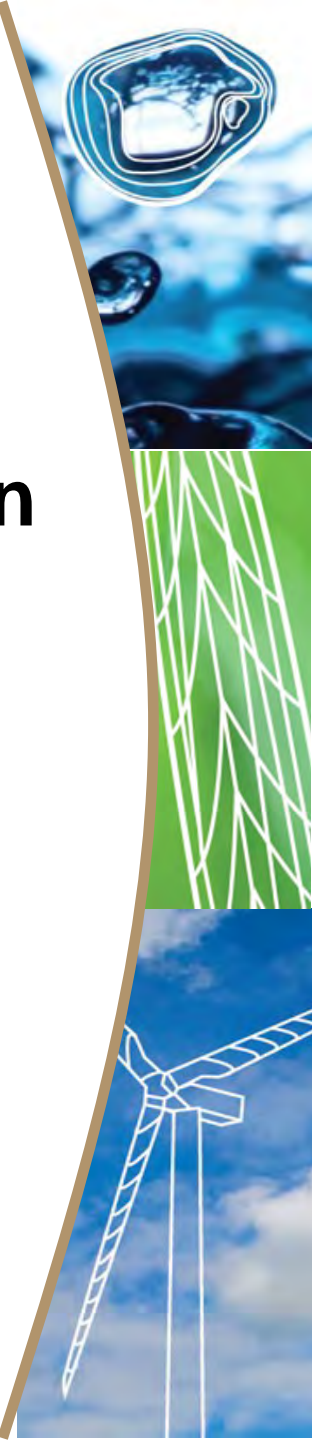
The vision for EEE embraces:

- ♦ **Methods to rehabilitate and restore contaminated sites/media,**
- ♦ **Technologies to manage and control waste streams, and**
- ♦ **Approaches to design and operate engineered systems to prevent, avoid, and/or minimize environmental problems.**



Philosophy of EEE

- ◆ **All engineering projects have environmental impacts. EEE seeks to understand these impacts, and design to minimize them, now and into the future.**
- ◆ **EEE is interdisciplinary, working with all types of engineers and others to design solutions at the boundary of engineered and natural systems.**



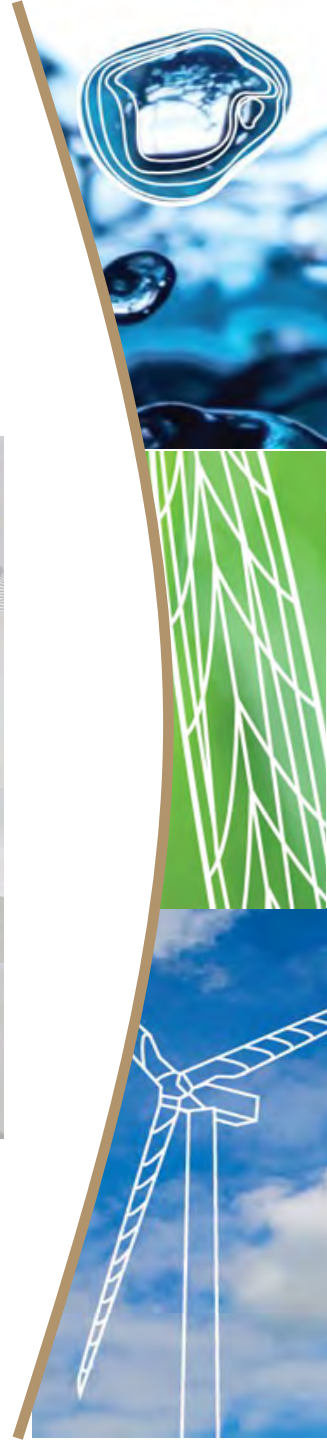
Environment across Engineering

**46 Professors
are involved in
EEE
— a truly
interdisciplinary
effort —
together they
support the
newest degree
program at
Purdue.**



