Syllabus
IE 662– Predictive Analytics for Decision Making Fall 2024

Instructor	Dr. Luis Segura Office JS-312 Office hours: Monday and Wednesday, from 12:00 am to 01:00 pm
GTA	Naresh Koju Office: TBD Office hours: TBD
Lecture	Monday and Wednesday 04:00 pm to 5:15 pm, JS 203
Textbook	Zhang *et al.*, Dive into Deep Learning, Online Available: https://d2l.ai/ Rencher *et al.*, Linear Models in Statistics. John Wiley & Sons, 2008. This book can be downloaded at http://www.utstat.toronto.edu/~brunner/books/LinearModelsInStatistics.pdf Friedman J *et al.*, The Elements of Statistical Learning. New York, NY, USA, 2009. This book can be downloaded at https://web.stanford.edu/~hastie/ElemStatLearn/
Prerequisites	IE 560 (Probability and Statistics) or similar course

Course Description

This course will prepare students with various predictive analytics methods for manufacturing, healthcare, etc., which will be illustrated in examples. Different data types from real-world examples will be shown. Subsequently, it will be demonstrated how the predictive analytics methods can be used for better decision making. The methods will be implemented in non-programming based – standard software such as Matlab, Excel, and Minitab.

Learning Objectives

After taking this course, Students should be able to do the following:

- Understand the basics of predictive analytics
- Define the modeling and analysis problems in manufacturing, healthcare, etc.
- Implement the methods in non-programming based software (e.g., Excel, Minitab, Matlab)
- Use the results to enable decision making in each problem context
- Develop critical analysis on various preventive modeling approaches and their applications in industry
- Identify potential research areas on preventive analytics for decision making

Grading Scale:

A+ = 97 to 100%	A = 93 to < 97%	A - = 90 to < 93%
B+ = 87 to < 90%	B = 83 to < 87%	B - = 80 to < 83%
C+ = 77 to < 80%	C = 73 to < 77%	C - = 70 to < 73%
D+ = 67 to < 70%	D = 63 to < 67 %	D - = 60 to < 63%
Below 60% = F		

Grade Basis	Homework	10%
	Project Phase I	10%
	Project Phase II	20%
	Project Phase III	20%
	Test 1	30%
	Review Paper	10%
	Bonus	5%

Students with Disabilities

If you need accommodations because of a disability, please contact the Disability Resource Center http://louisville.edu/disability and communicate with the instructor by email no later than the first week of class.

General Communication Procedures
Communications will be sent to students' official university email addresses. It is the responsibility of students to check their University mailboxes on a regular basis. While sending an email to instructor, it is needed to put **IE662** in the subject of the email.

Academic Integrity Policy
Students are encouraged to work together and learn from each other. However, cheating in any form will not be tolerated. Refer to the Speed School Academic Integrity Statement located at:
http://louisville.edu/speed/academics/academicDishonesty

Class Policy
The honor system is an important part of your education at University of Louisville. I consider honor to be one of the highest traits of human character. As such, it is important that I make clear what is permissible with regards to student cooperation and working together.

Contingency Plans

- If the university transitions ALL courses to 100% online, a MS Teams meeting link will be provided on Bb to support online teaching. Video recordings will be provided on Bb.
- If a student falls ill or must quarantine, an email notification should be sent to the instructor ASAP. Compensation will be provided case-by-case.
- If the instructor falls ill, the GTA or a guest speaker will be invited to give lecture(s).

Homework Assignments

- Homework assignments (including reading assignments) are open book and open notes. You can use your laptops, too.
- Homework assignments can be online (i.e., on Bb) or in hard-copy format.
- Any online resources should be acknowledged (i.e., cite in APA format[1]).

Test

- Test will be closed book. You will be allowed to bring a calculator and one sheet (8.5" x 11") of notes, formulas, or examples to each test. You may write on both sides of the paper.
- No computer (e.g., laptop, tablet, phone) is allowed during a test.
- Test is to be an individual effort. There will be no communication of any kind (talking, sharing notes, sharing calculators, etc.) with anyone else.
- If I observe suspicious behavior during a test, I will remove you from the classroom and you will complete your test in an isolated location.
- Test missed in case of special situations (e.g. illness) may be considered on a case-by-case basis, pending submission of supporting documentation.

Project

- Project will be assigned in three phases:
  - Phase I: Project proposal, including problem definition, data plan, background, comprehensive literature review.
  - Phase II: Project methodology and evaluation, including methodology development, performance evaluation in numerical experiments, benchmark comparison.
  - Phase III: Project report in a paper format
- Project should be completed individually
- Project deliverables should be submitted on Bb

[1] https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/in_text_citations_the_basics.html#:~:text=When%20using%20APA%20format%2C%20follow,the%20end%20of%20the%20paper.

