THE AGENDA OF AN INTENSIVE INTERNATIONAL EDUCATION PROGRAMME

MODERN TECHNOLOGIES IN LOGISTICS

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I. A brief description of the course

This intensive course provides a comprehensive introduction to logistics with a strong emphasis on modern technologies, digital tools and data-driven decision-making**.** Participants gain insight into the foundations of logistics and explore advanced technological solutions such as ERP and WMS systems, EDI communication standards, RFID identification, barcoding, inventory management concepts (including VMI), agent and voice-control technologies, and database systems. The course also includes extensive laboratory work, particularly in RFID applications and logistics process modelling using AnyLogic, therefore enabling hands-on experience with the tools shaping contemporary supply chains.

In an era of global disruptions, rapid digitalisation and increasing supply chain complexity, logistics is undergoing dynamic transformation. Companies require professionals who understand both the technological foundations and the analytical frameworks which drive resilience, efficiency and competitiveness. This course equips participants with knowledge aligned with current scientific developments in automation, simulation modelling, IoT-based identification systems and data processing. At the same time, it addresses the economic need for smarter, more agile logistics systems which can respond to market volatility, sustainability requirements and Industry 4.0 innovations.

Participants will develop practical skills allowing them to:

- Work with ERP and WMS systems to support operational decision-making,
- Implement and assess data identification technologies such as RFID and barcodes**,**
- Use EDI standards for electronic data interchange in supply chain settings,
- Apply VMI concepts to optimize inventory systems and supplier-client collaboration,
- Build simulation models in AnyLogic to analyse, test, and improve logistics processes,
- Understand the architecture of databases and agent-based technologies relevant to smart logistics solutions,
- Evaluate modern and emerging technologies and their role in shaping the future of logistics**.**

These competencies can be directly applied in warehousing, production planning, transportation management, supply chain coordination, digital transformation projects, and R&D-driven logistics process optimization.

The course is designed for:

- Students of logistics, management, engineering or related fields seeking a modern and practice-oriented introduction to logistics technologies.
- Early-career professionals working in warehousing, supply chain management, procurement, manufacturing or IT systems supporting logistics.

- Individuals planning to expand their competencies in Industry 4.0 logistics solutions or preparing for more advanced training in modelling, automation and digital supply chain tools.

Introducing participants to the current state of knowledge in the field of modern technologies in Logistics:

Description of course content topics

1. Logistics – the Essence.

Introduction to the fundamental concepts, functions and goals of logistics within modern supply chains. Participants explore logistics flows, the role of information and the relationship between logistics, competitiveness and customer service. The topic provides context for understanding why advanced technologies are essential in contemporary logistics systems.

2. Essence of Modern Technologies and Informatics Support in Logistics.

Overview of technological tools and IT systems used to enhance logistics processes. This module focuses on digital transformation, automation and the integration of information systems. Participants learn how ICT solutions support visibility, planning, coordination and decision-making across the supply chain.

3. Classification of Modern Logistics Technologies and Their Application Areas.

A structured review of technological categories applied in logistics, including identification technologies, communication systems, automation solutions and simulation tools. The module highlights where and why each class of technology is used in warehousing, transport, production or distribution environments.

4. ERP Systems – Enterprise Resource Planning.

Introduction to ERP architecture, core modules (procurement, inventory, production, sales) and data flows across the organization. The focus is on how ERP systems integrate logistics functions and support planning accuracy, resource management and real-time monitoring of operations.

5. WMS – Warehouse Management Systems.

Detailed presentation of WMS functionality such as receiving, put-away, picking, packing, replenishment and dispatching. Participants learn how WMS systems optimize warehouse efficiency, reduce errors and support human-technology interaction through mobile terminals, scanners and automated solutions.

6. EDI – Electronic Data Interchange.

Study of electronic data exchange standards enabling automated communication between supply chain partners. Participants explore EDI message formats, communication

protocols and the role of EDI in reducing lead times, errors and transaction costs in procurement and distribution processes.

7. VMI – Vendor Managed Inventory.

Presentation of the VMI model and its application in modern supply chain collaboration. The topic covers data-sharing requirements, benefits for suppliers and buyers, and technology enablers ensuring inventory visibility, demand forecasting, and replenishment automation.

8. RFID – Radio Frequency Identification.

Hands-on exploration of RFID technologies, including tag types, readers, communication principles, and system configuration. Laboratory exercises demonstrate how RFID improves traceability, automation, real-time inventory tracking, and error elimination compared to traditional identification methods.

9. Barcodes and Automatic Identification Systems.

Study of barcode standards, symbology, scanning technologies and industrial applications. Participants learn to design, analyse and apply barcode solutions in warehouse and transport environments, gaining practical experience with barcode generation and reading devices.