Environment across Engineering

CE



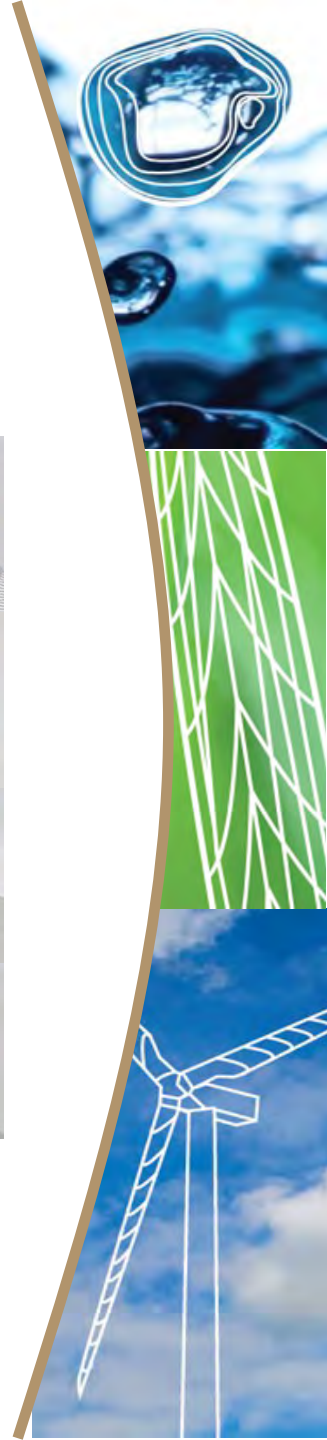
Environment across Engineering

CE
ABE



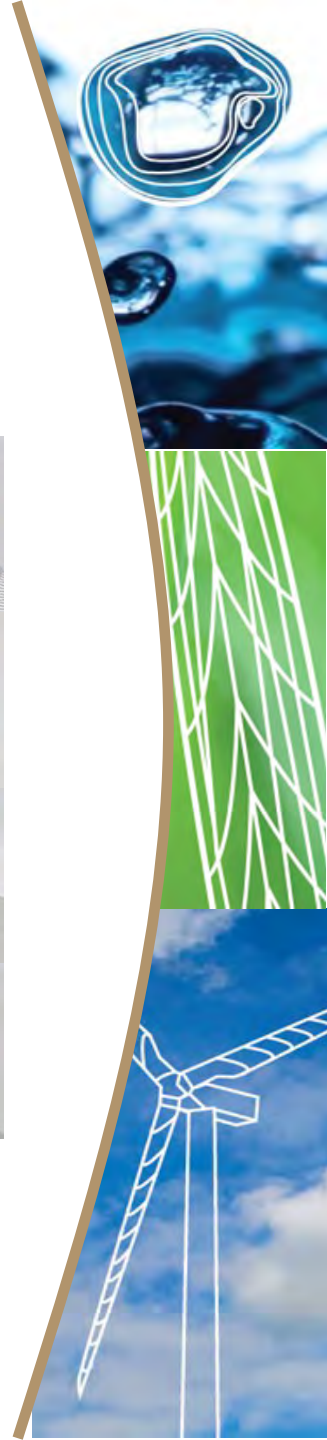
Environment across Engineering

CE
ABE
ME



Environment across Engineering

CE
ABE
ME
ENE



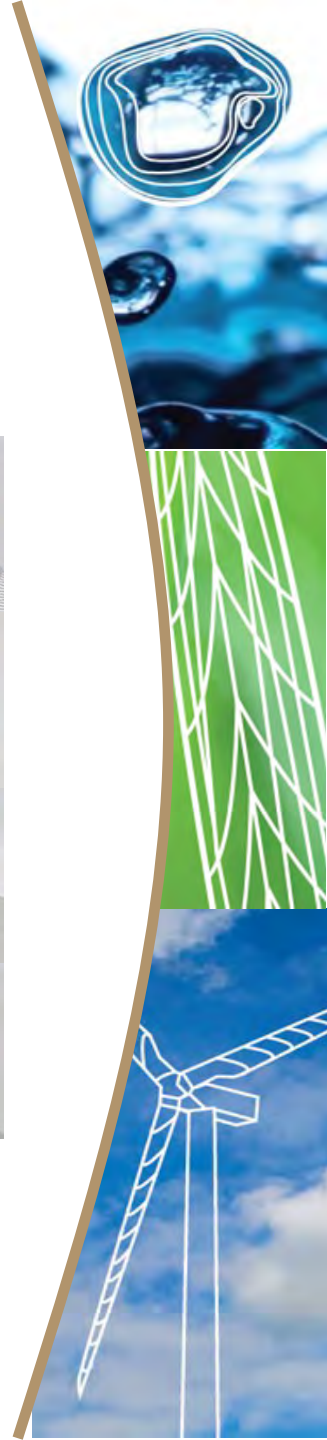
Environment across Engineering

CE
ABE
ME
ENE
CHE



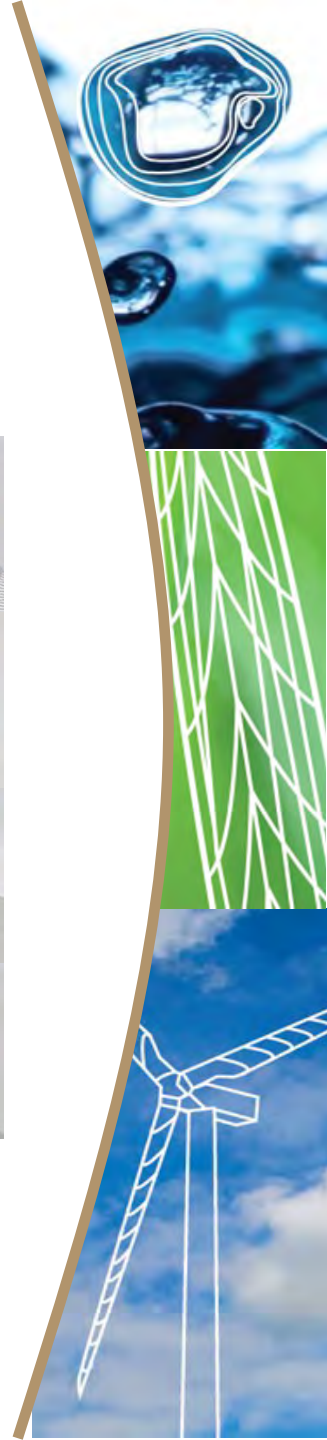
Environment across Engineering

CE
ABE
ME
ENE
CHE
MSE



Environment across Engineering

CE
ABE
ME
ENE
CHE
MSE
AAE



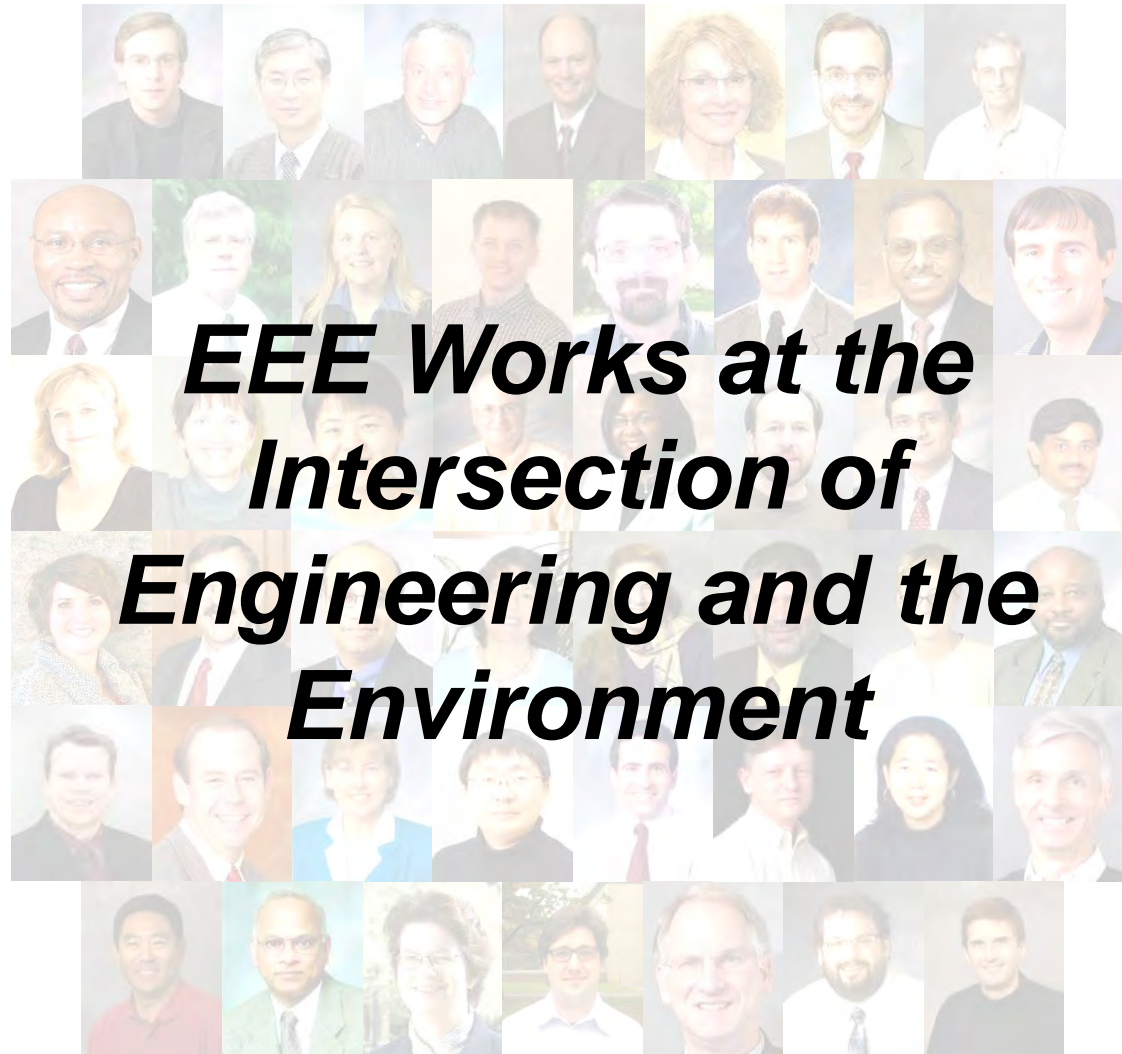
Environment across Engineering



CE
ABE
ME
ENE
CHE
MSE
AAE
Other



Environment across Engineering



Demand for Environmental Engrs.?

Engineering Job Outlook (BLS)

| Occupation | Jobs (2010) | Proj. Change 2010-20(%) |
|------------------|---------------|----------------------------|
| BioMedE | 15,700 | 61.7 |
| Env Engrs | 51,400 | 21.9 |
| CivE | 262,800 | 19.4 |
| Health/Safety | 23,700 | 13.0 |
| NucE | 19,100 | 10.2 |
| CompE | 70,000 | 9.0 |
| Ag/BioE | 2,700 | 9.0 |
| MechE | 243,200 | 8.8 |
| MatlsE | 22,300 | 8.7 |
| IndE | 203,900 | 6.4 |
| ElecE | 294,000 | 6.0 |
| ChemE | 20,200 | 5.9 |
| AeroE | 81,000 | 4.9 |

You Bet!



Career Paths for Our Students

- ◆ **Natural Resources Engineering**
 - Provide clean water and preserve other resources
- ◆ **Pollution Control, Monitoring, Abatement, and Remediation**
- ◆ **Manufacturing (managing waste streams & enterprise greening)**
- ◆ **Energy Technology**
- ◆ **Built environment**
- ◆ **Sustainability Engineering**



