

Material Handling and Transportation Technologies

Code: 42651
ECTS Credits: 6

Degree	Type	Year	Semester
4313489 Logistics and Supply Chain Management	OB	1	2

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External teachers

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Use of Languages

Principal working language: english (eng)

Prerequisites

None

Objectives and Contextualisation

The course considers the issues related to material handling and transportation technologies.

After the course students are expected to be able:

- to analyse material transport systems (construction features, facilities and equipment).
- to analyse material storage systems (construction features, facilities and equipment).
- to explain material unitizing procedures and security requirements in material handling system.
- to use material identification systems
- to select the most appropriate means of transport for cargo transportation
- to create and analyse the main transport documents for cargo transportation
- to understand parameters that influence the efficiency of the material handling and transportation system

Competences

- Address problems of management and coordination of logistics operations in production, transport and services in a holistic approach, by means of the consistent application of the supply chain management concepts and strategies, taking into account the pertinent aspects of environment, human capital, quality, technology, and economics.
- Analyse, organise and discuss situations in logistics in order to identify and model the dependency relationships, influence and impact that usually occur in the main performance indicators and quality factors as well as evaluating their complexity.
- Demonstrate abilities in oral and written communication both in the student's native language and in English. Demonstrate synthesis skills and ability in presentation techniques.

- Demonstrate information management skills: ability to retrieve and analyse information from different sources.
- Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context
- Select and apply the most relevant analytical methodologies, strategies and current technologies for designing solutions to the problems of management and coordination of material, information and financial flows.
- Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent
- Work collaboratively in a group.

Learning Outcomes

1. Address LSCM problems by using a holistic approach, taking into account technological aspects, such as the suitability and performance of technologies in material handling being used.
2. Demonstrate abilities in oral and written communication both in the student's native language and in English. Demonstrate synthesis skills and ability in presentation techniques.
3. Demonstrate information management skills: ability to retrieve and analyse information from different sources.
4. Identify material handling problems and specify requirements for MHT functionality, performance and automation technologies.
5. Know and apply methods to calculate materials handling performance.
6. Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context
7. Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent
8. Understand the typical materials handling techniques in logistics.
9. Understand the working principles, operational modes, application constraints and automation opportunities in material handling and transport.
10. Work collaboratively in a group.

Content

The course demonstrates the basic principles of cargo handling and transportation, provides the classification of equipment intended for cargo handling and transportation (cargo gripping mechanisms, devices for removing cargo, belt conveyors, cargo transfer equipment, dedicated devices, etc.). The course also considers the issues of storage facility organization, purposes and functions. It describes possible mechanical and automated equipment for material handling operations. It describes also material unitizing procedures and security requirements in material handling system. Students are also introduced to the main cargo labelling and identification systems. During the course students have at least one - two industrial visits, if there would not be any official restrictions and limitations for group meetings.

List of topics/themes/sessions:

- General description of transport systems;
- Combined transport systems;
- Characteristics of cargo units;
- Cargo packaging;
- Containerization;
- Labelling and identification of cargo units in logistic systems;
- Basic principles of cargo handling, cargo handling systems;
- Functions and objectives of transport terminals and warehouses;
- Structure, description and costs of operations at transport terminals and warehouses;
- Piece goods handling terminals. Liquid cargo handling terminals. Bulk cargo handling terminals;
- Mechanical and automated equipment for implementing technological processes at transport terminals and warehouses;

- Characteristic elements of mechanical and automated equipment. Classification of load lifting and transportation machine;
- Flexible elements (chains, ropes, cables) of load lifting machines. Load-grappling devices. Rope pulley blocks. Brakes;
- Mechanical equipment for transport works. Simple lifting mechanisms. Pullers;
- Load lifting mechanisms;
- Cranes. Cantilevers and bridge cranes;
- Loaders. Container loaders;
- Automated equipment for transport works. Classification and characteristics of continuous machines;
- Belt conveyors and specialized equipment. Conveyors and shifting machines;
- Gravity transfer devices;
- Estimation of productivity of transport machines;
- Operating safety of cargo loading equipment. Methods and devices for the diagnostics of vehicle loading equipment;
- Design of cargo handling systems.
- Performance calculation in intralogistics.

Methodology

Teaching will be offered on campus or in an on-campus and remote hybrid format depending on the number of students per group and the size of the rooms at 50% capacity.

The course is organized by means of traditional lectures combined with seminars and practical work. The learning process will combine the following activities:

- Theory lectures: Understanding the material handling and transportation system
- Practical sessions: Small group sessions in applying theoretical concepts (exercises and problems).
- Student presentations: Analytical work with scientific literature and other sources of information. Structuring information about the specific topic with practical examples.
- Study project: Performance calculations in intralogistics. Material flow analysis in a production company.
- Autonomous work

The proposed teaching methodology may undergo some modifications according to the restrictions imposed by the health authorities on on-campus courses.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical sessions	20	0.8	1, 9, 8, 4, 3, 6, 10
Theory lectures	45	1.8	1, 9, 5, 8, 4
Type: Supervised			
Student presentations	24	0.96	1, 9, 8, 4, 3, 2
Type: Autonomous			
Mastering in the lectured course material	38	1.52	1, 9, 5, 8, 4, 7, 3
Study project	20	0.8	5, 7, 3, 6, 10

Assessment

The proposed evaluation activities may undergo some changes according to the restrictions imposed by the health authorities on on-campus courses.

The final grade will be calculated from the assessment of different evaluation activities:

- Study project: Performance calculations in intralogistics. Material flow analysis in a production company.
- Practical exercises: Practical in class exercises on the topics discussed during lectures
- Student presentations: Individual small oral presentations of the given research topic
- Oral exam. Students have to answer theoretical questions and solve case studies on the topics discussed during lectures

In order to average all the evaluation activities, the mark of each of them must be above 4 points (out of 10). All the report-based activities must be submitted within the due dates specified by the professor. If a report-based activity is failed, the student will be asked to re-submit the report according to the corrections/indications provided by the professor. If the exam is failed, the student will have the opportunity to retake it. The dates for retaking an exam will be communicated to the student well in advance.

The weights of each evaluation activity are given in the table below.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Oral exam	40%	2	0.08	1, 9, 5, 8, 4, 2
Practical exercises	20%	0	0	1, 9, 8, 4, 3, 6, 10
Student presentations	10%	1	0.04	1, 9, 8, 4, 3, 2
Study project	30%	0	0	5, 7, 3, 6, 10

Bibliography

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8. Frazelle, E: World-class Warehousing And Material Handling; McGraw-Hill, USA, 2002
9. Harrison, A.; Hoek, R.: Logistics Management and Strategy. Competing through the Supply Chain, 3rd edition, FT Prentice Hall, 2008
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Software

No specific S/W is foreseen

