Space Operations Research  SPSM-5730

Meeting Times

Thursday, 5:00 - 9:00 PM

https://webster-edu.zoom.us/j/94310545184

Colorado Springs Metro Campus

Contact Information

INSTRUCTOR: DR. LYNNANE GEORGE

Email: lynnanegeorge93@webster.edu

Phone: (719) 235-8610

Website: https://www.linkedin.com/in/lynnanegeorge/

Description

Students examine modeling techniques that assist in the decision-making process of space operations. Linear, nonlinear, integer, and dynamic programming techniques applicable to space operations are among the deterministic mathematical methods explored.

Requisites

None

Outcomes

The student will:

- Learn and apply operations research techniques to help solve problems encountered in the space operations research environment.
- Become familiar with and apply the terminology associated with operations research models used to analyze system behavior.
- Understand the concepts associated with various operations research models and underlying principles governing their application.
- Gain knowledge of the fundamentals for, and be capable of, designing and conducting research based on the scientific method.
- Demonstrate their ability to understand, synthesize and apply the knowledge gained in this course through oral discussions and written examinations.

Required Textbook

Introduction to Operations Research

Author: Hiller and Lieberman
Publisher: McGraw-Hill
Edition: 9th
ISBN: 978-0077298340

Materials

Please use current edition of textbook (11th).

Deliverables

Skills Review
The skills review will be a refresher on mathematics that will be used for the course. It will include basic calculator operations, algebra and graphing techniques.

Exams
Exam 1 will cover Chapters 1 - 6
Exam 2 will cover Chapters 7 - 12

Homework
Individual homework will be due every week except week one. The intent of the homework is for the student to become more familiar with the lecture material.

Exercises
There will be two exercises over the term. The purpose of the exercises is to reinforce the concepts learned and apply them to real-world scenarios. The exercises will assess your critical thinking skills and ability to express them in written and oral form.

Final Project
The final project will be a case study of a current space application. You will write a report on your findings and present your results on week 9.

☑ Evaluation

Breakdown
Skills review: 40 points
Exams (2): 500 points
Homework: 160 points
Exercises: 150 points
Final Project: 150 points