Review Paper

- Review paper should cover data modeling approaches improvements and applications to manufacturing, healthcare, etc.
- Review paper should be submitted on Bb

Use of Blackboard

I will use Blackboard (Bb) to post the syllabus, lecture notes, and announcements. I also use the Bb gradebookto post all your grades. Please check your grades in Bb to make sure I have the proper grade recorded for each assignment. Also, I will often use Bb to email messages to the entire class or select students – it is your responsibility to check your UofL email account regularly for these messages.

Technology Required for Class:

- A mobile computer to play with computer programs (e.g., Minitab, Excel, Matlab) http://louisville.edu/speed/academics/tabletPC

Title IX/Clery Act Notification

Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain **confidential** support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111).

Disclosure to University faculty or instructors of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is **not confidential** under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer. For more information, see http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure.

Computer Issues and IT Support: Speed IT staff are available by appointment from 9 am to 4 pm to assist you with your technology needs. You may schedule an appointment by sending a detailed email including any relevant error codes and screen snips at SPDHelp@Louisville.edu (preferred) or 502-852-7620.

COVID-related

As a Community of Care, all Cardinals are expected to abide by public health guidelines and regulations as published by the University. This includes:

1) wearing of cloth/paper masks (covering nose and mouth) when in shared indoor spaces like classrooms. (Per the July 2020 code of student conduct, a student who refuses to follow these guidelines may be asked to leave a classroom).
2) staying home when sick—any UofL community member experiencing fever, consistent dry cough, or other symptoms of contagious disease should remain at home until symptoms subside or advised that it is safe to return by a medical professional.
3) practicing good hygiene and responsibility for one's own surrounding.
    a. Cover sneezes and coughs
    b. Wash hands frequently with soap and water when possible, use hand sanitizer when soap and water are not available
    c. Wipe down frequently touched surfaces
    d. Maintain 6 feet physical distancing when possible

Faculty have the responsibility to help students meet these recommendations by:

1) SSoE instructors will allow students absent for reason of illness and/or quarantine to make up missed work and not penalize students for these absences
2) Notifying physical plant when classrooms are not adequately stocked with cleaning supplies and arranging classroom furniture or seating charts to maximize physical distancing where possible.

Topics

Topics covered in this course:

- T1: Introduction to predictive analytics
- T2: Types of data (e.g., signals, videos, images, etc.)
- T3: Decision making in real world (e.g., applications in manufacturing, health, etc.)
- T4: Preliminaries
    - Data manipulation
    - Data preprocessing
    - Basic linear algebra
    - Basic calculus
    - Probability
- T5: Ethics in data analysis
- T6: Data preparation and cleansing (e.g., Excel, MatLab, etc.)
- T7: Descriptive statistics
    - Data visualization (e.g., Excel, Minitab, Tableau, etc.)
    - Data reduction (e.g., R, Matlab, Excel, etc.)
- T8: Regression (e.g., Minitab, R, Matlab, etc.)
    - Linear regression
    - Multiple regression
- T9: Classification (e.g., Minitab, R, Matlab, etc.)
    - Logistic regression
    - Decision tree
    - Bagged and boosted approaches
- T10: Clustering (e.g., Minitab, R, Matlab, etc.)
    - Methods (centroid, density, hierarchical, etc.)
    - K-means, K-medoids, SVM, etc.

Week	Date	Monday	Wednesday
1	22-Aug	Syllabus, T1	T2
2	29-Aug	T3	T3
3	5-Sep	Labor Day (No Class)	Project Phase I – Project Proposal
4	12-Sep	Project Phase I – Project Proposal	T4
5	19-Sep	T4 (ICP 1)	T5
6	26-Sep	T5 (ICP 2)	T6
7	3-Oct	Mid-term Break	T6 & Project Phase II – Project Progress (In-person Session)
8	10-Oct	Review of T1~6	Test (Bonus Question)
9	17-Oct	INFORMS	INFORMS
10	24-Oct	T7	T7
11	31-Oct	T7	T8
12	7-Nov	T8	T8
13	14-Nov	T9	T9 (ICP)
14	21-Nov	T10 & Project Phase III – Project Final Revision (In-person Session)	Thanksgiving
15	28-Nov	Project Presentation	Project Presentation
16	05-Dic	Paper Review / Project Reports (Presentation, data, analysis files, etc.)	

Note: Instructor reserves the right to make changes in the syllabus, if needed. Students will be notified of the changes via their university emails, Bb or in class.

IE 561-50-4242
Developing Decision Support Systems with Excel
Course Syllabus – Spring 2024

Instructor Dr. Monica Gentili
Office: J.B. Speed Building, Room 200A
Virtual **Office hours**: By appointment (MS Teams required)
Phone: (502) 852-0143
Email: monica.gentili @louisville.edu
Teaching Method: 100% online asynchronous
Exams: 2 on line exams

COURSE

This course teaches the fundamentals of computer programming using Excel's macro language, Visual Basic for Applications (VBA), as the language of instruction. The course starts by teaching students to simplify and extend code generated by Excel's macro recorder and then builds on that base toward developing applications that analyze information and enhance decision making. This course also provides an introduction to the concepts and methods of Decision Science, which involves the application of mathematical modeling and analysis to management problems. It also provides a foundation for modeling with VBA in Excel.