10. Logistics Process Modelling (AnyLogic) – Laboratory.

Extensive practical module introducing simulation modelling of logistics processes using AnyLogic. Participants learn to build and analyse discrete event, agent-based and hybrid models of warehouses, production systems or supply networks. The focus is on understanding process behaviour, identifying bottlenecks and supporting decision-making with simulation results.

11. Database Technology.

Introduction to database structures, relational models, SQL basics and the role of databases in logistics information systems. Participants learn how data is stored, processed and integrated across ERP, WMS and identification systems to support analytics and operational control.

12. Agent Technologies.

Overview of autonomous agent systems and multi-agent collaboration in logistics. The module explores concepts such as decentralized decision-making, swarm intelligence and AI-driven coordination of transport, warehousing or inventory systems.

13. Voice Solutions – Voice-Control Systems.

Presentation of voice-directed technologies used in warehousing and order picking. Participants learn about system architecture, benefits for ergonomics and efficiency, and practical scenarios involving voice-controlled work processes.

14. Logistics of the Future vs New Technologies.

A forward-looking summary addressing emerging trends such as IoT, AI, autonomous vehicles, drones, blockchain and smart logistics networks. Participants discuss future challenges and the role of technological innovation in shaping next-generation supply chains.

Learning outcomes

After completing the course, participants will gain a solid understanding of the key concepts, technologies and information systems which shape modern logistics. They will understand how tools such as ERP, WMS, EDI, RFID, barcode systems, simulation models and database technologies support decision-making, coordination and automation in contemporary supply chains. Students will also become familiar with the current trends and future directions of technological development in the logistics sector.

In terms of practical skills, participants will be able to operate selected logistics systems, apply automatic identification methods, use voice and agent-based solutions, and build basic simulation models of logistics processes using AnyLogic. They will learn how to interpret data flows, manage selected database functions, and apply concepts such as VMI and EDI to real supply chain situations. Through laboratory exercises, students will develop hands-on abilities useful in warehousing, inventory management and logistics process analysis.

Upon completing the course, students will be prepared to participate in technology-oriented logistics projects, collaborate with interdisciplinary teams, and critically evaluate technological solutions from functional and economic perspectives. They will understand the significance of continuous learning and digital transformation in maintaining competitive and efficient logistics operations, and will be able to responsibly apply modern technologies in professional practice.

The course aims to produce measurable and meaningful changes in participants' knowledge, skills and competencies. After completing the course, students will be able to understand, apply and critically evaluate the technologies and tools shaping contemporary logistics systems.

II. Duration, number of training hours and method of organisation

Training content	Number of hours	Form of organisation	
		Theoretical training	Practical training
1. Logistics – The Essence	2	2	
2. The Essence of Modern Technologies and Informatics Support in Logistics - 4H	4	4	
3. The Classification of Modern Logistics Technologies and Their Application Areas – 2h	2	2	
4. The ERP Systems – 5h	5	5	

5. WMS – Warehouse Management System -5h	5	5	
6. EDI – 4 h	4	4	
7. VMI – Vendor Manager Inventory – 3h	3	3	
8. FRID (Radio Frequency Identification) – 5h	5	2	3
9. Barcodes – 6h	6	3	3
10. Logistics Processes Modelling (Anylogic) – 12 h	12	4	8
11. Database Technology – 6h	6	6	
12. Agent Technologies – 2h	2	2	
13. Voice Solutions – Voice Control Systems – 3h	3	3	
14. Logistics of the Future vs. New Technologies- 1 h	1	1	

** a 60-hour course*

III. Prerequisites for the participants

Participants should possess basic knowledge of logistics or related fields such as supply chain management, production management or business operations. They are expected to understand fundamental concepts such as material and information flows, inventory, warehousing and transport processes. A general exploration of topics concerning the way organisations use information systems in daily operations is recommended.

In terms of skills, students should be able to work with standard computer applications, navigate digital environments, and interpret simple data or process descriptions. Analytical thinking, problem-solving ability and readiness to learn new technologies are important for successful participation in the course. No advanced programming or modelling experience is required, but openness to technical tools and digital systems will support effective learning throughout the training.

