THE OHIO STATE UNIVERSITY
FISHER COLLEGE OF BUSINESS

BUSML 4382 –
Logistics & Supply Chain Analytics

Semester: Spring 2023	**Classroom:** Schoenbaum 215 (M & W) Schoenbaum 219 (F)	**Zoom Meeting ID:** 614 292 0568; PW: buckeyes Direct link: go.osu.edu/zoom_with_dr_castillo
Instructor:	Dr. Vince Castillo	**E-mail:** Castillo.230@osu.edu
Student Hours (Virtual):	Thursday 10a-11:00a (all sections) via Zoom Additional appointment requests are always welcome	**Office:** Fisher Hall 532

Course Content Website: http://carmen.osu.edu/

Class Meeting Times:

Section	Time	M	W	F +/-
4123	11:30a-12:25p	Lecture (SB215)	Lecture (SB215)	Lab (SB219)
4530	12:40p-1:35p	Lecture (SB215)	Lecture (SB215)	Lab (SB219)

Course Description:
This course introduces students to the tools necessary to understand, analyze, and make decisions in logistics and supply chain management (LSCM). We will study classic analytics methods (e.g., forecasting, optimization, heuristics, and simulation) in detail to understand how they are used to evaluate and enhance understanding of common LSCM problems. Specifically, we're going to study time series forecasting, fundamental machine learning methods, inventory management, transportation planning, and network design problems from an analytical modeling perspective. By the end of the course, you should be familiar with common analytical modeling tools, how they're used, and how to interpret their results. This course will enhance your analytical thinking, that is, the process of transforming a real-world LSCM problem into a mathematical one.

Mode of Delivery, Required Materials, and Technology:
We will meet on Mondays and Wednesdays for lectures in SB215. These lectures will cover of the theory behind the methods along with discussion of the benefits and drawbacks when they're used in LSCM. On Fridays, we will have lab sessions in SB219. Labs will typically consist of a period of practical instruction on the analytics methods covered that week with an emphasis on managerial interpretation of the results.

There is no required textbook for you to purchase for this course, although there will be reading assignments with each lesson. I will provide you with all course materials, including the course schedule, lecture slides, exercises, and readings via Carmen. You also need a laptop or desktop computer with a working webcam and microphone along with a reliable internet connection. Please ensure that you have Zoom updated. Please ensure that you have MS Excel installed to your desktop (I advise using the desktop application as opposed to using it through MS Teams or your web browser, both of which have limited functionality). All readings are obtainable through the OSU library, although, I will provide copies of them on Carmen for your convenience.

You will need two software packages in addition to standard Microsoft Office programs. In the first module of the course, we will learn to use RStudio to do machine learning on LSCM problems. You can download it for free for Windows or Mac by following this link. It is also installed on the computers in the SB219 and Mason Hall labs. I strongly recommend installing RStudio and not just R.

In the latter half of the course, we will learn to use AnyLogistix (ALX) for vehicle routing, supply chain design, and network optimization. You can download the software from the ALX website by clicking on the link above and creating a free account. Please note that this is a Windows-based software package so if you're using a Mac, you'll need to set up a virtual machine (VM) via Amazon Workspaces (instructions will be posted on Carmen), use the computer lab in Mason Hall, or partition your hard drive using VMware or Bootcamp. I strongly recommend the Amazon Workspaces virtual machine option if you are a Mac user.

Evaluation Criteria:

Graded Components	% of Total	Type
Individual Case Studies (2 @ 8% ea.)	16%	N ♦
Group Case Studies (2 @ 15% ea.)	30%	C ⚏
Exams (3 @ 18% ea.)	54%	N ♦

Requirements for each form of graded component.
Failing to follow these will represent academic misconduct. See below.

Independent Work [N ♦]: Strictly non-collaborative, original individual work. You may discuss this assignment with your instructor only. Discussions with other individuals, either in person or electronically, are strictly prohibited.
Collaboration Required [C ⚏]: An explicit expectation for collaboration among students either in class or outside of class (i.e. group work).
Collaboration Optional [O⚐]: Students are permitted, but not required, to discuss the assignment or ideas with each other. However, all submitted work must be one's original and individual creation.

Academic Conduct:
If a student is suspected of, or reported to have committed, academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct (COAM). If you have questions about the above policy or what constitutes academic misconduct in this course, please contact me. See OSU Prohibited Conduct – Section 3335-23-04(A)

University Policies, Services and Resources (go.osu.edu/UPolicies)

Fisher Undergraduate Handbook and QuickLinks (www.bsbalinks.com)

Fisher Navigator Resource Portal (www.nav-1.com)

Grade Components

All assignments will be distributed and submitted via Carmen. Grades will be posted on Carmen as soon as I finish grading them (usually within a week). I will gladly review any grades I give during student hours or via appointment. The following sections describe the areas in which students earn points towards their final grade as well as the weights for each of those areas.