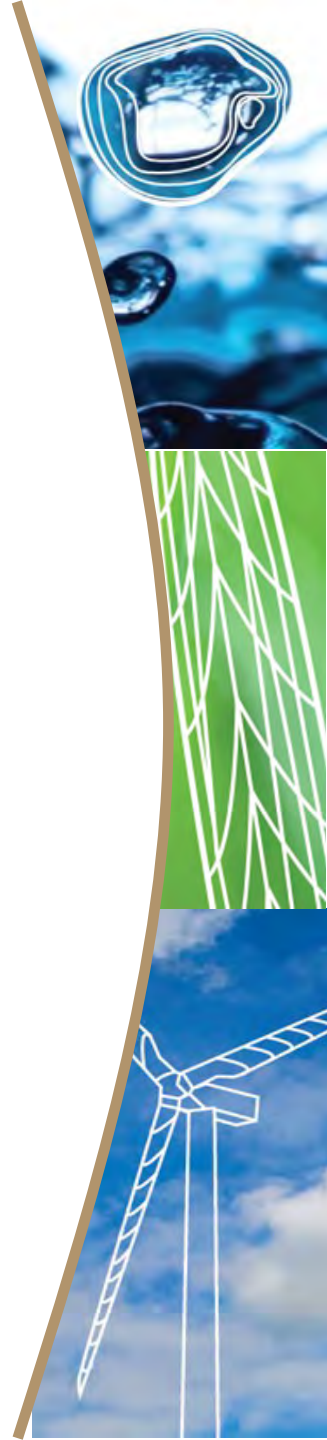
EEE Curriculum Status

◆ Undergraduate Program

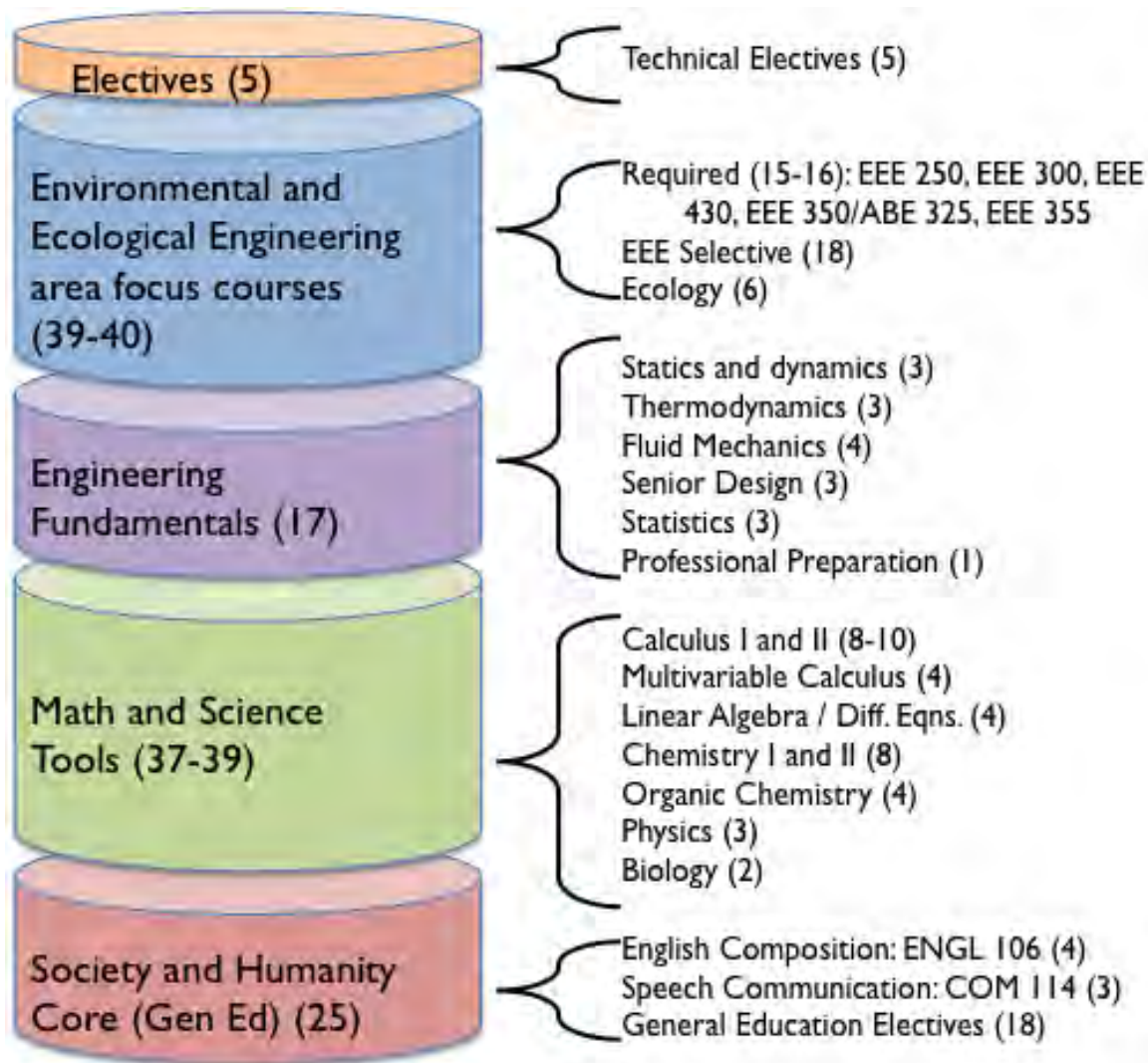
- EEE Minor
- BSEEE degree (was approved last Sept.) – first graduates produced this spring

◆ Graduate Program

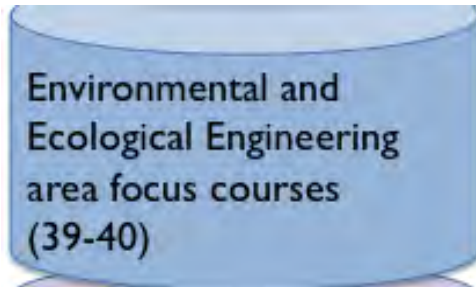
- Currently planning MS and PhD programs



EEE Curriculum



EEE Curriculum



***THESE ARE THE
COURSES THAT
HELP MAKE
PURDUE EEE
UNIQUE:***

**Traditional Environmental Engineering Skills:
EEE 350/ABE 325, EEE 300**

**Complex Systems and Sustainability:
EEE 250, EEE 355, EEE 430**

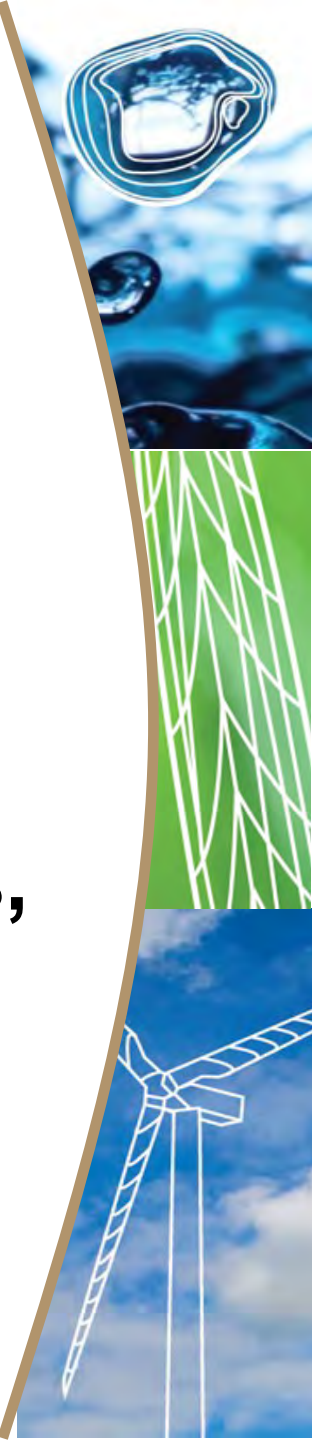
**Flexibility to Study across Environment and Engineering:
18 credits of EEE Selectives**

