

# SAE GREEN ENGINEERING & TECHNOLOGY TRANSFER WORKSHOP – HOW CAN A GREEN CENTER HELP THE AUTOMOTIVE INDUSTRY SUCCEED?

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Feasibility Study for Establishing a Center for Green Innovation &  
Technology Transfer for the Automotive Industry in Michigan

Education / Re-Training / Workforce Needs

From Single Course to Greening the Curriculum

Terri Lynch-Caris, Ph.D., P.E.  
Associate Professor of Industrial Engineering  
Kettering University  
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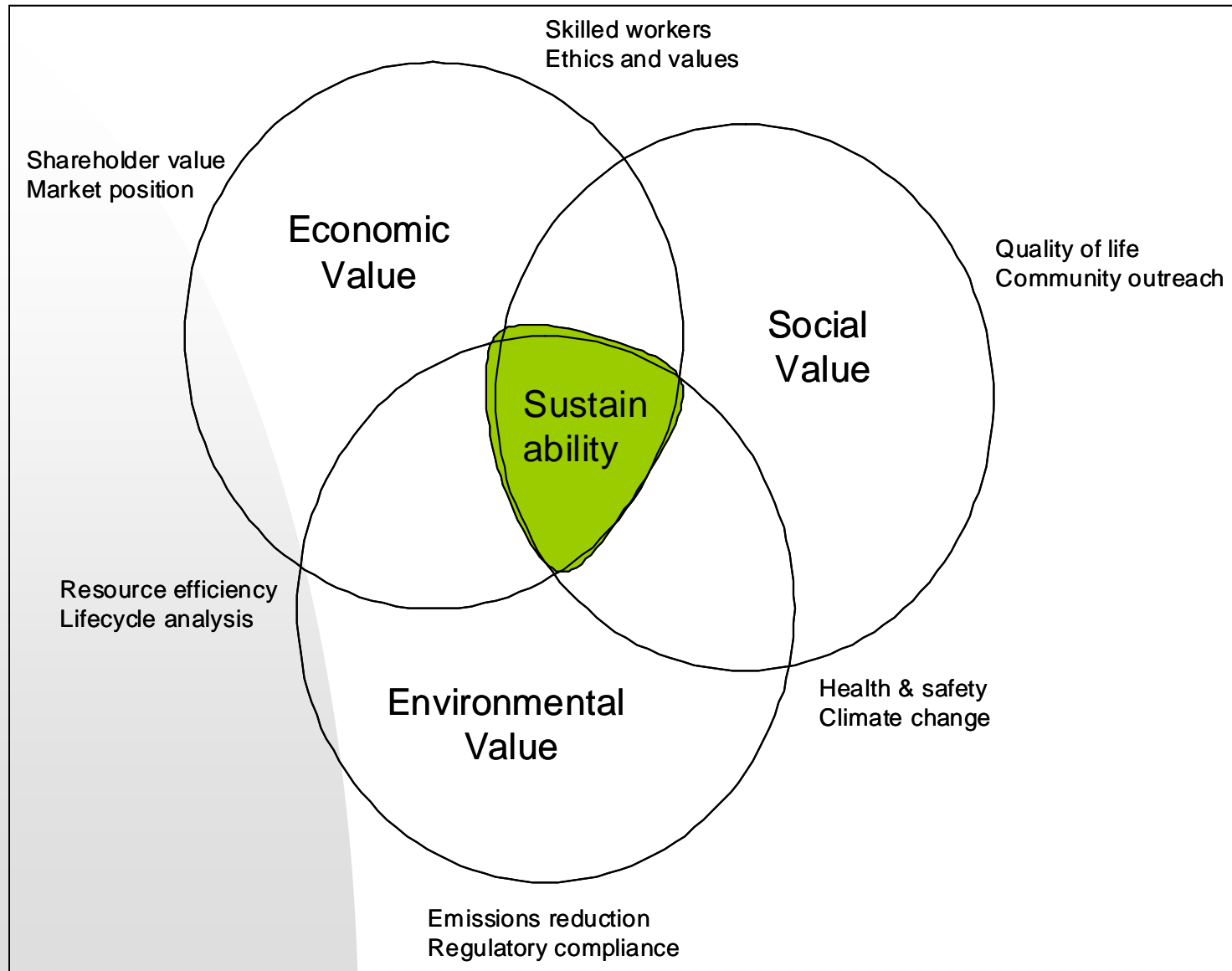
# Agenda

1. Sustainability: The Triple Bottom Line
2. Educational Needs
3. Impact of A Single Course
4. Potential Impact of Flexible Modules



# 1. Sustainability: The Triple Bottom Line

# 1. Sustainability: The Triple Bottom Line – people, planet, profit



Sustainable Engineering is defined as  
engineering for human development

“that meets the needs of the present without  
compromising the ability of future generations  
to meet their own needs”

(Brundtland Commission, 1987).



