BFF1113
Engineering Materials

DR. NOOR MAZNI ISMAIL
FACULTY OF MANUFACTURING ENGINEERING

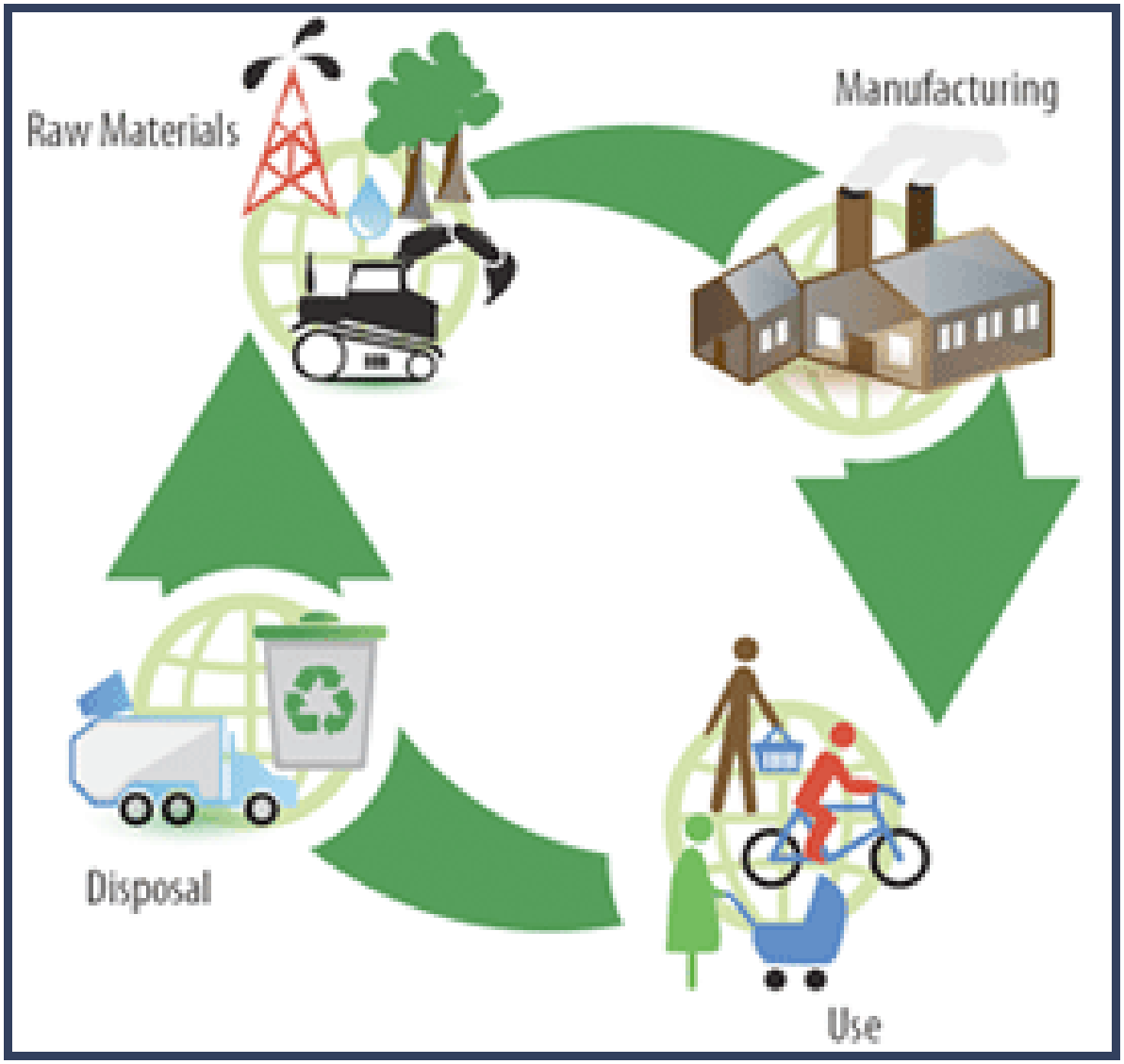
Course Guidelines:

1. Introduction to Engineering Materials
2. Bonding and Properties
3. Crystal Structures & Properties
4. Imperfection in Solids
5. Mechanical Properties of Materials
6. Physical Properties of Materials
7. Failure & Fundamental of Fracture
8. Metal Alloys
9. Phase Diagram
10. Phase Transformation – Heat Treatment
11. Processing and Application of Metals
12. Ceramic Materials
13. Polymer Materials
14. Composite Materials
15. Corrosion & Degradation of Materials
16. Environment and Sustainability

- For many years, reducing the environmental impacts of products focused solely on production processes, treatment of waste, and effluent streams.

- While this remains important, in order to successfully address environmental sustainability issues, we must also consider the design, manufacture, and use of a product across its entire life cycle: from raw material extraction and conversion; to manufacture and distribution; through use, re-use, and recycling; to ultimate disposal.

- The use of a holistic life cycle perspective helps manufacturers and policy makers identify possible improvements across the industrial system and through all the product's life cycle stages. It also applies to improving industrial processes and activities.


