Title: 2A. Ethics of Science and Technology

Goal: To introduce students to social and ethical dimensions of science, engineering, and technology.

Module Objectives: Introduce students to: 1) The Impacts of Scientific and Technological Change; 2) The Concepts of Moral Agency and Moral Consequences; 3) The Intersection of Engineering and Business; 4) The Concepts of Positive and Negative Duties

Prerequisites by Topic: None

Required Texts:
- Jonas, Hans, "Toward a Philosophy of Technology," *Hastings Center Report,* (February, 1979), 34-43.
- Nelson, C, and S.R. Peterson, "If You're an Engineer, You're Probably a Utilitarian," *Proceedings of the American Society of Civil Engineers: Issues in Engineering* (1982) 8:1, 13-18.
- Harris, Charles E., Jr., Michael S. Pritchard, and Michael J. Rabins, "Tests in Moral Problem Solving" in *Engineering Ethics, Concepts and Cases,* (Belmont, CA: Wadsworth, 1995), 155-187.
- Drexler, K. Eric, "Three Revolutions and a Fourth," in *Radical Abundance: How a Revolution in Nanotechnology will Change Civilization,"* (New York: Public Affairs, 2013) 39-54.
- Layton, Edwin T., "The Engineer and Business," in Deborah G. Johnson, ed. *Ethical Issues in engineering* (Englewood Cliffs, NJ: Prentice Hall, 1991) 45-62.

Reading: Write-up of this module
References: [Refs. 14-17, 20]

Student Learning Outcomes:

- Be able to explain social and ethical impacts of scientific and technological change
- Be able to recognize the ethical dimensions of decisions, actions, and policies
- Be able to differentiate between personal values and professional ethics
- Be able to distinguish between cultural or individual preferences and ethically relevant situations and practices.
- Be able to employ major ethical theories – Deontology(Kantian Ethics) and Utilitarianism/Consequentialism
- Be able to discuss and debate the ethical dimensions of decisions, actions, and policies
- Be able to propose possible solutions to ethical concerns
- Be able to compare and evaluate differing possible solutions
- Develop critical thinking skills and judgment
- Develop an ethical identity to carry forward to working life

Topics Covered: (Green highlighted topics are priority#1, Yellow highlighted are if time permits)

- **Lecture I:** Science, Technology, and Change
  - o a fourth technological revolution (Drexler)
  - o the formal and material dimensions (Jonas)
  - o false problems (Ellul – notes and PowerPoint)
  - o business (Layton)
- **Lecture II:** Developing an Ethical Framework 1:
  - o Why Ethics? – past problems
    - ▪ Biomedical – Tuskegee
    - ▪ Chemical/Agricultural – DDT
    - ▪ Construction – Kansas City Hyatt Regency
    - ▪ Aerospace – Challenger
  - o Negative and Positive Duties
  - o Introducing Two Approaches (Harris, Pritchard, and Rabins):
    - ▪ Deontology
    - ▪ Consequentialism
      - • Why Engineers are Utilitarians (Nelson and Peterson)

Relationship to ABET Program Outcomes
[Note: Please, refer ABET program outcomes list (a) through (l) in attached standard template.]

- (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical constraints as well as considerations of public health and safety, manufacturability, and sustainability.
- (f) An understanding of professional and ethical responsibility.
- (g) An ability to communicate effectively.
- (h) The broad education necessary to understand the impact of engineering solutions in a global economic, environmental, and societal context.
- (i) A recognition for the need for and an ability to engage in lifelong learning.
- (j) A knowledge of contemporary issues.