Schedule

<table>
<thead>
<tr>
<th>When</th>
<th>Topic</th>
<th>Notes</th>
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| Lecture       | Course Overview        | Course Introduction
What is Operations Research?
Steps Involved in Decision Modeling
Development of a Linear Programming (LP) Problem
Formulating an LP Problem
Read: Chapters 1 and 2
Assigned: Skills Review, Homework 1, Exercise 1 |
| Lecture       | Graphical Solutions    | Graphical Solution of an LP problem with 2 variables
A minimization LP problem
Special situations involving LP problems
Setting up and solving LP problems using Excel solver
Applications
Read: Chapter 3
Assigned: Homework 2
Due: Skills Review, Homework 1 |
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<th>When</th>
<th>Topic</th>
<th>Notes</th>
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| Lecture      | Sensitivity Analysis                           | Simplex Method  
Sensitivity Analysis  
Review  
Read: Chapters 4 - 6  
Assigned: Homework 3  
Due: Homework 2 |
| Week #3      |                                                 |                                                                     |
| 06/17/2021   |                                                 |                                                                     |
| 4:00 PM - 8:00 PM |                                             |                                                                     |
| Colorado Springs Metro Campus |                        |                                                                     |
| Lecture      | Exam #1, Alternate Solutions                   | Exam #1  
Alternate Solutions  
Read: Chapter 7  
Assigned: Homework 2, Exercise 2  
Due: Homework 3, Exercise 1 |
| Week #4      |                                                 |                                                                     |
| 06/24/2021   |                                                 |                                                                     |
| 4:00 PM - 8:00 PM |                                             |                                                                     |
| Colorado Springs Metro Campus |                        |                                                                     |
| Lecture      | Applications of Linear Programming             | Transportation  
Assignment Model  
Shortest Path  
Maximum Flow  
Minimal Spanning Tree  
Read: Chapters 8 - 9  
Assigned: Homework 6, Final Project  
Due: Homework 4 |
| Week #5      |                                                 |                                                                     |
| 07/01/2021   |                                                 |                                                                     |
| 4:00 PM - 8:00 PM |                                             |                                                                     |
| Colorado Springs Metro Campus |                        |                                                                     |
| Lecture      | Dynamic and Integer Programming                | Dynamic Programming  
Integer Programming  
Read: Chapters 10 - 11  
Assigned: Homework 6  
Due: Homework 5 |
| Week #6      |                                                 |                                                                     |
| 07/08/2021   |                                                 |                                                                     |
| 4:00 PM - 8:00 PM |                                             |                                                                     |
| Colorado Springs Metro Campus |                        |                                                                     |
| Lecture      | Nonlinear Programming                          | Nonlinear Programming  
Review  
Read: Chapter 12  
Assigned: Homework 7  
Due: Homework 6, Exercise 2 |
| Week #7      |                                                 |                                                                     |
| 07/15/2021   |                                                 |                                                                     |
| 4:00 PM - 8:00 PM |                                             |                                                                     |
| Colorado Springs Metro Campus |                        |                                                                     |
| Lecture      | Exam #2, Decision Making                       | Exam 2  
Decision Making  
Read: Chapter 15  
Assigned: Homework 8  
Due: Homework 7 |
| Week #8      |                                                 |                                                                     |
| 07/23/2021   |                                                 |                                                                     |
| 4:00 PM - 8:00 PM |                                             |                                                                     |
| Colorado Springs Metro Campus |                        |                                                                     |
| Lecture      | Final Presentations                            | Course Wrap-up  
Final Presentations  
Due: Homework 3, Final Project |
| Week #9      |                                                 |                                                                     |
| 07/30/2021   |                                                 |                                                                     |
| 4:00 PM - 8:00 PM |                                             |                                                                     |
| Colorado Springs Metro Campus |                        |                                                                     |
Course Policies

Activities
This course will involve some mathematics. Prior to the first class, students should familiarize themselves with their calculators and algebraic functions as well as graphing.

Homework
Homework is due the week after it is assigned. Late homework will be assessed a late penalty of 10% per day.

Attendance
Students are expected to attend all class sessions. In the case of an unavoidable absence, the student must contact the instructor. The student is subject to appropriate academic penalty for incomplete or unacceptable makeup work, or for excessive or unexcused absences.

Institutional Policies

Academic Policies
Academic policies provide students with important rights and responsibilities. Students are expected to familiarize themselves with all academic policies that apply to them. Academic policies for undergraduate students can be found in the Undergraduate Studies Catalog; graduate students should review the Graduate Studies Catalog.

Undergraduate Studies Catalog
The Undergraduate Studies Catalog contains academic policies that apply to all undergraduate students. The academic policies and information section of the catalog contains important information related to attendance, conduct, academic honesty, grades, and more. If you are an undergraduate student, please review the catalog each academic year. The current Undergraduate Studies Catalog is at:

http://www.webster.edu/catalog/current/undergraduate-catalog/

Graduate Studies Catalog
The Graduate Studies Catalog contains academic policies that apply to all graduate students. The academic policies section of the catalog contains important information related to conduct, academic honesty, grades, and more. If you are a graduate student, please review the catalog each academic year. The current Graduate Studies Catalog is at:

http://www.webster.edu/catalog/current/graduate-catalog/

Grading
The Grades section of the academic catalog outlines the various grading systems courses may use, including the information about the final grade reported for this class.

Undergraduate
http://www.webster.edu/catalog/current/undergraduate-catalog/academic-policies.html#grading

Graduate
http://www.webster.edu/catalog/current/graduate-catalog/academic-policies.html#grades

Incomplete
There are important policies that govern grades of Incomplete (I), including the circumstances under which Incomplete grades are granted, deadlines for completion, and consequences should the remaining course work not be completed. It is the responsibility of a student who requests an Incomplete to ensure that he/she understands and follows the policies.