PREREQUISITES: IE250

RECOMMENDED TEXT

There is not a required textbook. You can find all the material I will be illustrating in several books or even online. However, I will follow the following reference:

- S. Christian Albright, VBA for Modelers: Developing Decision Support Systems, 4th Edition (or higher)

ACADEMIC CALENDAR DATES

Classes Start	January 8, 2024 (Mon)
Last day to drop/add	January 10, 2024 (Wed)
Martin Luther King holiday	January 15, 2024 (Mon)
Last day to withdraw	February 6, 2024 (Tue)
Last day of classes/Final Exam (if needed)	February 26, 2024 (Mon)

SOFTWARE

Microsoft Excel 2013 or 2016

LAPTOP

Students will be expected to use Excel and VBA on their laptops.

COMPUTER ISSUES AND IT SUPPORT.

Speed IT staff are available by appointment from 9 am to 4 pm to assist you with your technology needs. You may schedule an appointment by sending a detailed email including any relevant error codes and screen snips at SPDHelp@Louisville.edu (preferred) or 502-852-7620.

TOPICS

- The Visual Basic Editor
- Recording Macros
- Starting with VBA
- Working with Ranges
- Control logic and Loops
- More on Variables and Subroutines
- User Interfaces
- Optimization in VBA

GRADE BASIS

Homework	20%
Exam 1	20%
Exam 2	20%
Project	40%

You may request a regrade of any question on an exam by submitting detailed explanation of the discrepancy, not to exceed one-half page in length. I will consider each case at the end of the term, but only if it appears that it may change your final grade. (We correct obvious arithmetic errors on the spot.)

GRADING SCALE

90 – 100	A
87-89	B+
81-86	B
77-80	C+
70-76	C
66 - 69	D+
60-65	D
<60	F

EXAMS

- There will be 2 exams. Both exams will be delivered on line.
- Exams will be open book, open notes.
- Tests are to be an individual effort. There will be no communicating of any with anyone else.
- Any instance of Academic Dishonesty will be reported to the Dean's Office. Additionally, the student will receive a 0 on the assignment in question.

If you miss an exam with a valid excuse (instructor's discretion), you have 7 calendar days to complete an oral makeup exam. Unless there are extenuating circumstances, failure to complete the makeup exam within one week of the actual exam will result in a score of zero for that exam

PROJECTS

You will be giving a ppt presentation to present your project. I will be evaluating not only the analysis and the code required for the project but also your ability to explain your analysis/methodology to others.

COMMUNICATIONS WITH THE INSTRUCTOR
Any time you have questions please write me an email to ask. I will do my best to answer within the next 48 hours. I will not extensively discuss assignments over email, but I am very happy to discuss assignments with you and provide feedback during virtual office hours. When emailing me, be sure to include **your name** and **IE 561** in the subject line.

VIRTUAL OFFICE HOURS
I will use MS Teams to hold my virtual office hours.
Identify a couple of date/times you would be available to meet and email me the identified time. When emailing me, be sure to include **your name** and **IE 561-50** in the subject line. Once I receive your email I will send you an MS Teams invitation. Do not forget to check your email for a confirmation of the date/and time for the meeting.

COURSE MATERIAL – USE OF BLACKBOARD
I will use Blackboard (Bb) to post all course material.
Recording of the lectures will be available on Bb for all students.
I will also use the Bb gradebook to post all your grades. Please check your grades in Bb to make sure I have the proper grade recorded for each assignment. Also, I will often use Bb to email messages to the entire class or selected students; it is your responsibility to check your UofL email account regularly for these messages. When emailing me, be sure to include **your name** and **IE 561-50** in the subject line.

STUDENTS WITH DISABILITIES:
If you need accommodations because of a disability, if you have emergency medical information to share with the instructor, or if you need special arrangements in case the building must be evacuated, please see the instructor after the first class meeting or make an appointment to discuss your needs as soon as possible.

ACADEMIC INTEGRITY:
The honor system is an important part of your education at University of Louisville. I consider honor to be one of the highest traits of human character. I have outlined several of my class policies regarding homework, in-class exercises and exams below. For further information please refer to the Speed School Academic Integrity Statement located at:
http://louisville.edu/speed/academics/academic-affairs/engineering-fundamentals/student-affairs/complaints.html

TITLE IX/CLERY ACT NOTIFICATION
Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain **confidential** support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111). **Disclosure to University faculty or instructors** of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is **not confidential** under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer.

For more information, see http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure.