IV. Learning outcomes

A learning outcome category ***Knowledge***	**Description of the learning outcome (having completed the course, a student/ participant is able to...)**	**Verification criteria The participant:**
K1	The student knows and	– The student explains

	understands the key concepts, processes and functions of logistics in modern supply chains.	fundamental logistics concepts and terminology. – S/he defines the role of logistics in the economy and organizations. – S/he describes how material, information and financial flows are integrated.
K2	The student understands the role and capabilities of modern logistics technologies and information systems (ERP, WMS, EDI, RFID, barcodes, voice systems).	– The student describes the purpose and structure of selected logistics IT systems. – S/he compares different identification and communication technologies. – S/he explains how technology supports efficiency and decision-making.
K3	The student understands the principles of database operation and data management in logistics.	– The student identifies basic database structures. – S/he explains how logistics data is stored, processed, and used in systems. – S/he describes the importance of data quality and integration.
K4	The student understands the foundations and applications of simulation modelling (AnyLogic) and agent technologies in logistics.	– The student explains modelling concepts and simulation types. – S/he describes example use cases of simulation and agent systems in logistics. – S/he interprets results of simple simulation models.
K5	The student has knowledge of current trends and future challenges in logistics technologies (IoT, automation, AI, digitalisation).	– The student identifies major technological trends shaping the sector. – S/he explains their expected impact on logistics operations. – S/he discusses opportunities

		and risks of emerging technologies.
Skills	**Description of the learning outcome (having completed the course, a student/ participant is able to...)**	**Verification criteria The participant:**
S1	The student is able to use selected ERP and WMS functions to support operational logistics tasks.	– The student performs basic tasks in ERP/WMS (inventory checking, order processing, resource allocation). – S/he interprets system outputs relevant to logistics decisions.
S2	The student can apply automatic identification technologies (barcodes, RFID) in logistics processes.	– The student generates and reads barcode labels. – S/he performs RFID tagging and scanning in laboratory conditions. – S/he selects appropriate identification technology for a given task.
S3	The student is able to build and analyse basic simulation models of logistics processes using AnyLogic.	– The student creates simple process models (e.g., warehouse flows, queues). – S/he identifies model parameters and performance indicators. – S/he interprets simulation results to diagnose bottlenecks.
S4	The student can use EDI standards and VMI concepts in supply chain collaboration scenarios.	– The student identifies main message types in EDI. – S/he explains or simulates simple EDI communication flows. – S/he analyses inventory data to apply VMI principles.
S5	The student is able to interpret logistics data and use basic	– The student retrieves data using simple queries.

	database queries.	– S/he interprets datasets relevant to logistics decision-making. – S/he identifies data anomalies or inconsistencies.
S6	The student can select and evaluate appropriate technologies for specific logistics needs.	– The student justifies the choice of a system or tool. – S/he compares alternative technological solutions. – S/he provides functional and economic arguments.
Social competencies	**Description of the learning outcome (having completed the course, a student/ participant is able to...)**	**Verification criteria The participant:**
C1	The student demonstrates openness to technological innovation and continuous learning in a dynamic logistics environment.	– The student actively seeks information on new technologies. – S/he reflects on personal competencies and areas for development. – S/he participates constructively in discussions on innovation.
C2	The student shows readiness to work responsibly in technology-supported logistics processes.	– S/he follows safety, ethical, and data-handling principles. – S/he acts with accuracy and reliability when performing tasks. – S/he demonstrates responsibility for using digital tools appropriately.
C3	The student is able to collaborate effectively in interdisciplinary teams and communicate on logistics and technology-related topics.	– The student works constructively in group tasks and laboratory activities. – S/he shares information clearly and respectfully. – S/he engages in joint problem-solving in practical

		scenarios.
C4	The student demonstrates awareness of the economic and social impact of logistics technologies.	– The student discusses implications of digitalisation for labour, sustainability, and competitiveness. – S/he evaluates risks and benefits of technological adoption. – S/he recognises the broader context of logistics decisions.

V. Teaching programme and content

Class / Module topic	Range of topics	Form of classes	Number of hours	Learning outcomes
Logistics – The Essence	Introduction to Logistics and Its Importance. Historical Development of Logistics. Core Elements of Logistics Systems. Basic Logistics Concepts. Types of Logistics. Logistics vs. Supply Chain Management. Modern Trends and Challenges in Logistics	Interactive lecture	2	K1, K2, K4, K5 S4, S6 C1, C3,C4
The Essence of Modern Technologies and Informatics Support in Logistics	Why Logistics Needs Technological Transformation. Limitations of traditional, manual logistics systems. Drivers of change. Shift from reactive to proactive logistics through data-driven technologies. Digital Transformations in Logistics. Core Functions of Technology in Modern Logistics. Key Technologies Transforming Modern Logistics: Automation and Robotics, Internet of Things	Interactive lecture	4	K1, K2, K3, K4, K5 S2, S4, S5, S6 C1, C2, C3, C4