Grade Appeals
Instructors are responsible for assigning grades, and student should discuss grade issues with the instructor. Policies and procedures for appealing grades are available in the appropriate catalog.

Academic Honesty Policy
Webster University is committed to academic excellence. As part of our Statement of Ethics, we strive to preserve academic honor and integrity by repudiating all forms of academic and intellectual dishonesty, including cheating, plagiarism and all other forms of academic dishonesty. Academic dishonesty is unacceptable and is subject to a disciplinary response. Students are encouraged to talk to instructors about any questions they may have regarding how to properly credit others’ work, including paraphrasing, quoting, and citation formatting. The university reserves the right to utilize electronic databases, such as Turnitin.com, to assist faculty and students with their academic work.

The University's Academic Honesty Policy is published in academic catalogs:

**Undergraduate**
http://www.webster.edu/catalog/current/undergraduate-catalog/academic-policies.html

**Graduate**
http://www.webster.edu/catalog/current/graduate-catalog/academic-policies.html

As a part of the University commitment to academic excellence, the Academic Resource Center provides student resources to become better acquainted with academic honesty and the tools to prevent plagiarism in its many forms:

http://www.webster.edu/arc/plagiarism_prevention/

**Statement of Ethics**

Webster University strives to be a center of academic excellence. The University makes every effort to ensure the following:

- The opportunity for students to learn and inquire freely
- The protection of intellectual freedom and the rights of professors to teach
- The advancement of knowledge through scholarly pursuits and relevant dialogue

To review Webster University's statement of ethics, see the Undergraduate Studies Catalog and the Graduate and Studies Catalog:

**Undergraduate**
http://www.webster.edu/catalog/current/undergraduate-catalog/overview.html#ethics

**Graduate**
http://www.webster.edu/catalog/current/graduate-catalog/ethics.html

**Contact Hours for this Course**

It is essential that all classes meet for the full instructional time as scheduled. A class cannot be shortened in length. If a class session is cancelled for any reason, the content must be covered at another time.

**Important Academic Resources**

**Academic Accommodations**

Webster University makes every effort to accommodate individuals with academic/learning, health, physical and psychological disabilities. To obtain accommodations, students must identify themselves and provide documentation from a qualified professional or agency to the appropriate campus designee or the Academic ADA Coordinator at the main campus. The Academic ADA Coordinator may be reached at 314-246-7700 or disability@webster.edu.

If you have already identified as a student with a documented disability and are entitled to classroom or testing accommodations, please inform the instructor of the accommodations you will require for this class at the beginning of the course.

**Academic Resource Center**

Additional support and resources may be accessed through the Academic Resource Center (ARC). Support and resources include academic counseling, accommodations, assistive technology, peer tutoring, plagiarism prevention, testing center services, and writing coaching. Visit www.webster.edu/arc or Loretto Hall 40 on the main campus for more information.

**Student Success Portal**

Webster University's Student Success Portal, powered by Starfish, is a communications tool to connect students with faculty members and campus support services. It allows faculty and staff members to communicate with you regarding academic achievements as well as areas where support may be helpful. You may use the portal to contact faculty and staff members for assistance and to arrange
meetings. Activity in the portal will be communicated to your Webster University email account. The Student Success Portal is available via your course home page in WorldClassRoom or via Connections. Learn more about the Student Success Portal at [http://www.webster.edu/success/students.html](http://www.webster.edu/success/students.html).

University Library

Webster University Library is dedicated to supporting the research needs and intellectual pursuits of students throughout the University's worldwide network. Resources include print and electronic books, journal articles, online databases, DVDs and streaming video, CDs and streaming music, datasets, and other specialized information. Services include providing materials at no cost and research help for basic questions to in-depth exploration of resources. The gateway to all of these resources and services is [http://library.webster.edu](http://library.webster.edu). For support navigating the library's resources, see [http://libanswers.webster.edu/](http://libanswers.webster.edu/) for the many ways to contact library staff.

