Does your company have potential BE Capstone Design Projects?

Do you want to support the BE Capstone Design Program?

Contact:
Dr. Luke Reese
Industry Liaison / Assoc. Professor
Michigan State University
Biosystems & Agricultural Engineering
524 S. Shaw Lane
103C Farrall Hall
East Lansing, MI 48824
(517) 353-3258
reesel@msu.edu

Real world design projects:
- Solved by student teams
- Advised by faculty
- Supported by industry

Specialty areas:
- Bioenergy Engineering
- Biomedical Engineering
- Ecosystems Engineering
- Food Engineering
## A Capstone Design Project:

<table>
<thead>
<tr>
<th>Requires engineering design</th>
<th>Bioenergy Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combines biology and engineering</td>
<td>Torrefaction Process Improvement</td>
</tr>
<tr>
<td>Solves a real problem</td>
<td>Increase product yield of torrefaction process.</td>
</tr>
<tr>
<td>Uses a holistic and systems approach</td>
<td>Sponsor: Heat Transfer International</td>
</tr>
<tr>
<td>Interprets data and statistics</td>
<td>Wastewater Treatment Using Anaerobic Digester</td>
</tr>
<tr>
<td>Interprets social and environmental impacts</td>
<td>Design and develop a novel, efficient pilot-scale (0.45 m$^3$) up flow and fixed film anaerobic digester.</td>
</tr>
<tr>
<td>Evaluates economic feasibility</td>
<td>Sponsor: Technova</td>
</tr>
<tr>
<td>Delivers a comprehensive, professional design report</td>
<td>Biomedical Engineering</td>
</tr>
<tr>
<td>Requires team presentations to industry, faculty, general community, and peers</td>
<td>Dried Blood Storage Device</td>
</tr>
<tr>
<td></td>
<td>Filter paper to efficiently dry and store blood samples.</td>
</tr>
<tr>
<td></td>
<td>Sponsor: Pfizer, Inc.</td>
</tr>
<tr>
<td></td>
<td>Design of a LED/Fiber Optic Treatment for Infant Jaundice</td>
</tr>
<tr>
<td></td>
<td>Design a portable, wearable, cost-efficient treatment for infant jaundice.</td>
</tr>
<tr>
<td></td>
<td>Sponsor: Sygiene</td>
</tr>
<tr>
<td></td>
<td>Ecosystems Engineering</td>
</tr>
<tr>
<td></td>
<td>Site Evaluation and Design Plan for a Created Forested Wetland Student</td>
</tr>
<tr>
<td></td>
<td>Designed wetland for US 27 road construction site.</td>
</tr>
<tr>
<td></td>
<td>Sponsor: Michigan Department of Transportation</td>
</tr>
<tr>
<td></td>
<td>Water Quality Best Management Practices Design for a City of Lansing Re-Development Project</td>
</tr>
<tr>
<td></td>
<td>Design of an efficient stormwater runoff treatment system for a parking lot re-development.</td>
</tr>
<tr>
<td></td>
<td>Sponsor: Tetra Tech</td>
</tr>
<tr>
<td></td>
<td>Food Engineering</td>
</tr>
<tr>
<td></td>
<td>Hydroponic Processing Optimization for Mung Bean Sprouts</td>
</tr>
<tr>
<td></td>
<td>Optimization of hydroponic system for mung bean sprouts.</td>
</tr>
<tr>
<td></td>
<td>Sponsor: ConAgra</td>
</tr>
<tr>
<td></td>
<td>Redesign of ProMix Batter Mixer Cooling Mechanisms</td>
</tr>
<tr>
<td></td>
<td>Redesign batter coolant system.</td>
</tr>
<tr>
<td></td>
<td>Sponsor: JBT FoodTech</td>
</tr>
</tbody>
</table>

Since 1906, the Department of Biosystems & Agricultural Engineering has responded to the changing needs of society by integrating and applying principles of engineering and biology in a systems context. Today, biosystems engineers at MSU solve complex, rapidly-changing problems related to food production, quality and safety, ecosystems protection, homeland security and health protection, biomass utilization, and renewable energy development.

### Recent Project Examples:

- **Bioenergy Engineering**
  - **Torrefaction Process Improvement**
    - Increase product yield of torrefaction process.
    - Sponsor: Heat Transfer International
  - **Wastewater Treatment Using Anaerobic Digester**
    - Design and develop a novel, efficient pilot-scale (0.45 m$^3$) up flow and fixed film anaerobic digester.
    - Sponsor: Technova
- **Biomedical Engineering**
  - **Dried Blood Storage Device**
    - Filter paper to efficiently dry and store blood samples.
    - Sponsor: Pfizer, Inc.
  - **Design of a LED/Fiber Optic Treatment for Infant Jaundice**
    - Design a portable, wearable, cost-efficient treatment for infant jaundice.
    - Sponsor: Sygiene
- **Ecosystems Engineering**
  - **Site Evaluation and Design Plan for a Created Forested Wetland Student**
    - Designed wetland for US 27 road construction site.
    - Sponsor: Michigan Department of Transportation
  - **Water Quality Best Management Practices Design for a City of Lansing Re-Development Project**
    - Design of an efficient stormwater runoff treatment system for a parking lot re-development.
    - Sponsor: Tetra Tech
- **Food Engineering**
  - **Hydroponic Processing Optimization for Mung Bean Sprouts**
    - Optimization of hydroponic system for mung bean sprouts.
    - Sponsor: ConAgra
  - **Redesign of ProMix Batter Mixer Cooling Mechanisms**
    - Redesign batter coolant system.
    - Sponsor: JBT FoodTech

### Faculty:

- Evangelyn Alocilja, PhD
- Kirk Dolan, PhD
- Darrell Donahue, PhD, PE
- Daniel Guyer, PhD
- Tim Harrigan, PhD
- David Hodge, PhD
- Amor Ines, PhD
- Dana Kirk, PhD, PE
- Wei Liao, PhD, PE
- Yan "Susie" Liu, PhD
- Bradley Marks, PhD, PE
- Jade Mitchell-Davis, PhD
- Pouyan Nejadhashemi, PhD
- Fei Pan, PhD
- Luke Reese, PhD
- Dawn Reinhold, PhD
- Steven Safferman, PhD, PE
- Chris Saffron, PhD
- Ajit Srivastava, PhD, PE
- Truman Surbrook, PhD
- Tim Whitehead, PhD

Biosystems Engineering (BE) is an ABET accredited B.S. degree program at MSU that prepares students to:
- Identify and solve problems at the interface of biology and engineering, using modern engineering techniques and a systems approach.
- Analyze, design, and manage systems and processes that involve critical biological components.