	(IoT), Artificial Intelligence and Machine Learning, Blockchain Technologies in Logistics, Cloud Computing. Informatics Support Systems in Logistics. Future Technologies, Ethics and Implementation Challenges.			
The Classification of Modern Logistics Technologies and Their Application Areas	Introduction to Classification and Its Purpose. Grounds for Classification ("Classification Criteria"). Classification by Supply Chain Function. Classification by Physical vs. Digital Technologies. Classification by Technology Generation. *Cross-Functional and Emerging Technologies. Emerging & Disruptive Technologies* Integration-Level Classification. Classification by Application Domain.	Interactive lecture	2	K1, K2, K4, K5 S5, S6 C1, C3, C4
The ERP Systems	Introduction to ERP Systems. Evolution from MRP → MRP II → ERP. Core Components of ERP. ERP in the Context of Logistics. ERP System Architecture and Technical Foundations. New Trends in ERP Architecture. ERP in Logistics and Supply Chain Management. ERP Systems in Practice. ERP Implementation Process. Most common challenges of ERP implementation	Interactive lecture	5	K1, K2, K3, K5 S1, S5, S6 C1, C2, C3, C4
WMS – Warehouse Management System	Foundations of WMS and Its Role in Modern Logistics. Difference Between WMS and IMS (Inventory Management	Interactive lecture	5	K1, K2, K3, K5 S1, S2, S5, S6

	System). The Role of WMS in the Logistics Chain. Historical Evolution of WMS. Core Warehouse Functions Supported by WMS. WMS Types, Tiers, Deployment Models and Architecture. Data Flows in WMS. Systems Integration. Warehouse Layout & WMS Configuration. Technologies Enabling Modern WMS. WMS Implementation Lifecycle. WMS Implementation Challenges and Best Practices. WMS of the Future.			C1, C2, C3, C4
EDI	Evolution of EDI in Logistics. The Role of EDI in the Supply Chain. Key Document Types in EDI. EDI Components, Standards & Technical Workings. Real-Time Integration with ERP, WMS, TMS. Error Handling & Acknowledgments. Comparison with Alternatives: APIs & Blockchain. EDI in Logistics Operations. EDI Standards and Protocols. Case Studies of EDI in Industry. EDI Implementation Lifecycle. Benefits, Risks and Future of EDI.	Interactive lecture	4	K2, K5 S4, S6 C2, C3, C4
VMI- Vendor Manager Inventory	Definition and Foundations n of VMI. Historical Context & Evolution. VMI Models and Their Application Contexts. Stakeholders and the Importance of Collaboration. VMI: Advantages, Limitations & Risks. VMI Operational Process	Interactive lecture	3	K2, K5 S4, S6 C1, C2, C3, C4

	Flow. VMI and Logistics Integration. Technology Enablers for VMI. Measuring VMI Performance (KPIs). VMI Implementation Lifecycle. Challenges, Best Practices and Future Trends.			
FRID (Radio Frequency Identification)	History and evolution of RFID systems. Physical principles of radio wave communication (frequency ranges: LF, HF, UHF, microwave). Comparison with barcode and NFC technologies. Structure and operation of RFID systems: tags, antennas, readers, middleware. Tag memory organization and encoding schemes. Communication protocols and anti-collision mechanisms. Connecting RFID with ERP, WMS and MES. Middleware architecture and API communication. Data acquisition, filtering and event management. Tag selection and placement optimization. Antenna configuration and signal testing. Setting up RFID readers and middleware interfaces. Team-based project: design and justify an RFID solution for a chosen logistics or production scenario. ROI analysis, implementation	Lecture, Interactive discussion, Laboratory classes	5	K2 S2 C1, C2, C3

	roadmap and presentation of results.			
Barcodes	History and evolution of barcode technology. Structure and functioning of 1D and 2D barcodes. Basic terminology and concepts of automatic identification (AIDC). GTIN, SSCC, GLN, and other identifiers. Traceability and serialization principles. Standardization in international logistics and manufacturing. Barcode scanners, printers, mobile terminals. Label design and printing software. System architecture and data flow. ERP, WMS, MES and IoT connectivity. Data exchange and process automation. Case studies of digital supply chain integration. Process mapping and event registration. Data capture, analysis and visualization. Team project: design of a barcode-based identification system. Justification, documentation and presentation of results. Peer review and reflection.	Interactive lecture, Interactive discussion, Laboratory classes	6	K2 S2 C1, C2, C3
Logistics Processes Modelling	Basics of Java. Basic knowledge of object	Lecture Laboratory	12	K4, S3, C1, C2, C3, C4