SCHEDULE

Module #	Dates	Learning objectives	To-do-list and Assignments
Module 1	01/08-01/14	• Outline the basic structure of the Excel Object Model. • Articulate the uses of the different windows within the VBE. • Build a simple program using the VBE. • Record basic macros within the VBE. • Create a subroutine and declare variables. • Set up input boxes and message boxes. • Write and use Excel functions, VBA functions, and string functions. • Specify objects, properties, and methods	1. Complete the Introduction Forum. 2. Review the Module 1 lessons. 3. Attempt the practice exercises in the Module 1 lessons. **4. Complete Homework Assignment 1.** 5. **Review the project list and submit the choice of your own project**
Module 2	01/15-01/21	• Specify and work with ranges to automate common, simple operations within VBA. • Utilize If...Then and Select...Case statements. • Write code designed to handle errors that occur when an application is running	1. Review the Module 2 lessons. 2. Attempt the practice exercises in the Module 2 lessons. **3. Complete Exam 1.**
Module 3	01/22-01/28	• Utilize For loops. • Utilize Do loops. • Differentiate between different types of For and Do loops	1. Review the Module 3 lessons. 2. Attempt the exercises in the Module 3 lessons. 3. Attempt the additional practice exercises. **4. Complete Homework Assignment 2.** 5. **Submit your project choice if you chose Option 2 or 3**.
Module 4	01/29-02/04	• Describe the characteristics and benefits of modular programs. • Determine the scope of variables and subroutines. • Differentiate between different scopes of variables and subroutines. • Utilize the Workbook_Event open handler. • Create a basic user form	1. Review the Module 4 lessons. 2. Attempt the practice exercises in the Module 4 lessons. 3. Complete Exam 2. 4. Submit your mid-term presentation.
Module 5	02/05-02/11	• Develop a bank account application that stores deposits and withdrawals and displays the current balance of a user's banking account.	1. Watch the video outlining the bank account application project and write the code explained in the video. **2. Complete Homework Assignment 3.**
Module 6	02/12-02/18	• Write VBA code to use the solver available in Excel to solve an optimization model.	1. Review the Module 6 lessons.
Module 7	02/19-02/25		1. Work on your project **2. Set a Team meeting with the instructor**
Module 8	02/26		**1. Submit your project**

University of Louisville
Department of Industrial Engineering

Syllabus
IE 645 – Simulation

Instructor:
Office:
Email:
TA:
Office Hours:
Communications: UofL email and blackboard announcement. Check these on a daily basis.

Textbook: Jeffrey S. Smith and David T. Sturrock, Simio and Simulation - Modeling, Analysis, Applications, 6th Edition.
(**Free online**: https://textbook.simio.com/books/SASMAA6.php#download)

Prerequisite: IE 360 or equivalent
Prerequisite by topic: Basic computer programming, fundamentals of probability and distribution theory

Course Description
The goal of this course is to give the student a basic working knowledge of the concepts of simulation modeling and analysis, especially as applied in the design and operation of both manufacturing-oriented and service-oriented systems. Following this course, students should be able to build and experiment with simulation models of manufacturing/service systems, and interpret the output of these models as an aid in the design and operation of these systems.

Grading Scale:

A+ = Above 97%	A = 93 to < 97%	A - = 90 to < 93%
B+ = 87 to < 90%	B = 83 to < 87%	B - = 80 to < 83%
C+ = 77 to < 80%	C = 73 to < 77%	C - = 70 to < 73%
D+ = 67 to < 70%	D = 63 to < 67%	D - = 60 to < 63%
Below 60% = F		

Grade Basis	Homework & Quiz	15%
	Lab assignment	15%
	Final Exam	25%
	Projects	45%

Students with Disabilities
If you need accommodations because of a disability, please contact the Disability Resource Center http://louisville.edu/disability and communicate with the instructor by email no later than the first week of class.

Academic Integrity Policy
Students are encouraged to work together and learn from each other. However, cheating in any form will not be tolerated. Refer to the Speed School Academic Integrity Statement located at:
http://louisville.edu/speed/academics/academicDishonesty

Hostile-free learning
To assure a safe learning environment and enhance academic freedom of expression, UofL requests that classroom settings and the course proceedings be harassment-free and non-discriminating. We will not challenge each other on a personal level, rather learn in good faith and honor, respect one another as adults, value our diversity and never demean each other by our critical comments. I will not tolerate any breach of this expectation.

Class Policies
The honor system is an important part of your education at University of Louisville. I consider honor to be one of the highest traits of human character. As such, it is important that I make clear what is permissible with regards to student cooperation and working together.