Drops and Withdrawals

Drop and withdrawal policies dictate processes for students who wish to unenroll from a course. Students must take proactive steps to unenroll; informing the instructor is not sufficient, nor is failing to attend. In the early days of the term or semester, students may DROP a course with no notation on their student record. After the DROP deadline, students may WITHDRAW from a course; in the case of a WITHDRAW, a grade of W appears on the student record. After the WITHDRAW deadline, students may not unenroll from a course. Policies and a calendar of deadlines for DROP and WITHDRAW are at:

- **Undergraduate**
- **Graduate**
  [http://www.webster.edu/catalog/current/graduate-catalog/enrollment.html](http://www.webster.edu/catalog/current/graduate-catalog/enrollment.html)
- **Academic Calendar** - [http://www.webster.edu/academics/academic-calendar/](http://www.webster.edu/academics/academic-calendar/)

Current tuition rates, policies, and procedures, including details of pro-rated tuition refunds, are available in the "Tuition, Fees, and Refunds” section of Webster’s Academic Catalogs:

- **Undergraduate**
- **Graduate**
  [http://www.webster.edu/catalog/current/graduate-catalog/tuition.html](http://www.webster.edu/catalog/current/graduate-catalog/tuition.html)

Student Handbook and Other Important Policies

Student handbook and other non-academic policies may apply to you and may impact your experience in this class. Such policies include the student code of conduct, privacy, technology and communications, and more. Please review the handbook each year and be aware of policies that apply to you. The handbook is available at:


**Sexual Assault, Harassment, and Other Sexual Offenses**

Webster University makes every effort to educate the community to prevent sexual assault, harassment, and other sexual offenses from occurring, and is committed to providing support to those affected when this behavior does occur. To access information and resources or to review the Policy on Sexual Assault, Harassment, and Other Sexual Offenses, visit:

[http://www.webster.edu/sexual-misconduct/](http://www.webster.edu/sexual-misconduct/)

Research on Human Subjects

The Webster University Institutional Review Committee (IRB) is responsible for the review of all research on human subjects. The IRB process applies to all Webster University faculty, staff, and students and must be completed prior to any contact with human subjects. For more information on the IRB, visit:

[http://www.webster.edu/irb/index.html](http://www.webster.edu/irb/index.html)

Course Evaluations
At the end of this course, you will have the opportunity to provide feedback about your experience. Your input is extremely valuable to the university, your instructor, and the department that offers this course. Please provide your honest and thoughtful evaluation, as it helps the university to provide the best experience possible for all of its students.

**Important Technology Information**

***Connections Accounts***

Webster University provides all students, faculty, and staff with a University email account through Connections. Students are expected to activate their Connections account and regularly check incoming University email. Students may choose to have their University email forwarded to an alternate email address. Connections account holders can call the Help Desk (314-246-5995 or toll free at 1-866-435-7270) for assistance with this setup. Instructions are also provided on the Information Technology website at:

[http://www.webster.edu/technology/service-desk/](http://www.webster.edu/technology/service-desk/)

***WorldClassRoom***

WorldClassRoom is Webster’s Learning Content Management System (LMS). Your instructor may use WorldClassRoom to deliver important information, to hold class activities, to communicate grades and feedback, and more. WorldClassRoom is available using your Connections ID at:

[https://worldclassroom.webster.edu/](https://worldclassroom.webster.edu/)

***Webster Alerts***

Webster Alerts is the University’s preferred emergency mass notification service, available free to current students, faculty and staff at all US campuses. By registering a valid cell phone number and email address, you will receive urgent campus text, voice mail and email communications. Valuable information concerning a range of incidents affecting you - from weather-related campus closures, class delays and cancellations, to more serious or life-threatening events - are immediately and simultaneously delivered through multiple communication channels. To register for Webster Alerts, visit:

[http://www.webster.edu/technology/services/webster-alerts/](http://www.webster.edu/technology/services/webster-alerts/)

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**Campus Information**