ME 4801 Sustainable Design and Manufacturing (Elective)

Catalog Description

Organizations are required to be more sustainable during the production of products. The course explores the intersection of sustainability, design and manufacturing as it relates social, environment, and economic drivers during product development. Key metrics that influence sustainability and trade-off decisions during the early phases of design and selection (materials and manufacturing) that guide reuse and recycle will be explored. All types of waste that result from product development will be considered and the suitable actions to avoid, reduce, reuse or recycle existing waste will be presented. Case studies will be used to illustrate topics during in class discussions.

Course information

- prerequisites and co-requisites* *ME 3210*
- *(1-0-0-1) Minimester class, taught 3 hours of lecture per week for 5 weeks*

Textbook

- *S. Kalpakjian and S. Schmid, Manufacturing Processes for Engineering Materials, 6th Ed., Pearson, 2016*
- *M.F. Ashby, Materials Selection in Mechanical Design, 5th Edition, Butterworth-Heinemann, 2017.*
- Other references:
  CES EduPack, Granta Design

Course coordinator

Dr. Tequila Harris

Topics Covered

1. Introduction:
   - Introduction to Sustainability and drivers for sustainable development and sustainable manufacturing
   - Fundamentals of Sustainable Manufacturing
2. Metrics:
   - Sustainable Manufacturing metrics overview
   - Societal, Environmental, and Economic metrics
3. Tools and Processes:
   - Principles of Life Cycle Assessment
   - Sustainable Manufacturing Processes
   - Sustainable Manufacturing Systems (Closed Loop Production)
4. Value Recovery:
   - Manufacturing recycling, reuse, and scrap
   - Public Policy
5. Final Project Presentations

Course Outcomes:

Outcome 1: Students will demonstrate the ability to improve the triple bottom line (social, environmental, and economic impacts) of engineering systems by identifying viable options for the redesign of products and processes.

Outcome 2: Students will be able to make a recommendation, including the justification for the most sustainable method of processing that could be used to process or produce a given product or material, discussing the merits and drawbacks of the processing steps in terms of the triple bottom line (social, environmental, and economic impacts).

Outcome 3: Students will demonstrate their ability to use software (CES EduPak) to assess and improve the triple bottom line, by implementing life cycle assessment (LCA).

Outcome 4: Students will be able to identify stakeholders in engineering activities related to economic, environmental, and social factors, including a broad range of cultural and social backgrounds.