



# Engineering and Technology Management

## COURSE SYLLABUS

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**Course Number:** E M 566

**Course Name:** Systems Engineering Analysis and Practice

**Instructor:** Alice Squires

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**Semester Credits:** 3

**Prerequisites:** None

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### Course Description and Objectives:

Systems Engineering Analysis and Practice employs an interdisciplinary approach and means to enable the realization of successful systems. The course covers: a) models and approaches for system analyses, b) design for operational feasibility, and c) evaluation and comparison of a set of feasible system design alternatives early in the system development life cycle. The course proceeds with design synthesis and reliability improvement while considering the complete problem including operations, performance, test, verification, manufacturing, cost, schedule, disposal and the related specialties. The course includes practical exercises to link systems engineering to decision theory, statistics, and optimization techniques. Current successful processes, methods, and tools for systems engineering are introduced. Students will gain mastery in planning the design and analysis of optimal and affordable system solutions. After taking this course, the student will be able to:

- Explain the system engineering design process including conceptual system design, preliminary system design, detail design and development, and system test, evaluation, and validation.
- Incorporate models for decision making and economic evaluation, operational optimization, queuing theory and analysis, and control concepts and methods and other system analyses as needed to support the completion of an optimal system design for a given system solution.
- Design for operational feasibility through design for reliability, availability, maintainability, usability (human factors), safety, logistics and supportability, producibility, disposability, sustainability, and life-cycle cost (affordability) and understand the trade-off approach for addressing inherent conflicts between design factors in the pursuit of an optimal system design.
- Perform initial systems analyses and design evaluation on a set of broad, differentiated system design alternatives developed to solve a stated need or address a technical opportunity, including identifying the operational scenarios and completing a life cycle cost analysis, effectiveness analysis, and risk assessment for each viable system alternative being evaluated.

### Course Topics:

- System Science and Engineering
- Bringing Systems into Being
- Conceptual and Preliminary Systems Design
- Detail Design and Development
- System Test, Evaluation and Validation
- Alternatives and Models in Decision Making
- Models for Economic Evaluation
- Optimization in Design and Operations
- Queuing Theory and Analysis
- Control Concepts and Methods
- Design for Reliability, Maintainability, and Safety
- Design for Usability (Human Factors)
- Design for Logistics and Supportability
- Design for Producibility
- Design for Sustainability
- Design for Disposability
- Design for Affordability (Life-cycle Costing)

### Grading:

Participation: 15%, Discussion: 15%, Exams: 20%, HW: 20%, Team Present: 10%, Final Project: 20%