

Engineering Ethics, Economy and Environment Syllabus

Course Number: NANA-XXXX

Course Name: Engineering Ethics, Economy and Environment (CNST-E⁴)

Course Category: Compulsory Course (All Streams)

Credits/Contact Hours: 3 credits/54 hours

Evaluation Method: weekly quizzes + group project and final comprehensive examination

Semester: 4th semester

Prerequisites: First three semesters of CNST English Courses

Follow-Up:

Lecturer: Manuel E. Brito

Syllabus Author: Manuel E. Brito

Syllabus Reviewer: XXXXXXXX

Text Book: Deb Bennett-Woods, 《Nanotechnology: Ethics and Society》, CRC Press, Taylor & Francis Group, 2008 (ISBN 978-1-4200-5352-4); and Lecture Notes.

Reference: Sally Dalton-Brown, 《Nanotechnology and Ethical Governance in the European Union and China: Towards a Global Approach for Science and Technology》, Springer, 2015 (ISBN 978-3-319-18232-2); and Lecture Notes.

Specific Goals for the Course

This course general objective is to educate the students in the application of practical judgments to actions related to their future work as engineers by combining underlying ethical assumptions with factual information, commonly held beliefs and values, and socially and culturally accepted standards of behavior. The course aims at providing the students with the tools that will allow them to assess the impact on the environment, as well as the economic or social consequences of technological and scientific activities.

By the end of the course, the students should be able to:

- (1) Identify the ethical issues present in engineering decisions and apply ethical considerations to the solving of social, environmental and economic disruptions created by nanotechnologies. Graduation Requirements Indicator 6-2
- (2) Identify the ethical issues present in engineering decisions and apply ethical considerations to the assessment of impact of nanotechnologies on health, safety, laws and culture. Graduation Requirements Indicator 7-2
- (3) Acquire, through discussion in class and analysis of case studies, a comprehensive understanding of the ethical responsibility and social consequences of engineering procedures and advances. Graduation Requirements Indicator 8-2
- (4) Through the formulation of safety standards, understand principles of engineering management, and well-balanced economic-decision making processes. Graduation Requirements Indicator 11-1

Topics for the Course

- (1) Students can explain models that incorporate ethical considerations into key decision points to respond quickly to stakeholders
- (2) Students can answer the practical question of what ought to be done in a particular situation or in a general situation.
- (3) Students can understand professional and ethical responsibility.
- (4) Students can understand engineering codes of ethics and use them with judgment and experience in specific situations.
- (5) Students can understand possible engineering ethical issues and evaluate the advantages and disadvantages of different approaches to their assessment.

(1) Assessments for the Course

- **Course Score = Weekly Quizzes (WQ, 30%) + Group Presentation (GP, 40%) + Final Comprehensive Exam (FCE, 30%)**
- **Achievement of Course Goal = (WQ Mean Score*WQ Weight*0.3 + GP Mean Score*GP Weight*0.4 + FCE Mean Score*FCE Weight*0.3) / (100*WQ Weight*0.3 + 100*GP Weight*0.4 + 100*FCE Weight*0.3)**

Course Goal	Weekly Quizzes Weight	Group Presentations Weight	Final Exam Weight
(i) Identify the ethical issues present in engineering decisions and to apply ethical considerations to the solving of social, environmental and economic disruptions created by nanotechnologies. (Support Graduation Requirements Indicator 6-2)	0.25	0.20	0.25
(ii) Identify the ethical issues present in engineering decisions and apply ethical considerations to the assessment of impact of nanotechnologies on health, safety, laws and culture. (Support Graduation Requirements Indicator 7-2)	0.25	0.20	0.25
(iii) Acquire, through discussion in class and analysis of case studies, a comprehensive understanding of the ethical responsibility and social	0.25	0.40	0.25

consequences of engineering procedures and advances. (Support Graduation Requirements Indicator 8-2)			
(iv) Through the formulation of safety standards, understand principles of engineering management, and well-balanced economic-decision making processes. (Support Graduation Requirements Indicator 11-1)	0.25	0.20	0.25