Raw Materials
Manufacturing
Disposal
Use

ECONOMIC CONSIDERATIONS

OBJECTIVE

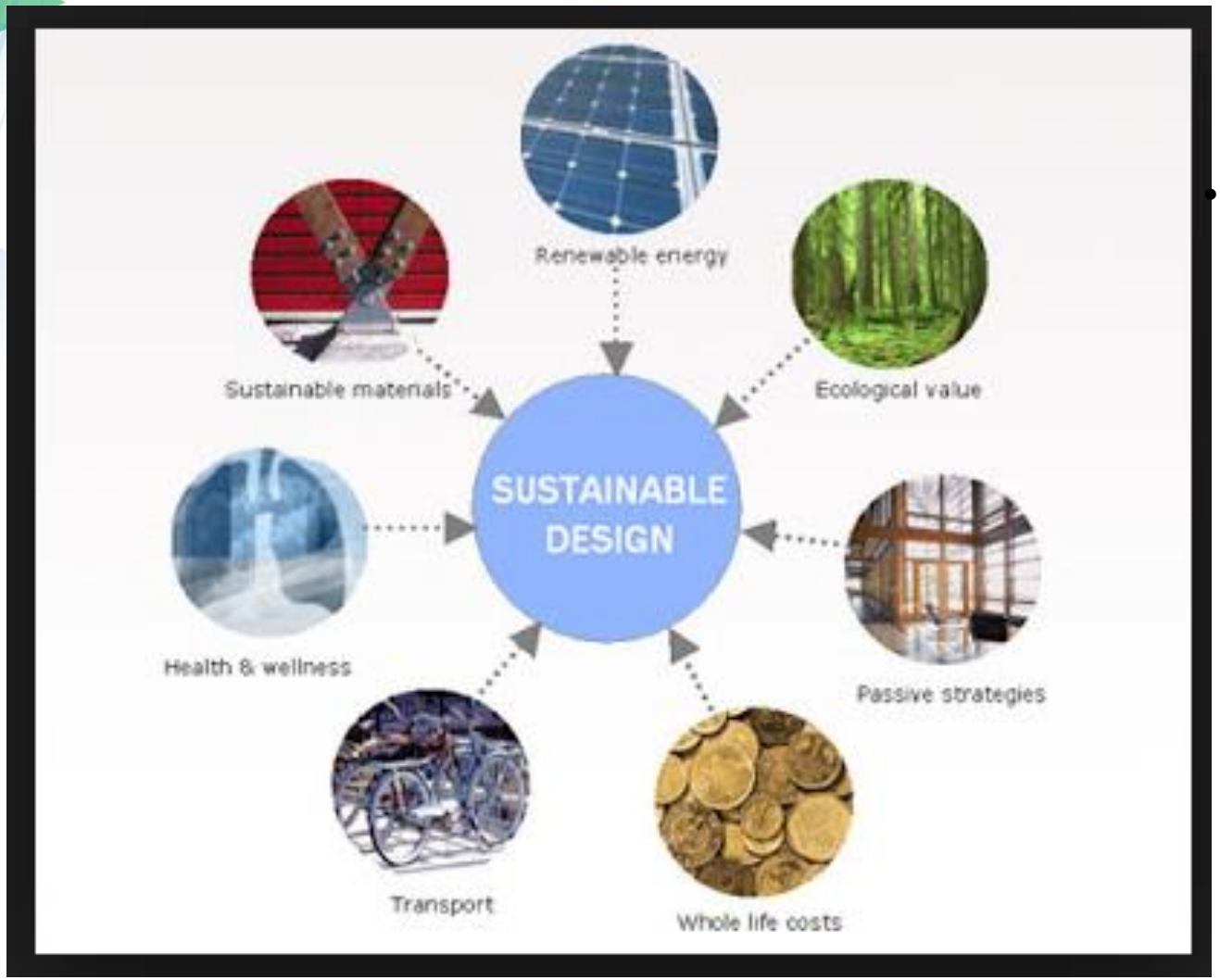
➢ to minimize cost

- Component design
  - Size, shape and configuration
  - Reliable
- Materials
  - Appropriate combination of properties.
  - Availability
- Manufacturing techniques
  - Equipment
  - Labour
  - Machine downtime
  - Waste

ENVIRONMENTAL & SOCIETAL CONSIDERATIONS

- Environmental effect
  - Climate change
  - Pollution
- Materials
  - Earth's resources
  - Recycling / Re-use
  - Disposable

SUSTAINABILITY

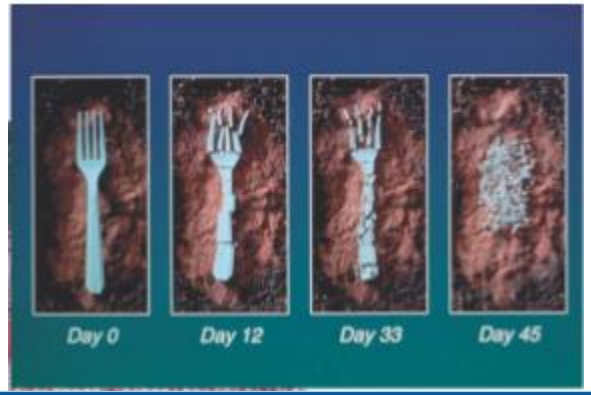


Element of designs for sustainability

- Design for sustainability requires a holistic view of our environment and how to manage manufacturing and products without degrading our environment.

BIODEGRADABLE & BIORENEWABLE POLYMERS

- **Biodegradable polymers** are those that degrade naturally in the environment, normally by microbial action.
- **Biorenewable polymers –** based on plant derived materials (biomass) was developed in order to reduce our dependence on petroleum and the emissions of greenhouse gases.
  - Example: PLA (poly(l-lactic acid))



Examples of applications for biodegradable/biorenewable poly(lactic acid): films, packaging, and fabrics.

Case study:

Glass as an environmentally friendly materials