(Anylogic)	modelling. Basic knowledge of production systems and their analysis. Introduction to AnyLogic. Preliminary continuous model. Tutorial – production system: - Warehouse, - Transport, - Production station, - 3D visualisation, - Building statistics and analysing simulation results, - Basics of optimisation using the OptQuest module.	classes		
Database Technology	Introduction to the Database Technology. Types of the Databases. Strategic role of the Database Technology in Logistics. Integration of the Databases with ERP, WMS and TMS. Future Trends in Logistics Database Technology.	Interactive lecture	6	K2, K3 S2, S3 C1, C2, C4
Agent Technologies	Key Characteristics of Agents. Components and Decision Cycle of an Agent. Classification of Agents. Applications of Agent Technologies in Logistics. Benefits of Agent-Based Logistics Systems. Implementation Challenges and Risks. Future Trends in Agent Technologies.	Interactive lecture	2	K4, K5 S3, S6 C1, C3, C4
Voice Solutions – Voice Control Systems	Foundations of Voice Solutions in Logistics. How Voice Solutions Work: Workflow and Architecture. Key Enabling Technologies. Applications of	Interactive lecture	3	K2, K5 S6 C1, C2, C3, C4

	Voice Solutions in Logistics. Benefits of Voice Systems. Implementation Process. The Future of Voice Solutions			
Logistics of the Future vs New Technologies- 1 h	Introduction – The Logistics of 2035 and Beyond. Hyper-Automation in Logistics. Logistics in Space. Digital Twins in Supply Chain Management. Metaverse and Virtual Reality in Logistics. Quantum Computing. Bio-logistics – Learning from Nature. Sustainability as the Future Battleground. Human and Social Dimensions. Future Scenarios and Strategic Questions.	Interactive lecture	1	K5 S6 C1, C2, C3, C4

Name of the subject / thematic unit	**No. of hours**
Logistics – The Essence	2
The Essence of Modern Technologies and Informatics Support in Logistics	4
The Classification of Modern Logistics Technologies and Their Application Areas	2
The ERP Systems	5
WMS – Warehouse Management System	5
EDI	4
VMI – Vendor Manager Inventory	3
FRID (Radio Frequency Identification)	5
Barcodes	6
Logistics Processes Modelling (AnyLogic)	12
Database Technology	6
Agent Technologies	2
Voice Solutions – Voice Control Systems	3
Logistics of the Future vs New Technologies	1

VI. Equipment and teaching aids

Equipment necessary for conducting the classes

1. Multimedia projector or large-format display screen
2. Instructor computer with presentation capabilities
3. Student workstations or laptops (individual or shared, depending on group size)
4. Stable high-speed internet connection
5. Whiteboard RFID readers and antennas
6. RFID tags (various types for demonstration)
7. RFID management software: tools for tag configuration, data filtering and system integration (e.g. Impinj Speedway Connect, Zebra RFID Data Service).
8. Computer workstations with installed software for data analysis (e.g. MS Excel, Access).
9. Sample products, labels or packaging for practical exercises or flipchart with markers.
10. Computer workstations with barcode design and database integration software (e.g. BarTender, MS Access, Excel).
11. Barcode printers (thermal transfer and direct thermal) and supplies (labels, ribbons).
12. Barcode scanners (1D and 2D types, handheld and fixed-mount) and mobile data terminals.
13. Barcode verification devices compliant with ISO/IEC 15416 for print quality control.
14. Lecture slides and multimedia presentations.
15. Worksheets and practical task instructions for ERP, WMS, RFID and AnyLogic labs.
16. Case studies illustrating logistics technologies in real industry scenarios.
17. Documentation and manuals for software tools.
18. Sample datasets for database and modelling exercises.

Suggested teaching methods

1. Lectures with Multimedia Presentations
2. Laboratory Classes and Hands-On Exercises
3. Demonstrations of Technologies and Tools
4. Case Studies and Problem-Based Learning
5. Group Work and Collaborative Projects
6. Discussion Sessions and Guided Debates
7. E-learning or Supplementary Online Materials
8. Individual Consultations or Feedback Sessions

VII. Teaching materials

Primary literature:

1. Hao Yu (2025). Smart Logistics in Industry 5.0. Taylor & Francis Group. – 218 p.
2. Ken Lyon, John Manners-Bell (2022). Logistics and Supply Chain Innovation: A Practical Guide to Disruptive Technologies and New Business Models. Kogan Page, The Limited. - 416 p.
3. Cigdem Gonul Kochan (2022). Logistics 4. 0: Digital Transformation of Supply Chain Management. Taylor & Francis Group. – 368 p.
4. Mac Sullivan, Johannes Kern, Mac Sullivan, Johannes Kern (2021).The Digital Transformation of Logistics. Demystifying Impacts of the Fourth Industrial Revolution. Wiley-IEEE Press. – 480 p.
5. John Manners-Bell, Ken Lyon (2019). The Logistics and Supply Chain Innovation Handbook: Disruptive Technologies and New Business Models, 1st Edition. Kogan Page. – 280 p.
6. Wanpracha Art Chaovalitwongse (2017). Supply Chain Management and Logistics: Innovative Strategies and Practical Solutions. Taylor & Francis Group. – 266 p.
7. I. Grigoryev, *AnyLogic 6 in three days : a quick course in simulation modeling*. AnyLogic North America, 2012.
8. „AnyLogic Help". Access: 28 December 2025. [Online]. https://anylogic.help/
9. Finkenzeller Klaus, RFID Handbook: Fundamentals and Applications (3rd ed.), Wiley, 2010
10. Miles Stephen B., Sarma Sanjay E., Williams John R., RFID Technology and Applications, Cambridge University Press, 2008
11. McEnroe Paul V., The Barcode: How a Team Created One of the World's Most Ubiquitous Technologies, Silicon Valley Press, September 19, 2023
12. Palmer Roger C., The Bar Code Book: A Comprehensive Guide to Reading, Printing, Specifying, Evaluating, and Using Bar Code and Other Machine-Readable Symbols, Trafford Publishing, October 16, 2007
13. Sadalage P. J., Fowler M., NoSQL Distilled [DRM], Pearson Education, London 2012

Supplementary literature:

1. What is logistics? Definition, meaning and all the essentials. – https://online.uj.ac.za/updates/what-is-logistics-definition-meaning-and-the-essentials-of-logistics-management

2. Understanding Logistics: Definitions, Origins, and Business Implications. - Understanding Logistics: Definitions, Origins, and Business Implications • BA Notes
3. The Evolution of Logistics: From Ancient Trade to Modern Supply Chains. - https://slm.mba/mmpo-005/evolution-of-logistics-ancient-trade-modern-supply-chains
4. 9 Key Modern Logistics Challenges Demystified: Everything You Need to Know! - https://www.a3logics.com/blog/modern-logistics-challenges
5. Logistics Transformation: Key Trends Shaping 2025. - https://www.dbschenker.com/global/insights/blog/logistics-transformation-key-trends-shaping-2025-1831910
6. KPMG International. (2025). Key trends impacting supply chains in 2026. - https://kpmg.com/xx/en/our-insights/operations/supply-chain-trends-2026.html
7. DHL. (2025). *Logistics industry trends*. https://www.dhl.com/discover/en-global/logistics-advice/essential-guides/logistics-industry-trends
8. KPMG International. (2025). *Key trends impacting supply chains in 2026*. - https://kpmg.com/xx/en/our-insights/operations/supply-chain-trends-2026.html
9. PortCity Logistics. (2025). *Logistics trends to watch in 2026*. - https://portcitylogistics.com/logistic-trends-2026/
10. SupplyChainBrain. (2025). *Supply chain uncertainty likely here to stay in 2026*. - https://www.supplychainbrain.com/articles/43011-supply-chain-uncertainty-likely-here-to-stay-in-2026
11. Slimstock. (2025). *Supply chain trends 2026*. - https://www.slimstock.com/blog/supply-chain-trends-2026/
12. Warehouse automation: What it is and why it matters. - https://www.netsuite.com/portal/resource/articles/inventory-management/warehouse-automation.shtml
13. Digital Transformation in Logistics: Key Drivers, Challenges, and Sustainable Solutions for the Modern Supply Chain. - https://twasp.info/public/paper/April%202025%20-logistics.pdf
14. Transforming Logistics Management: The Role, Challenges and Opportunities of ICT Integration. - 007-0005(2025).pdf
15. Four Technology Problems Facing Logistics & How to Overcome Them. - https://aag-it.com/4-technology-problems-facing-logistics
16. The Role of Technology in Modern Logistics. – https://www.robinwaite.com/blog/the-role-of-technology-in-modern-logistics
17. Innovation in Logistics: The Role of Technology in Modern Supply Chains. - https://www.ucumberlands.edu/blog/role-of-technology-in-modern-supply-chain
18. Supply Chain Technology. - https://aims.education/supply-chain-technology-impact-types-and-future

