University of North Texas
College of Business
LSCM 6071
Operations Research in Logistics and Supply Chain Management

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1 Welcome

Welcome to LSCM 6071, Operations Research in LSCM. This is a math-based, graduate-level course that is relatively challenging as it focuses on translating real-world problems into mathematical models.

As a way of an introduction, here is a "brief" biographical sketch of me.

> *Dr. David Nowicki is an Associated Professor at the University of North Texas (UNT) and serves as the Director of its College of Business' Logistics Center for Education and Research. He holds a joint appointment in the College of Business' Department of Marketing and Logistics and the College of Engineering's Department of Engineering Technology. Dr. Nowicki received his Master's Degree in Industrial and Systems Engineering from Virginia Tech and both his bachelors and doctorate degrees in Industrial Engineering from the University of Wisconsin – Madison.*
>
> *Dr. Nowicki's research efforts focus on applying advanced analytical techniques to solve supply chain management problems from a systems engineering context. Professor Nowicki's research is concentrated on performance based logistics modeling, supply chain management, resiliency and risk, econometrics, game theory, multi-resource optimization, reliability theory, and inventory optimization. Dr. Nowicki brings over 20 years of industry experience holding executive positions at i2 Technologies and the TFD Group with a focus on supply chain management, systems engineering, lifecycle affordability, operations research modeling, reliability, inventory optimizations and software engineering.*

Please make sure that you do not fall behind. There is a great deal of content in this course and you will find it difficult to catch up once you fall behind.

Let us have a wonderful learning experience!

All the best,

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Dr. David Nowicki

2 Instructor Contact

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3 Course Description

This course brings a strong modeling orientation to bear on the process of obtaining and utilizing resources to produce and deliver useful goods and services so as to meet the goals of the organization. Decision-oriented models such as linear programming, inventory control, and forecasting are discussed and then implemented utilizing spreadsheets and other commercial software. A review of the fundamentals of statistical analysis oriented toward business problems will also be conducted.

4 Course Advise/Guidance

- This course is math-based – it's about translating real-world word problems into mathematical models; if your math skills are rusty, this course will be EXTRA-challenging;
- Operations research is *extremely* practical – it was developed to solve real-world problems;
- Operations research presents a new way of looking at processes - and it may take you time to assimilate this new "world view";
- You may feel that you're spinning your wheels for a bit – please be patient with the material and with yourself;
- *Experience has shown the main stumbling block in EM-605 is that students don't allocate enough time do the assignments;* and
- In this course, give yourself 10 hrs/week for the problems during the first few weeks; this doesn't include the time to read the chapter(s) and think about them.

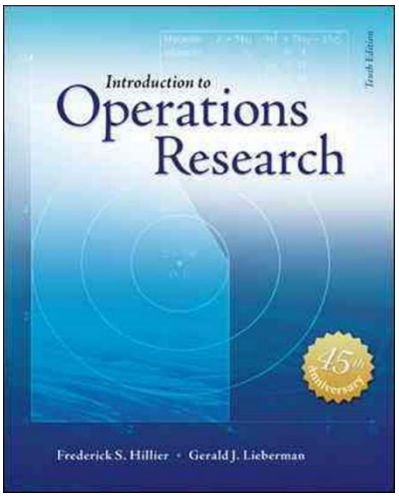
5 Course Objectives

By the end of this course, students will be able to:

- Build operations research models of complex systems;
- Use software packages for the solution of management problems;
- Understand the results of computer modeling;
- Apply the appropriate analytical technique to real-world problems; and
- Summarize and present analysis results in a clear and coherent manner.

7 Required Text

Frederick S. Hillier & Gerald J. Lieberman (2015), *Introduction to Operations Research*, **10th Edition**, McGraw-Hill.
ISBN-13: 978-0-07-352345-3



8 Course Material

8.1 Weekly Lectures and Problem Solving Meetings

- Lecture slides for the course are provided in Canvas; and
- There will be a weekly real-time, problem solving, Q&A meeting using Zoom. Zoom is located in your Canvas work space for this course. The meetings will be held on Saturday mornings from 10:00am to 11:00am (Hoboken time).