**Ecology Focus:
BIOL 286, BIOL 585**



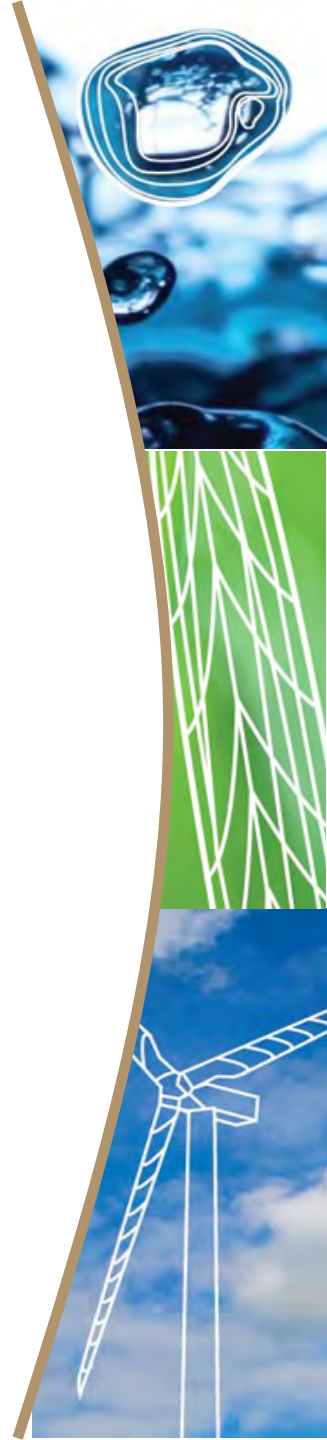
EEE Themes

- ◆ **Water, Air, Soil, and Natural Resources Engineering**
- ◆ **Energy Systems and Energy Conservation Engineering**
- ◆ **Urban Systems, Industrial Systems, and Sustainability Engineering**



EEE Highlighted Classes

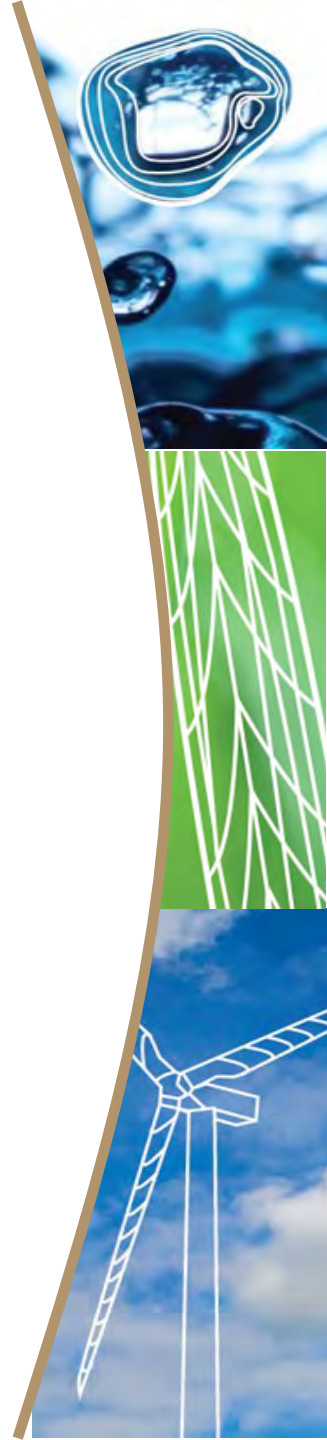
- ◆ **Urban Water Projects**
- ◆ **EEE Laboratory**
- ◆ **Regulations and Compliance**



EEE Student Skill Sets

◆ After Sophomore Year

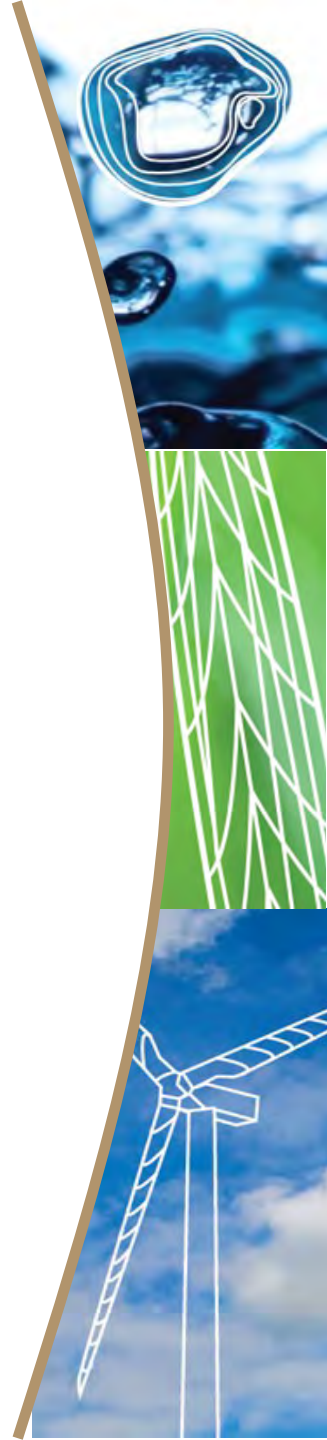
- **Multivariate Calculus/Linear Algebra**
- **Statics**
- **Thermodynamics**
- **Organic Chemistry**
- **EEE Systems**
- **Engineering Environmental Sustainability**