Criteria for grading the Course:

Course Goal	90-100 (Excellent)	75-89 (Good)	60-74 (Pass)	0-59 (Fail)
(i) Identify the ethical issues present in engineering decisions and to apply ethical considerations to the solving of social, environmental and economic disruptions created by technologies. (Support Graduation Requirements Indicator 6-2)	Students show comprehensive knowledge of ethical principles and can apply them to formulate innovative ways to solve social, environmental, and economic problems.	Students show comprehensive knowledge of ethical principles and can apply them to formulate ways to solve social, environmental, and economic problems.	Students show comprehensive knowledge of ethical principles and can apply them to understand their application to the solution of social, environmental, and economic problems.	Students are lack of basic knowledge of ethical principles, and/or are not able to understand their application to the solution of social, environmental, and economic problems.
(ii) Identify the ethical issues present in engineering decisions and apply ethical considerations to the assessment of impact of technologies on health, safety, laws and culture. (Support Graduation Requirements Indicator	Students show comprehensive knowledge of ethical principles and can apply them to formulate innovative	Students show comprehensive knowledge of ethical principles and can apply them to formulate ways to solve	Students show comprehensive knowledge of ethical principles and can apply them to understand their	Students are lack of basic knowledge of ethical principles, and/or are not able to understand

7-2)	ways to solve problems related to health, safety, laws and culture.	problems related to health, safety, laws and culture.	application to the solution of problems related to health, safety, laws and culture.	their application to the solution of social, problems related to health, safety, laws and culture.
(iii) Acquire, through discussion in class and analysis of case studies, a comprehensive understanding of the ethical responsibility and social consequences of engineering procedures and advances. (Support Graduation Requirements Indicator 8-2)	Students are able to identify key issues in potential and current societal problems and to analyze them in order to formulate innovative measures that could lead to their solution or alleviation.	Students are able to identify key issues in potential and current societal problems and to analyze them in order to formulate measures that could lead to their solution or alleviation.	Students are able to identify key issues in potential and current societal problems, and to analyze them and to understand the measures that could lead to their solution or alleviation.	Students are not able to identify relevant issues in potential and current societal problems, and/or are not able to understand the measures that could lead to their solution or alleviation.
(iv) Through the formulation of safety standards, understand principles of engineering management, and well-balanced economic-decision making processes. (Support Graduation Requirements Indicator 11-1)	Students understand the importance of formulation and implementation of safety standards, as well as their economic cost and the risk of excessive regulation.	Students understand the importance of formulation and implementation of safety standards as well as their economic cost and the risk of excessive regulation.	Students understand the importance of formulation and implementation of safety standards as well as their economic cost and the risk of excessive regulation.	Students do not understand the importance of formulation and implementation of safety standards and/or do not understand their economic cost and the risk of excessive regulation.

Course Plan

Part 1: Theoretical and Formal Aspects of Ethics

1. Introduction to the Course: Purpose, Objectives, Scope, Methods.
2. Introduction to Ethics: General Aspects
3. Engineering and Scientific Ethics: Codes of Ethics, Whistle Blowing, Case Study Methodology
4. Engineering and Scientific Ethics based Safety Guidelines and Compliance
5. Management and Economic Decision-making.
6. Ecological Awareness: Ecological Economics

Part 2: Case Studies

7. Case Studies I
8. Case Studies II
9. Case Studies: Current News Articles
10. Case Studies III

Part 3: Discussion at the light of learned Ethical Principles

11. Solving Ethical Problems vs. Economic Realism and Ecological Awareness
12. Individual, Professional, and Institutional Values
13. Leadership in Engineering and Industry
14. Competency with Good Character

Starting 7 th week, Assigned Research Projects and Presentations

Purpose: To initiate a systematic approach to the problems of identifying cross-cultural issues in the ethical education of science and engineering students, and extract from these issues lessons that may enhance the research experience in the globalization process. Beside the study of classical case studies, projects on current issues will be assigned.