Homework (HW)

- HWs are open book and open notes. You can use any sources. If you need help with these HWs, you can schedule a meeting with me, too.
- The deadline for every HW is five days after the day it is posted on Bb. But you can submit the answer for that HW, on the 6th or 7th day after it is posted on Bb, and 10 points (out of 100 points for that HW) will be deducted because of the delay.
- HWs missed in case of special situations (e.g. illness) may be considered on a case-by-case basis, pending submission of supporting documentation.
- HWs will contain extra questions which are optional for undergraduate students, but required for graduate students.

Labs

- Labs are open book and open notes. You can use any sources. If you need help with these lab assignments, you can schedule a meeting with the GTA, too.
- Labs require attendance. GTA will supervise the labs. You will be required to complete a simple lab assignment per each lab and be graded during the lab class.
- The objective is to explore the functionality of Simio for discrete-event simulation analysis and debugging.
- As graduate students, you will be given additional challenges on each lab.

Test

- You can use your book and all the material that I post on Bb for the tests.
- The date and time for the final test at the bottom of the schedule. Final test includes all the chapters/material covered in this course.
- The detailed instructions for the test will be shared on Bb the week before the test.
- Test is to be an individual effort. There will be no communication of any kind with anyone else.
- Test missed in case of special situations (e.g. illness) may be considered on a case-by-case basis, pending submission of supporting documentation.

Projects

- You can use your book and all the material you can find for the projects.
- Projects should be completed individually.
- Two course projects will be assigned (see tentative class schedule).
- As graduate students, you will be given additional requirements and scenarios to model for each project, extending the challenge and requirement of understanding advanced concepts covered in class.

Use of Blackboard
I will use Blackboard (Bb) to post the syllabus, lecture notes, and announcements. I also use the Bb gradebook to post all your grades. Please check your grades in Bb to make sure I have the proper grade recorded for each assignment. Also, I will often use Bb to email messages to the entire class or select students – it is your responsibility to check your UofL email account regularly for these messages.

Items Required for Class:

- MS- Excel
- Simio (Please note that Simio is a Windows-based application)

Computer Issues and IT Support: Speed IT staff are available by appointment from 9 am to 4 pm to assist you with your technology needs. You may schedule an appointment by sending a detailed email including any relevant error codes and screen snips at SPDHelp@Louisville.edu (preferred) or 502-852-7620.

Title IX/Clery Act Notification
Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain **confidential** support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111).

Disclosure to University faculty or instructors of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is **not confidential** under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer. For more information, see http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure.

Tentative Schedule

Week	Date	Tuesday	Thursday
1		1: Syllabus, Introduction to Simulation	2: Types of Simulation / Prob & Stats Review
2		3: Basics Of Queueing Theory	4: Manual Simulation
3		5: Introduction to Discrete-Event Simulation & Application Examples	6: Introduction to Simio (1)
4		7: Introduction to Simio (2)	8: Debugging & Intermediate Modeling in Simio
5		9: Input Analysis & Time-Varying Arrival Processes	10: Lab 1 - Building a Simio Model
6		11: Output Analysis for Discrete-Event Simulation	12: Lab 2- Building a more complex Simio Model, Simio Debugging
7		14: Working With Model Data	15: Advanced Modeling in Simio, Part 1
8		Mid-term Break	16: Advanced Modeling in Simio- Part 2 – (Project 1 Distributed)
9		17: Lab 3	18: (Project 1 Approximation due)
10		19: Optimization via Simulation	20: Random Numbers (Project1 Model due)
11		21: Discuss Project 2 (Project 1 Report due)	22: Lab 4

12		23: Steady State Analysis (Project 2 Approximation due)	24: Digital Twins & Industry 4.0
13		25: Lab 5	26: Verification and Validation (Project 2 Model Due)
14		27: Lab 6	Thanksgiving Break
15		28: Review for Final (Project 2 Report Due)	Last Day of Class (Tentative Date for Final Exam)

Final date/time: TBD

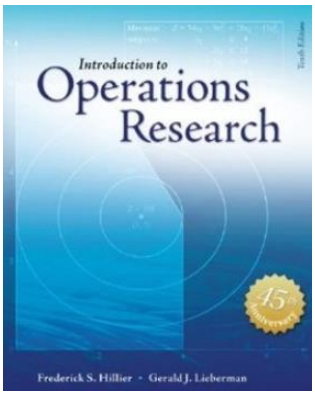
This is a TENTATIVE schedule, subject to adjustments as the semester progresses. Students will be notified of the changes via Bb, email

Note: Instructor reserves the right to make changes in the syllabus, if needed. Students will be notified of the changes via their university emails, Bb.

IE 646
Operations Research Methods
Fall 2024

Instructor Dr. Lihui Bai
office: 200 J.B. Speed Building
phone: (502) 852-9166
email: lihui.bai@louisville.edu
TA email: TBD
Office Hours: TBD
Communications: UofL Email and Blackboard Announcement. Check these on a daily basis.

Text: *Introduction to Operations Research (10th Edition)* by Frederick Hillier and Gerald Lieberman (ISBN 10: 0073523453, ISBN 13: 9780073523453). Published by McGraw Hill.



