New Course EFD Template

PURDUE UNIVERSITY | College of Engineering

Engineering Faculty Document
No.: 61-24
October 25, 2023

TO: The Engineering Faculty

FROM: The Faculty of the Lyles School of Civil Engineering

RE: New graduate course – CE 56901: Smart Logistics

The Faculty of the Lyles School of Civil Engineering has approved the following new graduate course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

FROM:

CE 59700 Smart Logistics 3 credits

Fall 2021 (6); Fall 2020 (4)

No Prerequisites

TO:

CE 56901: Smart Logistics

Fall

Three total credits

No Prerequisites

Course Description: This course provides a foundation of analytical tools, methods and applications of logistics systems in the context of planning and operations of integrated supply chain systems. The material is useful for students interested in managing supply chain systems providing a background on where and how specific methods can be used for improving overall performance of the supply chain. The course is broadly divided into two parts: (1) Science of Logistics which provides an introduction to unique characteristics of supply chain management; demand forecasting, planning and management; inventory control and planning; operational transportation issues such as vehicle routing and supply chain contracts and network design. (2) Business of Logistics which discusses the applications of the science to real-world logistics systems. Real-world case studies from past problems will be the basis for discussion and will include the nature of costs in supply chain networks, operational issues, vehicle routing problems, interactions of carriers and shippers using auctions and yield management. The course will use intuitive arguments

and mathematical optimization tools will be used to illustrate many situations in a rigorous fashion.

RATIONALE:

The course fills a critical gap in the educational offerings related to supply chain management and logistics, focusing on both the scientific and business aspects of logistics systems. As supply chain networks become increasingly complex and integral to global commerce, there is a growing demand for professionals with a deep understanding of logistics from both a quantitative and a managerial standpoint. This course serves the need for specialized training in this area, offering a unique blend of theoretical models, practical tools, and real-world case studies. The course will also augment existing graduate programs that require expertise in operations research, supply chain management, and industrial engineering. This is the only course in civil engineering/transportation that fills this need.

Head/Director of the Lyles School of Civil Engineering

Link to Curriculog entry: https://purdue.curriculog.com/proposal:25616/form

CE 56901: Smart Logistics and Supply Chains

Instructor: Satish Ukkusuri
Professor
Lyles School of Civil Engineering
G167 D, HAMP Bldg.
Purdue University
West Lafayette, IN 47906
Email: sukkusur@purdue.edu

Prerequisite: Undergraduate calculus, basic knowledge of probability and statistics at the undergraduate level. Competency in using excel and VB for data analysis. As a graduate elective, this course is appropriate for students with an interest in learning about models and business aspects of logistics systems.

Credits: 3

Day/Time: TBD

Texts:

- No recommended text book. The material will be derived from various sources which will be distributed by the instructor
- (**LL**): Simchi-Levi, David; Chen, Xin; and Bramel, Julien. *The Logic of Logistics*, 2nd edition, Springer, 2005.
- (**UOR**): Chapter 6. Applications of Network Models. Urban Operations Research. Larsen and Odoni. http://web.mit.edu/urban_or_book/www/book/chapter6/contents6.html

Other References:

- Ahuja, R.K., Magnanti, T.L. and Orlin, J.B. *Network Flows: Theory, Algorithms and Applications*. Prentice-Hall Inc., 1993.
- Daganzo, Carlos, *Logistics Systems Analysis*, Fourth Edition, Springer, 2005.

Course Description:

This course provides a foundation of analytical tools, methods and applications of logistics systems in the context of planning and operations of integrated supply chain systems. The material is useful for students interested in managing supply chain systems providing a background on where and how specific methods can be used for improving overall performance of the supply chain. The course is broadly divided into two parts: (1) Science of Logistics which provides an introduction to unique characteristics of supply chain management; demand forecasting, planning and management; inventory control and planning; operational transportation issues such as vehicle routing and supply chain contracts and network design. (2) Business of Logistics which discusses the applications of the science to real-world logistics systems. Real world case studies from past problems will be the basis for discussion

and will include the nature of costs in supply chain networks, operational issues, vehicle routing problems, interactions of carriers and shippers using auctions and yield management. The course will use intuitive arguments and mathematical optimization tools will be used to illustrate many situations in a rigorous fashion.