EEE Student Skill Sets

◆ After Junior Year

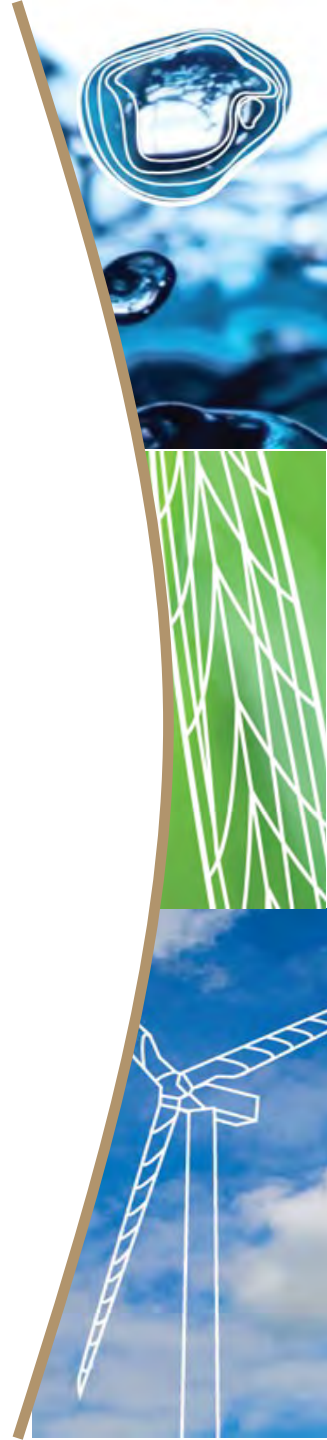
- Dynamics
- Hydraulics (Fluid Mechanics)
- Environmental Engineering
- Environmental Modeling
- Professional Practice
- Industrial Ecology
- Life Cycle Analysis
- Statistics
- EEE Selectives