Learning Objective: By the end of this course you will be able to: 1) demonstrate mastery of linear and integer linear program concept, linear and integer linear program solution theory and linear program sensitivity concepts; 2) demonstrate mastery of network models; 3) demonstrate mastery of formulation and modeling skills for linear, network and integer linear programs; 4) demonstrate mastery of applying computer solution software (e.g., LINGO) to make recommendations with supporting evidence and logical rationales for a linear program, or network or integer linear program model that is developed for a real-world case; and 5) for graduate students, to demonstrate mastery of formulating a linear program, network and integer linear program models in computationally programmable and scalable fashion.

Prerequisite: ENGR 307 or MATH 407
Prerequisite by topic: Basic computer programming, linear algebra, differential calculus

Students with Disabilities:
If you need accommodations because of a disability, if you have emergency medical information to share with the instructor, or if you need special arrangements in case the building must be evacuated, please see the instructor after the first class meeting or make an appointment to discuss your needs as soon as possible.

Honor Policies
All work in this course will be under the University's Honor Code (https://louisville.edu/justiceadministration/stud-info/honor-code/honor-code.html). I will define authorized aid for all assignments and tests below. Should the instructor fail to define authorized aid for a specific assignment/test, it is the student's responsibility to seek such a definition.

Title IX/Clery Act Notification

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Speed IT:
Computer Issues and IT Support: Speed IT staff are available by appointment from 9 am to 4 pm to assist you with your technology needs. You may schedule an appointment by sending a detailed email including any relevant error codes and screen snips at SPDHelp@Louisville.edu (preferred) or 502-852-7620.

Homework Assignments

- Reasonable discussions among students are allowed in homework assignments. But the final write-up work must be individual effort.
- Homework due dates will be posted to Blackboard (Bb) along with the homework assignments.
- In some homework assignments, different questions are directed to undergraduate versus graduate students. Please read them carefully.
- NO late homework will be accepted.
- Lowest homework will be dropped in calculating your final letter grade.

In-Class Assignments

- In-class assignment is important for interactive learning and constant feedback.
- NO make-up will be made for in-class assignment.
- Lowest in-class assignments will be dropped in calculating your final letter grade.

Tests

- Tests are to be an individual effort. Any kind of communications (e.g., talking, sharing notes or books, sharing calculators, etc.) will not be tolerated.
- Tests will be closed book.
- In all tests, there will be questions designated specifically to undergraduate versus graduate students. Please read them carefully.
- One two-sided reference sheet may be used. No worked-out examples are allowed in the reference sheet, which will be turned in along with the test.
- All tests will contain conceptual questions (multiple choice or true/false), in addition to problem solving questions.
- Upon approval, a makeup test will be taken **one week before or after the actual test.**
- **Makeup tests will take the form of a combination of paper and oral exam.**

Case Study

- One case study will be given on by **XXX** and due on **XXX**.
- The case study can be an individual effort or a group effort with a maximum of three students for undergraduate students and a maximum of two students for graduate students.

Class participation

- Students participation in class including asking questions, answers questions, presenting group ideas, etc.
- Students participation in INFORMS tutoring sessions *with prepared questions.*
- Students participation in Blackboard discussions *with substantive and technically meaningful posts.*
- Students participation in office hours *with prepared questions.*

Extra Credit

- No extra credit assignments will be offered. Your final grade is determined by approximately 8 homework assignments (after dropping the lowest), in-class assignments, three tests and project.

Computer Usage
Students will use LINGO to solve linear programs and integer linear programs in homework assignments and case study throughout the semester. Two lectures will be devoted to programming in LINGO. However, feel free to contact me if additional assistance is needed.

Use of Blackboard and UofL email
I will use Blackboard (Bb) to post the syllabus, lecture notes, homework assignments and homework solutions. Be sure you check your grades from Bb regularly.

Grade Basis	Homework	10%
	Test 1*	18%
	Test 2*	19%
	Test 3*	18%
	Case Study	20%
	In class assignment	10%
	Class participation	5%
	**For any make-up exam, the oral and written portion will be 30% and 70%, respectively.*	

Scale for Final Course Grade	90 – 100	A
	80 – 89	B
	70 – 79	C
	60 – 69	D
	< 60	F
	Instructor reserves the right to assign plus or minus for the letter grade.	

