ICEE 3060 - System Optimization

This course is required for all Engineering majors.

Course Coordinator:
Evelyn C. Brown

Catalog Description:
Introduces mathematical tools applied to system privatization including problem formulations, identification of decision variables, use of graphical methods, linear programming, concepts of duality, and sensitivity analysis. Applications include transportation problem analysis, network analysis, project management, decision analysis, game theory, Markovian process, queuing problems, and inventory problems.

Course Structure:
Two 75-minute lectures per week (three credits)

Prerequisites:
MATH 3100, MATH 3307

Required Materials:
1. *Operations Research: Applications and Algorithms, 4th Edition,* Wayne L. Winston, Prentice Hall, 2003, ISBN 13: 9780534380588

Course Objectives:
Upon completion of this course each student will be able to:
- Formulate an optimization problem
- Identify decision variables and constraints
- Solve optimization problems employing graphical and iterative methods
- Understand the simplex method and duality
- Perform sensitivity analysis on an optimized solution
- Apply linear programming to solve optimization problems from a range of engineering applications
- Understand application of integer programming: formulate and solve an integer programming problem

Lecture Topics:
- matrices and vectors (6 classes)
- overview of operations research modeling (2 classes)
- concepts of linear programming (2 classes)
- graphical approaches to solving linear programming problems (2 classes)
- basic feasible solutions and extreme points (2 classes)
- Simplex Method (2 classes)
- algebra of the Simplex Method (2 classes)
- duality theory and sensitivity analysis (2 classes)
- economic interpretation of the dual (1 class)
- transportation and assignment problems (2 classes)
- network analysis using PERT and CPM (2 classes)
- integer programming (2 classes)
- introduction to queuing theory (1 class)

Relevant Program Outcomes:
Graduates of the Engineering Program will demonstrate:
a) an ability to apply knowledge of mathematics, science, and engineering

c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) an ability to function on multi-disciplinary teams
e) an ability to identify, formulate, and solve engineering problems
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Professional Component Content:
Math/Science: 1 credit; Engineering: 2 credits; General Education: 0

Assessment Requirements:
Student Work Samples:

- sample problem from a quiz (outcome a)

Targeted Exam Questions:

- linear programming formulation problem on final exam (outcome e)

Student Course Survey

Last Review:
January 5, 2008 by Evelyn C. Brown