## 2. Educational Needs

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### Inputs – Citizens

“Learning level of citizen”

#### Influencers:

- Engineering undergraduate students
- High school students
- Graduate students
- Educators
- Undefined general population

#### Decision Makers:

- Working professionals
- Industry and political leaders

Personalized Learning  
in **Sustainability**

Modules containing  
topics in  
**Sustainability** add  
transformational value

### Outputs-

Environmentally  
conscious decisions  
and actions

“Sustainability Learning  
Objectives Achieved”

- Engineering undergraduate core and elective classes
- General knowledge
- Certificate
- Prof. Development
- High school credit
- High school enrichment
- Graduate elective
- Corporate training

Where do we currently find educational learning objectives related to environmental sustainability?

*Environmental Engineering Programs*





### 3. Impact of A Single Course

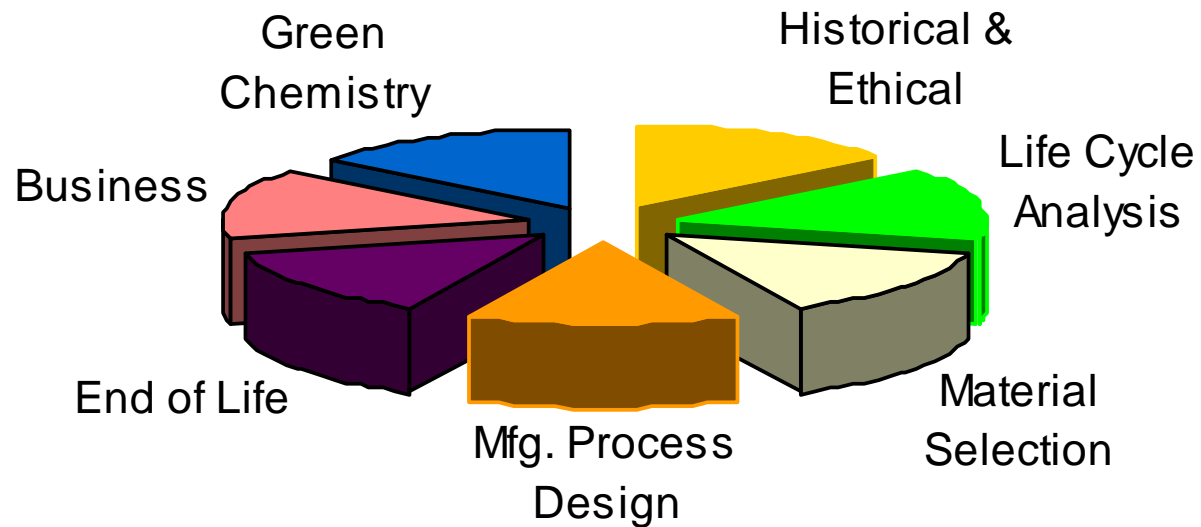
### 3. Impact of A Single Course


*IME540 – Environmentally Conscious Design & Manufacturing* was introduced as a new course at Kettering in 2007

Currently offered (first in 2009) as asynchronous online offering for graduate & undergraduate, on-campus & off-campus students.

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# IME540: Environmentally Conscious Design & Manufacturing

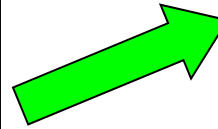
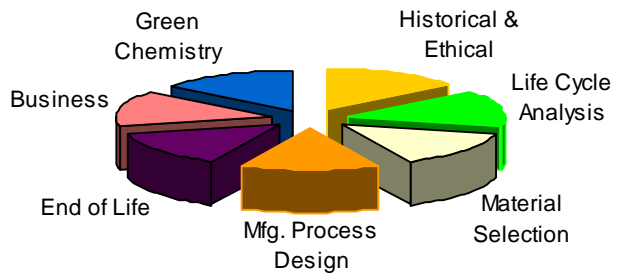




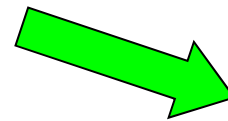
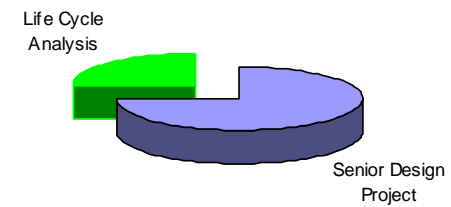
## 4. Potential Impact of Flexible Modules

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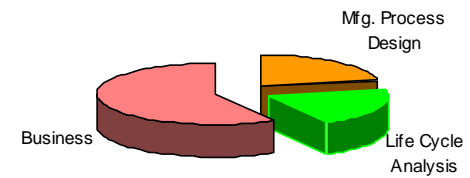
### IME540: Environmentally Conscious Design & Manufacturing