TENTATIVE CLASS SCHEDULE

Dates	Topics	References
W1L1	Syllabus, Introduction to OR, Linear program (formulation)	Ch. 1-3
W1L2	Linear program (formulation)	Ch. 3
W2L1	Linear Program (formulation)	Ch. 3
W2L2	LP Formulation Recitation	Ch. 3
W3L1	Linear program graphical solution, Basic LP theory	Ch. 3
W3L2	Simplex method (I)	Ch. 4
W4L1	Simplex method (II)	Ch. 4
W4L2	Simplex Recitation	Ch. 4
W5L1	**Test 1**	**Ch. 1, 3, 4**
W5L2	Simplex method (III)	Ch. 4
W6L1	Test 1 review	Ch. 1, 3, 4
W6L2	LP formulation recitation extra (I)	Ch. 3
W7L1	LP formulation recitation extra (II)	Ch. 3
W7L2	LINGO tutorial (I)	Supplements
W8L1	Fall break, no class	
W8L2	Transportation, transshipment, assignment problems	
W9L1	Network model (I): shortest path problem	Ch. 10
W9L2	Network model (II): maximum flow problem	Ch. 10
W10L1	Network model (III): Applications/recitation of network models	Ch. 10
W10L2	Network flow Recitation (II)	Ch. 10
W11L1	**Test 2**	**Ch. 6, 9, 10**
W11L2	Integer program formulation (I); Case study	Ch.12
W12L1	Integer program: formulation (II)	Ch.12
W12L2	Integer program: formulation (III)	Ch. 12
W13L1	IP formulation Recitation (I)	Ch. 12
W13L2	LINGO tutorial (II)	Ch. 12
W14L1	IP formulation Recitation (II)	Ch.12
W14L2	IP formulation Recitation (III)	Ch.12
W15L1	Q&A on Case Study	Ch. 12
FINAL EXAM: TBD		**Ch. 3, 10, 12**

W#L# represents Week # Lecture #. This class meets twice a week.

Syllabus
IE 663 – Predictive Analytics for Decision Making II
Spring 2023

Instructor	Dr. Xiaoyu Chen Office JS-309 Office hours: TBD
GTA	TBD Office JS-309 Office hours: TBD
Lecture	TBD
Textbook	Zhang *et al.*, Dive into Deep Learning, Online Available: https://d2l.ai/.
Prerequisites	462/662 or similar Experience with Python IE 560 (Prob&Stats) or similar course

Course Description

This course provides an introduction to several classical and state-of-the-art machine learning methods and their applications for engineers. Fundamentals of linear model and shallow neural networks, multilayer perceptrons, and deep neural networks will be covered. Modern convolutional neural networks (CNN, including AlexNet, NiN, GoogleNet, ResNet, DenseNet), recurrent neural networks (RNN, including GRU, LSTM, Bi-LSTM, Transformer), and optimization techniques will be discussed with engineering examples implemented in Python.

Course Objectives

After taking this course, Students should be able to do the following:

- Understand the basics of machine learning, including classical and advanced machine learning models;
- Implement classical and advanced machine learning models in Python;
- Select, compare, and use an appropriate machine learning models in specific engineering applications;
- Create new model structures, implement in Python, and validate on data sets.

Grading Scale:

A+ = 97 to 100%	A = 93 to < 97%	A - = 90 to < 93%
B+ = 87 to < 90%	B = 83 to < 87%	B - = 80 to < 83%
C+ = 77 to < 80%	C = 73 to < 77%	C - = 70 to < 73%
D+ = 67 to < 70%	D = 63 to < 67 %	D - = 60 to < 63%
Below 60% = F		

Grade Basis	Homework	20%
	Project Phase I	10%
	Test 1	30%
	Project Phase II	20%
	Project Phase III	20%
	Bonus	5%

Students with Disabilities

If you need accommodations because of a disability, please contact the Disability Resource Center http://louisville.edu/disability and communicate with the instructor by email no later than the first week of class.

General Communication Procedures
Communications will be sent to students' official university email addresses. It is the responsibility of students to check their University mailboxes on a regular basis. While sending an email to instructor, it is needed to put **IE663** in the subject of the email.

Academic Integrity Policy
Students are encouraged to work together and learn from each other. However, cheating in any form will not be tolerated. Refer to the Speed School Academic Integrity Statement located at:
http://louisville.edu/speed/academics/academicDishonesty

Class Policy
The honor system is an important part of your education at University of Louisville. I consider honor to be one of the highest traits of human character. As such, it is important that I make clear what is permissible with regards to student cooperation and working together.

Contingency Plans

- If the university transitions ALL courses to 100% online, a MS Teams meeting link will be provided on Bb to support online teaching. Video recordings will be provided on Bb.
- If a student falls ill or must quarantine, an email notification should be sent to the instructor ASAP. Compensation will be provided case-by-case.
- If the instructor falls ill, the GTA or a guest speaker will be invited to give lecture(s).

Homework Assignments

- Homework assignments (including reading assignments) are open book and open notes. You can use your laptops, too.
- Homework assignments can be online (i.e. on Bb) or in hard-copy format.
- Any online resources should be acknowledged (i.e., cite in APA format[1]).