Case Studies (2x Individual @ 8% each; 2x Group @ 12.5% content + 2.5% peer evaluations each; 46% total):
Two individual case studies will be assigned in the predictive and prescriptive analytics modules. Submittals will consist of an executive summary as well as a quantitative analysis. For the two group case studies, you'll work in groups of 3-4 students, which I'll randomly generate from the course roster. Just like the individual case studies, you'll need to submit via Carmen an Executive Summary of your results as well as a quantitative analysis. Group studies also consist of peer evaluations where you'll provide a score for each of your teammates based on their contributions to project. The first group case study will be conducted using RStudio. The second group case study on network design will be conducted with the network design software, AnyLogistix. I will introduce both software packages during the semester. Both are freely available for download from their respective websites, so you will be able to work on it at your own convenience. However, both ALX and RStudio are installed on the machines in the Mason Hall computer lab, so you'll always have access to the tools.

Case Study Evaluation Criteria
Importantly, I will strive to make these case studies a realistic experience. Think of me as your boss assigning you a problem to solve and your job is to analyze and recommend (a) course(s) of action. As such, I will provide "guidance" on completing the assignments, but I **will not** provide a "grading rubric". The reason for this is simple and pragmatic – you don't get "rubrics" in the real world, so continuing to offer them only stunts your professional growth. So, when I provide "guidance", what I mean is that in addition to the narrative and associated case study data, I will provide clear task statements, suggestions on how you can reach a decision, and what to include in your write-up. For example, each write-up will need to include a description of the firm's current situation, a problem statement that describes the decision needing to be made and why it's important to address, a description of the methodology you're employing to study the problem, a statement of the assumptions you're making to simplify the analysis, a discussion of the results you've obtained, and finally, your recommendation with **quantitative support** that demonstrates how it will improve upon the firm's current approach. The last point in this list is a critical component of your write-up and should be reported as percentage improvements in important outcome variables. The report itself will also be evaluated in terms of writing clarity, grammatical composition, accuracy/logic/relevance of analysis & conclusions, whether it is evenhanded (i.e., are alternatives, risks, and limitations explored?) and creativity.

A Note on the Use of AI-Based Technologies in this Course

Artificial intelligence (AI)-based tools continue to proliferate. One such set of tools are apps that use a type of AI (usually natural language processing and deep learning in combination with other methods) to help authors in the writing process. For instance, apps such as OpenAI Playground and LEX are browser-based word processors (think Google Sheets or MS Word Online) that incorporate an AI assistant to generate prompts that help you break through "writer's block". Another AI-based tool is ChatGPT, a recently released chatbot capable of not only answering a plethora of questions about anything under the sun but can even provide specific coding suggestions for machine learning applications in any language you need (something we may find particularly helpful in the predictive analytics module). While there are pros and cons to using these tools (which we'll discuss), I encourage you to explore their capabilities, especially for this course. More importantly, I would like to have an open dialogue about their usefulness. To that end, **I'll ask you to declare if you've used an AI-based writing assistant to develop your executive summaries for each case study.** I do not oppose their use, but you should be aware of their limitations first, because I will hold **you** accountable, **not the AI**, for instances of plagiarism, factual inaccuracy, poor grammar/composition, and the litany of other issues that come with using AI. If you have any concerns, please don't hesitate to contact me to discuss further. The first person to email me the phrase, "Go Bucks!" will get two bonus points on their first exam.

Exams (3 @ 18% each; 54% total):

We will have three exams in this course: two will be paper exams taken on a Wednesday in SB215; the third will be a lab-based exam taken in SB219. More details will be provided closer to each exam date. While the second and third exams are not cumulative per se, there may be carry-over in that the content we discuss early in the semester lays the foundation for understanding content discussed later in the semester. If you need special accommodations for an exam due to COVID or another unexpected event, please contact me as soon as possible to discuss. I will handle these on a case-by-case basis. If you miss an exam without notifying me and cannot provide a statement of support from the University or do not have an intermittent flex plan through SLDS, this will be considered an unexcused absence and earn a 0% grade. See the policies in the two sections on Accommodations below for more information.

Grading Scale:

The following table is used to assign final course grades. I do not round grades, so 89.50 is a B+.

Letter (Points)	A (4.0)	A- (3.7)	B+ (3.3)	B (3.0)	B- (2.7)	C+ (2.3)	C (2.0)	C- (1.7)	D+ (1.3)	D (1.0)	E (0.0)
Range	100% -	93% -	90% -	87% -	83% -	80% -	77% -	73% -	70% -	67% -	60% - 0%

Note: Above percentages are % of overall points earned

Attendance / Participation Expectations:

I will not be monitoring attendance nor does your grade include a participation component. However, you should plan on attending each class session, since we cover a lot of material in a short period of time. I understand that extenuating circumstances occasionally arise which may affect your ability to be in class. Courtesy emails are appreciated in such cases, but not necessary (unless it potentially conflicts with an exam as stated above). I will still hold you accountable for the content covered in those sessions, so if you need to miss a class you should 1) review the slides and associated reading to ensure you can follow along; 2) contact a classmate to ask for a copy of their notes (and perhaps buy them a coffee in exchange); then 3) make an appointment with me to ask specific questions remaining from the lectures/labs.

