

ETE 7040

COURSE SYLLABUS

Department of Engineering and Technology Education
Utah State University
Spring 2007

- Course Title:** Dynamic and Network Engineering Processes for Technology Education
- Course Instructors:** Dr. Timothy A. Taylor, Principal Lecturer
Department of Biological and Irrigation Engineering
Utah State University
Office Phone: (435) 797-2241
e-mail: ttaylor@cc.usu.edu
- Dr. Edward M. Reeve, Professor
Department of Engineering and Technology Education
Utah State University
Office Phone: (435) 797-3642
e-mail: ed.reeve@usu.edu
- Course Time:** Wednesdays, 1:30 – 4:00 p.m. (MST)
January 10, 2007 – April 25, 2007
- Textbooks:** Garmire E., & Pearson, G. (eds) (2006). *Tech Tally: Approaches to Assessing Technological Literacy*. Washington, DC: The National Academies Press.
[Read Online Free: <http://www.nap.edu/catalog/11691.html>]
- ITEA (2003). *Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards*. Reston, VA: Author
[Read Online Free:
<http://www.iteaconnect.org/TAA/PDFs/AETL.pdf>]
- Gomez, A.G., Oakes, W.C., & Leone, L.L. (2006). *Engineering Your Future: A Project-Based Introduction to Engineering, 2nd ed.* Wildwood, MO: Great Lakes Press.
[Available at:
http://www.glpbooks.com/titles/project_based_hs.html]

- Prerequisites:** Core Courses #1, #2, #3 and NCETE Seminars
- Reading List:** Required weekly readings and other assigned supplemental course materials.
- Key Concepts:** Engineering Design Process, Technology Education Design Process, Analysis, Mathematical Predictions, Optimization, Standards, Constraints and Trade Offs, Modeling, Problem-Based Learning (PBL), Backward Design, Technological Literacy, Evaluation, Assessment, and Measurement

Course Overview

This course focuses on the integration of engineering design principles and the use evaluation and assessment in engineering and technology education. In this course the concepts of Problem Based Learning (PBL), Experiential Learning and students as both teachers and learners will be integrated with engineering problem solving, analysis, modeling, optimization, and design. The differences between the engineering and technology education approaches to design will be discussed and engineering learning modules will be developed that are exemplars of the engineering approach.

This course will also focus on developing a K-12 pre-engineering curriculum that includes appropriate engineering design challenges and it will examine how evaluation and assessment can be used to improve the teaching and learning in engineering and technology education. In this course, students will be required to develop a secondary school engineering course curriculum that contains appropriate engineering design challenges.

Course Objectives

At the completion of this course, students should be able to:

1. Discuss the methods of increasing student involvement and enhancing the engineering learning experience.
2. Describe how Problem Based Learning (PBL) and Experiential Learning are used to enhance learning engineering concepts.
3. Use problem solving, analysis, modeling, and optimization in the engineering design process.
4. List and discuss how student assessment standards, program standards and other organizations guide and affect the evaluation and assessment of engineering and technology education programs and students.
5. Discuss how engineering concepts can be infused into a pre-engineering curriculum that is taught by a technology education teacher.

6. Describe various approaches to developing and delivering a standards-based pre-engineering curriculum.
7. Discuss the typical components contained in a pre-engineering curriculum.
8. Develop a K-12 engineering design challenge.
9. Describe a variety of evaluation and assessment approaches and instruments that are available for use in engineering and technology education.

Final Project

In this course students will be given a project that requires them to develop a pre-engineering curriculum package that utilizes the engineering design process. This package will be designed to infuse the principles associated with engineering design into a secondary school environment. This curriculum package will include information related to the resources needed to complete the project, an engineering analysis, a modeling or optimization component, and an assessment and evaluation plan.

Course Requirements

1. Complete all assigned readings and participate in class discussions.
2. Complete all assigned student activities.
3. Develop a secondary school pre-engineering curriculum.
4. Complete one K-12 engineering design challenge.
5. Complete one final exam.