EEE Student Skill Sets

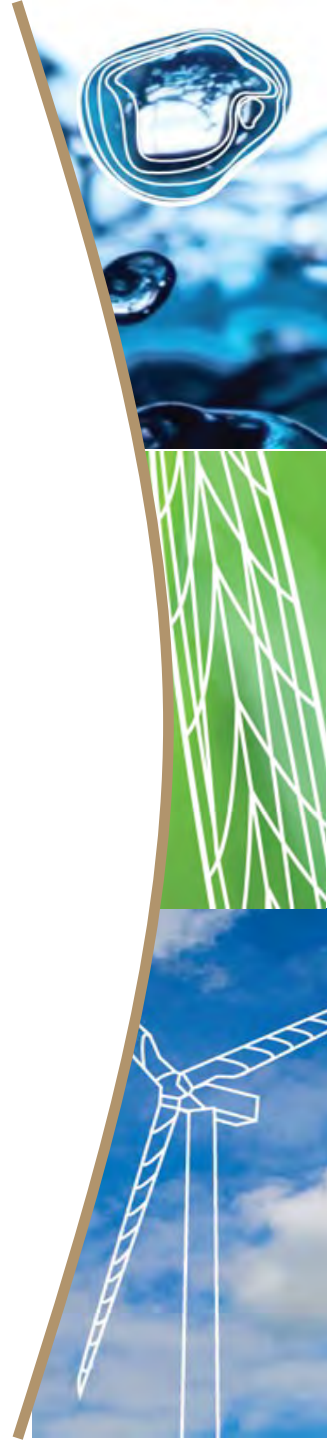
◆ Senior

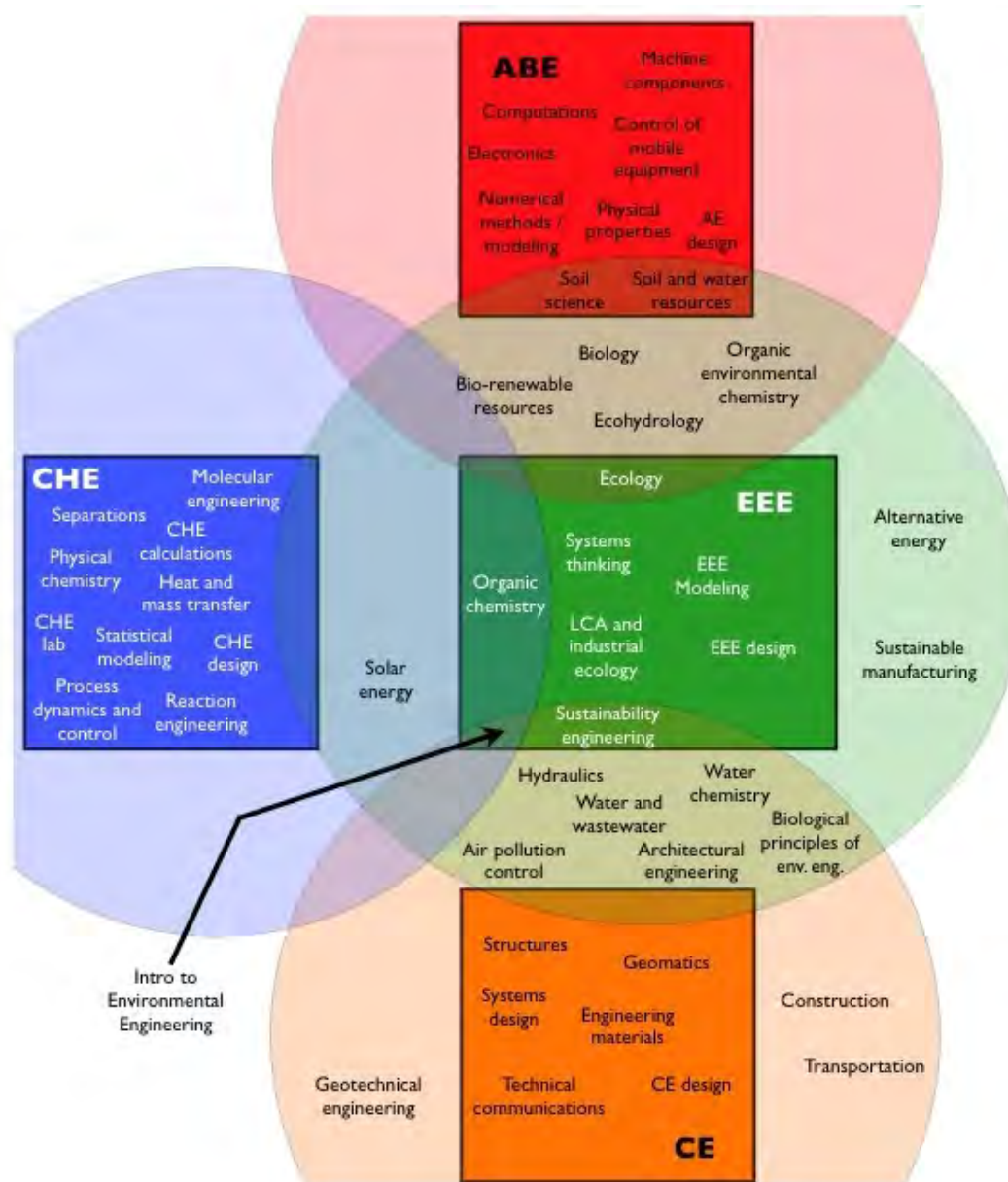
- Senior Design
- Ecology
- EEE Selectives



EEE Selectives

- ◆ EEE 495 Regulations and Compliance
- ◆ EEE 495 Water and Wastewater Treatment
- ◆ ABE 325 Soil and Water Resources Engineering
- ◆ CE 457 Air Pollution Control and Design
- ◆ ME 597 Sustainable Design and Manufacturing
- ◆ ME 597 Sustainable Energy Options and Analysis
- ◆ CE 515 Building Energy Audits
- ◆ CE 597 Sustainable Building Design, Construction, & Operation
- ◆ CE 311 Architectural Engineering
- ◆ ASM 540 GIS Applications





Basic Math and Science — Chemistry, Physics, Calculus, Differential Equations, Linear Algebra

Engineering Core — First-Year Engineering, Statics, Dynamics, Thermodynamics, Materials, Statistics

Society and Humanity — Communication, Composition, Social Sciences and Humanities Electives ("General Education")

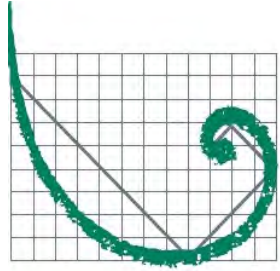


ENVIRONMENTAL & ECOLOGICAL
ENGINEERING

EEE Internships



EEE Placement



ERM

ExxonMobil



KERAMIDA
Global EHS & Sustainability Services



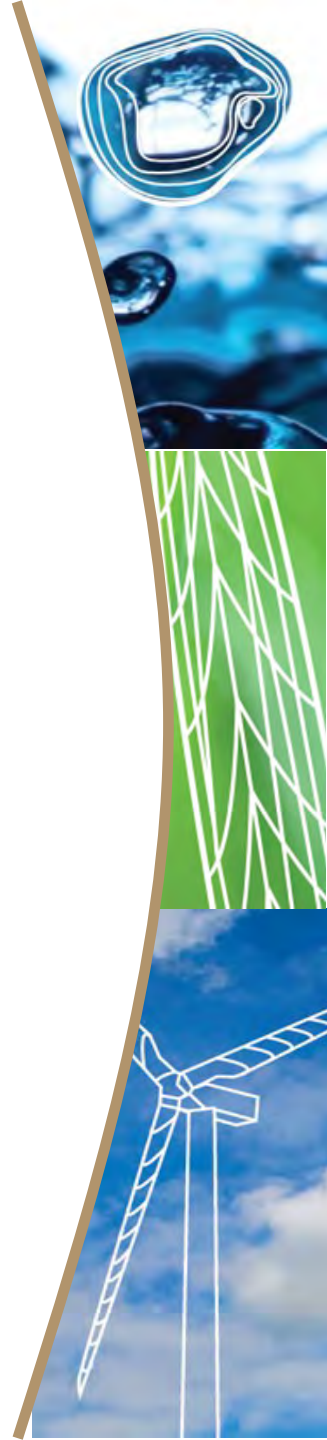
KOHL'S

INTERNATIONAL  PAPER

SA
STRAND
ASSOCIATES[®]

Industry Interaction with EEE

- ◆ Research projects
- ◆ Testing agreements
- ◆ Collaborations
- ◆ Senior design projects
- ◆ Consulting



