PURDUE UNIVERSITY | College of Engineering

Engineering Faculty Document
No.: 78-24
February 26, 2024

TO: The Engineering Faculty

FROM: Logistics Systems Engineering Program Committee*, and School of Industrial Engineering

RE: New Engineering Major in Logistics Systems Engineering

The Logistics Systems Engineering Program Committee has approved the following **residential Interdisciplinary Professional Master of Science in Logistics Systems Engineering** under the Interdisciplinary Engineering Degree (IDE) program within the College of Engineering. This is now being submitted to the Engineering Faculty with a recommendation for approval.

DESCRIPTION:

The new Logistics Systems Engineering (LSE) major will support education across the broad set of skills within the evolving logistics ecosystem – supporting education in design, analysis, and control of logistics systems. Specifically supporting LSE topical areas such as autonomous systems, advanced materials and manufacturing, human-technology interfaces, network and value chain design and management, and decision making in logistics systems.

RATIONALE:

Logistics systems are pervasive in industry. As the number of manufactured goods and diversity of services continues to expand, and the technology to support movement of goods and people becomes more complex, the need to educate engineers across the logistics ecosystem is becoming more acute. Further, Indiana, as the "crossroads of America" has experienced a particularly visible increase in logistics activity within the state over the past several years. Hence, Purdue has a unique opportunity to support the continued expansion of logistics systems expertise within the region.

Young-Jun Son
James J. Solberg Head and Ransburg Professor
School of Industrial Engineering

*Logistics Systems Engineering Program Committee: Young-Jun Son (IE), Reem Khir (IE), Patrick Brunese (IE), Satish Ukkusuri (CE), and Amy David (DSB)

Link to Curriculog entry:

https://purdue.curriculog.com/proposal:27756/form

What is the focus of the major?

The new Logistics Systems Engineering (LSE) major will support education across the broad set of skills within the evolving logistics ecosystem – supporting education in design, analysis, and control of logistics systems. Specifically supporting LSE topical areas such as autonomous systems, advanced materials and manufacturing, human-technology interfaces, network and value chain design and management, and decision making in logistics systems.

How does this major benefit students?

Logistics systems are pervasive in industry. As the number of manufactured goods and diversity of services continues to expand and the technology to support movement of goods and people becomes more complex, the need to educate engineers across the logistics ecosystem is becoming more acute. Further, Indiana, as the "crossroads of America" has experienced a particularly visible increase in logistics activity within the state over the past several years. Hence, Purdue has a unique opportunity to support the continued expansion of logistics systems expertise within the region.

Estimated demand?

We expect between 5-10 new enrollments per academic year within the first two years. At steady state, the total enrollment will be between 30 and 45 students.

We anticipate that students will come predominately from engineering programs, either immediately after completing their BS degree (to further specialize in logistics systems engineering), or after some years of industry experience in logistics (or a similarly related area such as operations management/engineering), to enhance their career prospects, increase employability, or upskill to increase their knowledgebase.

Proposing University Unit

Purdue College of Engineering is proposing this new major.

Curriculum

The **residential Interdisciplinary Professional Master of Science in Logistics Systems Engineering** requires 30 credits.

Organization: The 30 credits are organized into the following groups

- Core Courses (7-9 credits)
- LSE Breadth Selectives (8-9 credits)
- Professional Focus Selectives (6 credits)
- Capstone Experience (6 credits)

Up to **6** credits may be taken as online (distance learning) courses. Remaining credits to reach 30 can be taken from area(s) of student preference.

Core Courses: All students must take 7-9 credits of LSE core courses, consisting of the following:

- One course (2-3 cr.) from Network and Value Chain Design and Management
- One course (2-3 cr.) from LSE Decision Systems
- One course (3 cr.) from Electrification and Autonomous Systems

LSE Breadth Selectives: All students must take 8-9 credits of LSE topic area courses

- Courses from at least two of the following areas: Smart Automation, Human-Technology Interfaces, and Advanced Materials and Manufacturing

Professional Focus Selectives: All students must take 6 credits of LSE topic area courses

- Two-to-three courses from an area of their choice.

Capstone Experience: All students must earn 6 credits in an Industry-sponsored Capstone project experience.

- IE 59801: LSE Capstone Project (to be established upon creation of the program)

Course Lists

These course lists will be reviewed and updated regularly by the LSE Committee members, with input from their respective faculties. All courses are 3 cr., unless otherwise noted.

LSE Topic Areas

Network and Value Chain Design and Management

Operations and Production Management

- IE 56600: Production Management Control;
- IE 57900: Design and Control of Production and Manufacturing Systems; or
- MGMT 57500: Supply Chain Technology (2 cr.); or
- MGMT 66000: Intro to Operations Management

Supply Network Design

- CE 56901: Smart Logistics; or
- IE 59000: Supply Chain Engineering and Analytics; or
- MGMT 56100: Logistics (2 cr.)

Facility Logistics

- IE 58200: Advanced Facilities Design
- IE 58300: Design and Evaluation of Material Handling Systems

Global Operations Design and Management

- MGMT 56600: Global Supply Chain Management (2 cr.)
- MGMT 56500: Strategic Sourcing and Procurement (2 cr.)

LSE Decision Systems

Modeling and Simulation

- IE 58000: Systems Simulation
- IE 53500: Linear Programming
- IE 53700: Discrete Optimization Models and Algorithms
- CE 66100: Algorithms in Transportation
- MGMT 56800: Supply Chain Analytics (2 cr.)

Artificial Intelligence and Machine Learning

- CE 54601: Data Science for Smart Cities
- ECE 57000: Artificial Intelligence
- IE 59000: Machine Learning and Its Applications; or
- ECE 50024: Machine Learning; or
- ME 53900: Introduction to Scientific Machine Learning

Smart Automation

Digital Integration

- CHE 55400: Smart Manufacturing in the Process Industries
- IE/MGMT 59000: Digital Transformation in Industrial Businesses
- ME 59700: Industrial IoT Implementation for Smart Manufacturing

Robotic Systems

- ECE 56900: Introduction to Robotic Systems
- IE 57400: Industrial Robotics and Flexible Assembly

Electrification and Autonomous Systems

Emerging Transportation Systems

- CE 59400: Transportation Systems Analysis
- IE 59000/EEE 59500: Urban Mobility Optimization

Autonomy and Autonomous Systems

- AAE 59000: Multi-Agent Autonomy and Control
- CE 56601: Network Models for Connected and Autonomous Vehicles
- ME 59700: Autonomous Systems
- CE 52601: Vehicular Cyber Physical Systems
- CE 59700: Machine Learning and Artificial Intelligence for Autonomous Vehicle Operations

Human-Technology Interfaces

- IE 55900: Cognitive Engineering of Interactive Software
- IE 58800: e-Work and e-Service
- SYS 51000: Tools and Methodologies for Designing Systems
- AAE 56000: System-of-Systems Modeling and Analysis
- IE 59000: Project Management
- MGMT 56200: Project Management (2 cr.)

Advanced Materials and Manufacturing

- MSE 56800: Additive Manufacturing of Materials
- MSE 58600: Experimental Characterization Of Advanced Composite Materials
- IE 59000: Nanomanufacturing