8.2 Assigned Homework

- Homework assignment will be posted on Canvas;
- Submissions are due no later than 11:59pm (Eastern Time) on the deadline day posted in Canvas. In general, it will be the Tuesday after the week the homework is assigned.
- **Late assignments will not be accepted**.
- Assignments will be graded within 72 hours of the required submission date.

8.3 Canvas

Course materials and assignments will be available within Canvas. You are expected to log in to Canvas at least once in every 24 hours. Important announcements and other communications are delivered to you via Canvas.

Please use the Canvas Discussion Section to discuss or comment on:

- Past homeworks,
- Software issues,
- Current subject topics,
- O.R. in the news, and
- Ideas or events (related to O.R.) that we all might find interesting.

8.4 Software and Templates

This course will use the following software:

1. Excel Solver Add-In
2. Analytic Solver Platfrom for Education (ASPE)
3. LINDO/LINGO
4. OR Tutor
5. Interactive Operations Research (IOR) Tutorial.

Descriptions and installations instructions are located on Canvas in the “Week 1 – Getting off to a Good Start” within the “OR Courseware”.

9 Calendar, Assignments, and Grading

Note: I may revise this schedule to accommodate class progress, more in-depth focus or discussion where warranted. We will attempt to stay as close to this schedule as possible.

Date	Topic Covered	Problems/Assignments
Jan 13 – Jan 19	Get off to a good start	Book, Software, and more
Jan 20 – Jan 26	Ch01 - Introduction Ch02 - Overview of Operations Research	1.3-2 2.1-1, 2.1-2
Jan 27 – Feb 02	Ch03 - Introduction to Linear Programming	3.1-2, 3.1-3, 3.1-5, 3.1-11, 3.5-6
Feb 03 – Feb 09	Ch04 - Solving Linear Programming	4.1-1, 4.1-4, 4.2-1, 4.3-2, 4.3-4, 4.7-6
Feb 10 – Feb 16	Ch05 – The Theory of the Simplex Method	5.1-1, 5.1-4, 5.3-1
Feb 17 – Feb 23	Ch06 - Duality Theory	6.1-1, 6.2-1, 6.3-8, 6.5-1
Feb 24 – Mar 01	Ch09 - The Transportation and Assignment Problem	9.1-2, 9.2-9, 9.3-2(a)(b)(c)(d)
Mar 02 – Mar 08	Ch10 - Network Optimization Models	10.3-2, 10.4-2, 10.5-3
Mar 09 – Mar 15	SPRING BREAK - NO CLASS	
Mar 16 – Mar 22	Ch11 - Dynamic Programming	11.3-4, 11.4-2
Mar 23 – Mar 29	Ch15 - Game Theory	15.1-3, 15.2-1, 15.2-7, 15.4-4

Mar 30 – Apr 05	Ch16 - Decision Analysis	16.2-2, 16.3-5, 16.4-3, 16.5-3, 16.5-6, 16.6-2
Apr 06 – Apr 12	Ch17 - Queuing Theory	17.2-2, 17.3-1, 17.4-5, 17.5-5
Apr 13 – Apr 19	Ch17 - Queuing Theory Ch18 - Inventory Theory	17.7-1, 17.8-1 18.3-1, 18-6.1
Apr 20 – Apr 26	Ch18 - Inventory Theory / Revenue Management	18.7-5, 18.8-2, 18.8-7
Apr 27 – May 03	Ch20 - Simulation	20.1-6, 20.1-10, 20.6-6, 20.6-7

Grading

Your grade will be comprised of three parts:

1. 15 homework assignments (50%),
2. Weekly article disposition (25%),
3. One journal articles instantiated in one of the software applications (25%).

There is no extra credit or make-up work. Please show all of your work. Answers without supporting work will receive no points. Please answer all questions in the assignments in a clear, concise manner. Providing only math and numbers will not be sufficient. Late submission are not accepted. Canvas prevents late submissions.

The grading scale is guaranteed. You will receive no less than the grade listed within the appropriate interval. I reserve the right to adjust the grading scale in favor of the class if warranted.