Course Objectives:

A student completing this course is expected to:

1. Reinforce the integrated nature of logistics systems from tactical, operational and strategic perspectives, different actors in this system and the role of logistics systems as an economic driver.
2. Understand the basics concepts and models of demand prediction, inventory management, operational and tactical planning in supply chain management.
3. Demonstrate the ability to develop appropriate quantitative tools for planning and logistics problems using optimization techniques and solve them using appropriate solution algorithms, techniques and software.
4. Apply the science of logistics systems to improve the cost and overall efficiency of real world logistics problems

Tentative Course Outline:

Block 1 *Conceptual Foundation*

- Overview of Logistics Systems Management
- Different Actors in Supply Chains: Firms, Shippers and Carriers
- Basic Concepts in Probability & Statistics and Network Optimization

Block 2 *Science of Logistics Systems Modeling*

- Role of Supply Chain Modeling – Strategic, Tactical and Operational Issues
- Demand Forecasting Methods
- Inventory Control Methods
- Operational Networks (Costs and modeling interdependencies)
- Shipper Perspective – Strategies and approaches for design and management (Vehicle Routing Problem)
- Routing and Scheduling Algorithms
- Carrier Perspective and Yield Management

Block 3 *Business of Logistics Systems*
Applications of Methods to real world problems
Case Study 1: Improving the Logistics Handling of Dell Systems
Case Study 2: Optimizing Daily Dray Operations Across an Intermodal Freight Network
Case Study 3: Tactical Distribution Decisions in a Beverage Industry

Block 4 *Additional Topics (based on availability of time and interest)*

- Network Design
- Supply Chain Contracts
- Auction in Freight Supply Chains
- Intermodal considerations in Freight Modeling (Drayage, Logistics Handling)

Format: Classes will be in a combination of lecture and discussion. Students are expected to participate actively in class discussions.

Homework:

- Five problem sets will be given, and the analysis of these assignments will be the basis for some class discussion
- Problem sets are due at the beginning of class on designated days; late problem sets will not be accepted.

Grading Policy:

Problem Sets	30%
Exam I and II	30% each
Paper Review	10%

For the problem sets, you may (are encouraged to) discuss with other students but the final written solution should be your own work. The exams will be open notes.

Paper Review: Students are encouraged to implement or review a logistics systems approaches as they apply to the real world.

Online Students: The paper should be a review of a real world logistics issue including data, critique of the solution and recommendation of solutions that you think will work.

In class Students:
The paper must be scholarly and, if possible, should have some original input from the student. The paper should be prepared according to the guidelines of a conference paper.

Course Policies

Attendance

Attendance is required. We will record attendance at each class. More than two unexcused absences will lead to reduction of your class participation grade. Patterns of tardiness will also be a concern. If you are absent for a class, you are responsible for all class materials and information mentioned in the class.

Personal Technology

Please do not use a cell phone, laptop, or other personal devices for any purpose unrelated to the class. Instances of distracting behaviors such as texting and web-surfing will lead to reduction of your class participation grade without notice. Cell phones may be left on vibrate for emergency notification purposes. If you are expecting an important phone call, please inform me beforehand and I will understand if you leave the classroom to take a call.

Late Assignments

All assignments need to be turned in by due date. Late assignments will incur a penalty of 20% of the assignment grade per day, including weekends and holidays. Assignments turned in late due to computer and other technical problems will not be excused unless in emergencies. No extension will be given unless you provide me with official documentation (e.g., doctor's note in case of illness) in advance. It is your responsibility to keep track of the due dates indicated in the syllabus.

Email and Communication

You are responsible for reading and responding to email messages from instructors. Please expect a response to your emails within 48 hours during weekdays. If you have not heard back within 48 hours, please follow up to ensure that we have received your email.

Grief Absence Policy

Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for misses assignments or assessments in the event of the death of a member of the student's family. See the University's website for additional information: http://www.purdue.edu/studentregulations/regulations_procedures/classes.html

Accessibility and Accommodations

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247. See Disability Resource Center's website for additional information: https://www.purdue.edu/drc/

Mental Health
Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and http://www.purdue.edu/caps/ during and after hours, on weekends and holidays, or through its counselors physically located in the Purdue University Student Health Center (PUSH) during business hours.

Violent Behavior Policy
Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity. See the University's website for additional information: http://www.purdue.edu/policies/facilities-safety/iva3.html

Nondiscrimination
Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.
Purdue's nondiscrimination policy can be found at:
http://www.purdue.edu/purdue/ea_eou_statement.html

Ethics and Academic Integrity
"As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue." Here is a link to a web page for Purdue's Honor Pledge.
Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, Student Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breeches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.
See Purdue's student guide for academic integrity (https://www.purdue.edu/odos/academic-integrity/) for more information.

Campus emergencies
In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.
When we hear fire alarms or are instructed to leave the building, we will use stairways to immediately evacuate the building and gather at the emergency assembly area location: XX
When we hear all hazards sirens, immediately seek shelter (Shelter-In-Place) inside the building. This course of action may need to be taken during a tornado, earthquake, release of hazardous materials in the outside air, or a civil disturbance. When you hear the sirens immediately go inside a building to a safe location and use all communication means available to find out more details about the emergency. Remain in place until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.
For additional information, see: https://www.purdue.edu/ehps/emergency_preparedness/

Disclaimer
I reserve the right to change readings and assignments based on the progress of the class. All changes to the syllabus will be announced in advance.