AE 8803 Special Topics - Syllabus

Logistical Planning Methods and Their Application to Space Mission Design. 3 Credit Hours.

General Information

Description

This course will introduce the concepts related to logistical planning methods and their applications in space mission design. The covered methods include: (1) logistics optimization methods, such as general linear programming (LP), integer programming (LP), mixed-integer linear programming (MILP), large-scale optimization techniques (e.g., Lagrangian methods, column generation, dynamic programming), and nonlinear programming (NLP); and (2) logistics modeling methods, such as queueing theory and inventory management. The covered applications include: (1) space exploration campaign; (2) in-space servicing, assembly, and manufacturing (ISAM); and (3) satellite constellations management.

Pre- &/or Co-Requisites

AE 6353 Orbital Mechanics
AE 6610 Optimization for the Design of Engineered Systems

Course Goals and Learning Outcomes

Upon completion of this course, you should be able to:

- Explain the basic principles of logistics optimization and modeling.
- Apply logistics analysis techniques to space mission design.
- Analyze the design and performance of complex space logistics systems.

Course Requirements & Grading

Note: Graded components of a course may vary with each offering. The example below is typical but subject to change.

Description of Graded Components

In this course, you are assigned to submit progress deliverables/reports toward a project. In the project, you are expected to come up with a unique idea for applying the logistics techniques covered in class to a spacecraft-related problem.

Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Topics Covered

Note: The exact topics covered in a course may vary with each offering. The example below is typical but subject to change.

The covered methods include:

(1) logistics optimization methods, such as general linear programming (LP), integer programming (LP), mixed-integer linear programming (MILP), large-scale optimization techniques (e.g., Lagrangian methods, column generation, dynamic programming), and nonlinear programming (NLP);
(2) logistics modeling methods, such as queueing theory and inventory management.

The covered applications include:

(1) space exploration campaign;
(2) in-space servicing, assembly, and manufacturing (ISAM);
(3) satellite constellations management.

Course Materials

Note: Course materials may vary with each offering. The example below is typical but subject to change.

Textbook

Required

- The logic of logistics: Theory, algorithms, and applications for logistics and supply chain management: 3rd edition. By David Simchi-Levi, Xin Chen, and Julien Bramel, Springer, 2014.
- Urban Operations Research: 2nd edition. By Richard C. Larson and Amedeo R. Odoni, Dynamic Ideas, 2007.

Recommended

- Introduction to linear optimization. By Dimitris Bertsimas and John N. Tsitsiklis, Athena scientific, 1997.
- Convex optimization. By Stephen P. Boyd and Lieven Vandenberghe, Cambridge University Press, 2004.
- Nonlinear Programming: 3rd edition. By Dimitri Bertsekas, Athena Scientific, 2016.

Course notes

Course notes are shared on the Canvas website.