Course Outline

Week 1 – January 10, 2007

- Course Introduction
- Review of Engineering Design and Technology Education Design Process
- Introduction to Problem-Based Learning (PBL) and Experiential Learning Theory
- Terminology

Week 2 – January 17, 2007

- Engineering Problem Solving
 - Overview
 - Boundaries
 - Problem Solving Techniques
- Developing Pre-Engineering Curriculum
 - Purpose
 - Content
 - Role of Standards

Week 3 – January 24, 2007

- Engineering Analysis
- Algebra Based Solutions to Common Engineering areas
 - Fluid dynamics
 - Heat Transfer
 - Mechanics
- Developing Pre-Engineering Curriculum
 - Backward Design Curriculum Planning Model
 - Biological Sciences Curriculum Study (BSCS) 5E Instructional Model

Week 4 – January 31, 2007

- Engineering Analysis
- Algebra Based Solutions to Common Engineering areas
 - Fluid dynamics
 - Heat Transfer
 - Mechanics
- Developing Pre-Engineering Curriculum
 - K-12 Engineering Design Challenge

Week 5 – February 7, 2007

- Engineering Modeling/Simulation
 - The derivative
 - The integral
 - Differential Equations
 - Finite Difference Modeling
 - Population Modeling
 - Spreadsheet Utilization
- Developing Pre-Engineering Curriculum
 - K-12 Engineering Design Challenge

Week 6 – February 14, 2007

- Engineering Modeling/Simulation
 - The derivative
 - The integral
 - Differential Equations
 - Finite Difference Modeling
 - Population Modeling
 - Spreadsheet Utilization
- Developing Pre-Engineering Curriculum
 - K-12 Engineering Design Challenge

Week 7 – February 21, 2007

- Engineering Modeling/Simulation
 - The derivative
 - The integral
 - Differential Equations
 - Finite Difference Modeling
 - Population Modeling
 - Spreadsheet Utilization
- Developing Pre-Engineering Curriculum
 - K-12 Engineering Design Challenge

Week 8 – February 28, 2007

- Engineering Design (utilizing engineering analysis)
 - Examples
 - House insulation
 - Structural design
- Developing Pre-Engineering Curriculum
 - K-12 Engineering Design Challenge

Week 9 – March 7, 2007

- Engineering Design (utilizing engineering analysis)
 - Examples
 - Water system
- Assessment

Week 10 – March 14, 2007

- No Class – ITEA Conference, San Antonio

Week 11 – March 21, 2007

- Engineering Design (utilizing modeling and optimization)
 - Examples
 - Population
 - House Heating
- Assessment

Week 12 – March 28, 2007

- Engineering Design Challenge

Week 13 – April 4, 2007

- Engineering Design Challenge

Week 14 – April 11, 2007

- Engineering Design Challenge

Week 15 – April 18, 2007

- Engineering Design Challenge

Week 16 – April 25, 2006

- Final Exam

NOTE: If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the Disability Resource Center, preferably during the first week of the course. Any requests for special considerations relating to attendance, pedagogy, taking of examinations, etc must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative formats--large print, audio diskette or Braille.

Dynamic and Networking Engineering Processes for Technology Education ETE 7040

Course Evaluation *Spring – 2007*

NAME: _____

Activities

Activity #1 (20 points) _____

Activity #2 (20 points) _____

Activity #3 (20 points) _____

Activity #4 (20 points) _____

Activity #5 (20 points) _____

K-12 Pre-Engineering Curriculum (50 points) _____

Final Exam (50 points) _____

TOTAL POINTS (200) _____

Grading Scale

186 - 200 A 180 - 185 A-
174 - 179 B+ 166 - 173 B 160 - 165 B-
154 - 159 C+ 146 - 153 C 140 - 145 C-
126 - 139 D+ 120 - 125 D