Grade	Numeric Range
A	93 - 100
A-	90 - 92.9
B+	87 - 89.9
B	83 - 86.9
B-	80 - 82.9
C+	77 - 79.9
C	73 - 76.9
C-	70 - 72.9

Doctoral Requirements

Literature Integration and Presentation
Students will sign up for one or more topic areas on the first day of class (total number of presentations determined by class size). Each student will make a 15-minute "discussant-type" presentation (i.e., following the format of a discussant at a conference session) in class on the assigned day. The student will then lead the class discussion on the relevant topic and present a conceptual model of the field and a bibliography of additional readings. It should be noted that students not presenting on a given day *should still come fully prepared* to evaluate and extend the presented material as well as discuss the thought questions assigned for that day.

General Topics for the Modeling and Analysis Seminar
1. Linear Programming
2. Duality Theory
3. Linear Programming under Uncertainty
4. Other Algorithms for Linear Programming
5. The Transportation and Assignment Problems
6. Network Optimization Models
7. Dynamic Programming
8. Integer Programming
9. Nonlinear Programming
10. Metaheuristics
11. Game Theory
12. Decision Analysis
13. Queueing Theory
14. Inventory Theory
15. Markov Decision Processes
16. Simulation

Pedagogical Framework

The underlying pedagogical framework for LSCM 6071 is shown in Figure 1. This framework has evolved through past faculty and industry partner experiences, funded research, student feedback, faculty feedback and feedback from industry subject matter experts. The underlying philosophy is to structure a course that moves away from a traditional learning by listening pedagogy to a more blended approach that focuses on the pedagogies of discovery learning, learning by doing, and learning through discussion and debate. The general course flow of this framework is shown in Figure 1.

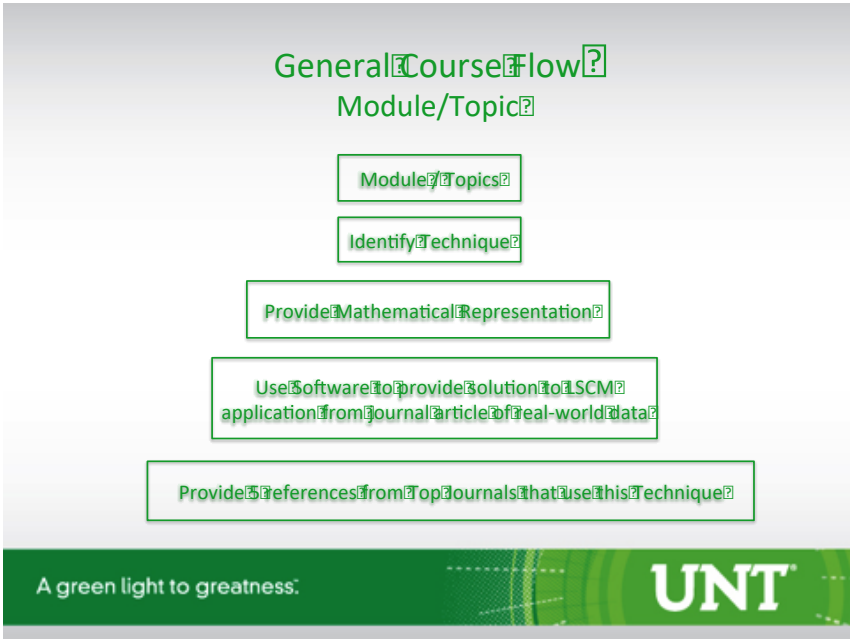


Figure 1. General Course Flow

The first step is to establish a topic that is applicable to Logistics and Supply Chain Management: Reliability, Meta Heuristics, Multi-Objective Optimization, Game Theory, Queuing Theory, Forecasting, Data Mining, and Machine Learning (deep learning and data analytics). The students then explore (discovery learning) a topic to identify relevant business challenges and analytical techniques that are used to support operational, tactical and strategic decisions. As part of the learning process the students are taught how to create a mathematical representation of a logistics and supply chain management problem. The transition from narrative to mathematical representation is non-trivial and the students quickly realize and work on this challenge. After the students understand the business challenge, the mathematical representation of the problem, and the mathematical technique(s) applicable to solving the problem; they will then use a software tool to solve the problem (learning by doing). The most commonly used software includes Excel, SPSS, MatLab, Mathematica, and Minitab. An example:

Business Challenge: Determine the remaining useful life of a bus engine
Topic: Reliability
Technique: Right censored, parametric survival analysis
Software: Minitab