Test

- Test will be closed book. You will be allowed to bring a calculator and one sheet (8.5" x 11") of notes, formulas, or examples to each test. You may write on both sides of the paper.
- No computer (e.g. laptop, tablet, …) is allowed during a test.
- Test is to be an individual effort. There will be no communication of any kind (talking, sharing notes, sharing calculators, etc) with anyone else.
- If I observe suspicious behavior during a test, I will remove you from the classroom and you will complete your test in an isolated location.
- Test missed in case of special situations (e.g. illness) may be considered on a case-by-case basis, pending submission of supporting documentation.

Project

- Project will be assigned in three phases:
    - Phase I: Project proposal, including problem definition, data plan, background, comprehensive literature review.
    - Phase II: Project methodology and evaluation, including methodology development, performance evaluation in numerical experiments, benchmark comparison.
    - Phase III: Project report in a paper format.
- Project should be completed individually.
- Project deliverables should be submitted on Bb.

[1] https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/in_text_citations_the_basics.html#:~:text=When%20using%20APA%20format%2C%20follow,the%20end%20of%20the%20paper.

- Any online resources should be acknowledged (i.e., cite in APA format[2]).

Use of Blackboard
I will use Blackboard (Bb) to post the syllabus, lecture notes, and announcements. I also use the Bb gradebook to post all your grades. Please check your grades in Bb to make sure I have the proper grade recorded for each assignment. Also, I will often use Bb to email messages to the entire class or select students – it is your responsibility to check your UofL email account regularly for these messages.

Technology Required for Class:
- A mobile computer to play with Python computer programs.
  http://louisville.edu/speed/academics/tabletPC

Title IX/Clery Act Notification
Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain **confidential** support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111).

Disclosure to University faculty or instructors of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is **not confidential** under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer. For more information, see http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure.

Computer Issues and IT Support: Speed IT staff are available by appointment from 9 am to 4 pm to assist you with your technology needs. You may schedule an appointment by sending a detailed email including any relevant error codes and screen snips at SPDHelp@Louisville.edu (preferred) or 502-852-7620.

COVID-related
As a Community of Care, all Cardinals are expected to abide by public health guidelines and regulations as published by the University. For Spring 2023, this includes:

1) wearing of cloth/paper masks (covering nose and mouth) when in shared indoor spaces like classrooms. (Per the July 2020 code of student conduct, a student who refuses to follow these guidelines may be asked to leave a classroom).
2) staying home when sick—any UofL community member experiencing fever, consistent dry cough, or other symptoms of contagious disease should remain at home until symptoms subside or advised that it is safe to return by a medical professional.
3) practicing good hygiene and responsibility for one's own surrounding.
    a. Cover sneezes and coughs
    b. Wash hands frequently with soap and water when possible, use hand sanitizer when soap and water are not available
    c. Wipe down frequently touched surfaces
    d. Maintain 6 feet physical distancing when possible

Faculty have the responsibility to help students meet these recommendations by:

1) SSoE instructors will allow students absent for reason of illness and/or quarantine to make up missed work and not penalize students for these absences

[2] https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/in_text_citations_the_basics.html#:~:text=When%20using%20APA%20format%2C%20follow,the%20end%20of%20the%20paper.

2) Notifying physical plant when classrooms are not adequately stocked with cleaning supplies and arranging classroom furniture or seating charts to maximize physical distancing where possible.

Topics

Topics covered in this course:

- T1: Introduction to machine learning
- T2: Brief review of preliminaries
- T3: Linear Neural Networks
- T4: Multilayer Perceptron
- T5: Deep Learning Computation
- T6: Convolutional Neural Networks
- T7: Modern Convolutional Neural Networks
- T8: Recurrent Neural Networks
- T9: Modern Recurrent Neural Networks
- T10: Optimization Algorithms

Week	Date	Tuesday (TBD)	Thursday (TBD)
1	09-Jan	syllabus, T1 (Reading Assignment)	T2 (Homework Assignment 1)
2	16-Jan	T3	T3 (Project Phase I)
3	23-Jan	T3 (Homework Assignment 2)	T4
4	30-Jan	T4 (Reading Assignment)	T5
5	6-Feb	T5 (Project Phase II)	T6 (Homework Assignment 3)
6	13-Feb	T6	T7 (Reading Assignment)
7	20-Feb	T7 (Homework Assignment 4)	T7
8	27-Feb	Review of T1~7	Test (Bonus Question)
9	6-Mar	T8 (Project Phase III)	T8 (Reading Assignment)
10	13-Mar	Spring Break	Spring Break

11	20-Mar	T8 (Homework Assignment 5)	T9
12	27-Mar	T9 (Reading Assignment)	T9
13	03-Apr	T9	T10 (Homework Assignment 6)
14	10-Apr	T10 (Reading Assignment)	T10
15	17-Apr	T10	Project Presentation

Note: Instructor reserves the right to make changes in the syllabus, if needed. Students will be notified of the changes via their university emails, Bb or in class.