### IME454: Senior Design Project



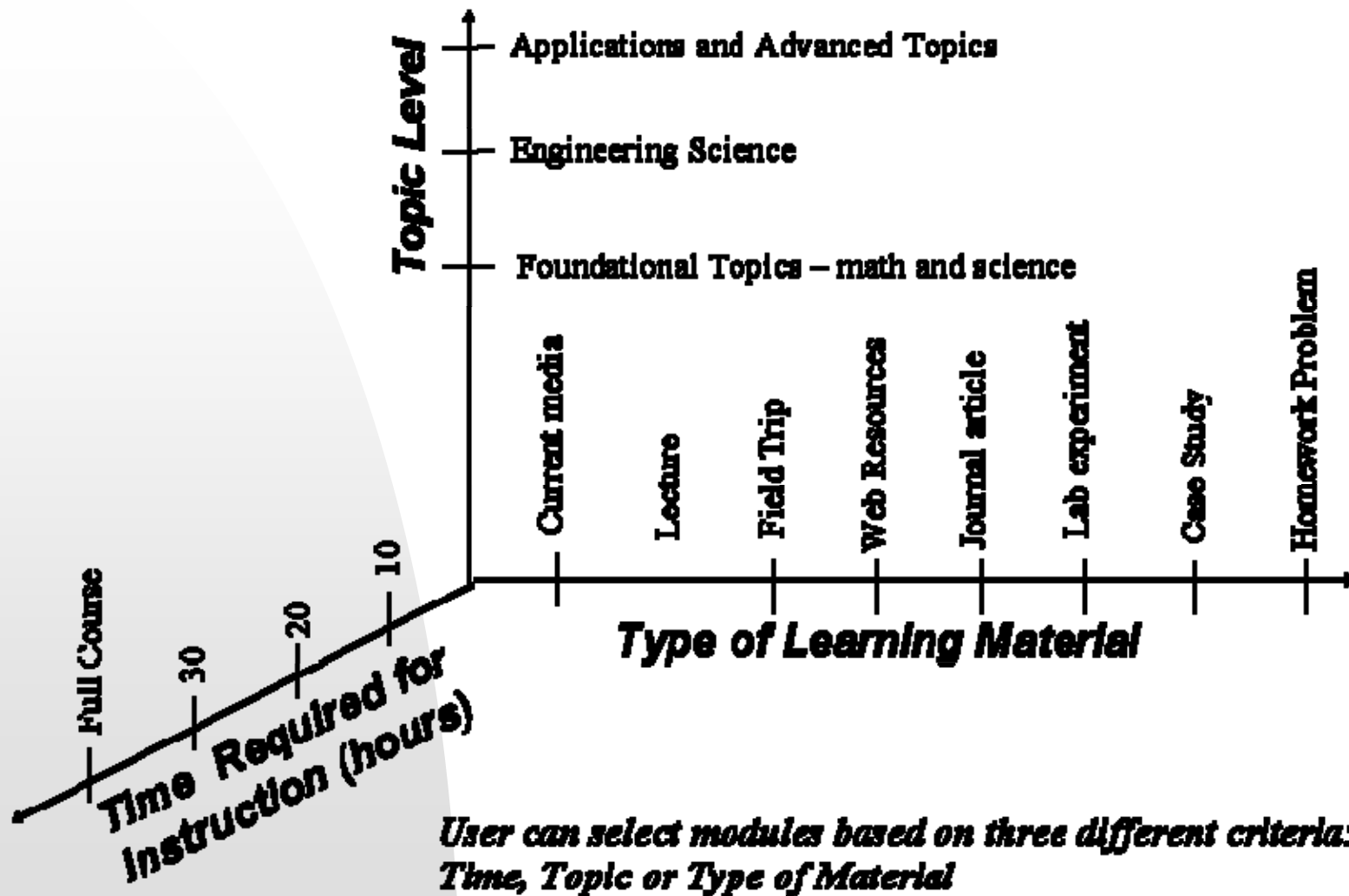
### Professional Certification Course



# Map Core Courses to Sustainability Concepts

<u>Core Engineering Course Topic</u>	<u>Sustainability Module for Integration</u>
1. Mathematics	1. Complex Systems & System Dynamics
2. Engineering Probability and Statistics	1. Complex Systems & System Dynamics
3. Chemistry	2. Natural World Basics, 4. Chemicals and Materials 11. Chemicals & Materials for Sustainability
4. Computers	6. Science and Issues Related to Alternative Energy Systems
5. Ethics and Business Practices	3. Institutions and Societal Systems 8. Implementing Sustainable Practices 9. Sustainable Design 10. Sustainable Manufacturing
6. Engineering Economics	7. Industrial Sustainability
7. Engineering Mechanics – statics/dynamics	5. Design and the Life Cycle 13. Sustainable Built Environment
8. Strength of Materials	4. Chemicals and Materials 11. Chemicals & Materials for Sustainability
9. Material Properties	4. Chemicals and Materials 11. Chemicals & Materials for Sustainability
10. Fluid Mechanics	
11. Electricity and Magnetism	6. Science and Issues Related to Alternative Energy Systems 12. Sustainable Energy Processes & Distribution
12. Thermodynamics	12. Sustainable Energy Processes & Distribution
Senior Design Project	5. Design and the Life Cycle 8. Implementing Sustainable Practices 9. Sustainable Design

# Overview of Modules



Industry Partners



Partnering  
Multi-Disciplinary  
Faculty

Academic Partners for  
Research and Impact



“Integrating Sustainability Concepts throughout the  
Engineering Curricula at Multiple Educational Institutions”