To further understand (learning by discovery) the applicability of a topic to the student's research interest, the student's must identify 5 journal relevant journal articles to the business challenge-topic-technique sequence. Here they begin to build a reference database using EndNotes. Throughout the semester the student's are shown the benefits of EndNotes. The student must take one of these articles and present to the class their evaluation of the article according to the criteria in Figure 2. Initially, the students are not provided guidance on the journals to explore. They soon discover that it is easier to answer the questions in Figure 2 with some journals rather than others. After a couple of weeks the students are provided a list of FT45 and A-level journals and realize that the top-tier journals are relatively consistent in their structure and lend themselves to answering the questions in Figure 2.

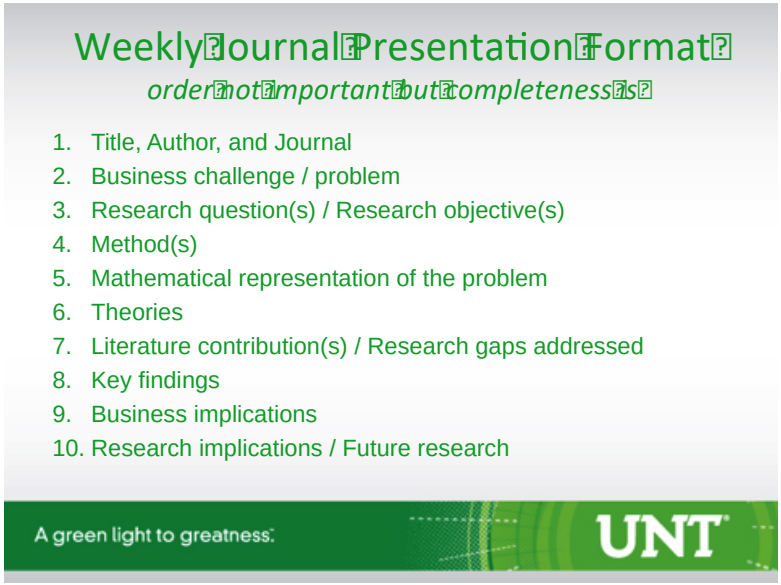


Figure 2. Weekly Journal Presentation Format

Figure 3 illustrate a typical weekly deliverable, Figure 3 shows the first week assignment for the LSCM 6071 course.

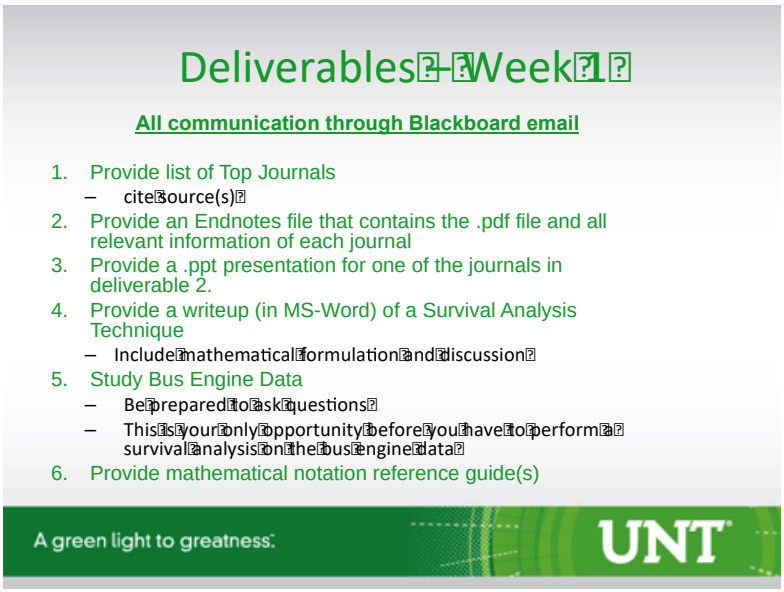


Figure 3. Week 1 Student Deliverables

The supporting pedagogical framework for Operations Research 6071encourages students to develop and utilize critical thinking skills. The framework embraces a multidisciplinary approach, enhances group learning and problem-solving experiences and has been shown to improve learning outcomes for students.