

國立臺北大學自然資源與環境管理研究所
104 學年度第二學期 『清潔生產與工業生態』

課程進度(17)：工業生態學之展望：永續工程、『從搖籃到搖籃』
Thinking Ahead: Sustainable Engineering and “From-Cradle-to-Cradle”

- INDUSTRIAL ECOLOGY AND SUSTAINABLE ENGINEERING CONCEPTS (G&A, Chp.3)
 - From Contemporaneous Thinking to Forward Thinking
 - ⇒ Yesterday's Needs => Today's Problem
 - The Greening of Engineering
 - ⇒ Characteristics of Modern Technology
 - ⇒ The environmental life cycle approach; total environmental cost accounting; and, the selling function of the product (*The Greening of Industrial Ecosystems*, NAE, 1994)
 - Definition of Sustainable Engineering ([UNESCO](#))
 - ⇒ Sustainable engineering is the process of using resources in a way that does not compromise the environment or deplete the materials for future generations.

- SUSTAINABLE ENGINEERING (G&A, Chp.8)
 - Engineering and the Industrial Sequence
 - ⇒ Conceptual Models vs. Mathematical Models
 - Green Chemistry
 - ⇒ Reduce/Eliminate the use/generation of hazardous substance
 - ⇒ The twelve principles of green chemistry
 - Green Engineering
 - ⇒ The design/implementation of engineering solutions that take environmental issues into account throughout the life cycle of the design/implementation.
 - ⇒ The 12 principles of green engineering
 - Pollution Prevention => Pollution Prevention Pays
 - ⇒ Process Modification / Technology Modification
 - ⇒ Good Housekeeping / Input Substitution
 - ⇒ One-site Reuse / Off-site Reuse
 - Green Technology and Sustainability
 - ⇒ Detoxification, Dematerialization, and Decarbonization

- “FROM-CRADLE-TO-CRADLE” CONCEPTS
 - The Life Cycle Perspectives
 - ⇒ From Cradle to Grave; From Cradle to Gate; From Gate to Grave
 - ⇒ The “Circular Economy”
 - Cradle-to-Cradle
 - ⇒ Architect McDonough and Chemist Braungart => [McDonough Braungart Design Chemistry](#)
 - ⇒ [C2C Network](#) => http://www.c2cn.eu/sites/default/files/C2C_InitiativesGuide_2011.pdf
 - ⇒ “From eco-efficiency towards eco-effectiveness”; “More Good = Less Bad = Less Waste?”
 - ⇒ “From Ownership to Usership”; “Technical and Biological Cycles”
 - ⇒ Product Service System (PSS)