I SY E 323, Operations Research-Deterministic Modeling

1. **Credits**: 3  
   **Contact Hours**: 3.3


a. **Other Supplemental Materials**: N/A

- **Specific Course Information**:
  
a. **Brief description of the content of the course (Course Catalog Description)**: Basic techniques for modeling and optimizing deterministic systems with emphasis on linear programming. Computer solution of optimization problems. Applications to production, logistics, and service systems.

b. **Pre-requisites or Co-requisites**: Math 222, Math 320 or Math 340

c. **This is a Required course**.

- **Specific Goals for the Course**:

a. **Course Outcomes**:

1. Write down an algebraic formulation of an optimization model that captures the main decision elements of practical problems.
2. Model a variety of basic problems as optimization models using Excel, and to solve them using Excel Solver.
3. Obtain experience in using an algebraic modeling language to model practical, large-scale problems.
4. Understand the simplex method for linear programming.
5. Understand the relationship between a linear program and its dual, including concepts
such as complementary slackness and strong duality.

6. Perform sensitivity analysis to understand how changes in the problem’s input impact the optimal solution output.

7. Understand the importance of networks for modeling many operations research problems.

8. Perform simple network optimization algorithms.

9. Understand how to model advanced logical constraints using integer decision variables.

10. Understand the branch-and-bound algorithm used in discrete optimization.

11. Understand the impact of convexity on an optimization instance’s complexity.

• **ABET Student Learning Outcomes:**

(a) Ability to apply mathematics, science and engineering principles.
(b) Ability to design and conduct experiments, analyze and interpret data.
(e) Ability to identify, formulate and solve engineering problems.
(k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

• **Brief List of Topics to be Covered:**

Linear Programming, Analysis of Linear Programming Solutions, Discrete Models, Nonlinear Programming