

Purdue University
 Environmental and Ecological Engineering
**EEE 560 Comprehensive Coverage: Environmental
 Impacts of Automotive Systems**

Instructors: Prof. Abigail Engelberth, 218 Potter, aengelbe@purdue.edu
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Lecture Schedule: TR 12:00 pm- 01:15 pm, PHYS 110

Office Hours: by appointment

Course Description

The outputs and processes associated with industrial (Automotive) systems are examined, with special emphasis placed on their interaction with ecological systems. The concept of industrial sustainability is explored. The processes used to produce materials and realize products are discussed. The effects of engineering design and manufacturing on the environment are examined. The product life cycle perspective is introduced. Topics to be covered include: energy and material flows, renewable energy, and life cycle issues including management of end-of-life products.. The course also introduces students to concept of societal sustainability and corporate social responsibility.

Learning Outcomes

1. Recognize how products and materials interact with the environment through energy and material flows at every stage of their life cycle, from raw material extraction to end of life disposal, life cycle thinking and life cycle analysis is required to design/develop products for improved environmental performance
2. Ability to assess the environmental impact of production and consumption in the automotive industry.
3. Develop an understanding of the key factors involved for the production of alternative fuels and power trains.
4. Formulate and defend positions of the influence of various aspects related to sustainability within the transportation sector.

Course web page on Blackboard

Assignments and homework will be submitted using Blackboard Learn.

Grading Plan:

	Percent
Homework/Project Milestones	20
Final Project	80

Grading Scale	
A > 93%	73 > C > 76
90 > A- > 92	70 > C- > 72
87 > B+ > 89	67 > D+ > 69
83 > B > 86	63 > D > 66
80 > B- > 82	60 > D- > 62
77 > C+ > 79	F < 60

Lecture Schedule

Class Period	Topics	Instructor
8/22	<ul style="list-style-type: none"> • Instructor Backgrounds • Sustainability Thinking <ul style="list-style-type: none"> ○ Economic, Environmental, and Social • Foundational Philosophy • About EEE • Automobile System 	Sutherland
8/24	<ul style="list-style-type: none"> • Introduction to Life Cycle Assessment <ul style="list-style-type: none"> ○ LCA case study • Environmental Consequence of Automobile 	Sutherland
8/29	<ul style="list-style-type: none"> • From Cradle to Gate <ul style="list-style-type: none"> ○ Product Design ○ Materials ○ Materials Extraction / Processing ○ Manufacturing Processes ○ Supply Chain • Sustainable Manufacturing 	Sutherland
8/31	<ul style="list-style-type: none"> • Industry Sector • Input-Output (EIO) Modeling • EIO-LCA (Lifecycle Analysis) • Unit Process Lifecycle Inventory(UPLCI) • Case Study of Industrial Application <ul style="list-style-type: none"> ○ Carbon Footprint for Industrial Facilities 	Sutherland
9/5 & 9/7	Fuels <ul style="list-style-type: none"> • Traditional petroleum fuels • Sustainability of Infrastructure • System Dynamics (Fuel) • Energy Analysis 	Engelberth
9/12	Alternative Power of Vehicles <ul style="list-style-type: none"> • EV • Vehicle Sizes • Infrastructure • Solid Fuel 	Engelberth
9/14	<ul style="list-style-type: none"> • End of Life • Design for Value Recovery • Vehicle End of Life: Remanufacturing economic model • Impact of Automobile System <ul style="list-style-type: none"> ○ Use phase (gate to grave) vs. production phases (cradle to gate) ○ How much energy needed (Exergy, Emergy) 	Sutherland
9/19	Team Project Presentation	Sutherland & Engelberth
9/21	Team Project Presentation	Sutherland & Engelberth

Academic Honesty

All students are expected to act in an honest and ethical manner consistent with Purdue University regulations. For reference, the document “Academic Integrity: A Guide for Students” is available on Blackboard. The consequences for acts of academic dishonesty will range from punitive grade reduction to course failure, depending on the severity of the infraction. As you

work on course assignments, the instructor welcomes and encourages questions about proper academic practice, e.g., limits of collaboration, methods of citation, and attribution of ideas.

Accommodations

If you require special accommodation in this course for any reason (e.g., scheduling, athletics, disability, and interviews), please inform the instructors as soon as possible, and a plan will be worked out.

Attendance

Participation in class discussion and activities is strongly encouraged for this course. Regular attendance is expected. Please let the instructors know if you will be unable to attend a class.

Late work

Deadlines for work will be announced in class and posted on Blackboard. Late work will not be accepted.

Emergencies

Be aware of emergency procedures should a campus emergency occur during class time. Procedures will be reviewed on the first day of class; you are encouraged to clarify procedures with the instructor if you are uncertain.

Communication

Please take full advantage of the instructors for help, questions, and discussion. Instructor email address is listed on the first page. Please also take advantage of the discussion board on Blackboard – your peers may also have insightful answers and you may hear back from them more quickly than from an instructor.