ENG 348 (0.5 CU)
SYSTEMS ENGINEERING

Course Information **Professor: Orlando Hernandez**
Fall 2013: R 4:00PM–6:50PM/AR144

Course Description:
This course presents and demonstrates the utilization of various analytical models and methods for accomplishing system analysis and design, not only in the design and evaluation of new systems, but in the evaluation and design applied to existing systems for the purpose their improvement. Also emphasized is the need to properly integrate a variety of engineering design and management disciplines to effectively implement the concepts and principles of systems engineering.

Instructor Information:
Office Location: ARM 147A
Phone: (609) 771-2470
E-Mail: hernande@tcnj.edu
Web: http://www.tcnj.edu/~hernande/

Office Hours:
Mondays 4:00 PM - 5:20 PM
Tuesdays 10:00 AM - 11:20 AM
By appointment (send me email)
And whenever my office door is open

Textbook:
SYSTEMS ENGINEERING AND ANALYSIS, Fifth Edition, by Benjamin S. Blanchard and Wolter J. Fabrycky, Pearson Prentice Hall, 2011.

Prerequisite:
Circuit Analysis (ENG 212) and Senior/Junior Standing

Grading Policy:
Homework 10%
Homework will be announced for each chapter after the chapter has been covered.
Design Projects 20% (Projects 1 and 2: 5% each, Project 3: 10%)
Mid-Term Exam 30%
Final Exam 30%
Miscellaneous 10%

Tips for Success:
Read the book sections prior to their discussion in class.
Do as much homework as possible. Attempt to do all the problems, even the ones that have not been assigned.
Do not be shy about asking questions, either during class or outside of the class.

College Level Policies:
Attendance Policy: http://www.tcnj.edu/~recreg/policies/attendance.html

Academic Integrity Policy: http://www.tcnj.edu/~academic/policy/integrity.html

Americans with Disabilities Act (ADA) Policy: http://www.tcnj.edu/~affirm/ada.html

Tentative Agenda:

Week	Topics	Reading
1 Monday 8/26	**INTRODUCTION TO SYSTEMS** System Definitions and Elements Classification of Systems **PROJECT ORIENTATION**	CHAPTER 1
2 Monday 9/2	**BRINGING SYSTEMS INTO BEING** The Engineered System System Life-Cycle Engineering The Systems Engineering Process **PROJECT 1:**	CHAPTER 2
3 Monday 9/9	**BRINGING SYSTEMS INTO BEING** System Design Considerations System Synthesis, Analysis, and Evaluation Implementing Systems Engineering **PROJECT 1:**	
4 Monday 9/16	**CONCEPTUAL SYSTEM DESIGN** Problem Definition and Need Identification Advanced System Planning System Feasibility Analysis **PROJECT 1:**	CHAPTER 3
5 Monday 9/23	**CONCEPTUAL SYSTEM DESIGN** System Operational Requirements Maintenance and Support Concept Technical Performance Measures **PROJECT 2:**	
6 Monday 9/30	**CONCEPTUAL SYSTEM DESIGN** Functional Analysis and Allocation System Trade-off Analyses System Specification Conceptual Design Review **PROJECT 2:**	
7 Monday 10/7	**REVIEW** **TEST #1 (MIDTERM)**	
8 Monday 10/14	**PRELIMINARY SYSTEM DESIGN** Subsystem Design Requirements Development, Product, Process, and Material Specifications Functional Analysis and Allocation (Subsystem) **PROJECT 2:**	CHAPTER 4
9 Monday 10/21	**PRELIMINARY SYSTEM DESIGN** Detailed Design Requirements Engineering Design Tools and Technologies Trade-off Studies and Design Definition **PROJECT 2:**	

Tentative Agenda (continued):