In rare but extreme situations, I may have to enforce University rule 3335-8-33, which states that any student may be disenrolled from a course for failure to attend by the first Friday of the term, or by the 3rd instructional day of the term, or by the second class meeting, whichever occurs first.

Course-specific Copyright Policy:

Material provided by the instructor may not be re-posted anywhere without the explicit permission of instructors. See University Copyright Policy.

Accommodations due to COVID-Related Absences:

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your

accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Additional Learning Accommodations:
The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, please make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

> *SLDS Contact Information:* slds@osu.edu; 614-292-3307; slds.osu.edu;

> *SLDS Office*: 098 Baker Hall, 113 W. 12th Avenue.

Mental Health Resiliency:
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292--5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.

Course Schedule:

Disclaimer – In the event that extenuating circumstances arise necessitating a change to the course schedule, policies, or other content, I will clearly communicate those changes by explaining them in class and posting an announcement to Carmen.

Location	SB215	SB215	SB219
Day	**M**	**W**	**F**
Date	9-Jan	11-Jan	13-Jan
Topic	Course Introduction	Predictive Analytics Forecasting Introduction ES Forecasts	Forecasting Models in Excel Measuring Forecast Fit
Preparatory Reading	n/a	Castillo (2021) pp.3-12	Castillo (2021) pp.12-17
Date	**16-Jan**	**18-Jan**	**20-Jan**
Topic	No class - MLK Day	Double and Triple ES Forecasts	Optimizing ES Forecasts using Forecast Fit
Preparatory Reading	n/a	Castillo (2021) pp.17-23	Castillo (2021) pp. 23-34
Date	**23-Jan**	**25-Jan**	**27-Jan**
Topic	Intro to Machine Learning Linear Regression	ML with Linear Regression Intro to RStudio	Intro to RStudio ML with Linear Regression
Preparatory Reading	Castillo (2021) pp. 34-38 Shamir (2014)	n/a	n/a
Date	**30-Jan**	**1-Feb**	**3-Feb**
Topic	ML with Logistic Regression	ML with Logistic Regression	ML with Logistic Regression
Preparatory Reading	Waltz (2018)	n/a	n/a
Date	**6-Feb**	**8-Feb**	**10-Feb**
Topic	Predictive Analytics in Practice Module Review	Exam 1	Case Study #1 Lab Time
Preparatory Reading	Bousquette (2023) Forecasting at Uber	n/a	n/a
Date	**13-Feb**	**15-Feb**	**17-Feb**
Topic	Prescriptive Analytics Optimization Introduction LP&IP Overview	LP Refresher & Examples	LP Lab
Preparatory Reading	Coyle et al (2013) - Optimization, Heuristics, and Simulation	Heizer et al (2019) pp. 701-719	n/a

Date	20-Feb	22-Feb	24-Feb
Topic	IP Introduction & Examples	IP Examples Cont'd	IP Lab
Preparatory Reading	n/a	n/a	n/a
Date	27-Feb	1-Mar	3-Mar
Topic	Heuristics Introduction Inventory Management Analytics	Inv Mgt Heuristics	Inv Mgt Lab
Preparatory Reading	Silver et al (2016) - Adj EOQ Silver et al (2016) - Inv Mgt Heuristics	Silver et al (2016) - Wagner Whitin Algorithm	n/a
Date	6-Mar	8-Mar	10-Mar
Topic	Module Review	Exam 2	No class
Preparatory Reading	n/a	n/a	n/a
Date	13-Mar	15-Mar	17-Mar
Topic	Spring Break	Spring Break	Spring Break
Preparatory Reading	n/a	n/a	n/a
Date	20-Mar	22-Mar	24-Mar
Topic	Vehicle Routing	Metaheuristics - ORION at UPS Module Review	Intro to ALX Vehicle Routing with ALX & Excel
Preparatory Reading	Vehicle Routing Problems 101	ORION at UPS paper (skim to get the gist)	n/a
Date	27-Mar	29-Mar	31-Mar
Topic	Descriptive Analytics & Simulation Modeling	Simulation Modeling	Virtual lab (no in-person class)
Preparatory Reading	Loten (2020) WSJ Article	Heizer et al (2019) pp. 791-800	n/a
Date	3-Apr	5-Apr	7-Apr
Topic	Supply Chain Network Design (SCND)	Module review	Exam 3 (Lab based)
Preparatory Reading	Coyle et al (2013) - SCND Chapter	n/a	n/a
Date	10-Apr	12-Apr	14-Apr
Topic	Optimization and Simulation Modeling in ALX	SCND Case Study	SCND Case Study
Preparatory Reading	Ivanov (2019) pp. 9-26	Ivanov (2019) pp. 27-40	n/a
Date	17-Apr	19-Apr	21-Apr
Topic	SCND Case Study	SCND Case Study	SCND Case Study
Preparatory Reading	n/a	n/a	n/a
Date	24-Apr		
Topic	SCND Case Study		
Preparatory Reading	n/a		