19. The Role of ERP in Supply Chain Management. - https://www.netsuite.com/portal/resource/articles/erp/supply-chain-management-erp.shtml
20. The value of ERP in supply chain management. - https://www.sap.com/resources/supply-chain-management-erp
21. The Power of ERP in Managing Supply Chains in 2026. - https://www.top10erp.org/blog/erp-supply-chain
22. ERP Implementation: 17 Common Challenges (And How To Overcome Them). - https://www.forbes.com/councils/forbestechcouncil/2024/05/03/erp-implementation-17-common-challenges-and-how-to-overcome-them
23. 7 Key ERP Implementation Challenges and Risks. - https://www.netsuite.com/portal/resource/articles/erp/erp-implementation-challenges.shtml
24. Core Functions of a Modern Warehouse Management System (WMS). - https://www.postalparcel.com/modern-warehouse-management-system-guide
25. The Complete Guide to Warehouse Management Systems. Understanding Features, Costs, and Future Trends. - https://www.logiwa.com/complete-guide-to-warehouse-management-systems
26. Unlocking Efficiency: How Do Warehouse Management Systems Work? - https://www.generixgroup.com/en/blog/unlocking-efficiency-how-does-wms-work-in-modern-warehousing
27. EDI Logistics: The Complete Guide to Electronic Data Interchange in 2025. - https://www.shipbob.com/blog/edi-logistics
28. What Are EDI in Logistics, and How Do They Work? - https://www.orderful.com/blog/edi-logistics
29. EDI vs. APIs: Understanding the Differences and Choosing the Right Solution. - https://www.orderful.com/blog/edi-vs-api
30. What is vendor managed inventory (VMI)? - https://www.sap.com/resources/what-is-vendor-managed-inventory-vmi
31. What is Vendor Managed Inventory (VMI)? Supply Chain Explained. - https://throughput.world/blog/vendor-managed-inventory-vmi
32. Vendor Managed Inventory (VMI): What It Is & A Complete Guide. - https://www.finaleinventory.com/inventory-planning-software/vendor-managed-inventory
33. Vendor Managed Inventory (VMI) Performance. - https://kpidepot.com/kpi/vendor-managed-inventory-vmi-performance
34. Vendor-Managed Inventory Programs: How to Choose the Right KPIs. - https://optimas.com/vendor-managed-inventory-programs-how-to-choose-the-right-kpis

35. 33 Inventory Management KPIs and Metrics for 2025. - https://www.netsuite.com/portal/resource/articles/inventory-management/inventory-management-kpis-metrics.shtml
36. How to transform global supply chain operations with agentic AI. - https://www.ey.com/en_us/insights/supply-chain/revolutionizing-global-supply-chains-with-agentic-ai
37. The what, why and how of agentic AI for supply chain management. - https://www.cio.com/article/4093231/the-what-why-and-how-of-agentic-ai-for-supply-chain-management.html
38. Transform Supply Chain Logistics with Agentic AI. - https://aws.amazon.com/blogs/industries/transform-supply-chain-logistics-with-agentic-ai
39. Naveen Krishnan. AI Agents: Evolution, Architecture, and Real-World Applications. - https://arxiv.org/html/2503.12687v1
40. Warehouse management with voice picking system. - https://industryinsider.eu/automation-and-production-lines/voice-picking-system-in-a-warehouse
41. Voice Solutions in Warehouse and Logistics: Enhancing Efficiency and Accuracy. - https://digitalidin.ai/voice-solution
42. 7 Ways Voice AI in Logistics Is Revolutionizing Supply Chain Management. - https://insighto.ai/blog/7-ways-voice-ai-is-optimizing-logistics-and-supply-chain-management
43. Bagci Ergun, RFID Systems Design for Potential Applications: Functional Analysis and Concepts, LAMBERT Academic Publishing, 2011
44. Iddrisu Abdul-Rahim, The Barcode Blueprint: Evolution and Impact on Supply Chain, Independently published, March 26, 2024
45. Chopra S., Supply Chain Management: Strategy, Planning, and Operation, Global Edition, PEARSON Education Limited, London 2018

VIII. Verification and evaluation of achieved learning outcomes

Form of assessment	Description	Share in the final mark (%)
Written test – single-choice closed questions. Credit is granted on the basis	During the classes, students receive all information. To get a satisfying mark for evaluation student must take the exam. The final grade is the arithmetic mean of the final examination.	The Final Mark is based entirely on

of the Exam.	Each question is worth 1 point – a maximum of 60 points can be obtained. Assessment: • 57 to 60 points – very good 5.0 • 51 to 56 points – good plus 4.5 • 45 to 50 points – good 4.0 • 39 to 44 points – satisfactory plus 3.5 • 31 to 38 points – satisfactory 3.0 • 0 to 30 points – unsatisfactory 2.0	the exam.

IX. Certificate template

Project title: "Development of Intensive International Education Programmes and Their Implementation as an Element of the Development of University Offers"

Project number: BPI/SPI/2024/1/00017

Name of Polish coordinating institution contracted with NAWA: The International University of Logistics and Transport in Wroclaw

CERTIFICATE / CONFIRMATION
of completion

Name of learning activity (forms of support):	Purpose of activity (forms of support):	Method of implementation:
Modern Technologies in Logictics – intensive international course.	Development of skills, knowledge and competences necessary for using modern technologies in logistics.	Participation in an intensive international educational programme including lectures, case study analysis, project tasks, teamwork, and laboratory classes.