Week	Topics	Reading
10 Monday 10/28	**DETAIL DESIGN AND DEVELOPMENT** Detail Design Requirements Integrating System Elements and Activities Design Tools and AIDS Design Data, Information, and Integration **PROJECT 3:**	CHAPTER 5
11 Monday 11/4	**DETAIL DESIGN AND DEVELOPMENT** Development of Engineering Models System Prototype Development Design Review, Evaluation, and Feedback Incorporation of Design Changes **PROJECT 3:**	
12 Monday 11/11	**SYSTEM TEST, EVALUATION, AND VALIDATION** Requirements for System Test, Evaluation, and Validation Categories of System Test and Evaluation Planning for System Test and Evaluation **PROJECT 3:**	CHAPTER 6
13 Monday 11/18	**SYSTEM TEST, EVALUATION, AND VALIDATION** Preparation for System Test and Evaluation Conducting System Test, Data Collection, and Test Reporting System Modifications **PROJECT 3:**	
14, 15 Monday 11/25 Monday 12/2	**PROJECT 3:** **REVIEW**	
16, 17 Monday 12/9 Monday 12/16	**TEST #2 (FINAL)**	

Educational Objectives

(What TCNJ ECE engineers should be able to accomplish during the first few years after graduation)

- To contribute to the economic development of New Jersey and the nation through the ethical practice of engineering;
- To become successful in their chosen career path, whether it is in the practice of engineering, in advanced studies in engineering or science, or in other complementary disciplines;
- To assume leadership roles in industry or public service through engineering ability;
- To maintain career skills through life-long learning.

Electrical and Computer Engineering Student Outcomes

(What TCNJ Electrical and Computer Engineering students are expected to know and be able to do at graduation. What knowledge, abilities, tools and skills the program gives the graduates to enable them to accomplish the Educational Objectives)

The Student Outcomes listed below are expected of all graduates of the Electrical or Computer Engineering Program.

ECE graduates will have:

a. an ability to apply knowledge of mathematics, science and engineering;
The course contributes to this outcome at a medium level by providing students with the knowledge and the tools to engineer complex systems.

b. an ability to design and conduct experiments, as well as to analyze and interpret data;

c. an ability to design a system, component, or process to meet desired needs;
The course contributes to this outcome at a high level by exposing students to the discipline, methodology, and processes necessary to design complex systems taking into account realistic constraints.

d. an ability to function in multidisciplinary teams;
The course contributes to this outcome at a medium level, because although this will be a required course for electrical and computer engineering students, it can be taken by students in the mechanical engineering, biomedical engineering, and engineering science programs.

e. an ability to identify, formulate and solve engineering problems;
The course contributes to this outcome at a high level, since it a course focus on design methodology.

f. an understanding of professional and ethical responsibility;

g. an ability to communicate effectively;
Students do presentations and write reports.

h. the broad education necessary to understand the impact of engineering solutions in a global and societal context;
The course contributes to this outcome at a medium level, as complex systems have many broad implications.

i. a recognition of the need for and an ability to engage in life-long learning;

j. a knowledge of contemporary issues;

k. an ability to use the techniques, skills and modern engineering tools necessary for engineering practice;
The course contributes to this outcome at a medium level since students use Matlab and other modern engineering tools to simulate the architecture of a designed complex system.

Course Objectives:*

Objective 1 To understand system organization. [a, c, e] [1]

Objective 2 To understand the utilization of various analytical models and methods for accomplishing systems analysis. [a, c, e, g, k] [3, 4, 5]

Objective 3 To understand the utilization of various analytical models and methods for accomplishing systems design. [a, c, e, g, k] [3, 4, 5]

Objective 4 To understand the need to properly integrate a variety of engineering design and management disciplines to effectively implement the concepts and principles of systems engineering. [a, c, e, k] [2, 6]

Topics Covered:

1. Introduction to Systems
2. Bringing Systems Into Being
3. Conceptual System Design
4. Preliminary System Design
5. Detailed Systems Design
6. Systems Test, Evaluation, and Validation

Evaluation:

A. Examinations
B. Project Assignments
C. Homework

Performance Criteria:**

Objective 1 Students will learn how to classify and organize systems. [A, C]
Objective 2 Students will be able to apply engineering analysis principles to system analysis. [A, B, C]
Objective 3 Students will be able to apply engineering design principles to system design. [A, B, C]
Objective 4 Students will apply reasoning techniques to the solution of a system design problem. [A, B, C]

---

* Small letters in brackets refer to the Student Outcomes
** Capital letters in brackets refer to the evaluation methods used to assess student performance