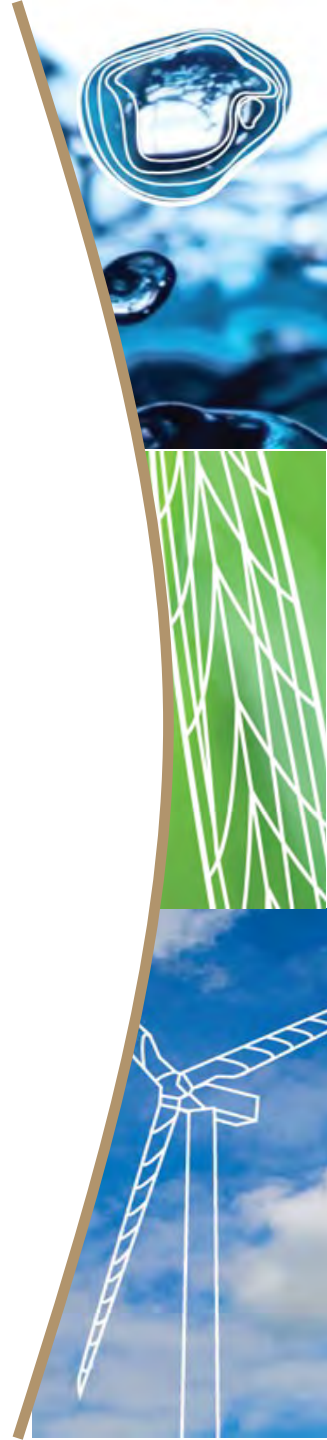
Research

- ◆ **Water Treatment**
 - Blatchley, Engel, Howarter, Jafvert
- ◆ **Sustainable Energy Development and Impacts**
 - Engel, Braun, Sutherland, Chaubey, Zhao, Frankenberger, Cherkauer
- ◆ **Climate Change and Carbon Footprints**
 - Cherkauer, Zhao, Sutherland, Frankenburger, Chaubey
- ◆ **Watershed Processes and Monitoring**
 - Frankenburger, Chaubey, Engel, Mohtar, Rao



Research – 2

- ◆ **Watershed Management and Modeling**
 - Chaubey, Frankenburger, Mohtar, Engel
- ◆ **Environmental Remediation**
 - Jafvert, Rao, Chaubey
- ◆ **Life Cycle Assessment / Sustainable Manufacturing**
 - Zhao, Sutherland, Tao, Ramani, Hua, Handwerker, Howarter, Nies



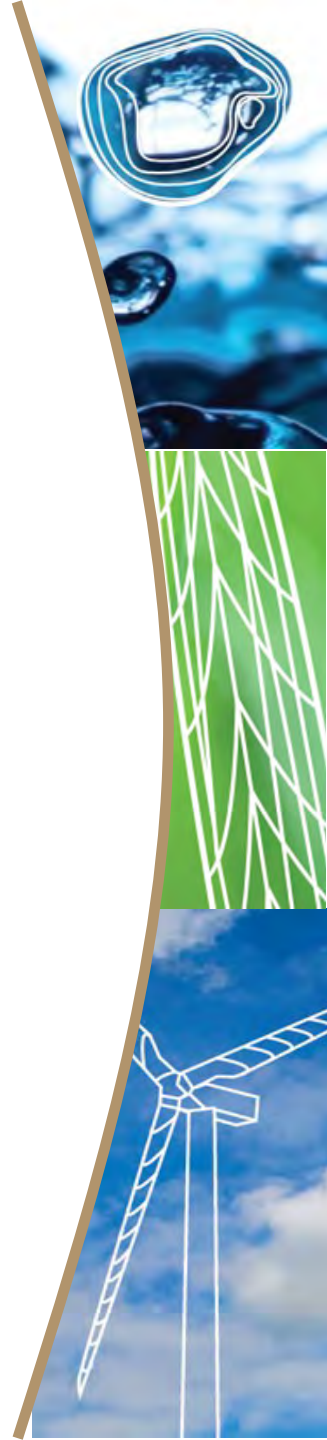
Research – 3

♦ Engineering Education and Outreach

- Cox, Ramani, Zhao, Hua, Mohtar, Cherkauer, Fentiman, Chaubey, Frankenburger, Harris

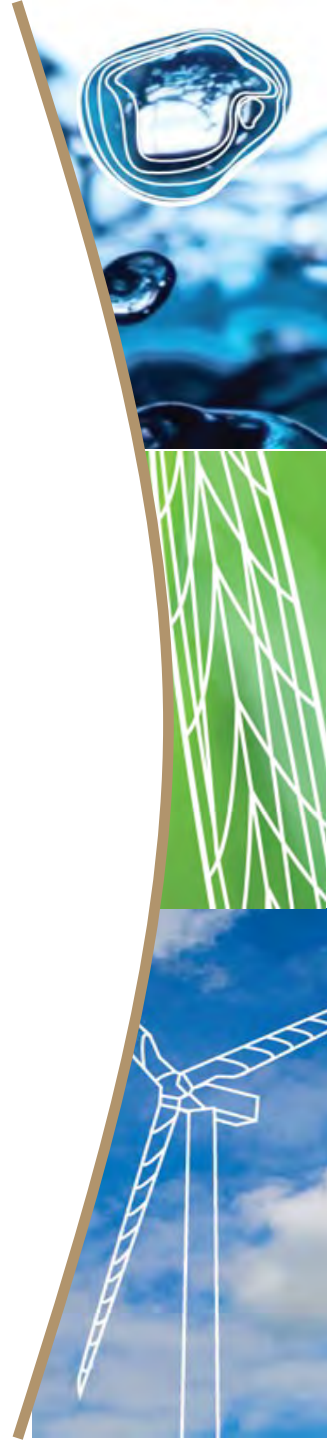
♦ Environmental Fate of Chemicals and Nanomaterials

- Nies, Jafvert, Hua



Senior Design

- ◆ **We are always looking for senior design and other projects!**
- ◆ **Water filtration in the developing world**
- ◆ **Recycling of LCD TVs**
- ◆ **Urban farming**
- ◆ **Alternative energy for homes**
- ◆ **WERC – an environmental design competition**



EEE Wrap Up

◆ Questions?

◆ Thank you for coming!