Emily Smith, born 15.03.1997

.....

[*participant identification: name and surname, date of birth*].

Organiser / Institution awarding the certificate The International University of Logistics and Transport in Wroclaw ..... [*Name of institution*].	
Duration of the educational activity from: ..... until:	Workload: 60 teaching hours ..... [Number of teaching hours or other units of workload]

Name of the competences acquired (developed)	Description of the learning outcomes for individual competences [broken down into: knowledge, skills, social competences for each competence].	Assessment criteria:
1. Understanding and using modern technologies in logistics	Knowledge: Knows and understands the key concepts, processes and functions of logistics in modern supply chains. Understands the role and capabilities of modern logistics technologies and information systems (ERP, WMS, EDI, RFID, barcodes, voice systems). Understands the principles of database operation and data management in logistics. Understands the foundations and applications of simulation modelling (AnyLogic) and agent technologies in logistics. Has knowledge of current trends and future challenges in logistics technologies (IoT, automation, AI, digitalisation). Skills: Is able to use selected ERP and WMS functions to support operational logistics tasks. Can apply automatic identification technologies (barcodes, RFID) in	1. Correctly explains fundamental logistics concepts and terminology. 2. Defines the role of logistics in the economy and organizations. 3. Describes how material, information and financial flows are integrated. 4. Describes the purpose and structure of selected logistics IT systems. 5. Compares different identification and communication technologies. 6. Explains how technology supports efficiency and decision-making. 7. Identifies basic database

	logistics processes. Is able to build and analyse basic simulation models of logistics processes using AnyLogic. Can use EDI standards and VMI concepts in supply chain collaboration scenarios. Is able to interpret logistics data and use basic database queries. Can select and evaluate appropriate technologies for specific logistics needs. Social competences: Demonstrates openness to technological innovation and continuous learning in a dynamic logistics environment. Shows readiness to work responsibly in technology-supported logistics processes. Is able to collaborate effectively in interdisciplinary teams and communicate on logistics and technology-related topics. Demonstrates awareness of the economic and social impact of logistics technologies.	structures. 8. Explains how logistics data is stored, processed, and used in systems. 9. Describes the importance of data quality and integration. 10. Explains modelling concepts and simulation types. 11. Describes example use cases of simulation and agent systems in logistics. 12. Interprets results of simple simulation models. 13. Identifies major technological trends shaping the sector. 14. Explains their expected impact on logistics operations. 15. Discusses opportunities and risks of emerging technologies. 16. Performs basic tasks in ERP/WMS (inventory checking, order processing, resource allocation). 17. Interprets system outputs relevant to logistics decisions. 18. Generates and reads barcode labels. 19. Performs RFID tagging and scanning in laboratory conditions. 20. Selects appropriate identification technology for a given task. 21. Creates simple process models (e.g., warehouse flows, queues). 22. Identifies model parameters and performance indicators. 23. Interprets simulation results to diagnose bottlenecks. 24. Identifies main message types in EDI. 25. Explains or simulates simple EDI communication flows. 26. Analyses inventory data to apply VMI principles. 27. Retrieves data using simple queries. 28. Interprets datasets relevant to logistics decision-making.

		29. Identifies data anomalies or inconsistencies. 30. Justifies the choice of a system or tool. 31. Compares alternative technological solutions. 32. Provides functional and economic arguments. 33. Actively seeks information on new technologies. 34. Reflects on personal competencies and areas for development. 35. Participates constructively in discussions on innovation. 36. Follows safety, ethical, and data-handling principles. 37. Acts with accuracy and reliability when performing tasks. 38. Demonstrates responsibility for using digital tools appropriately. 39. Works constructively in group tasks and laboratory activities. 40. Shares information clearly and respectfully. 41. Engages in joint problem-solving in practical scenarios. 42. Discusses implications of digitalisation for labour, sustainability, and competitiveness. 43. Evaluates risks and benefits of technological adoption. 44. Recognises the broader context of logistics decisions.

Confirmation of the validation of learning outcomes:

I hereby confirm that the validation/evaluation of the learning outcomes has been carried out in a way that is appropriate to the competences acquired, respecting the principles that ensure the separation of the learning process from the validation (the person verifying the learning outcomes was not the person providing the training). During the classes, students receive all information. The Final Mark is based on 100% Exam – written form. Assessment:

- 57 to 60 points – very good 5.0
- 51 to 56 points – good plus 4.5
- 45 to 50 points – good 4.0

- 39 to 44 points – satisfactory plus 3.5
- 31 to 38 points – satisfactory 3.0
- 0 to 30 points – unsatisfactory 2.0

On……(date), student received …….. points on the exam. The final grade is…….